NATURAL HISTORY TRANSACTIONS

OF

NORTHUMBERLAND, DURHAM,

AND

NEWCASTLE-ON-TYNE,

BEING PAPERS READ AT THE

MEETINGS OF THE NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE,

AND THE

TYNESIDE NATURALISTS' FIELD CLUB, 1890-94.

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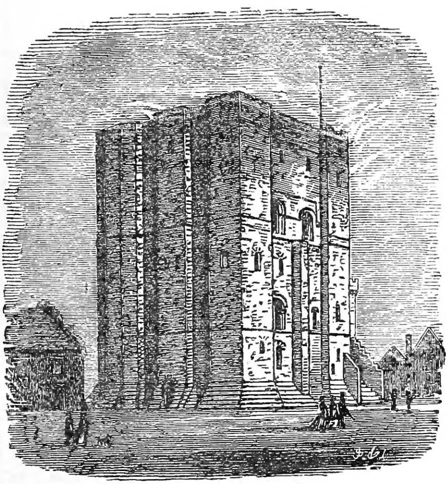

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THE Committees of the two Societies beg to state that the Authors alone are responsible for the facts and opinions contained in their respective papers.

RICHARD HOWSE, *Editor.*

CONTENTS OF VOL. XI.

LIST OF ILLUSTRATIONS, VOL. XI.

John Hancock

NATURAL HISTORY TRANSACTIONS

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

I.—*Memoir of the Life of John Hancock.* By D. Embleton, M.D.

John, the subject of this memoir, the fourth child and third son of John Hancock, was born in his father's house, Nos. 49 and 50, at the north end of Tyne Bridge, Newcastle-upon-Tyne, on the 24th of February, 1808, and died on the 11th of October, 1890, at No. 4, St. Mary's Terrace, Newcastle-upon-Tyne. His grandfather, Thomas Hancock, of whose ancestors I find no certain record, was a saddler and ironmonger, and had a shop on Tyne Bridge before its destruction by the great flood in 1771; his name, however does not occur in the list to be found in Sykes' Local Records of the sufferers from that catastrophe. After that occurrence he established himself and carried on his business till his death in the house above named. In Whitehead's (the first) Directory of Newcastle, 1778, under the heading 'Hardware Shops,' we find, at page 24, "Hancock, Thomas opposite Tyne Bridge end."

He married the younger of the Misses Baker, of whose relatives we only know that they were by the maternal side allied to the family of Henzells, who, with the Tisacks or Tyzacks and Tytterys, brought the art of glass-making to Tyneside and Staffordshire in the latter half of the 17th century. See *Gentleman's Mag.*, Vol. CC. and CCI. The elder Miss Baker, being in Holland, a Dutch gentleman, a lawyer, named Van Paas, fell in love with her at first sight, obtained an introduction to and married her; of this marriage there were four children, who all died early. A painting of this family Miss Hancock possesses.

The younger Miss Baker, who was married to Thomas Hancock, gave him two sons, John and Henry. The latter, who was talented, never married, and died about the year 1850. The former joined his father in business after leaving school, but the shop and trade disgusted him; Natural History was his delight, and all the time he could spare he devoted to it. In the memoir of his son Albany* it was recorded that he became distinguished for his acquirements in that absorbing study, for his collections of specimens in its different branches, and for his library of the best books on Natural History, at a time when he and his friends were almost the only students of nature in his native town. He was certainly much in advance of his time in the above pursuit. From him his children no doubt derived the steadfast love and success in the study of his favourite science, which have made the names of Albany and John Hancock celebrated, not only in their own country but wherever Natural History pursuits are held in honour. Not only were they men of mark each in his special department, but with their sister Mary were artists in the true sense of the term.

John, whose loss we all have had recently to mourn, was, as his surviving sister Mary informs me, from his earliest years very fond of birds; at Bensham, where their father had taken a house, he, then a little fellow of about four years, used to run about in the fields after birds trying to catch them. In 1812, after his father's death at the early age of 43 years, his mother furnished a house beyond the Windmill Hills, Gateshead, which in those days was quite in the open country, and so was nicknamed 'Botany Bay,' and there John and his sister Mary had their summer enjoyments in hunting the fields and hedges for flowers, birds, and insects. After a few years John was sent to school with the Misses Prowitt, who had succeeded their father and mother in the management of a then celebrated seminary for young ladies and gentlemen, situated at the bottom of an entry leading eastward from Pilgrim Street towards the Carliol Croft, nearly opposite to the present Hood Street, and where there was a considerable open space for recreation and an absence of smoke.

* Nat. Hist. Trans. of Northumberland and Durham, Vol. V., p. 118.

All the children were at the same school. There, John was quite a favourite with Miss Anna Prowitt, the younger of those ladies, and there he learnt the rudiments at least of drawing. Thence he went to learn arithmetic, etc., at the school of Mr. Henry Atkinson, on the High Bridge, at that time the best in the town. How long he attended that school, and whether he ever went to any other, there is nothing to show. There can be no doubt that the early education both of John and Albany was only rudimentary.

During the summer season the family would go to the seaside, and John, and Mary, whom he lovingly called his 'little wife,' used to wander about the banks and sandhills at Tynemouth and Cullercoats, [= Culvercotes] where they discovered several insects and plants new to them, and were constantly together. Similarly Joshua and Miss Alder were loving companions, and in each case death only separated them.

At home during the long winter evenings they had large social gatherings—scenes of pure and mirthful enjoyment, as was related in the Notice of the Life of Joshua Alder, in Vol. I. of the Nat. Hist. Trans. of Northumb. and Durham, p. 324. They had private theatricals, puppet shows, games, and dances. John was often the life and soul of the party, and used, after the elders had retired, to dance about grotesquely in the exuberance of his spirits; he paid much attention to the little ones—young wallflowers whom he thought neglected or shy; was very sensitive himself, and keenly alive to dangers threatening others; was enthusiastic and passionate, and both he and Albany were early accurate observers of the forms and colours of objects.

After leaving school he joined his oldest brother Thomas, who became the business man of the family, though he also had inherited a love of Natural History, at the shop at the Bridge end; but after a time finding, like Joshua Alder and his brother Albany, business to be irksome, and longing for freedom to follow the bent of his mind, he entered into an arrangement with Thomas that he might quit the shop for ever. From that time up to 1826 we know little of him except that he was absorbed in his favourite pursuit of plants, insects, shells, and birds, especially those of Northumberland and Durham; that he began taxidermy, and frequented the workshop of Mr. R. R. Wingate, then the well-known, respected, and skilful stuffer of birds, etc., in Newcastle.

He joined a band of naturalists, friends who were in the habit of making summer excursions to different parts of the district surrounding Newcastle, favourite places being the seaside, Prestwick Carr, Tanfield, Tyneside, etc., where most of the objects of their studies were to be found. The members used to meet every Wednesday evening at each other's house in rotation, to enjoy each other's society, and discuss their discoveries and their pet theories. The following are the names of those who commonly attended those pleasant evening meetings:—William Hutton, Joshua Alder, George Burnett, W. C. Hewitson, George Wailes, William Robertson, John Thornhill, R. B. Bowman, the Rev. George C. Abbs, Albany and John Hancock, and occasionally other friends. These excursions and evening meetings were the forerunners of the Natural History Society of Northumberland and Durham in 1829, and of the Tyneside Naturalists' Field Club in 1846.

When quite a young man John thought it no trouble or fatigue to start from home at three o'clock in the morning, walk to the seaside and back, after a storm at sea or during the seasons of the migrations of birds, to observe the forms and habits of those which he was sure to find there; and being an excellent shot, he was enabled readily to secure specimens for his museum and for study at home. By degrees, and through the encouragement and indulgence of his mother and sisters, their house became a real museum; his treasures and those of his brother Albany not only filled the single room which was at first devoted to their collections, but overflowed into almost every other apartment of the house.

In January, 1829, he observed and pointed out, for the first time in England, the specific differences between the Wild Swan or Whooper, *Cygnus ferus*, and the then newly-noticed and smaller Swan, the *Cygnus Bewickii*. In Vol. I., p. 1, Transactions of the Natural History Society of Northumberland and

Durham, there appeared a paper in 1831, by Mr. R. R. Wingate, entitled "Notice of a New Species of Swan," of which paper John Hancock, in his admirable "Catalogue of the Birds of Northumberland and Durham," thus modestly writes at page 145: "Mr. Wingate's notice was read on the 20th of October, 1829, and published the following year" (in the Transactions above named) "but by some unaccountable inadvertency my specimen was not alluded to." And yet these two men had been old friends. John's specimen, the subject of his discovery, is in the Museum of the Society. Soon after the publication of Mr. R. R. Wingate's paper another appeared in the same volume, by P. J. Selby, Esq., F.R.S.E., more minutely describing the bird than Mr. Wingate had done. "Mr. Yarrell read at the meeting of the Linnæan Society on February 19th, 1830, a description of the bird, which was published in the Transactions of that Society, Vol. XVI., page 445, 1833. He had previously (November 24, 1829) given some account of the distinguishing characters of this Swan to the Zoological Club of the above Society."* It was Yarrell who in 1829 gave the specific name '*Bewickii*' to the new Swan.

In the year 1833 John went with his friends Mr. W. C. Hewitson and Mr. Benjamin Johnson on an expedition to Norway, to collect specimens of Natural History generally,—birds' skins and eggs, insects and plants, and especially to add to our knowledge of the breeding places of those birds which migrate from Norway to England to pass the winter months in our milder climate. This was rather a bold enterprise at that time, when no Englishmen had as yet found their way across the North Sea to rent, and catch salmon in, the rivers of Norway, and where the facilities of travel and accommodation in that country were peculiar, and very unlike those of the present day. They left Newcastle on board a Scotch brig, and arrived at Trondhjem in seven days. After necessary preparation they started thence on foot for the north, with a cart to carry their stores of food, their implements, and collections. The northern part of their journey was by boat, and thus they were enabled to visit and explore

* Catalogue of the Birds of Northumberland and Durham, p. 145.

various islands, mountains, fiords, waterfalls, and lakes; they penetrated to the island Bodö, south of the Lofóden group, but a little within the Arctic circle, and where the sun was visible at midnight. They kept a journal of their expedition, illustrated by Mr. Hewitson's sketches, drawings from which were afterwards made by Mr. T. M. Richardson, Jun., and they drew out a map of their track, which was added to Mr. Hewitson's journal.—See "Memoir of Life of Mr. W. C. Hewitson, Nat. Hist. Trans. North. and Durh., Vol. VII., p. 223. They had so much difficulty at times in obtaining ordinary food that they were obliged to subsist on the birds they shot, and once when on an island, to which they were confined by stormy weather, they had to fast for twenty-four hours, with only a little tea and sugar, the last of their stores. Their expedition lasted three months. In August they landed at Leith, on their way to Newcastle. They brought home a valuable collection of skins and eggs of birds, plants, insects, etc., and much new information on the ornithological subjects in quest of which chiefly they went abroad, had been obtained. Some of the plants collected are in the possession of Miss Hancock. In 1834 Mr. Hewitson read a portion of his journal before the Natural History Society of Northumberland and Durham, and in 1835, "Notes on the habits of Birds observed by him in Norway." A few notes also "On the Ornithology of Norway" were contributed to the second volume of Jardine's Magazine of Zoology. His journal was not published in the Nat. Hist. Trans. of the time. In 1833 Messrs. Hewitson and Hancock presented to the Natural History Society skins of thirteen species of birds, seven species of shells, and 143 species of plants from Norway. Both before and after that date Hancock, up to 1836, had presented numerous specimens of birds' skins.

In their early days of manhood John and Albany had in contemplation the projection of a work on British Birds, with plates, to be published in quarto. This work was dropped, for John found that they had not stuffed birds enough to enable them to follow up their project at that time, though he had already executed some of the drawings. Both were for some years engaged in drawing objects of Natural History, in modelling in clay, and casting in plaster. Albany accomplished a fair bust or two, and John some statuettes. Soon after these John modelled in plaster a Greenland Falcon, with hood at its feet; a small Eagle, with outspread wings, cast in a beautiful bronze made by himself, from an antique receipt, at the Gallowgate works of his friend Mr. James Burnett; he also executed

A group of Woodpeckers, now in the upper Western Corridor, in plaster.

Do. of two small Leopard Cubs, do. do.

Do. of Lions attacking Giraffes, do. do.

Do. of Peregrine Falcon and Weasel attacking a Grouse, in plaster.

Two Eagles, in hardened lead, at entrance of Museum grounds, from casts in plaster, now in the Vestibules of the Museum.

An Iceland Falcon, in silver, for the Duke of Leeds, as a prize for the Falconry Club of Loo in Holland.

He made casts of the eggs of the Great Auk, and coloured them so deftly that it was difficult at first sight, or on casual inspection, to point out among a number of what appeared or were said to be eggs of that bird which of them were genuine and which fictitious, and it was only when the surfaces were carefully scrutinized that the difficulty was solved.

John also tried his hand at wood engraving, after the manner of his old friend Thomas Bewick, and not without success; an impression from one of his blocks, showing a gorged Iceland Falcon, has been very appropriately prefixed to the "Guide to the Central Hancock Bird Room," which can be had at the Museum. Miss Hancock has kindly presented the above block, together with three others of John's engraving, to the Museum, Impressions of these are given on Plates I., II.

The blocks figured, are as follow:—

1st attempt.—A small bird—a Pipit, imperfect, in 1845.
2nd ,, —A Blue Titmouse, in 1845.
3rd ,, —The Falcon mentioned above, in 1845.
4th ,, —A small Butterfly. (See tail-piece.)

In 1845 he accompanied his friend Mr. W. C. Hewitson on an expedition to Switzerland, where John applied himself especially to the observation of birds and the collection of their eggs and skins, whilst his friend devoted himself to the study of the diurnal Lepidoptera, and in these pursuits they mutually aided each other.

They left London for Antwerp on the 8th of June, thence they passed up the Rhine to Cologne and Basel, then on to Berne, Thun, and Kandersteig, the Gemmi and Leukerbad. Having examined the three last localities, Hewitson at times on horseback and John always on foot, each with his butterfly net, and John in addition carrying a gun slung over his shoulder, they proceeded down the Valais, and encountered the mosquitoes of Martigny; by the Col de Balme they crossed over to Chamounix, examining that valley from the Mer de Glace to La Flegère. Returning to the Gemmi for additional research they afterwards made their way by Grindelwald and Interlachen to Thun, Berne, and Luzern. Here the friends parted, Hewitson going to Italy with some ladies, Hancock alone to Belgium, and then to England, where he arrived on August 22nd.

One can imagine his delight on hearing the Nightingale on the banks of the Rhine, for the first time in his life, and witnessing the Storks and their lofty nests; also at discovering, in the Canton Valais, the Alpine Swift, the Ptarmigan, the Alpine Crow, the Shrike, and a flock of Hoopoes, and at being able to purchase of Herr Anderegg, near Leukerbad, the skin of the Lämmergeier which now conspicuously adorns and almost lives again in our Museum. He visited the Museum of Berne, and entered in his Journal, "Some of the birds are tolerably stuffed, and the specimens of *Falco fulvus*, L., Eagle Owl, Bearded Vulture, or Lämmergeier, Giraffe, and Leopard are creditable pieces of art." At Grindelwald he got the Wall Creeper exactly at the rock precipice where he said it would be found. At Interlachen "he was disgusted with the English here, who dress for dinner and all that sort of thing." He was enraptured with the view from Berne of the snow-capped mountains of the Oberland, and the scene from Luzern was "indescribable." He brought home a valuable collection of bird-skins, lepidoptera, plants, etc.

For the edition of Bewick's "British Birds," published in 1847, he drew up the Synopsis and revised the nomenclature of the book.

He contributed to the Great Exhibition in London in 1851 a series of Stuffed Birds, three of which were illustrative of Falconry, and single specimens, namely, of the Lämmergeier, from Switzerland, and the Dead Gull. They were all highly admired by naturalists, artists, and the public as a signal advance upon previous performances, showing not only, as it were, the creatures brought to life again, but exhibiting to the best advantage the heightened artistic and manipulative skill of the taxidermist. Of these articles the *Athenæum* of June 21st, 1851, says, dilating on the necessity of artistic feeling being combined with a thorough knowledge of all the details of taxidermy, "No one can look at the beautiful specimens of prepared animals by Mr. John Hancock, of Newcastle, exhibited in the transept, without recognising the mind of the artist as well as the hand of the taxidermist."

Of these groups, the late Rev. T. W. Robertson, of Brighton, thus spoke in one of his lectures:—"I have visited the finest museums in Europe, and spent many a long day in the woods, in watching the habits of birds, hidden and unseen by them, but I never saw the reproduction of life till I saw these. They were vitalized, not by the feeling of the mere bird stuffer, but of the poet, who had sympathised with Nature, felt the life of birds as something kindred with his own, and, inspired with their sympathy, and labouring to utter it, had thus recreated life, as it were, within the very grasp of death."

Mr. R. Bowdler Sharp, in a paper published in the "English Illustrated Magazine of Ornithology," at South Kensington, said that to Mr. Hancock was due the credit of having broken away from the time-honoured tradition in the mode of mounting animals in this country—that he taught how to combine scientific accuracy with artistic feeling, and that Mr. Hancock's name was a password throughout England wherever taxidermy was mentioned.

Charles St. John, Esq., in his "Tour in Sutherland," Vol. II., page 168, says, in 1849, "I have spoken of the Peregrine, the Iceland, the Greenland Falcon, and also the Falcon of Norway, as being distinct species. This, however, is a point to be decided by naturalists more skilful in the anatomy of birds than I am myself. *Scribimus indocti.* My remarks are merely the result of my own unscientific observations, aided by the inspection of the numerous and beautifully-prepared specimens of my friend Mr. Hancock, who, I believe, I may safely assert is the best stuffer of birds in the kingdom. The examination of his collection has been a source of great pleasure to me, but it has also had the effect of making me dissatisfied with the performances of all other preservers of birds. A bird when it is stuffed and 'set up,' as they term it, ought to be '*aut Cæsar aut nihil.*' A bird stuffed in a second-rate manner is a very valueless and unsatisfactory affair; and it would be far better for the furtherance of Natural History if people, instead of having a rare bird badly stuffed and put into a distorted shape and attitude, with projections where no projections should be, and hollows where there should be none, would be content to keep merely the skin just sufficiently filled with cotton or tow to prevent its shrinking." Mr. Hancock accompanied Mr. St. John in his tour in Sutherland.

In 1853 he published "A Fasciculus of Eight Drawings on Stone of Groups of Birds, the whole being representations of specimens stuffed and contributed by the Author to the Great Industrial Exhibition of 1851. Newcastle-on-Tyne: Published by the Author, 1863." Copies of these adorn the walls of the Committee Room of the Museum.

John Hancock knew birds thoroughly. At a distance he recognised them by their flight, and nearer, their movements and their notes were all familiar to him. He had observed and sketched their various fashions of plumage for each sex, age, and season, inclusive of their nuptial dresses and habits; and so well was he acquainted with their habitual feeding and nesting places that he could find them easily, as he did in Switzerland, and even provide them on occasion, as he once did at

Oatlands for the Kingfishers, with a suitable place that he knew would be appreciated, and which at the proper time of year they would and did occupy. He knew at once every nest and egg of the indigenous British birds that came under his inspection. Desirous on one occasion of giving a friend an idea of John's acquaintance with the plumage of birds, I said that if he would take any dead bird and pluck off the whole of the feathers, put them in a bag, shake them up, and afterwards throw them out carelessly on a table, that John could and would, if necessary, place each feather in its proper place on the body of the bird. I mentioned this some time after to John, who said, in a few minutes, "Well, I believe I could do it;" and there was no room for doubt. He was well provided with a knowledge also of the skeleton and of the internal anatomy of birds.

He often inveighed strongly against ornithologists and other scientific men who were fond of signalizing themselves by multiplying species and giving new names to things which in his better judgment were only varieties of a common type, differing in some trivial particular or other according to age, sex, season, or climate, and which called for no change of name whatever. As may be expected he bitterly complained of the indiscriminate slaughter of rare birds and useful ones for the paltry satisfaction accruing from the possession of a badly stuffed bird, whether on or off the bonnet or hat of a lady.

Before and after 1844, when Joshua Alder and Albany Hancock were busy with their studies of Mollusks and their shells, noting their minute external characteristics, John was occupied with skins and eggs, laying foundations for classification, they all three, though unequally, began to see that external characters alone were not enough to settle moot-points or decide on classification, but that internal structure should be with equal care investigated.

At that time I was Lecturer on Human Anatomy and Physiology in the Newcastle College of Medicine, and being more or less intimate with these gentlemen, and often in their company, and at the Wednesday evening meetings, I have reason to believe that I had something to do with turning their attention more than before to the internal structure of animals, and what we termed "the dry-skin philosophy" became not the only subject of research.

In 1844 Albany Hancock and I began the dissection of the Nudibranchiate Mollusks with *Eolis papillosa.* The dissection was mine, the beautifully-coloured and absolutely correct drawings were Albany's. After a year or two Albany dissected as well as copied his dissections.

John gave increased attention to the anatomy of birds—their skeleton, muscles, viscera, and general form of their parts. In preparing entire birds to be mounted, after having skinned the body he took a model of it, and thus by applying the skin to that exact form would restore to it its proper proportions and size; the muscles of the legs were imitated with wire and tow, arranged of the exact natural size. The cleaning and preparation of the skin was often a difficult and laborious process, and the arranging of the feathers demanded great care and skill. As he had been accustomed to sketch living and wild birds, and was familiar with their natural forms, positions, and attitudes, he was capable of easily imparting to his specimens the necessary life-like appearance which so signally distinguish them.

The skinning and stuffing would occasionally occupy many hours of many days, and John, in fact, could model a bird in clay in one fourth of the time it would take him to stuff one and set it up.

The scrap drawings which he had been long in the habit of making were of great service to him in the above manipulations. They were all given by him to the Museum, and are hung up in the upper western corridor, having been handsomely framed through the kind liberality of Lady Armstrong. Many of them equal or even surpass the drawings of his old friend Thomas Bewick, whose works have deservedly created such a furore.

How very imperfectly and miserably the antiquated term bird-stuffing applies to John Hancock's art and knowledge! Any one can literally *stuff* a bird's skin or a quadruped's, but very few indeed can impart apparent life to the spoils of a dead creature in the way in which our late friend could do. One day, about two months before he was confined to bed, he showed me the skin of a large bird, which many years before had been stuffed, in the lowest meaning of the term. It was bulging out here, hollow there, and, in short, a deformity; had no expression in its lack-lustre eye, and its legs were knockkneed and bandy. "That wont do!" he exclaimed; "I must do that over again, and put some life into it!" In the course of a few days the inert mass was changed, and looked like a living active bird, full of expression. Would that some one would invent a term better than "*stuffing!*" *Taxidermy* has never been naturalized among us, and perhaps never will be. Preparation, arrangement, and so on, are inadequate terms for the art of setting-up of birds in their natural shape.

In 1868 John Hancock elaborated a plan for the planting and beautifying of the Town Moor and Leazes, the advocacy of which before the Town Council was entrusted to the late Alderman William Lockey Harle. The plan, however, was rejected by that body; but Mr. Hancock was thanked for his gratuitous preparation of the plans. These are now in the possession of the Corporation of the City.

In 1874, in Vol. VI. of the Natural History Transactions of Northumberland and Durham, appeared his "Catalogue of the Birds of Northumberland and Durham, with fourteen photographic Copper Plates from Drawings by the Author." The Catalogue was reviewed at length, and favourably, in *The Field* of April 17th, 1875.

The following extracts from Professor Newton's Review of the same work, in *Nature*, Vol. XI., p. 281, have been kindly made for me by Mr. Jos. Wright, of the Museum, and are full of interest, and place Mr. Hancock's labours in ornithology in a proper light.

Extracts from Review of "Birds of Northumberland and Durham," by Professor Newton.—"Nature," Vol. XI., p. 281.

"Mr. John Hancock has long been known to some who, though comparatively few in number, are perhaps best able to form an opinion, as one of the closest and most careful observers of birds and bird-life in this country. The circle of his admirers would have been indefinitely wider but for the reticence which his natural modesty has for years made him keep. While others without a tithe of his knowledge have ostentatiously come forward as teachers so as to acquire a character as 'celebrated ornithologists' out of all proportion to their ability, he has been content to look on, seldom obtruding on the public any of the results of his experience, and then perhaps only at the earnest solicitation of some particular friend. Yet this ornithological oracle of the North of England has never been hard to consult, and the number of those who, through information privately derived from him, have in a manner reaped the fruit of his continual observation—not always, we fear, with due acknowledgement on their part—is not inconsiderable. It is, therefore, with great pleasure that we find he has at last summoned courage to speak for himself. As a consequence of his diffidence a good deal of what he has to tell us has oozed out through other channels, but there is more than sufficient novelty in the 200 and odd pages of this Catalogue amply to repay their study, and even when facts ascertained by him have been announced before, it is most satisfactory to have the record of them here stamped by his personal authority. It will be news, we take it, to most people to learn that Mr. Hancock was the first who recognised Bewick's Swan as a distinct species; and we cannot but wonder that forty-five years and more have been allowed to elapse before this fact was made publicly known. Yet Mr. Hancock shews not the least trace of annoyance at the way in which his claims have been overlooked—his conduct in this respect being in exemplary contrast to the selfish and utterly unphilosophical squabbling as to 'priority' which so often disgraces the votaries of all sciences. To him it is enough that a discovery was made; if important, so much the better; but, so long as knowledge has been extended, it matters nothing by whose means the end was attained. If we have not here a practical illustration of true scientific spirit, it will be difficult to meet with it anywhere."

In speaking of the question of the plumage of the Greenland

and Iceland Falcons, Mr. Hancock's discrimination and settlement of the same enabled him to lay down this general law:—"Not only do all the noble or true falcons acquire their adult plumage in the first moult, but many of the ignoble species do so likewise, as the Honey Buzzard, the Goshawk, the Sparrowhawk, and the Harriers. This fact cannot be too strongly pressed on the attention of ornithologists, for it leads to a correct understanding of the variations of the plumage of the Falconidæ."—(Catalogue, p. 10.)

This is no mere *dictum*, but the result of long continued observation; and well indeed would it be were writers who have very recently attempted to deal with this subject, to learn, as Mr. Hancock has done, in Dame Nature's simple school, instead of perpetuating error and confusion by grandly setting forth their unsound and arbitrary views on the "first year's," "second year's," and "third year's" plumage of birds of prey.

In writing on this same question in Vol. I. of the last edition of Yarrell's British Birds, p. 38, of which he is the editor, Professor Newton says, "Professor Schlezel, Mr. Gurney, and Mr. Gould, among others have adopted Mr. Hancock's opinions, which it may be added are strictly in accordance with the traditions of falconers, and to him therefore belongs the credit of first discovering and making public the exact state of the case."

In speaking of the plates by which the Catalogue is embellished, Professor Newton says, "All of them are characteristic, and most of them excellent; a fact specially to be noticed, since they are chiefly designed from birds stuffed and mounted by Mr. Hancock. Yet most of us who are old enough to remember his beautiful contributions to the Great Exhibition of 1851, to say nothing of the specimens of his skill which we have since seen elsewhere, have therein no cause for surprise. In the art of taxidermy—for art it is with him in a high sense—Mr. Hancock has no equal now, and possibly never had but one, the late Mr. Waterton; and the difference between specimens mounted as these are and the handiwork of ordinary bird-stuffers is apparent to any one who has an eye for a bird. Whether Mr.

Hancock's genius in this respect is innate, or whether it has been developed in him from a study of his fellow-townsman Bewick's labours, matters not much; both artists may be rated equally high as delineators of birds, while the younger one, as the pages of this publication prove, stands as a naturalist immeasurably above the elder."

John was one of the original members of the Tyneside Naturalists' Field Club, in 1846, and afterwards became a member and a Vice-President of the Natural History Society, he was also a member of the Literary and Philosophical Society.

On the death of Albany Hancock in 1873 a movement took place for a memorial to his memory, and his brother John suggested that a new Museum would be the most appropriate and desirable form for such a memorial. This movement was not continued.

About the year 1879 John conceived the idea of building such a Museum upon the site it now occupies,* which is the most suitable in the city, and his friend Col. Joicey, with great liberality, purchased the site, which was of leasehold tenure by the Magdalen Hospital under the Ecclesiastical Commission, and enfranchised it. From that date John Hancock threw all his energy into raising the necessary fund for the erection of the building, and through his personal influence he at length accomplished what no one else could have done, raising the magnificent sum of £39,000.

The old Museum at the back of the Library of the Literary and Philosophical Society had from its increasing collections become much too small and inconvenient, and the ground occupied by it was required by the North Eastern Railway Company.

The Museum was begun in 1880, and completed in 1883. When completed John Hancock presented to it his entire col-

* Brand, after Bourne, tells us that this was the site of St. James' Chapel and of a great Cross, not far from the *barrows* or burying places of lepers and plague-stricken people in past centuries, situated by the side of the clear burn that anciently ran across the Great North Road, but now under it in the form of a common sewer at the place absurdly called the "Barras instead of 'Barrows' Bridge." The Magdalen Hospital was not far from the site of the Chapel, and the burying ground belonged to that Hospital, and the Cross stood within the "Maudlin barres" and without the New-Gate.—Harleian MSS. 708, Escheats 12, Rich. II.

lection of British stuffed birds, skins, eggs, nests, and the magnificent groups under glass cases which now fill the central and largest room of the edifice. Very few specimens are in that room that have not passed through his skilful hands. Many others in the first or southern room were also contributed by him. The collection in the central or Hancock Bird-room is probably unequalled for the beauty and variety of British Birds, and it would be very difficult to appraise its value in money.

In August, 1884, the Museum was formally opened by their Royal Highnesses The Prince and Princess of Wales, accompanied by their two sons, Prince Albert Victor Edward and Prince George.

All those, and they were many, who listened to the concluding portion of the address of the President of the British Association for the Advancement of Science, in 1889, may recollect that Professor Flower could hardly find words enough to express his high sense of the excellence and value of the Museum after having critically examined it over and over, and observed, "You are fortunate in possessing in Newcastle an artist who, by a proper application of taxidermy, can show that a dead animal may be converted into a real life-like representation of the original; perfect in form, proportions, and attitude, and almost, if not quite, as valuable for conveying information as the living creature itself."

John, together with his brother Albany, as already stated, inherited from his father his inextinguishable love for Natural History, and that inheritance was fostered in both by a kind and discerning mother, and enlarged by their friend Thomas Bewick, whose workshop John was fond of frequenting, and by the members of the Wednesday Evening Club. In addition, John received from the parental stock a healthy and vigorous frame of body, of medium stature and well knit, and a sensitive nervous system. On arriving at manhood his powers of observation and his memory were strongly developed, and both he and Albany became adepts at drawing the subjects of their study and colouring their drawings, though of tuition in the art of design John had little and Albany none; but the "Nudibranchiate Mollusca" of the Ray Society proclaims the proficiency of the latter, and the drawings of birds in the Museum that of the former.

John's power of enduring fatigue was of signal service in obtaining his coveted specimens. The only interruption to his ornithological pursuits was in 1860, when he began to undertake temporarily, for some friends who appreciated his taste, the profession of landscape-gardening. His sketches of birds now in the upper west corridor of the Museum show how remarkably accurate were his observations and execution. His conversations with his friends told how intimately he was acquainted with the characters and habits of his bird favourites, for he could describe and imitate their motions and sounds so vividly, by feature, voice, and posture, as to be most instructive and at the same time amusing, whilst he convinced his auditors of the naturalness of his pantomime. There can be little doubt that he was the foremost man in his peculiar pursuit in England. It may be said truly of him that he was a genius in ornithology —potentially in childhood, actually in manhood. It may be long before Newcastle "shall look upon his like again."

John Hancock, as every one who knew him can testify, was a kind, quiet, unassuming, straightforward and virtuous character; fond of children, though never married; always glad to impart to students, or any one interested in his favourite pursuit, whatever he could out of his stores of knowledge, anxious to draw on the young to the rich beauties of Natural History, and to incite them to observe accurately for themselves. Many middle-aged persons, even those of distinction in other walks of life, owe much happiness to his teaching. He was indeed a centre from which radiated a pure love of Nature to all around.

In illustration of the above I am allowed to quote the following passage from a letter recently received from Admiral H. C. St. John. "John Hancock was a great friend of my father's, and a frequent visitor to our house in Scotland. His influence with children was very marked—a strange trait in his character considering the unmarried life he led. No doubt his kind and gentle disposition was the cause of young hearts being drawn to him. During his stay with us in Morayshire he taught us boys to train and fly both the Peregrine and Merlin, and in after years we used to fly the latter Hawk with our old friend on the Newcastle Town Moor. To collect birds, shells, and other Natural History objects he also taught us; and during my wanderings in all parts of the world I have always felt the greatest gratitude to my old friend for the tastes and pursuits he instilled, and which have been of the greatest benefit and pleasure in whatever part of the world I have found myself."

His habits of life at home were of an almost Spartan simplicity and temperance. When at Oatlands, in 1886, he suffered a partial paralysis of his left side, which never passed away or was repeated, but acted as a drag upon his bodily and mental powers. As his strength declined he had an attack of cystitis, which at the end of eleven months proved fatal. During those months he became irritable, suffering much pain at times, and his early passionate nature reasserted itself now and then. At the end he was quite calm, and fully conscious of the near approach of death.

On the 14th of October he was interred in Old Jesmond Cemetery, in a vault with his brothers Albany and Henry and his sister Ellen. An inscribed granite slab covers them. Among the large number of his friends present at the funeral were five octogenarians.

His life-long friend, W. C. Hewitson, who died in May, 1878, bequeathed his charming place at Oatlands, Surrey, to John, who took up his abode there in the autumn of the same year, and both he and his sister had much enjoyment in their summer's residence in the South of England as a change from the atmosphere of Newcastle.

It may be that many of his friends will desire to raise a Memorial to a man who has done so much for the fame of his native town and for the Natural History of the district, and this is only fitting. There is one memorial, the last step in the establishment of this Museum, and one very appropriate to this occasion; one which John Hancock himself much longed for, and which he greatly regretted not being able to obtain, as the crowning act of his life's work, and that is that the Memorial should consist of a sufficient sum of money, of which a few hundred pounds have already been subscribed, to form a Maintenance Fund, for keeping up the splendid building, and its valuable contents in due order, and for the acquisition and preservation of new specimens as they may occur.

In conclusion, it was one of John Hancock's desires that his valuable collections should be utilized, together with the other parts of the Museum, as a means for teaching every branch of Natural History.*

The portrait of John Hancock at the head of this Memoir is from a photograph taken by his friend Joseph W. Swan about the year 1874. Twelve hundred copies of this portrait, printed at the Photogravure Works of Messrs. Annan & Swan, of Devonshire Road, South Lambeth, London, have been most handsomely presented to the Natural History Society and Tyneside Naturalists' Field Club, for their joint Transactions, by their fellow-member, Joseph W. Swan, Lauriston, Bromley, Kent.

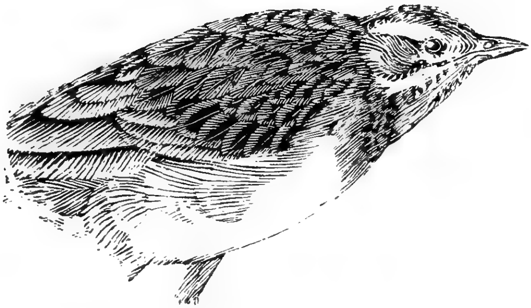
For the following list of papers written and published by Mr. John Hancock I am indebted to Mr. Joseph Wright:—

Annals and Magazine of Natural History.

Remarks on the Greenland and Iceland Falcons, shewing they are distinct species. II., 1839, pp. 241—250; and Brit. Assoc. Report, 1838, p. 106.

Occurrence of *Falco Islandicus?* in England. II., p. 159.

* Mr. Thomas Thompson, one of the Hon. Secretaries of the Tyneside Naturalists' Field Club, sends the following anecdote, illustrative of John's knowledge of Bird architecture. It occurred at his seat at Oatlands, when Mr. Thompson and another friend of John's were visitors there. This friend one day expressed an earnest wish to obtain the nest of a Chaffinch. They all went out and searched without success the whole of the grounds, to the disappointment of the friend. In the evening John said he would get up early next morning and try again. Accordingly he did so, went out, and collecting moss, spiders' webs, hairs, and lichens, did his best to fabricate a Chaffinch's nest, and returned to the house. The friend on coming down to breakfast eagerly enquired, "Well, I hope you have got me a nest!" To this John replied, "Just take a look into the lobby." He went, and came back delighted, exclaiming, "What a splendid one, too! I *am* pleased. Many, many thanks!" John always enjoyed a joke, and this was one of his. The friend looked crestfallen when the truth was confessed, for he considered himself quite a judge of such matters, and was unaware of Mr. Hancock's manipulative dexterity.



Pipit.

Blue Titmouse.

ICELAND FALCON.

Regulus modestus, Gould, a British bird. II., pp. 310-311.

Notice of the capture of *Sylvia turdoides*, Meyer, in Britain. XX., 1847, pp. 135-136.

Note on the Greenland and Iceland Falcons. XIII., 1854, pp. 110-112.

Transactions of Tyneside Naturalists' Field Club.

Ornithological Notes. Vol. IV., pp. 57—60.

On the occurrence of the Grey Seal, *Halichœrus gryphus*. Vol. IV., p. 71.

On the occurrence of the Great Tortoise-shell Butterfly, *Vanessa polychloris*, at Whitburn. Vol. IV., p. 72.

On the occurrence of *Gryllus migratorius* on the coast near the Tyne. Vol. IV., p. 185, 1858—60.

Notice of the breeding of the Tufted Duck, *Anas fuligula*, in Northumberland. Vol. V., p. 39—41.

Notice of the occurrence of the Red-necked Goat-sucker, *Caprimulgus ruficollis*, in England. Vol. V., p. 84, 1860—62.

Notice of various recent captures of Pallas's Sand Grouse, *Syrrhaptes paradoxus*, in Northumberland and Durham. Vol. VI., p. 100-103, 1863-64.

Natural History Transactions of Northumberland, Durham, and Newcastle-on-Tyne.

Ornithological Notes. Vol. I., pp. 281—284, 1865-67.

On the occurrence of the Passenger Pigeon, *Columba* (*Octopistes*) *migratoria*, Linn., in Yorkshire. Vol. V., p. 337, 1873-76.

Catalogue of the Birds of Northumberland and Durham. Vol. VI., 1873.

Notes on the breeding of the Stock Dove, *Columba œnas*, Linn., in the County of Durham. Vol. VII., p. 359, 1877-79.

On the occurrence of Sabine's Gull, *Larus Sabini*, Leach, in the County of Durham. Vol. VIII., p. 27.

Note on the habit of the Young Cuckoo in ejecting the eggs and young of its foster-parent from the nest. Vol. VIII., p. 213.

Note on the Indian form of the Spotted Eagle, *Aquila nœvia*, Briss., shot on the Northumberland coast, near Cresswell, Oct. 31st, 1885. Vol. VIII., p. 217, 1880-89.

Note on a curious proceeding of a Bullfinch. Vol. X., p. 218.

On two Wild Hybrids recently captured in Northumberland. Vol. X., p. 218, 1887-90.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, THE REV. CANON TRISTRAM, LL.D., F.R.S., ETC., AT THE FORTY-FOURTH ANNIVERSARY MEETING, HELD IN THE COMMITTEE ROOM OF THE LITERARY AND PHILOSOPHICAL SOCIETY, NEWCASTLE-UPON-TYNE, ON FRIDAY, MAY 30TH, 1890.

LADIES AND GENTLEMEN,—For the third time in the course of forty years I have the honour of addressing the members of the Tyneside Naturalists' Field Club from the President's chair. In accordance with time-honoured custom it is my duty to recapitulate the circumstances and incidents of the various meetings in field or hall held during the year; and with deep regret and many apologies I must begin by acknowledging my own shortcomings, and the fact that I only on one excursion appeared in my place amongst you. But I am certain the members will extend some kind forbearance to their President when he assures them that his absence was in every instance caused either by illness or by the unavoidable demands of official and professional duties.

The FIRST FIELD MEETING for 1889 was appointed to be held at Bebside, for Hartford Bridge and a walk along the banks of the river Blyth. The unsettled and threatening state of the weather previous to the 24th of May did not encourage many members to join in this excursion, and the difficulty of finding a suitable place for refreshment at the end of a long walk obliged the Secretaries to arrange the excursion by the Blyth and Tyne Railway to Bedlington, instead of the shorter route by the North Eastern. In the unavoidable absence of our President, the Rev. Canon Tristram, our energetic Vice-President, Dr. Embleton, kindly acted as chairman and conductor of the meeting. The railway routes north from Newcastle pass through the least interesting and most uninviting portion of Northumberland. A uniform, dull-looking, flat piece of country, with only a few elevations to relieve the monotonous level, occupies, as is well known, all the south-east corner of the county from the Tyne to the Coquet, and this flat country is intersected by only a few deep cuttings, forming the valleys of the Blyth and Wansbeck, and varied by a few long ridges, such as the one on which the village or town of Bedlington stands. Everywhere covered with a thick coating of drift-clay, producing a very scant vegetation, the general barrenness of the district is visible on all sides, and it is only in a few sheltered situations, by the sides of the larger valleys, that a more luxuriant growth can be attained. The valley of the river Blyth and its drainage basin is one of these favoured spots, and it was to enjoy its scenery and early spring vegetation that our excursion to this place was fixed upon.

The village of Bedlington appears at a short distance off to stand on a hill, and it is really situated on one of those long, low, sandstone ridges which are seen here and there in this part of the county. The origin of these sandstone ridges is perhaps due to the former glaciation of the Coal-measure surface by the ice-sheet during the glacial period—the softer beds having been ground down and denuded off, and only the hard sandstone ridges cropping out to the west being left.

On arriving at the village, after a walk of two miles from the railway station, a short visit was made to the Church, when our Chairman informed us that the Rev. Canon Whitley had expressed to him his regrets that several engagements that afternoon prevented him from shewing the members of the Club the attentions he would have wished on their visit to Bedlington. After making arrangements for tea in the village the party proceeded by the shortest route to Hartford Bridge. Here they were hospitably entertained by Mr. Shorthose, and accompanied through his beautiful grounds and also through those of Hartford Hall. On account of the recent heavy rains the roads by the side of the river were found to be impracticable, and almost impassable for the generality of the members. Only one adventurous explorer ventured back by the river side, the rest of the party returned by the regular roads. All the early spring flowers were in full bloom, of such kinds as are common in all damp woods in the early spring time in this district.

Two days before our visit a severe thunderstorm (drawn perhaps by the elevation of the place in this direction) had passed over the village, and from the clean-washed appearance of the main street, and the extensive accumulation of mud and dirt in the lowest part, a perfect deluge of rain must have washed the place from one end to the other.

Judging from the rooms of the hotel in which we met, and the size and appearance of many of the houses and the great width of the main street, it would be inferred that Bedlington in former years had seen better days—perhaps long ago, when it was the chief place of the district to which it formerly gave a name, Bedlingtonshire. The Bishop of Durham in ancient times possessed a mansion here. St. Cuthbert's body is said to have rested at Bedlington on its way from the Tweed towards Durham.

Those who had been all the fine spring afternoon wandering through fields and pastures new were able to enjoy a comfortable tea in the best inn the place could afford, and afterwards through heavy rain they had to make the best way they could to the railway station, in order to catch the last train to Newcastle. Yet all were gratified, if not much enriched with specimens, by their visit to a district which was to most of the party quite new or known only in name.

Second Field Meeting.—On the 24th June the members mustered in some numbers at Castle Eden Station, for the exploration of their old favourite resort Castle Eden Dene, opened to them by Mr. Burdon. Mr. Howse's detachment explored the geology of the district of Heddon and Hutton Henry, south of the Castle Eden. The large portion of the party roamed down the Dene, under the guidance of the President and Mr. G. Baker Forster, as far as the shore, and returned to the Station Inn in the afternoon. Their researches, though very enjoyable, could not be expected to produce any novelties in a so thoroughly beaten field, and the objects of interest were chiefly botanical. It was noticed with regret that the local butterfly *Erebia blandina* seems to be almost extinct in its former habitat; and the other peculiar butterfly, *Polyommatus salmacis*, had not yet appeared on the sea banks. A fair number of scarce and local plants were observed, including *Epipactis ensifolia* and *Pyrola rotundifolia.*

The large party afterwards dined together at Castle Eden Inn. After dinner a short paper was read by one of the Secretaries, entitled, *Note on the South Durham Salt Borings, with remarks on the Fossils found in the Magnesian-Limestone Cores, and the Geological position of the Salt.* This paper is published in the Nat. Hist. Transactions, Vol. X.

The Third Field Meeting was held at Gilsland, on July 10th. Two members only left Newcastle by the 10.15 A.M. train. On reaching Gilsland they walked by the footpath to the Shaws Hotel, and after some slight refreshment walked to the "Popping Stone," and up the Irthing to the Linn, returning to the Shaws Hotel by the moor. On the way were noted the Dipper, Water-hen, Whinchat, Redstart, Yellow-hammer, Curlew, Grouse, and two Kestrels fighting. Tracks of an Otter were also seen. The *Asplenium viride* and Scented Orchis were found, but no other plants of note excepting the well-known *Saxifraga azoides.* After dinner it was found that two other members had gone by an earlier train, but the two parties unfortunately did not meet till time for returning home.

The Fourth Field Meeting was held at Allendale, on August 5th. A party of the members went to Allendale on the 3rd, and after a pleasant drive from Allendale Town to Allenheads found comfortable rooms at the Inn. After dinner the members had a pleasant ramble up the hill by the stream side, specially admiring the various Conifers, some of which were of unusual luxuriance. They proceeded as far as the county boundary, and saw Kilhope Head and the upper part of Weardale. Kilhope Law, 2,206 feet high, was visited on the following day, the party much enjoying the bracing air of the moors and the extensive view from the summit. On the way were found *Rubus Chamæmorus*, *Vaccinium myrtillus*, and *V. Vitis Idæa.* Next day they went over the hill to the head of Rookhope, but found the view very bleak and desolate. After sheltering from some showers they drove down to Allendale Town to join the members who had by an early train arrived from Newcastle.

The Last Field Meeting was held at Marsden, on Friday, October 4th. The members proceeded from the Central Station by the eleven o'clock train for Cleadon Lane, where the number of the party was increased by the addition of a few members from Sunderland. The weather was fine and all that could be expected for a late autumnal day, and the walk through the fields by way of Cleadon to Whitburn was much enjoyed, although few wild flowers were left to interest those botanically inclined. After leisurely walking to Whitburn, and a short survey of that neatly-kept and attractive seaside village, most of the party partook of slight refreshment in one of the neighbouring inns. The party now became scattered, some preferring the straight road to Marsden, and others the more circuitous route by the sea coast. A short examination was made of a portion of the cliff near Whitburn, where the Conglobated or Ball-Limestone occurs in the coast section, and it was intended to read at this place, and with this peculiar structure of the Magnesian Limestone in view, a short note suggesting the manner in which these globular concretions have been formed; but as only two or three members were present the reading of the note was deferred till the party had reassembled at Marsden Grotto.

During the last twenty years enormous changes have taken place on the sea coast between Whitburn and Marsden. The unavoidable requirements of trade and commerce have done and are still doing much to destroy the natural features and the lonely beauty of this part of the Durham coast. Not its wildness only but some of its almost unique physical and lithological features have entirely disappeared. The extensive quarrying carried on by the Whitburn Coal Company has been, unfortunately, the means of destroying the only habitats left in the county of a few of our rarer plants. *Spiræa filipendula*, the Bee Orchis, and *Orchis pyramidalis* are now entirely eradicated from the neighbourhood of Byer's Quarry, where for so many years past they have grown and rewarded the excursions of our botanical students. The Sea Asplenium, the Moonwort, the Adder's-tongue, and the *Orchis ustulata* and several other species have shared the same fate, and are now quite lost to this district. But some interest still lingers about Marsden Bay, in the peculiar forms of the limestone cliffs and the puzzling problems they suggest, problems not easily solved or satisfactorily explained. Our Vice-President, H. Cooper Abbs, presided, and after a plain tea a paper was read "*On the Probable Stalactitic Origin of the Conglobated form of the Magnesian Limestone,*" by one of the Secretaries, and then the members strolled homewards by the cliffs or travelled by rail from the Marsden station to Shields.

On 18th April, a joint meeting of the Natural History Society of Northumberland, Durham, and Newcastle, and the Tyneside Naturalists' Field Club, was held in the Committee Room of the Literary and Philosophical Society, Newcastle. Dr. Embleton presided. Mr. Howse read a paper by Mr. John Hancock, "*On the curious proceedings of a Nuthatch* (Sitta cæsia) *observed at Oatlands, 1889.*" In a note by Mr. Thos. Thompson, "*On the occurrence of the Willow Wren near Blaydon, in January, 1890,*" it was stated that on Thursday, the 16th January, a specimen of the common migrant, the Willow Wren, was observed between Blaydon and Scotswood Bridge. It was in good condition and plumage, having no old wounds whatever visible. He had never heard of such an occurrence before in the North of England. The bird was preserved by Mr. Walker of Blaydon, who kindly sent it to Mr. Thompson for inspection. It was agreed that the singularity of the occurrence was the season of the year at which the bird was seen, this being on account of the mildness of the winter.—Notes by Mr. Thompson were also read upon varieties of the Common Mole and upon tracks left on a footpath by Earth-Worms in their nocturnal wanderings.—Mr. Howse read the Introduction to a *Catalogue of the Fishes of the Rivers and Coast of Northumberland and Durham and the* *adjacent Sea.* In concluding the paper he said that in former years the use of the trawl-net was quite unknown on the East Coast and the northern part of the British Islands; but since the introduction of trawls, and their increased use, many rare fishes and other creatures which were before accounted rare, and many which were unknown as inhabitants of the North Sea, were now found to be some of them abundant with others which are quite new to this part of the British Coast. No one had attempted a systematic catalogue of our local fishes, or, indeed, to form a special collection of them. This remark applied more particularly to the shore fishes, or those that live chiefly in the rock pools between high and low water mark, such as the Gobies and Blennies, and other small fishes which are not likely to be captured by fishermen, and are only occasionally thrown up on the shore after severe gales. This Catalogue forms a part of the Nat. Hist. Transactions, Vol. X.

Obituary Notices.

During the past year we have to record the loss of several of our members by removal from the neighbourhood and a few by death. Among the latter we deplore the loss of one of our entomological workers, Mr. Matthew Henderson, whose quiet and unassuming gentle manners endeared him to all who had the pleasure of his acquaintance. Mr. Wright has obligingly communicated the following short notice of our esteemed member.

Mr. Matthew Henderson was a native of Kirkley, near Ponteland, where his father resided, and where his early years were spent. He followed the profession of a gardener, and was in the employ of several gentlemen in the county of Northumberland; and eventually he settled at Fenham, near this town, as gardener to the late Mr. James Archbold. On the opening of All Saints' Cemetery at the Minories he was appointed Superintendent of that place, which position he held up to the time of his death, April 21st, 1890, having held the appointment nearly forty years. His leisure was devoted to the study of botany, entomology, and conchology to some little extent. In 1876 he became a member of the Field Club, and was an occasional attender at the Field Meetings, and a very regular one at the Evening Meetings. In the Entomological Notes in the Transactions his name frequently appears. He was a member of the Entomological Society of this town, and while it existed one of its most active supporters. He was an Honorary Curator of the Entomological department in the Museum, and was ever ready to assist in preparing specimens in this department. He was a genial, kindly man, always ready to impart his knowledge to all enquirers and lend a helping hand to beginners in his favourite pursuits. The esteem in which he was held by those who had the pleasure of knowing him was well shewn on the occasion of his funeral, by the attendance of the members and officials of the Burial Board, whose servant he had been from its commencement, and the many friends who thronged the little chapel at the cemetery and around his grave, anxious to shew their respect to the memory of a good man.

It is with deep regret that we have also to record the loss of another member of our Club, and one who has served many years on our Committee, Mr. T. T. Clarke, of Chirton, near North Shields. Mr. Clarke contributed an interesting note on the Yorkshire Caves and the scenery of the Craven district to the Nat. Hist. Transactions.

Such is the record of the outdoor work of the year, as performed by the Club; and though no startling discoveries have been made, nor any novelties brought to light, yet the love of Nature has been fostered and the powers of intelligent observation exercised by the enjoyable, even if small, gatherings which have assembled at our various trysting places.

The study of Natural History is certainly not on the wane in this country, but its progress has recently been in directions other than those pursued in the last generation. The unexhausted fields of the naturalist are now rather in the ocean than on dry land (though let me not be supposed to imply that any field is exhausted); while our scientists are devoting themselves rather to the minute study of structures and functions than to generalization. Every year physical students find themselves more and more compelled to become specialists, and the motto of all Natural Science is "thorough," however minute and limited the area of investigation. Our members now are rather biologists than naturalists. But that Natural History still maintains its place among the sciences is fully recognized, in the fact that the other day among the selected fifteen for the Fellowship of the Royal Society three were naturalists, two of them being eminent marine biologists, and one of them being my most distinguished predecessor in this chair, and whom we congratulate heartily on his well-earned honours, the Rev. Canon Norman, D.C.L.

The meeting of the British Association at Newcastle was the most important local event of last year, so far as regards Natural Science. With Professor Flower for its President, biological subjects had their full share of attention. The botanical section was especially prominent, and the papers and discussions were of unusual interest. The head of the British Museum was able to see provided here, through the munificence of Lord Armstrong and many other local friends, and the genius of our veteran John Hancock, a Museum of Natural History, in the completeness and yet simplicity of its arrangements, in the historic interest of its older specimens, and the beauty and artistic perfection of the Hancock Collection, such as is possessed by no other city in the kingdom. The Museum is a fitting monument to the memory of the successive generations of northern naturalists who, from the days of Tunstall, 150 years ago, have made Tyneside illustrious as the nursery and home of Natural Science.

For new discoveries on dry land we have now to go far afield, and few lands save those of Central Africa and Arabia remain unransacked by the biological collector. The sea alone, in its depths, fathomed and unfathomed, will yet provide for generations to come scope for the researches of the biologist. Yet still in nooks and corners easily accessible there is work to be done. It might have been thought, for instance, that in the European outliers (for such they really are) of the Canary Islands, the seven folio tomes of Webb and Bertholet had left but little for their successors to supplement. Yet in the last two years we have been able to collect facts and specimens which illustrate the modification and extinction of specific forms and the results of isolation. For instance, it has been shewn that the Blue Titmouse, which was formerly identified with that of North Africa, is really distinct, and has been modified, so that four perfectly distinct forms are found in the Archipelago; one, very closely allied to the Algerian form, in the two eastern islands; another, inhabiting the three central islands of Canary, Teneriffe, and Gomera; another, very distinct (with white instead of yellow and black underparts), confined to the Island of Palma; and a fourth, equally marked, having the back green instead of blue, restricted to a single bird found in the Island of Hiérro. In a similar way the Chaffinch of Europe, which in North Africa is represented by a very distinct form, of different coloration and considerably larger size, is, in the Atlantic Islands, further and most distinctly modified. There is considerable general affinity between the races of Madeira, the Azores, and the different islands of the Canary group, but each easily recognizable; and, as in the case of the Titmouse, the birds of the three central islands, Canary, Teneriffe, and Gomera, are identical, while that of Palma is distinct, and that of Hiérro intermediate between the Palma and the Teneriffe species. In the two eastern islands, which are without forests, the Chaffinch is absent. But in Teneriffe there is also another very distinct Chaffinch, much larger than the others, of an uniform slaty blue, and of very different habits, entirely confined to the Pine forests round the Peak of Teneriffe, about 5,000 feet above the sea. Again, the Gold-Crest, which is identical through all the islands, is distinct from the European bird in some slight characters, in which it resembles the Fire-Crests, while the Gold-Crest of Madeira is entirely distinct. But the most remarkable feature of the ornithology of these islands is the existence of three very distinct species of Pigeon, distantly allied to our Wood Pigeon; one in Madeira; a second in the Laurel forests of Teneriffe, Gomera, and Palma, and which formerly no doubt existed in Canaria before the destruction of the forest; and a third confined to the precipitous ledges of the forests of Gomera and Palma, but not found in Teneriffe. In some respects these birds recall the large fruit-eating genus of Indian Pigeons (*Treron*), but their coloration is quite peculiar.

Mammals and ophidians are absent, with the exception of introduced species of the former, while lizards are most abundant, all of them, with the exception of one black, fruit-eating species, which is peculiar, being common to the Mediterranean countries. To these must now be added a very large species recently discovered, *Lacerta Simoni*, confined to an isolated rock off the west coast of Hiérro, the most distant and isolated of the group. This lizard, which attains a length of three feet, and lives on crabs and sea weed, was probably once common on the shores of the island, but has been exterminated by man for food. It is remarkable that the Salmono Rock, on which it is found, is the only rock in the Canaries, at any distance from the shores, while the aborigines, the Guanches, did not possess any boats. Three specimens which I succeeded in sending home alive, the only ones which have ever reached Europe, are now in the Zoological Gardens of London.

Of the insects, the Rhopalocera, excepting the introduced species, are all identical with, or allied to, the ordinary species of Southern Europe, while the Coleoptera, equally distinct, are allied for the most part to those of South Africa.

The botany, which is wonderfully rich and most peculiar, is, on the contrary, rather African than European in its affinities, while possessing many gigantic forms belonging to familiar Mediterranean genera. The extraordinary Dragon Tree is too well known to need further description, and the Euphorbias attain an unusual development on this volcanic soil.

How these various anomalies are to be solved I do not presume to guess. I only attempt to collect and tabulate the facts, as within the province of the field naturalist. I can only conclude by expressing my hope that the excursions and meetings of the Tyneside Field Club may stimulate and quicken our interest in the observation of the works of God in Nature, and that wherever we travel, whether on land or sea, we may find that there is still much for us to observe, to note, and to learn.

The following gentlemen were elected members of the Tyneside Naturalists' Field Club during the years 1889–90:—

At the Anniversary Meeting, May, 1889:—Messrs. Edward Bidwell, Twickenham-on-Thames; Johnson Hedley, 49, Derby Street, Newcastle; R. Ryle, Ravensworth Crescent, Low Fell, Gateshead; J. W. Turnbull, Prior House, Corbridge; C. G. Henzell, Colwell, Barrasford-on-Tyne.

At Marsden Meeting, October 4th, 1889:—Messrs. Matthew Henry Dodd, 96, Holly Avenue; Alfred Simpson, 244, Westgate Road, Newcastle-on-Tyne.

At Evening Meeting, 18th April, 1890:—Messrs. W. T. Embleton, The Cedars, Methley, Leeds; Alfred Wright, 8, Bentinck Terrace, Elswick Road; C. H. Bryant, 19, Wentworth Place, Newcastle; Alfred Field, 8, Esplanade, Whitley; R. A. Strachan, 16, Ivy Road, Gosforth.

The Field Meetings for 1890 were arranged to be held as follows:—

June 6th	Croft.
June 25th................	Upper Swaledale.
July 17th and 18th........	Holy Island and Bamborough.
August 4th (Bank Holiday)..	Wooler and Neighbourhood.
September 15th	Woodburn and Redewater.
October 10th	Ryhope.

THE TREASURER IN ACCOUNT WITH THE TYNESIDE NATURALISTS' FIELD CLUB.

FROM JANUARY 1ST TO DECEMBER 31ST, 1889.

Dr.		£	s.	d.	Cr.		£	s.	d.
1889.					1889.				
Jan. 1.	To Balance brought forward	130	9	6	Dec. 31.	By Printing Transactions	111	0	6
	,, Subscriptions	60	15	0		,, Journal	18	7	11
	,, Sale of Transactions	5	16	0		,, Plates	8	12	9
						,, Commission	3	10	9
						,, Secretaries' Expenses	4	13	0
						,, Sundry Accounts	0	16	10
						,, Postage	0	13	9
						,, Balance	49	5	0
		£197	0	6			£197	0	6

1890, May 1st.—Examined and found correct,

T. P. BARKAS, AUDITOR.

THE following gentlemen were elected officers of the Club for the years 1890–91 :—

PRESIDENT.

The Rev. Canon Tristram, LL.D, F.R.S., etc.

VICE-PRESIDENTS.

Joseph Blacklock, Esq.	John Hancock, Esq.
D. O. Drewett, Esq.	Wm. Maling, Esq.

D. Embleton, Esq., M.D.	Rev. G. R. Hall, M.A., F.S.A.
Rev. Dr. Norman, M.A.	G. H. Philipson, Esq., M.D.
Rev. J. C. Bruce, LL.D.	Rev. R. E. Hooppell, LL.D.
Rev. A. Bethune, M.A.	A. S. Stevenson, Esq., J.P.
E. J. J. Browell, Esq., J.P.	H. C. Abbs, Esq., J.P.
Rev. R. F. Wheeler, M.A.	Rev. J. M. Hick.
Prof. G. S. Brady, M.D., F.R.S.	John Philipson, Esq., J.P.
H. B. Brady, Esq., F.R.S.	

TREASURER.

R. Y. Green.

SECRETARIES.

Richard Howse.	Thomas Thompson.	Faraday Spence.

COMMITTEE.

T. W. Backhouse.	Rev. J. M. Hick.
Benj. Barkus, M.D.	Rev. W. Johnson.
E. J. J. Browell.	G. H. Philipson, M.D.
Wm. Dinning.	John Philipson.
D. Embleton, M.D.	J. F. Spence.
John Glover.	Col. J. R. Young.

AUDITORS.

J. S. Forster.	Ald. T. P. Barkas.

NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

ANNUAL MEETING, 19TH JULY, 1890.

REPORT OF THE COMMITTEE, 1889—1890.

THE Society ends the sixty-first year of its existence with a roll of 315 members. Twenty-four new members were elected during the past year, while eleven have died and three resigned.

The Committee regret that notwithstanding the great increase in the local population, the number of members still increases so slowly. Whilst proud of possessing a Museum which only last September was characterised by the President of the British Association as one "which in some of its features is a model for institutions of its kind," the Committee feel that the work of the Society is being unnecessarily and even painfully crippled for lack of funds, and they would again appeal not only to their members but to the public to aid them in the two following ways, viz., (1) By endeavouring to secure a large increase in the number of annual subscribers. (2) By contributions to the "Maintenance Fund."

During the past year the British Association for the Promotion of Science visited Newcastle for the third time, twenty-six years having elapsed since their second visit. The meeting was doubly interesting to this Society, as Professor Flower, the head of the Natural History Museum at South Kensington, was

President of the Association for the current year. Professor Flower paid several visits to the Museum, both before and during the meeting, and expressed his warm satisfaction both with the collections and the details of the Museum building. Commendation coming from so high a quarter cannot fail to be gratifying to the members of the Society.

It is also a pleasure to the Committee to be able to note that in his inaugural address Professor Flower alluded to the scientific services of "Alder, Embleton, Hutton, Atthey, Norman, the two Hancocks, the two Bradys, and other names honoured in the annals of Biology," names, too, which are indissolubly linked with the records of this Society.

Two conversaziones were given, one by the Mayor and Corporation, the other by the Local Committee, to the members of the British Association during their visit to Newcastle, both of which were held in the Museum building, which was lighted for these occasions with the electric light in a manner which displayed the collections in a most satisfactory way. As both of these conversaziones were a great success, and as more than 2,000 guests were entertained on each occasion, the capabilities of the Museum for the accommodation of a large body of people was thoroughly tested.

The Committee are glad to report that through the liberality of the Local Committee of the British Association, who were at the expense of laying the wires, and of J. W. Swan, Esq., who very kindly presented the lamps, the entrance hall, the committee and ladies' rooms, the library, and two staircases are now permanently fitted with the electric light; and they hope soon to be able to arrange for a permanent supply of electricity, when these rooms will be available for evening meetings of the Society.

The Committee feel that the usefulness of the Society would be much increased if arrangements could be made for courses of lectures on Natural History at the Museum during the winter months. Arrangements of this nature would necessarily entail an increased expenditure, which the Committee do not feel justified in incurring in their present financial condition.

Mr. John Hancock has, with his accustomed generosity, made a valuable addition to the collections of the Society by the gift of his own original water-colour and pencil drawings of birds, etc , which have been drawn with the greatest care from life, and which to a great extent served as the models for his stuffed cases of birds now in the Museum. These drawings have been mounted and framed, the frames having been most kindly presented by Lady Armstrong.

In the autumn of last year Capt. Nevile R. Sayers, ever mindful of the wants of the Museum, kindly presented an interesting collection of Madrepore Corals, which he had obtained from the Pearl-fishing divers on the edge of the Great Barrier Reef, off Queensland. Likewise several specimens of Fishes and Mollusca, from Australia and Torres Straits. In September last Messrs. Wm. Benson & Son, of Allerwash, obligingly presented to the Society six large slabs of fossil footprints from the Red Sandstone Quarries of Corncockle Moor, Dumfriesshire. Originals of these footprints have been long desired for the Museum, and which are only obtained very rarely. The casts given to the Society by Henry Witham, Esq., an original member and Vice-President of the Society, were obtained in 1829–30.

The additions to the library through exchanges with kindred Societies have considerably increased during the current year, consisting chiefly of Reports and Transactions of the Learned Societies of North America, Great Britain, Europe, and the Colonies. Nearly one hundred volumes or parts of volumes have in this way been added to the library.

A list of other donations and additions to the Collections of the Society will be found at the end of this Report.

The following donations to the Maintenance Fund have been made during the past year:—

J. Ralph Carr Ellison, Esq., Hedgeley, Alnwick ...	£10	0	0
G. H. Philipson, Esq., M.D., Eldon Square............	5	5	0

The Committee cannot close their Report without expressing their regret at the loss the Society have sustained in the death of their President, the late Bishop of Durham. It is needlees to speak of the learning and attainments of Bishop Lightfoot, but it may be named that while his studies necessarily lay in another direction, he was always warmly interested in and keenly alive to the modern revelations of science, and to the necessity for the spread of scientific truth.

By the death on the 11th inst. of our venerable Vice-President, John Clayton, Esq., of the Chesters, the Society has to mourn the loss of its oldest officer, Mr. Clayton having been elected a member in 1832 and Vice-President in 1835. Though taking no active part in the scientific work of the Society, Mr. Clayton always took a lively interest in its proceedings, and was ready on all occasions, by his judicious advice, experience, and presence at its meetings, to promote the welfare and the objects and interests of the Society through the long period of fifty-eight years.

The Committee have also to deplore the death of Mr. James Richardson, which occurred very suddenly on the 16th June. He had been a member of the Society for twenty-five years, and though not devoting himself to any special branch of Natural History he ever took a warm interest in the progress and welfare of the Society, and for several years was a member of the Committee and a liberal subscriber to the Museum Building Fund.

From the staff of Honorary Curators we have to record the loss of Mr. Matthew Henderson, whose unassuming manners and careful work as an entomologist endeared him to all who came in contact with him. Ever busy in his moments of leisure with some Natural History pursuit, and ever ready to communicate his observations to young and old, he will be much missed by those with whom he worked and had the pleasure of his intimate acquaintance.

The Honorary Treasurer's Financial Account shews a balance of £156 : 16 : 10, in contrast with a balance of £106 : 18 : 10 for last year. The excess of £50 is accounted for by a private donation, which the Committee suggest should be transferred to the Maintenance Fund Account. It will be seen from the General Account that the strictest economy has been exercised during the year; no outlay for increasing the collections or completing the furnishing of the Museum has been made, but only such payments as were absolutely necessary for the routine work and keeping the collections in order.

The following ladies and gentlemen were elected members of the Society during the past year, from July, 1889, to 30th June, 1890 :—

Armstrong, Wm. Watson, Esq., Cragside, Rothbury.
Armstrong, Mrs. Watson, do. do.
Armstrong, J. H., 32, Eldon Street.
Bell, Charles Robt., 22, Osborne Avenue.
Blair, Hunter, 2, Fernwood Road.
Dawson, Wm., Westoe, South Shields.
Emley, Frederick, 7, Ellison Place.
Hope, T. M., 3, Tankerville Terrace.
Hutchinson, G., 34, Eldon Street.
Laycock, J. F., Wiseton, Bawtry, Notts.
Leach, R. E., M.A., F.G.S., Hartlepool.
Lloyd, Rev. Canon, D.D., Vicar of Newcastle.
Milburn, Edward, 6, Windsor Terrace.
Moore, Joseph M., Harton, South Shields.
Oliver, Prof. Thos., M.D., Eldon Square.
Perkins, Charles, Gallowhill, Meldon.
Potter, M. C , Durham College of Science.
Pybus, Robt., jun., 63, Osborne Road.
Sanderson, W. J., 14, Claremont Place.
Watson, Mrs., Burnopfield, Co. Durham.
Weeks, J. Geo., Bedlington.
Williamson, G. E., 22, Eldon Square.
Wise, Frederick, Benton Hall.
Wright, Alfred, 8, Bentinck Crescent.

ABSTRACT OF MINUTES.

19th July, 1890.

The Hon. Secretary read the Committee's Report.

Mr. Irving moved, and Mr. Walker seconded:—

"That the Report now read be adopted."

The Hon. Treasurer's Financial Statement was presented.

Mr. P. Hobbs moved, and Mr. Swan seconded:—

"That the Hon. Treasurer's Report be adopted."

The following gentlemen were proposed as officers of the Society for 1890–91. See List, pp. 48, 49.

Mr. Rich moved, and Mr. M. J. Pelegrin seconded:—

"That the officers now proposed for 1890–91 be elected."

Mr. C. H. Bryant, 19, Wentworth Place, Newcastle, was proposed and elected a member.

On the motion of Mr. R. Y. Green, seconded by Major Ernest Anne, the thanks of the members were given to the Auditors and other officers for their labours during the past year.

THE HONORARY TREASURER IN ACCOUNT

Dr. CURRENT ACCOUNT FROM JULY 1st,

1890.	RECEIPTS.		£	s.	d.
June 30.	To Balance from last Account...		106	18	10
	,, Members' Subscriptions		321	2	6
	,, Admission Fees		180	2	3
	,, Interest on Stocks:—				
	Newcastle Corporation $3\frac{1}{2}$ per cent. Stock, Half-year	£34 2 6			
	Wear Commissioners' $4\frac{1}{2}$ per cent. Stock, 1 year	21 18 8			
			56	1	2
	,, Guides to Museum sold		7	3	2
	,, Donation per J. H. Richardson		50	0	0
	,, ,, British Association Electric Light		51	0	0
			£772	7	11

June 30.	To Balance forward	£156	16	10

WITH THE NATURAL HISTORY SOCIETY.

1889, TO JUNE 30TH, 1890. CR.

1890.	PAYMENTS.	£ s. d.	£ s. d.
June 30.	By Salaries and Wages :—		
	Richard Howse (11 months)......	183 6 8	
	Joseph Wright........................	90 0 0	
	Jno. Jackson...........................	66 15 0	
	Wm. Voutt	57 18 0	
	Mrs. Atkinson	20 16 0	
			418 15 8
	,, Incidental Expenses :—		
	Coal	6 11 0	
	Coke	22 12 0	
	Water	5 9 4	
	Gas	4 7 0	
	Advertisements	4 8 0	
	Taxes—Income and Land & House	8 3 6	
	Insurances	31 2 0	
			82 12 10
	,, Tradesmen's Accounts :—		
	Messrs. Dinning & Cooke	13 2 2	
	,, Gurney & Jackson.........	1 10 0	
	,, Sopwith & Co.	7 16 9	
	,, Emley & Son	1 8 6	
	,, J. Bell & Co.	15 5 0	
	,, Holmes & Son, Electric Light	51 0 0	
	Mr. G. G. Laidler.....................	2 10 2	
	,, J. Ferguson	2 14 8	
	,, J. Backhouse	0 14 0	
	Sundries, per J. Wright	16 10 4	
			112 11 7
	,, Two Cheque Books		0 10 0
	,, W. L. Adamson, Subscription overpaid............		1 1 0
	,, Balance in Bank		156 16 10
			£772 7 11

I. G. DICKINSON,

HON. TREASURER.

25th March, 1891.

Examined and found correct,

JNO. D. SCOTT,
E. O. REID,
} AUDITORS.

THE HONORARY TREASURER IN ACCOUNT

MAINTENANCE FUND ACCOUNT,

		£	s.	d.
1890.				
June 30.	To Balance of Maintenance Fund Account, July 1st, 1889	10	4	2
	,, Subscriptions to Maintenance Fund from July 1, 1889, to June 30, 1890	15	5	0
		£25	9	2
June 30.	To Balance forward	£25	9	2

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1890.

		£	s.	d.
1890.				
June 30.	By Cash in Messrs. Lambton & Co.'s Bank, Grey Street	25	9	2
		£25	9	2

I. G. DICKINSON,
HON. TREASURER.

25th March, 1891.

Examined and found correct,

JNO. D. SCOTT, } AUDITORS.
E. O. REID, }

THE HONORARY TREASURER IN ACCOUNT

CAPITAL ACCOUNT,

1890.		£	s.	d.
June 30.	To Invested in Newcastle Corporation $3\frac{1}{2}$ per cent. Stock, as per last Capital Account	2000	0	0
	,, Invested in River Wear Commissioners' $4\frac{1}{2}$ per cent. Stock	500	0	0
	,, Balance and Donations to the Maintenance Fund to June 30, 1890, in Messrs. Lambton & Co.'s Bank	25	9	2
		£2525	9	2

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1890.

I. G. DICKINSON,
HON. TREASURER.

25th March, 1891.

Examined and found correct,

JNO. D. SCOTT,	Auditors.
E. O. REID,	

OFFICERS OF THE NATURAL HISTORY SOCIETY,

1890–91.

PATRONS.

His Grace the Duke of Northumberland, K.G.
The Lord Bishop of Durham.
The Lord Bishop of Newcastle.

PRESIDENT.

The Rt. Honorable Lord Armstrong, C.B., F.R.S.

VICE-PRESIDENTS.

The Rt. Hon. the Earl Ravensworth.
The Rt. Hon. the Earl of Tankerville.
Sir Lowthian Bell, Bart., F.R.S.
The Worshipful the Mayor of Newcastle.
Lieut.-Col. Addison Potter, C.B.
John Hancock, Esq.
D. Embleton, Esq., M.D., F.R.C.P.
John A. Woods, Esq.
George Hare Philipson, Esq., M.D., F.R.C.P., M.A., D.C.L.
Thomas Bell, Esq.
John Daglish, Esq.
John Rogerson, Esq.
J. W. Swan, Esq.
Capt. A. Noble, C.B., F.R.S.
Joseph Blacklock, Esq.
John Coppin, Esq.
D. O. Drewett, Esq.
Wm. Maling, Esq.
H. N. Middleton, Esq.

TREASURER.

I. G. Dickinson, Esq.

SECRETARIES.

Wm. Dinning.
A. H. Dickinson.

COMMITTEE.

Mr. C. M. Adamson.
Mr. H. T. Archer.
Mr. Benj. Barkus, M.D.
Mr. E. J. J. Browell.
Mr. R. Y. Green.
Mr. N. H. Martin.
Prof. G. A. Lebour, F.G.S.
Rev. Canon Norman, M.A., D.C.L., F.R.S.
Mr. John Pattinson.
Ald. J. F. Spence.
Mr. A. S. Stevenson.
Mr. Thos. Thompson.

AUDITORS.

John D. Scott.
E. O. Reid.

HONORARY CURATORS,

1890–91.

ZOOLOGY.

VERTEBRATA.

John Hancock.
D. Embleton, M.D.
Samuel Graham.
Thos. Thompson.

INVERTEBRATA.

Rev. A. M. Norman.
John Hancock.
C. M. Adamson.
Wm. Maling.
N. H. Martin.
W. Dinning.
Prof. Jayme Batalha-Reis.

BOTANY.

Rev. Henry Fox, Durham.
Rev. Wm. Johnson, Gateshead.
C. E. Stuart.

GEOLOGY.

E. J. J. Browell.
J. Daglish.
W. Dinning.
E. J. Garwood.
J. W. Kirkby.
Prof. Lebour.
Jno. Pattinson.

CURATOR.

Richard Howse.

KEEPER OF THE MUSEUM.

Joseph Wright.

LIST OF EXCHANGES AND DONATIONS TO THE MUSEUM AND LIBRARY

OF

THE NATURAL HISTORY SOCIETY,

FROM JULY 1ST, 1889, TO JUNE 30TH, 1890.

AMERICAN SOCIETIES.

Boston:—American Academy of Arts and Sciences.

Proceedings, Vol. 15, New Series, Part 2. 1888. *The Academy.*

Boston:—Society of Natural History.

Proceedings, Vol. 24, Parts 1, 2. *The Society.*

Cambridge:—Museum of Comparative Zoology, Harvard College.

Bulletin, Vol. 16, Nos. 5, 6, 7, 8.
,, ,, 17, ,, 4, 5, 6.
,, ,, 18, No. 29.
,, ,, 19, Nos. 1, 2, 3, 4.
Memoirs, Vol. 14, No. 1, Part 2.
,, ,, 16, ,, 1, ,, 2, No. 3.
,, ,, 17, ,, 1, ,, 3. Feb., 1890.
Annual Report of the Curator. 1888–89. *Prof. Alex. Agassiz.*

Kansas:—Academy of Science.

Transactions, Vol. 10. 1885-86. *The Academy.*

Madison:—Wisconsin Academy of Sciences, Arts, and Letters.

Transactions, Vol. 7. 1885–87. *The Academy.*

New York:—Academy of Sciences and Lyceum of Nat. History.

Annals, Nos. 10, 11, 12, Vol. 4.
,, ,, 1, 2, 3, Vol. 5. *The Academy.*

Philadelphia:—Academy of Natural Sciences.

Proceedings, Parts 1, 2. 1889. *The Academy.*

Philadelphia:—American Philosophical Society.

Proceedings, Vol. 26, No. 129, with copy of Subject Register of papers published in Transactions and Proceedings, with Supplement and Committee Report of Amended Orthography.
Proceedings, Vol. 26, No. 130. 1889, July—Dec.
Transactions, ,, 16, New Ser., Part 3. *The Society.*

Trenton :—Natural History Society.
Journal, Vol. 2, No. 1. *The Society.*

Washington :—Smithsonian Institution.
Annual Report, 1886, Part 1. *The Institution.*

Washington :—Smithsonian Institution, Bureau of Ethnology.
5th Annual Report. 1883–84.
6th ,, 1884–85.
Five Bulletins:
1. Earthworks of Ohio, by Cyrus Thomas.
2. Problems of the Ohio Mounds, by Cyrus Thomas.
3. Textile Fabrics of Peru, by Wm. H. Holmes.
4. Bibliography of Muskhogean Languages, by J. C. Pilling.
5. ,, Iroquoian ,, ,, ,,

The Bureau of Ethnology.

Washington :—Smithsonian Institution, U.S. National Museum.
Proceedings, Vols. 10, 11. 1888, 1889.
Bulletins, 33—37:
No. 33. Catalogue of Minerals.
,, 34. Batrachia of North America.
,, 35. Catalogue of Described Transformations of North American Lepidoptera.
,, 36. Review of the Family Delphinidæ.
,, 37. Catalogue of Shell-bearing Mollusca of the S.E. Coasts of United States.

Smithsonian Contributions to Knowledge, Vol. 26. 1890.
The Institution.

Washington :—United States Geological Survey.
Monograph 13, with Atlas.
,, 14.
Bulletins, 48—53.
7th Annual Report. 1885-86. *The Director of U.S. Geol. Survey.*

Washington :—Department of Agriculture.
Bulletin 1. The English Sparrow.
N.A. Fauna. No. 1. North American Pocket Mice.
,, 2. New Species of North American Mammals.
The U.S. Department of Agriculture.

Washington :—American Association for the Advancement of Science.
Proceedings 37th Meeting, Cleveland. 1888. *The Association.*

BRITISH SOCIETIES.

Berwickshire :—Naturalists' Field Club.
Proceedings, Vol. 12, No. 2. *The Club.*

Cardiff :—Naturalists' Society.
Report and Transactions, Vol. 21, Part 1. 1889. *The Society.*

Dublin :—Royal Society.
Scientific Transactions, Vol. 4, Ser. 2, Parts 2, 3, 4, 5.
Scientific Proceedings, Vol. 6, New Ser., 3, 4, 5, 6. *The Society.*

Ealing :—Microscopical and Natural History Society.
Twelfth Annual Report. 1889. *The Hon. Secretary.*

Edinburgh :—Botanical Society.
Transactions and Proceedings, Vol. 17, Part 2. *The Society.*

Edinburgh :—Scottish Meteorological Society.
Journal, 3rd ser., No. 6. 1888. *The Society.*

Essex :—Field Club.
Essex Naturalist, Vol. 3, Nos. 1—6, 7—9, 10—12.
,, ,, ,, 4, ,, 1—3. *The Club.*

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Portrait in Water-Colour of Thomas Bewick, by Wm. Nicholson. *Mr. Thos. E. Crawhall, Condercum.*

Rhopalocera Exotica, Parts 9, 10, 11, 12. *Purchased.*

An Original Sketch by Thos. Bewick—"A Proclamation for a Jubilee," 29th Dec., 1800. *Misses Bruce, Whitley.*

MAMMALS.

1889.

July. Specimen of Tanned Rhinoceros Hide. *R. N. Redmayne, Esq.*

Sept. Malformed Antler of a Red Deer. *Robt. Blair, Esq., So. Shields.*

1890.

Jan. Skull of Fuegean Fox and a Tuco-tuco Mole, from Tierra del Fuego. *Philip Hobbs, Esq.*

Feb. Water Vole, from Felton. *Rev. H. Withams, Felton Vicarage.*

Mar. Field Vole, from Riding Mill. *Ernest Scott, Esq.*

April. Chacma Baboon (male), *Cynocephalus porcarius.* *Mr. Day, Menagerie.*

BIRDS.

1889.

July. Kestrel (male), from Rothbury. *Mr. John Duncan.*

„ Skin of Great Bustard, from North Africa. *Admiral St. John, R.N.*

„ Specimen of the Nonpareil Finch. *Mr. Futcher, Nat. Prov. Bank.*

Aug. Egg of Cassowary, from New Guinea. *R. C. Clephan, Esq., Birtley White House.*

„ Young Bullfinch. *Rev. W. Featherstonhaugh, Edmondbyers.*

Oct. Nest of Common Wren. *Miss Armstrong, Hill Croft, Gateshead.*

„ Nonpareil Finch. *Dr. F. Page.*

„ Common Creeper, *Certhia familiaris.* *Mr. Thos. Thompson.*

Nov. Specimen of *Corvus Hawaiiensis*, from Kona, Hawaii.
Two specimens of a Honey Eater, from Keanhou Kona.
Scott Wilson, Esq., Heather Bank, Weybridge, per Mr. J. Hancock.

" Seven Bird Skins, from the Nile. Shot between Assiout and Luxor. *Major R. A. Marriott, R.M. Artillery.*

" Part of Skeleton of Wood Owl, made at Oatlands, 1887.
Young Quail (downy), from Mr. Bidwell.
Chiff-chaff (male), from Oatlands, 1888.
Nest of Sedge Warbler, lined with feathers and down of Swan, from Oatlands, 1888.
Egg of Red-legged Partridge, from Wisley, Weybridge, S. G. Wilson. *Mr. John Hancock.*

Dec. Pale variety of the Red Grouse, *Lagopus Scotica*, shot near Newbrough. *Geo. J. Cookson, Esq., Newbrough Hall.*

" Head of the Giant Petrel, *Procellaria gigantea*, shot at Pisagua, Chili. *Mr. Jas. Thomson, Rose Cottage, Newport-on-Tay.*

1890.

Jan. Lesser Redpole, from Oatlands. *Miss Abbs.*

" A Green Parakeet. *Mrs. Hetherington, 48, De Grey St.*

" A fine specimen of Hornbill, *Hydrocorax planicornis* (*Buceros hydrocorax*, L.), from Philippines. *Mr. I. G. Dickinson.*

Feb. Red-crested Pochard, *Branta* (*Fuligula*) *rufina*, Pall. *Capt. Noble, Jesmond Dene House.*

Mar. Mandibles and Pouch of a Pelican. *Master R. Joseph Kay, 24, Shieldfield.*

" White Pelican (*Skeleton*). *Purchased, Bostock's Menagerie.*

" Snowy Owl and Kelp Goose, from Straits of Magellan. *Admiral St. John, R.N.*

" Kestrel, with faint white spots on wings and back. *Mr. Robson, Beaufront Kennels.*

" Willow Wren, shot near Winlaton, January, 1890. *Mr. Thos. Thompson.*

April. Eagle Owl, *Bubo maximus*, Fleming. *Mr. Day, Menagerie.*
Skeleton of the Condor, *Sarcorhamphus gryphus*, L. This bird was presented, 1888, by *W. C. Tripler, Esq., Santiago, per Dr. H. J. Pattinson.*

1889.

REPTILES.

Aug. Snake, from Bombay. *Master Chas. Fowke, 18, Grosvenor Place.*
Lizard, *Moloch horridus*, from South Australia. *Master Chas. T. Nichol, 22, Grosvenor Road.*

Oct. Common Chameleon. *Master F. C. Anderson, 22, Leazes Terrace.*

" Sloughed Skin of Snake, from Maryland, U.S.A. *Mr. H. T. Archer.*

1890.
April. Alligator and three Serpents. *Mr. Day, Menagerie.*
May. Viper, from Northumberland.
Master Augustus Catoni, per Dr. Embleton.

FISHES.

1890.
Feb. A fine specimen of the Dory, *Zeus faber*, caught off the Tyne.
Mr. Wm. Spouse, North Shields.
" Portion of Skull of Sword-fish, *Xiphius gladius*, taken off the Northumberland Coast. *Mr. Walter S. Corder, North Shields.*
" Specimen of the Witch Sole, *P. cynoglossus.*
" Long Rough Dab, *Hippoglossoides limandoides.*
" Common Dab, *P. limanda.*
" Flounder, *P. flesus*, *Mr. Wm. Clift, So. Shields.*
" Wolf-fish, *Anarrhichas lupus*, L.
Messrs. W. Graham, Carr, & Son, Berwick-upon-Tweed.
" Trifurcated Hake, *Raniceps trifurcatus*, from the Fishing Boats, North Shields. *Mr. E. H. Birchall, North Shields.*
April. Reversed Flounder, *P. flesus.* *Mr. Wm. Clift, North Shields.*
May. Greater Pipe-fish, *Syngnathus acus* (male), caught in the Tyne, at St. Peter's, May, 1890. *Mr. James S. Rea.*
" Two specimens of the Whiff, *Rhombus megastoma* (Donovan), caught by Trawlers off Holy Island. *Mr. Thos. Beldon, North Shields.*
" Specimen of Halibut, the interior of which had been eaten out by Hag-fishes, *Myxine glutinosa.*
Mr. Thos. McKenzie, North Shields.
" Flounder, *Platessa flesus*, caught in the Salmon nets at Blaydon-on-Tyne. *Mr. Thos. Thompson, Winlaton.*
June. Lumpsucker, *Cyclopterus lumpus.*
Mr. Alex. McArthur, 1, Argyle Street.
" A stuffed specimen of the Lumpsucker, *Cyclopterus lumpus*, taken at Blyth. *Capt Jas. Hodgson, 10, Oxford Street.*
Four Fishes from Moreton Bay, Port Douglas, etc.
Capt. N. R. Sayers, Leazes Terrace.

MOLLUSCA, ETC.

1889.
July. A collection of Australian Shells, sent in exchange for some duplicate type species from the Angas Collection.
The Trustees of the Australian Museum.
Sept. Collection of Madrepore Corals, from Great Barrier Reef.
Specimens of *Ovulum ovum* (L.), from Great Barrier Reef.
Two specimens of Haliotis, two Tridacna, and two Starfishes, from Magnetic Island, near Townsville, Queensland.
Capt. N. R. Sayers, Leazes Terrace.

Oct. Collection of *Balani*, obtained chiefly from the bottoms of steamers trading to tropical parts of the world.
F. Schnitger, Esq., Leazes Terrace.

Nov. Teeth of Shark and Skull and Wing-bone of Albatross.
Master R. J. Kay, Shieldfield Green.

„ Unio with Pearls, from the Thames, near Oatlands.
Mr. John Hancock.

Dec. A small collection of Recent Shells, etc. *Miss Joicey, Gateshead.*

1890.

May. Specimen of *Eledone cirrhosa*, and of *Ommastrephes todarus*, caught by North Shields Trawler; *Loligo Forbesii*, caught at Cullercoats. *Mr. Thos. Beldon, North Shields.*

June. Thirteen specimens of Recent Shells. *Prof. G. A. Lebour.*

BOTANY.

1889.

Nov. Three Cones of *Pinus Coulteri*, one of *Auracaria imbricata*, grown at Whitmoor House. *Capt Salvin.*

Two Cones of *Cedrus Libani*, from a young tree planted by Mr. Wm. C. Hewitson at Oatlands about forty years ago, and six Cones of Cluster Pine, from Oatlands. *Mr. John Hancock.*

MINERALS AND FOSSILS.

1889.

July. Specimen of Native Copper, from Lake Superior, U.S. America.
Mr. Geo. Sisson.

„ A collection of Fossils, from the St. Cassian beds of Lake Como, North Italy. *Mr. Edmund J. Garwood.*

Sept. Six slabs of Fossil Footprints, from Corncockle Quarry, Lockerbie, N.B. *Messrs. Benson & Co.*

„ Specimen of Red Copper Ore, from Spain.

Two specimens of Syenite, from the Malvern. *Mr. M. J. Pelegrin.*

„ Three specimens of Magnetic Iron Ore, from Gellwara Mountains, Sweden. *Mr. H. Oswin Bell.*

Nov. Slab of Sandstone, shewing Ripple marks.
John Clayton, Esq., The Chesters.

„ Antlers of Red Deer, *Cervus elaphus*, dredged up from the silt of the Tyne at Newcastle Quay, 27 feet below low-water mark.
Mr. Wm. Geo. Laws.

Dec. Specimens of Flint-flakes and Gun Flints, to illustrate the manufacture of the latter from Flint nodules.
Mr. E. Lovett, Croydon.

„ *Lepidodendron Sternbergii*, small portion of branch, from Gosforth Quarry, near the Colliery. *Mr. Gibson.*

1890.

Jan. Specimens of Carboniferous Limestone, from the Great Limestone at Stanhope, Weardale, containing Corals.
Mr. Wm. Powell, Woodhouse, Crawleyside, Stanhope.

,, Bones dredged from the bed of the Tyne, near Quayside, two fragments of skull of Cow, part of antler of Red Deer, and horn core of Goat with tool marks on them, 30—35 feet in quicksand below low water mark. *Mr. Wm. Geo. Laws.*

,, Red Deer Antler (small), found in silt resting on Boulder Clay, at the New Dock, Bull Ring, North Shields, 1884.
Mr. H. S. Edwards, Corbridge.

,, Five Rock specimens from the Isle of Wight:
Banded Sandstone, Variegated Clay, Freshwater Limestone.
Miss Naters, 9, Lovaine Place, per R. Y. Green.

Feb. Several fine specimens of Native Sulphur, from Lorca, Spain.
Mr. M. J. Pelegrin.

,, Twenty specimens of Carboniferous Limestone Corals, from the Great Limestone, Stanhope, Weardale.
Mr. Wm. Powell, Woodhouse, Crawleyside, Stanhope.

,, Nine specimens of Agate and Amethyst, and one Septaria.
Miss Green, Lovaine Crescent.

Mar. Octahedral Crystal of Senarmontite (Oxide of Antimony), from Algeria. *Miss C. Birley, Manchester.*

,, Fragment of large stem of *Lepidodendron*, from the neighbourhood of Bellingham. *Mr. W. L. Charlton, The Reenes, Bellingham.*

May. *Ammonites bifrons*, split and polished, from Whitby, and a large Carnelian. *Mr. R. Y. Green.*

,, Fragments of Coal Plants, *Lepidodendron*, from Deckham Colliery (Yard Seam). *Mr. Surtees Hutchinson.*

June. Specimen of Middletonite, from Haigh Moor Coal, Savile Pit, Methley Junction Colliery, 1890.
Mr. T. W. Embleton, Methley, Leeds.

ETHNOLOGY, ETC.

1889.

Mar. A Japanese Toy Snake. *J. S. Forster, Esq.*

,, Japanese Toys: three Frogs, three Mice, and a Japanese Woman.
Mrs. Schmalz, per Mr. J. Hancock.

Dec. Copper Coins and Tokens. *Miss Joicey, Gateshead.*

,, Memorial Tablet (earthenware), from the Foundation Stone of the old Museum, Westgate Road. Date of laying the Foundation Stone 5th August, 1833, by the Right Worshipful the Mayor of Newcastle, John Brandling, Esq., and the Officers of the Society.
Chas. A. Harrison, Esq., C.E.

1890.

Jan. Pair of Slippers. *Mrs. Dinning, Eldon Street.*

,, Model of Native Boat with Outriggers, from Ceylon. *Mr. S. C. Dutton, St. George's Terrace, Jesmond.*

Mar. Cast, in metal, of Face of an Indian who came into the Arsenal at Esquimault and dropped down dead. *Ernest Scott, Esq.*

Donation of Electric Lamps for the permanent lighting of the Committee Room, Ladies' Room, Lavatories, Entrance Hall, Staircases, and Library of Museum. *J. W. Swan, Esq., Bromley, Kent.*

IV.—*Note on the Conglobated form of the Magnesian-limestone of the County of Durham.* By Richard Howse.*

Most of the members of the Club, especially those who have been accustomed to join in the annual excursion to Marsden and Whitburn, must often have observed the remarkable and varied structure of the Magnesian-limestone exposed in the sea-cliffs, the quarries, and stone walls of the fields on this part of the Durham coast. The stratified masses of rock of a coralloidal and botryoidal appearance are so striking that a geologist is, on a first visit, taken by surprise at the peculiarities of the rock structure so well displayed on many parts of this coast, and the most indifferent and heedless observer can scarcely pass the large masses of Cannon-ball limestone at Roker without some passing remark. Most persons consider, at first sight, the coralloidal form of the limestone to be organic.

These peculiar forms of limestone are characteristic of the Upper series of beds of the Magnesian-limestone, as seen on the coast between Marsden and the Wear, in the Fulwell Hill quarries, and formerly at Building Hill, in the neighbourhood of Sunderland.

In no known part of the world are these peculiar lithological forms of rock structure so extensively and so instructively

* Read at Marsden, October, 1889.

displayed; and the facilities for their examination and study are increased by their exposure along the coast line, and in the extensive quarries which have been for a long series of years worked at Fulwell and Southwick for the production of lime, the greater part of which has for many years been shipped to Scotland in small sailing vessels.

So remarkably like corals are some of these beds of limestone that the partial observer jumps immediately to the conclusion that many of the beds are of organic origin, and that they are really formed of corals in different states of preservation; and this opinion when once formed by ignorant and untrained observers is very hard to dispel, as the following anecdote will, for example, shew.

One fine Saturday morning, not long ago, a gentleman residing in one of the suburbs of Newcastle was busily engaged arranging some very fine masses of the coralloidal limestone from Fullwell Hill into a rockery in his garden. A stranger, respectably dressed in black, came near, and leant for a considerable time over the garden rails watching the proceedings very attentively. At length, finding words, he accosted the rockery maker in a decided tone with, "You've got a lot of fine corals there, sir." "Corals," replied the owner, "I am told that they are not corals but only curious forms of the Magnesian-limestone, which are very common at the Fulwell Hill Quarry." The respectable man drew himself up to his full height, and with some warmth and emphasis replied, "Not corals; you must not tell me that. I'm a schoolmaster, and know all about these things, and I say they are corals, and no mistake." This was unanswerable, and the respectable schoolmaster, who certainly was 'abroad' that day, walked off with the self-satisfied air of a person who had finally settled a very knotty question.

But the coralloidal form of limestone, though of great interest, is not the kind of structure to which I wish at this time to confine my remarks. It is to the structure which the late Prof. Sedgwick long ago styled "the large globular concretionary structure," and which, as you can see at Whitburn and Roker, occurs in beds or pockets, interstratified between other beds of a harder and more compact nature, on several parts of the coast, and in the Fulwell Hill Quarries.

Many years since Prof. Sedgwick gave a careful description of several of these beds, and as I cannot, after long examination, improve his description, I am obliged (inclined rather) to quote some parts of his account of them than attempt something new.

He says that "this (conglobated) structure is seen in its most imposing form on some parts of the coast of Durham, where the whole cliff resembles a great irregular pile of cannon-balls; but it is not in those localities that the large spheroidal concretions can be studied with greatest advantage. Their true history will be best understood where they are associated with other modifications of the limestone."

"Some of these masses (of limestone) have been erroneously called stalactitic. They have not the structure of stalactites, for they are not made up of successive layers arranged about the axes of the pendent cones; but on the contrary (where the crystalline structure has not been carried too far), we may find them made up of circular plates piled one upon each other, with their planes at right angles to the same imaginary axes, and these plates seem to be the prolongations of the laminæ of contiguous beds."

"The last set of concretions to be noticed are to be found in association with the dolomitic earth occupying the cells. They are unattached to any surrounding beds, and are always more or less perfectly spheroidal in form. Sometimes they are single; but more frequently several spheres are in contact, which by mutually penetrating each other produce a number of grotesque forms; and occasionally they are grouped in beautiful regular clusters. In general they are less crystalline than the globular masses before described, and they do not exhibit the same kind of laminated structure; but in some instances they are studded with the projecting angles of the inverse rhomb, and on fracture are found, as in the former instances, to be composed of diverging bundles of crystals. The largest of these concretions (which at Fulwell are more than a foot in diameter) have commonly a smooth surface, and when broken in two, expose a number of thick ill-defined concentric layers, which are either aggregated about an earthy nucleus or are hollow in the centre (in the latter case the earthy nucleus has probably been afterwards carried off). These layers are of various colours. Towards the centre the fracture is generally dull and earthy, but towards the circumference the layers are made up of many thin crystalline plates, and the lustre is shining. In other instances balls of considerable size have the internal structure here described, while the outer zone is made up of diverging crystalline fibres, with the usual acumination. The transverse fracture in such cases is very beautiful."

"The spheroidal concretions are in some places subordinate to the pulverulent matter; in others they abound so much that they nearly fill the irregular cells; and the ochreous powder appears as an upfilling matter in the intervening spaces. In some rare instances the earthy matter becomes hard and coherent, and when broken with a hammer exposes a surface which passes through the centre of the imbedded balls."

The rock structure alluded to in these extracts, and to which more particularly it is wished to direct attention, is made up almost entirely of spheroidal balls of various sizes imbedded in a loose powdery yellowish marl, which is in some instances finely laminated and arranged in layers between the spheroidal compact balls. As stated before, these spheres occur occasionally perfectly isolated in the powdery marl; in some other instances they are joined together, and more or less attached to others in some part of their circumference. Most of these when split asunder are homogeneous in structure and finely crystalline. Others have a hollow centre, the nucleus having been removed; and in some the parts near the circumference shew a radiating crystalline structure. They are all more or less globular, but this shape is modified a little in the balls which occur in the lowest part of the bed, where they are flatter and more stalagmitic in appearance and shape. In the upper part of the bed, the concretions are attached to the base of the superior stratum, and are of a semispheroidal or mammillated form, and have the appearance of flattened stalactites. In some of these nodules, when broken open, we find a layer of bivalve shells, and this layer can be traced out of one nodular mass through the intervening laminated marl into an adjoining nodule.

It seems clearly proved by this occurrence of shells passing in a straight line through these adjoining nodules, and also through the laminated marl which connects them, that the beds in which these nodules now occur was in the first instance composed entirely of fine laminated marl, on the surfaces of which when first deposited and laid out on the sea floor, these characteristic mollusca lived, and in which they were eventually entombed.

These marly beds rest on undisturbed compact beds, and are covered by others equally compact and undisturbed in many places. How, then, has the material, the carbonate of lime, which forms the spheroidal balls been introduced into these beds of pulverulent, dolomitic marl, causing the globular structure. Certainly not from any action or changes taking place beneath the marl, because the stratum underlying the marl has not been in the least disturbed.

The explanation seems to be that the new substance introduced into these beds of marl has been filtered or dropped in from above; in fact, that the carbonate of lime was introduced by water surcharged with that material dropping in from the roof of the marl bed, and forming first, on the base of the hard, overlying stratum, mammillated masses; and lower, in the soft marl, the carbonate of lime continually introduced in drops of water aggregated into spheroidal concretions, the marl itself being either partially incorporated in the concretions or carried off by molecular change, caused by the excess of water percolating through the whole series of limestone beds. Though this may not be considered as stalactitic, in the sense in which Prof. Sedgwick explains the form of a stalactite found in an empty cave, yet, as these drops, formed by the percolation of water through the roof of the upper stratum, fall and carry with them carbonate of lime in solution, and as this carbonate of lime is deposited in semiglobose or mammillated, pendent concretions on the roof, and into globular concretions in the bed of loose powdery marl, with more stalagmitic-like forms at the base of the bed, it seems safe to conclude that the method of formation of these globes or balls is more stalactitic, using that word in a primary sense, than geologists and others seem willing to admit.

But that these modifications of structure are secondary and superinduced, and are not the original form or material which was first deposited, even the most superficial observer will be inclined to admit, when it is pointed out that these beds were at first deposited in finely laminated layers of yellow, powdery, dolomitic marl, and that between some of these layers organic remains were entombed, which have not been entirely obliterated, but are still preserved in some of the beds, which are now almost entirely filled with more or less crystalline compact globes or partially radiated spheres.

It may be of interest to state that, according to the analyses made many years since by Messrs. Browell and Kirkby,* the concretionary beds contain a large percentage of carbonate of lime, and scarcely a trace of magnesia. On the contrary, the yellow, soft, marly beds are composed of nearly equal parts of carbonate of lime and carbonate of magnesia, sometimes the latter in excess of the former. In former times the fine, yellow, laminated limestone was extensively quarried in Marsden Bay, and conveyed to the Jarrow Chemical Works for the manufacture of Epsom Salts, which is an additional proof of the large percentage of magnesia contained in some of the originally-deposited and unaltered beds. That this stratum is original and unaltered is proved by the perfect manner in which the remains of small fishes occasionally found in it are preserved.

* See Nat. Hist. Trans. Northumberland, Durham, and Newcastle-upon-Tyne, Vol. I., pp. 204—230, 1867. Refer also to Prof. Sedgwick's Memoir, Trans. Geol. Soc., Ser. II., Vol. III., 4to.

V.—*Miscellanea.*

Note on the curious proceedings of a Nuthatch (Sitta cæsia, Wolf) *observed at Oatlands, 1889.*—This short note is written to show the sagacity of two Nuthatches observed by myself, my sister, and a lady friend, at Oatlands, this summer.

We are in the habit in the mornings at breakfast time of throwing on to the lawn fronting the window steeped bread, etc., for the small birds which assemble there. This year two Nuthatches have joined in the repast, but Sparrows are the most numerous visitors. The bread given to the birds not being much appreciated by the Nuthatches we laid some nuts out for them, which were very soon carried off, no doubt to some hiding place, by our little sprightly friends; but observing that there were always some of the nuts left on the ground, we at once thought there must be some reason for it. It struck us all very forcibly that the nuts left behind must be bad, empty nuts, and this, on examination of all the nuts that were left behind by the Nuthatches, was really the case. Each nut examined was, without exception, empty.

Watching the actions of the birds more carefully, we noticed that the birds took the nuts first in their bills, and then often dropped them on the ground; these were found on examination to be all empty nuts. We certainly broke more than twenty nuts that had been left, and each one was empty, that is, no kernel had been matured in it. Afterwards I tried the weight of several nuts in my hand, and I found a very perceptible difference in the weight of those nuts that were full and those that were empty, and I need scarcely say that the birds must have determined by the same mode the full nuts and those that were empty. Is this an instance of reasoning, or is it instinct?—*John Hancock.*

Tracks and Travels of Earth Worms.—On the morning of the 21st November, 1889, at nine o'clock, after heavy rain, I noticed a great number of worm tracks on a footpath in a field near here, the property of Col. Towneley, and farmed by Mr. Jeffrey. The path runs along the side of a mud fence, on the top of which very old thorns are growing; the other side of the path, which is between eight and nine feet broad, is quite open, being a potato field, the crop recently taken. One of the tracks was nearly thirty yards in length, in a straight line along the path, and had evidently been made by a very large dew-worm. Other tracks were more tortuous, forming sometimes a rough resemblance to the figure 8, and other fanciful shapes; and not unfrequently some of the tracks were of a circular form, and terminated near the same spot on the same side of the road where they had begun. The worms that had formed the tracks were of all sizes, from the large dew-worm to worms less than a brandling.—*Thomas Thompson, Winlaton, January, 1890.*

Varieties of Mole (*Talpa Europeus*).—Two moles of an unusual colour were caught here on 11th January and brought to me. They are, I think, scarcely the full size; at least I have seen larger specimens, but I never saw any like them before in colour. One has a stripe of pale orange, three-fourths of an inch broad at the throat, and which extends down the belly to the tail, where it is bright orange, three-eighths of an inch broad; the tips of the tail are white. The other specimen has only half as much orange colour, which is bright, and nearly in the middle of the body. I have also in my possession a white variety and a cream-coloured mole.—*Thomas Thompson, Winlaton, January, 1890.*

On the occurrence of the Willow Wren in January, near Blaydon-on-Tyne.—On Thursday, the 16th inst., a specimen of this common migrant, the Willow Wren (*Sylvia trochilus*), was shot between Blaydon and Scotswood Bridge, county of Durham. It was in good condition and plumage, no old wound whatever visible. I never heard of such an occurrence before in the North of England. It is being preserved by Mr. John Walker, taxidermist, of Blaydon, who kindly brought it to me for inspection.—*Thomas Thompson, Winlaton, January, 1890.*

VI.—*A Revision of the British Species of Fresh-water Cyclopidæ and Calanidæ.* By George Stewardson Brady, M.D., LL.D., F.R.S., Professor of Natural History in the Durham College of Science, Newcastle-on-Tyne. (Plates I.–XIV.).

Nowhere amongst the Entomostraca is there a group whose members offer greater difficulties as to specific discrimination than the genus *Cyclops.* In the first place, the changes undergone by each animal in the course of individual development are very extensive and have been as yet only imperfectly investigated. There can be no doubt that many so-called species have been founded upon forms which represent only transitory evolutionary phases, and as, not only amongst Crustacea but in many other groups of animals, the function of reproduction is certainly by no means confined to fully-developed adults, it is certain that we cannot entirely rely on the presence of ovisacs or other reproductive organs as conclusive evidence of the morphological maturity of the animals in which they occur. Nor is there in most cases any salient feature, such as an easily distinguished peculiarity of colour or form, which can enable one at a glance, by the help of an ordinary hand lens, to distinguish between nearly related species. It therefore becomes a necessity to dissect and examine under high microscopic powers very large numbers of specimens; and even when this is done, variations dependent upon race, habitat and other circumstances are so abundant that it often becomes a work of the greatest difficulty to decide as to the species to which any particular specimen may belong.

No wonder then that much confusion prevails in the nomenclature of these species: it is, indeed, rather wonderful that the confusion is not still greater, more especially when it is remembered that many copious authors have furnished only written descriptions of their species—drawings being absolutely essential to a proper understanding of minute points of specific difference. I cannot pretend to have cleared up all the doubtful points even amongst the small number of species noticed in this paper, nor do I suppose that no new or unrecorded species have been missed amongst the numerous collections which I have had to examine. There will certainly, for many a year, be plenty of scope for the energy of collectors even if they limit their researches only to the discovery of new species. The two counties of Northumberland and Durham present probably as good an area as can anywhere be found for the prosecution of this kind of work, their numerous salt-marshes, moorland tarns and pools offering a fine field for research. Several of the most interesting species noticed in the following pages have been found within the confines of the two counties which we have been used to consider as the proper hunting ground of the Tyneside Field Club; but in these days of rapid and easy railway communication there seems no reason to restrict the survey of the Club within what are frequently mere arbitrary boundaries resting upon no important physical characters.

In the preparation of this paper I have had the very valuable help of many friends, to whom my best thanks are due:—to the Rev. Canon Norman, D.C.L., F.R.S., for a fine collection of tow-net and hand-net captures from almost all parts of England and Scotland, and from Lough Neagh and other localities in Ireland; to Mr. Thomas Scott, F.L.S., of the Scottish Fishery Board, for many very interesting species from various districts of Scotland; to Mr. D. J. Scourfield, for numerous gatherings from the neighbourhood of London. To Professors G. O. Sars of Christiania, B. W. Thomas of Chicago, M. Richard of Paris, and Herr S. A. Poppe of Vegesack, Hanover, I am also much indebted for the communication of specimens and other valuable information.

As regards the illustrative drawings now given, it may be explained that I have not thought it necessary to figure over again such species as were fairly well done in my Ray Society Monograph, except that in the genus *Cyclops* I have given in each case a single new figure of the entire animal. These, I think, will be useful as affording a ready means of comparison as to the external characters of the species. I regret that *Cyclops Ewarti* forms an unavoidable exception to this statement, no specimens of that species being attainable.

The reference numbers given in the lists of synonyms indicate the memoirs to which similar numbers are attached in the appended "Bibliographical Index."

Family CYCLOPIDÆ.

Genus CYCLOPS, Müller.

A. *Anterior antennæ eighteen-jointed.*

1. **Cyclops elongatus**, Claus, (Pl. I., figs. 1–5).

1863.	*Cyclops elongatus*,	Claus (**18**), p. 97, pl. XI., figs. 1, 2.
1871.	,, ,,	Heller (**23**), p. 4.
1880.	,, ,,	Rehberg (**33**), p. 538.
1883.	,, ,,	Cragin (**40**), p. 2, pl. I., figs. 1, 19-23.
1885.	,, ,,	Daday. (**44**), p. 207.

Body gradually tapering from before backwards; none of the segments much produced laterally, posterior angles of the first three rounded off or obtuse, those of the much smaller fourth and fifth segments somewhat produced backwards and acutely angulated; abdomen about half as long as the cephalothorax, margins not denticulated; caudal rami rather stout, about as long as the last two abdominal segments; principal caudal setæ half as long as the body of the animal. Anterior antennæ eighteen-jointed, scarcely as long as the first body-segment. The last joint of the outer branch in the second, third, and fourth pairs of feet has three spines on the outer and three setæ on the inner margin, the first of the three spines being smaller than the other two. The fifth foot is two-jointed, the basal joint rather short and wide and bearing a single long seta, the second joint elongated, narrow, and having at the extremity a short, awl-shaped spine and a long seta. Length 1·4 mm.

This species seems to be very uncommon, and has been noticed only by Professor Claus and Rehberg in Germany, by Heller in the Tyrol, and by Cragin in America, where it occurred "sparingly in a rain-pool near the Cambridge Museum of Comparative Zoology." The chief characteristic of the species is the division of the seventh joint (as it would be counted in the seventeen-jointed species) into two, thus giving eighteen joints to the antennæ. The measurement given by continental authors is about twice that of British specimens.

C. elongatus was found plentifully in a gathering sent to me by the Rev. Dr. Norman, F.R.S., from "pools near Broomley Lough, Northumberland." This is the only British habitat known to me.

B. *Anterior antennæ seventeen-jointed,*

a. Reaching, when reflexed, beyond the posterior margin of the first somite.

2. **Cyclops signatus,** Koch (Pl. II., fig. 5).

Antenna with serrated ridge.

1820. *Monoculus quadricornis albidus*, Jurine (**3**), p. 44, pl. II., figs. 10, 11.
1841. *Cyclops signatus*, Koch (**4**), H. 21, tab. VIII.
1850. ,, *quadricornis* var. *c.*, Baird (**7**), p. 203, pl. XXIV., fig. 5.
1857. ,, *coronatus*, Claus (**13**), p. 29, pl. II., figs. 1–11.
1863. ,, ,, Claus (**18**), p. 97, pl. II., fig. 16; pl. X., fig. 1.
1863. ,, *signatus*, G. O. Sars (**20**), p. 33.
1863. ,, *coronatus*, Lubbock (**19**), p. 199.
1872. ,, ,, Fric (**24**), p. 218, fig. 11.
1874. ,, *Clausii*, Poggenpol (**26**), p. 70, pl. XV., figs. 4–14.
1875. ,, *signatus*, Uljanin (**28**), p. 29, pl. IX., figs. 6–11, pl. XI., fig. 8.
1876. ,, *coronatus*, Hoek (**29**), p. 12, pl. III., figs. 1–11.
1878. ,, *signatus*, Brady (**32**), p. 100, pl. XVII., figs. 4–12.
1883. ,, ,, var. *fasciacornis*, Cragin (**40**), p. 3, pl. II., figs. 1–14.
1885. ,, ,, Daday. (**44**), p. 208.
1886. ,, ,, Vosseler (**46A**), p. 189, pl. IV., figs. 1–5.

Antenna with simple ridge.

1820. *Monoculus quadricornis fuscus*, Jurine (**3**), p. 47, pl. III., figs. 2–4.
1850. *Cyclops quadricornis*, var. *b.* Baird (**7**) p. 202, pl. XXIV., fig. 4.
1857. ,, *tenuicornis*, Claus (**13**), p. 31, pl. III., figs. 1–11.
1863. ,, ,, Claus (**18**), p. 99, pl. I., fig. 3; pl. II., fig. 17; pl. IV., fig. 5.
1863. ,, *annulicornis*, G. O. Sars (**20**), p. 34.
1863. ,, *tenuicornis*, G. O. Sars (**20**), p. 33.

1863. *Cyclops tenuicornis*, Lubbock **19**), p. 202.
1872. ,, ,, Fric. (**24**), p. 219, fig. 12.
1875. ,, *Clausii*, Poggenpol (**26**), p. 70, pl. XV., figs. 4–11.
1875. ,, *tenuicornis*, Uljanin (**28**), p. 30, pl. IX., figs. 12, 13.
1876. ,, ,, Hoek (**29**), p. 12, pl. III., figs. 1–11.
1878. ,, ,, Brady (**32**), p. 102, pl. XVIII., figs. 1–10.
1883. ,, ,, Cragin (**40**), p. 3, pl. II., figs. 1–14.
1884. ,, ,, Herrick (**41**), p. 153, pl. R., fig. 16.
1885. ,, ,, Daday (**44**), p. 211.
1886. ,, ,, Vosseler (**46a**), p. 189, pl. IV., figs. 6–10.

Herrick, in his "Final Report on the Crustacea of Minnesota," expresses the opinion that the two forms known under the names *signatus* or *coronatus* and *tenuicornis* represent but different stages of development of the same species. In this opinion, after an examination of all the material at my disposal, I am disposed to agree, though until the actual course of development has been watched in artificially bred specimens, one cannot be quite certain. The serrated edges of some of the joints, and the serrated rib on the last joint of the antenna, in the *signatus* form, seem to represent the ultimate, as the smooth joints and rib represent the penultimate (*tenuicornis*) stage of growth. The pectinate armature of the second joint of the antenna, which I have figured in the Ray Society Monograph as a character of *C. signatus*, I find to occur also in *C. tenuicornis*. Nor can the frequent presence of ovisacs in *C. tenuicornis* be held certainly to indicate the maturity of the individual, parthenogenesis being so frequent a phenomenon amongst the Entomostraca.

This species, in both its forms, is widely distributed: it is in fact one of the commonest species, not only in the British Islands but on the Continent of Europe and in North America, having been recorded as occurring in Scandinavia (Sars), Germany (Claus, Rehberg, &c.), Bohemia (Fric), Tyrol (Heller), France (Richard), Holland (Hoek), America (Herrick). In Great Britain, both forms of the species are very common and constantly occur together, as indeed they must necessarily do if the view of their relationship here adopted be correct.

3. **Cyclops strenuus,** Fischer (Pl. II., figs. 1-4).

1820. *Monoculus quadricornis rubens,* Jurine (**3**), p. 1, pl. I.; pl. II., fig. 1–9.
1841. *Cyclops pictus,* Koch (**4**), H. 21, pl. I.
1851. ,, *strenuus,* Fischer (**8**), p. 419, pl. IX., figs. 12–21.
1853. ,, *quadricornis,* Lilljeborg (**9**), p. 150, pl. XIV., figs. 5, 6; pl. XV., figs. 1–12; pl. XXVI., fig. 19.
1857. ,, *brevicaudatus,* Claus (**13**), p. 34, pl. II., fig. 12.
1863. ,, ,, Lubbock (**19**), p. 200.
1863. ,, *Clausii,* Lubbock (**19**), pl. XXXI., figs. 12–14.
1863. ,, *strenuus,* G. O. Sars (**20**), p. 27.
1872. ,, *brevicaudatus,* Fric (**24**), p. 221, fig. 15.
1878. ,, *strenuus,* Brady (**32**), p. 104, pl. XIX., figs. 1–7.
1885. ,, ,, Daday (**44**), p. 216.
1886. ,, ,, Vosseler (**46A**), p. 195, pl. IV., figs. 18–22.

Though not nearly so common a species as the foregoing, *C. strenuus* seems to be pretty generally distributed, having been found in Russia by Fischer, in Norway by G. O. Sars, in Germany (Claus), Hungary (Fric), Holland (Hoek). It has not, however, as yet been noticed in America.

I have notes of its occurrence in the following British localities: Belsay and Plessey, Northumberland; Seaton Marsh, county Durham; Staithes, Yorkshire; Llanfairfechan, North Wales; (*G.S.B.*); Loch Leven, Kinross (*Mr. T. Scott*); Lambton Park, county Durham; Loch Rutton and Carlingwark Loch, Kirkcudbrightshire; Grasmere and Lough Neagh (*Rev. Dr. Norman*).

4. **Cyclops abyssorum,** G. O. Sars (Pl. III.).

1863. *Cyclops abyssorum,* G. O. Sars (**20**), p. 29.

Female.—Body subtruncate in front, gradually tapering backwards, first segment forming at least half the length of the cephalothorax; the second, third, and fourth segments are not greatly produced laterally, but are abruptly narrowed in front and the posterior margins form acute angles laterally; the fifth segment is short, narrow, and much constricted in front: the abdomen is more than half as long as the cephalothorax, its first segment not greatly narrower than the last thoracic, wider in front and equal in length to the following three segments;

caudal rami slightly divergent, nearly as long as the preceding three segments, each marked by a longitudinal ridge, which is continued faintly over the last abdominal segment; the two principal setæ are of nearly equal length, the inner somewhat the larger, but shorter than the abdomen, and more than twice as long as the neighbouring lateral seta; outer lateral more than half as long as the inner; marginal seta situated near the extremity of the furca: the posterior margins of the abdominal segments are obscurely dentated except the last, which bears a series of minute hairs. Anterior antennæ slender, reaching backwards to the third segment of the body, and provided plentifully with setæ, especially towards the base. Posterior antennæ long and slender, the posterior margins of all the joints bearing patches of short hairs arranged in a pectinate manner; while the third joint has its anterior margin armed with a series of six moderately long, equal setæ, besides the usual apical hairs. Branches of the swimming feet all three-jointed and nearly equal in length, except in the fourth pair, where the inner branch is distinctly the longer: in the first and second pairs the marginal spines of the last joint of the outer branch are three in number, in the third and fourth pairs only two: the inner branch of the fourth pair has the last joint prolonged externally, forming a process about half as long as the terminal spine. Fifth foot composed of two nearly equal joints, first joint with one seta of moderate length, second with one long and one short seta. The animal is almost colourless. Length about 2 mm.

Taken in gatherings made by the deep net in Windermere and Coniston Water, but by no means plentiful: August, 1883. Prof. G. O. Sars has kindly examined specimens from one of these localities and identifies them as belonging to *C. abyssorum*. It occurs also in gatherings from Loch Awe, Loch Ness, Loch Achray, and Loch Lomond, Scotland; and in Broomley Lough, Northumberland (*Rev. Dr. Norman*). The foot-jaws do not present any characteristic features. This species has hitherto been recorded only by Prof. Sars, who found it at a depth of 40–50 fathoms in Maridals-water near Christiania.

I am rather disposed to look upon *C. abyssorum* as a deep-water variety of *C. vicinus*, the differences between the two forms being merely matters of degree; the most important point is, perhaps, the length of the anterior antennæ, which are decidedly shorter and thicker in *C. vicinus:* the peculiar setose armature of the antennæ is seen, though more feebly, in *C. vicinus:* the characters of the fifth feet, the abdomen, and caudal rami are alike in both forms.

5. **Cyclops Scourfieldi**, G. S. Brady (Pl. IV.).

1863. *Cyclops Leuckartii*, G. O. Sars (**20**), pl. VI., figs. 6–8, p. 30 (not *C. Leuckarti*, Claus).

Female.—Body slender, subtruncate in front and tapering gradually backwards; thoracic segments rounded off behind and not produced into angles laterally; the last segment smaller than the rest, from which it is separated in front by a deep constriction: first abdominal segment nearly as wide as the last thoracic, slightly wider in front than behind, and longer than the three following segments combined: caudal rami as long as the two preceding segments, the innermost of the two median tail-setæ is the longest and equal to the length of the abdomen, the other only slightly shorter; the two lateral setæ short and subequal; between the principal seta and the inner lateral there is a fifth seta of intermediate length; marginal setæ short and situated not far from the middle of the furca. Anterior antennæ slender, reaching a little beyond the second cephalo-thoracic segment, the last two joints elongated and slender; the fourth, seventh, and fifteenth joints are of medium length, all the rest short, except the first and the last two, which are the longest of all. The anterior maxilliped has the posterior margin of the second joint minutely crenulated near the middle. All four pairs of swimming feet have their branches three-jointed, the last joint of the outer branch bearing only one lateral spine; spines long and slender, with ciliated margins: the terminal joints of the inner branches are elongated and of peculiar shape, being dilated at the apex, with produced, spine-like angles; the first three pairs have a single terminal spine, the fourth pair two such spines, the outermost of which is slightly the larger. Fifth foot small, two-jointed, the basal joint short, wide, and bearing one long apical seta; second joint narrower, with two long, almost equal setæ. Length 1·4 mm.

I am indebted to Mr. D. J. Scourfield (after whom I have pleasure in naming it) for specimens of this species taken at Wanstead Park and in a pond at the Botanic Gardens, Regent's Park. My first knowledge of the species was, however, derived from specimens which I took myself by moonlight in the surface-net at Coniston, in August, 1883; in this gathering it occurred in considerable numbers, as also in a subsequent daylight surface-gathering from the same lake. It occurs also in gatherings made by the Rev. Dr. Norman in Kirk Loch and Castle Loch, Lochmaben, Dumfriesshire, and at Mallow, county Cork. Mr. Scourfield has sent me the following additional list of localities in which he has taken it: Victoria Regia Tank, Royal Botanic Gardens, Regent's Park; Wroxham, Filby and Rollesby Broads, and Heigham Sounds, Norfolk; Higham Park, Woodford.

There can, I think, be little doubt that this is the species referred to by Sars as *Cyclops Leuckartii*,—the peculiar build and armature of the swimming feet agreeing with the descriptions of that author. Claus, however, does not mention these characters, and as he states that the fifth foot is similar to that of *C. brevicornis*, it seems impossible that his *C. Leuckartii* can be identical with the species now under consideration; the fifth foot of *C. Scourfieldi* bears three long and nearly equal setæ, while that of *C. bicuspidatus* has two such setæ and a short dilated seta or spine.

The Coniston specimens of *C. Scourfieldi* are very much less robust than others, more slender in all their parts, and perfectly pellucid except for masses of ingested material in the alimentary tract. An interesting form which must, I think, be looked upon as a variety, has been found by Mr. Scourfield at Higham Park, Essex. Its chief peculiarities are the more nodose anterior antennæ,—the joints of these appendages being more constricted at their proximal ends,—a slightly different arrangement of the setæ of the fifth foot, the two terminal setæ of which spring from the same plane or nearly so, and the presence on the internal margins of the protopodite in the second, third, and fourth pairs of feet, of rounded laminar projections, which have spinulose margins. I have myself found the same variety in a collection from Lough Fadda, Connemara. Figures of this remarkable form are given in Plate VI.

The character which, so far as I know, distinguishes at once *C. Scourfieldi* from all other species is the presence, on the second joint of the posterior maxilliped, of a series of short marginal setæ. The crenulation of the posterior margin of the anterior maxilliped is a less constant character, but perhaps also diagnostic when it occurs. The apical dilatations of the inner branches of the swimming feet—more especially of the fourth pair—is another, and perhaps more important, character, which, however, is wanting in the Higham Park specimens.

β. Anterior antennæ, when reflexed, not distinctly longer than the first somite.

6. **Cyclops vicinus,** Uljanin (Pl. I., figs. 6-9).

1875. *Cyclops vicinus*, Uljanin (**28**), p. 30, pl. X., figs. 1–7; pl. XII., figs. 7–9.
1878. *Cyclops pulchellus*, Brady (**32**), p. 107, pl. XVII., figs. 1–3.

Professor G. O. Sars has kindly examined specimens of the species ascribed by me in my Ray Society Monograph to *Cyclops pulchellus*, Koch, and believes them to be quite distinct from the form described by himself as *C. pulchellus*, and likewise from the very nearly related *C. lucidulus*, Koch. He suggests that they come nearer to *C. strenuus*, Fischer, and I have, in fact, sometimes found it difficult to distinguish between the two species, but the shorter antennæ, the comparatively small size of the cephalic segment in the present species, the very marked and prominently angular outlines of the following three segments, and the different character of the caudal rami and setæ, forbid its being ascribed to *C. strenuus*. On the other hand, the very beautiful drawings of *C. vicinus* given by Uljanin, in his memoir on the Crustacea of Turkestan, agree most accurately with this species. I therefore adopt the name proposed by that author.

The most noteworthy characters of *C. vicinus* are to be found in the shape of the thoracic segments, the short anterior antennæ, the serrated margins of the abdominal segments, the proportions of the caudal rami and setæ, and the form of the fifth foot.

The British localities already published are Bolam Lake and Paston Tarn (Northumberland), and Tresco (Scilly Islands). I have now to add the following localities, where it has been found by Mr. D. J. Scourfield: Wanstead Park, Essex; Tottenham; Dulwich; Leytonstones; Eagle Pond, Snaresbook; Royal Botanic Gardens, Regent's Park; Pinner, Middlesex; Higham Park, Woodford. In Dr. Norman's gatherings it occurs as follows:—Loch Achray; Loch Katrine, Loch Leven, Kinross; pools near Sprinkling Tarn, and Ennerdale Water, Cumberland; Broomley Lough and Fallowlees Lough, Northumberland.

7. **Cyclops bicuspidatus,** Claus (Pl. V., figs. 1-5).

1857.	*Cyclops bicuspidatus,*		Claus (**14**), p. 209, pl. XI., figs. 6, 7.
1863.	,,	,,	Claus (**18**), p. 101.
1863. ?	,,	,,	G. O. Sars (**20**), p. 38.
1876.	,,	,,	Hoek (**29**), p. 17, pl. I., figs. 7–11.
1880.	,,	*bisetosus,*	Rehberg (**33**), p. 543.

Female.—The body is long and slender, gradually tapering from the front backwards, and without any distinct constriction between thorax and abdomen. The first body-segment is about equal in length to the three following segments and has its posterior angles rounded off; second segment produced laterally, its posterior angles forming sharp angular projections; third segment narrower and also having sharply produced posterior angles; lateral margins of the fourth segment rounded and showing no posterior angles; last thoracic segment very short, scarcely more than one-half the length of the preceding segment, its posterior angles sharp; all the segments are sharply separated one from another, being much constricted in front. The first abdominal segment is large, tumid in front and narrowed behind, nearly equal in length to the following three segments. Caudal rami long, closely approximated and parallel, about five times as long as broad, their inner margins destitute of hairs: the two median terminal setæ are long and very feebly ciliated, the innermost the longer of the two, being equal in length to the whole abdomen; of the lateral setæ the outer is the longer; the inner one is so closely appressed to the long seta as to be almost invisible; the outer margins of the rami bear near the extremity a single short seta. The anterior antennæ are rather stout, only slightly tapered towards tho apex, and do not exceed in length the first body-segment. The posterior border of the posterior maxilliped is irregular, having near the base a slight abrupt prominence, each end of which forms an obscure tooth: this structure is variable in development but is usually more or less distinctly visible. Both branches of all the swimming feet are three-jointed, and the terminal joint of the outer branch bears on its outer margin two spines, on the inner margin three long setæ. and at the apex a single spine and a seta; but in the case of the first pair of feet, the last joint of the outer branch has two lateral spines only, the usual apical spine being absent. The feet of the fifth pair are extremely small (·027 mm., exclusive of setæ), two-jointed, the first bearing only one long apical seta, the second one long seta and a much shorter, stout spine. Length 1·3 mm. Colour (of spirit specimens) very deep, opaque brown (Windermere); bluish, semi-opaque (Wanstead Park).

I have specimens of this species which were taken several years ago in Windermere amongst weeds at the surface of the lake, and one (probably this species) from a deep-net gathering taken in Ellesmere Lake, Shropshire. It occurs also in gatherings from Lambton Park, county Durham (*Rev. Dr. Norman*); and from Duddingston Loch, near Edinburgh (*Mr. T. Scott*). I am indebted to Mr. D. J. Scourfield for others taken in 1890 and 1891 at Wanstead Park, Essex: more recently Mr. Scourfield has sent me the following supplementary list of stations:—Hackney Marsh; Leytonstone; Royal Botanic Gardens, Regent's Park; Cuckoo Pits, Chingford; Southend, Essex; Higham Park and Warner's Pond, Woodford; Pavenham, Bedfordshire.

The specimens generally agree very exactly with the description of Professor G. O. Sars, except as to the spines of the fourth pair of feet. Respecting these Sars says, "aculeorum apicalium rami interioris pedum quarti paris interior altero duplo longior," and in the synopsis* he states with reference to the external branch, "intus setis 3, extus aculeis 3 instructus." I give drawings of the fourth foot of a Wanstead Park specimen, from which it will be seen that the last joint of the outer branch possesses only two marginal spines. Dr. Claus gives the length of his species as 2 millimetres—a discrepancy perhaps of no great moment: in other respects his description is applicable to the specimens here described. Mr. Herrick, in his elaborate memoir on the Crustacea of Minnesota, includes under the term *Cyclops pulchellus*, Koch, several forms which have been described by various authors as distinct species: these are *C. bicuspidatus*, Claus; *C. Thomasi*, Forbes; *C. navus*, Herrick; *C. bisetosus*, Rehberg; *C. bicuspidatus*, Sars, and (?) *C. insectus*, Forbes. The species appears to be generally distributed, though by no means very common,—having been noted by Sars in Norway, Rehberg and Claus in Germany, Dr Anton Fric in Bohemia, and Forbes and Herrick in the United States of America. It appears to differ in certain minor characters from all of the forms described by Forbes and Herrick, while agreeing with Sars' description of *C. bicuspidatus* in the more important points, excepting the spinous armature of the swimming feet. It would seem impossible, without actual comparison of authentic specimens of these various forms, to come to any certain conclusion as to their specific distinctness.

8. **Cyclops Thomasi**, Forbes (Pl. VI., figs. 1-4).

1882. *Cyclops Thomasi*, Forbes (**38**), p. 640, pl. IX, figs. 10, 11, 16.
1883. ,, ,, Cragin (**40**), p. 3, pl. III., figs. 1-13.
1884. ,, ,, Herrick (**41**), p. 151, pl. U, figs. 4, 5, 7, 8.

Female.—Body obtusely rounded in front, abdomen much narrower than the cephalothorax; none of the segments are very prominent laterally, but the posterior angles are mnch produced backwards, forming sharp cusps, the segments rapidly decreasing

* The specific name appears in the synopsis as *bispinosus*, but the reference is apparently to *bieuspidatus*.

in size from the first to the fifth, which last is scarcely wider than the first abdominal segment. First abdominal segment rather tumid in front, nearly as long as the following three segments, and bearing on each lateral margin in front of the middle a stout seta: borders of the abdominal segments smooth, except the last, which is finely pectinated; caudal rami slender, elongated, parallel, or slightly divergent, about five times as long as broad, lateral setæ short, considerably removed from the apex; at the anterior third, on the outer aspect of the ramus, is a transverse row of several short setæ, and the inner margins are minutely ciliated; the outer and inner tail-setæ are very short, the outer rather the shorter of the two; of the two median setæ the innermost is the longer, equalling in length the entire abdomen; both are minutely ciliated. Anterior antennæ shorter than the first body-segment. All the swimming feet have both branches three-jointed; the outer branch of the first foot has at the apex of the last joint a single spine and a seta, and on the outer margin one spine; the remaining feet have the same apical armature, but have two lateral spines. The feet of the fifth pair are two-jointed, the basal joint rather wide and bearing at the distal angle one long seta, second joint long and narrow and bearing two apical setæ, one as long as the joint itself, the other more than twice as long. Length 1·55 mm.

The only British locality known to me for this species is Duddingston Loch, Edinburgh, where it was found by Mr. Thomas Scott, F.L.S., of the Scottish Fishery Board. On comparing these British specimens with American ones, kindly sent to me by Mr. B. W. Thomas, I cannot find any great difference. The antennæ in the latter are perhaps somewhat longer.

It is with considerable doubt that I have admitted *C. Thomasi* as a distinct species. Probably Herrick may be right in looking upon it as a mere variety of the preceding. Hoek, in his figure of the caudal rami of *C. bisetosus*, gives the characteristic basal row of setæ, though very feebly developed.

9. Cyclops viridis, Jurine (Pl. V., figs. 6-10).

1820. *Monoculus quadricornis viridis,* Jurine (**3**), p. 46, pl. III., fig. 1.
1851. *Cyclops viridis,* Fischer (**8**), p. 412, pl. IX.. figs. 1–11.
1857. ,, *brevicornis,* Claus (**13**), pl. III., figs. 12–17.
,, *gigas,* idem, ibidem, p. 207, pl. XI., figs. 1–5.
1863. ,, *viridis* and *C. gigas,* G. O. Sars (**20**), p. 35.
1863. ,, *brevicornis,* Lubbock (**19**), p. 200.
1871. ,, *Clausii* (junr.), Heller (**23**), p. 7.
1871. ,, *brevicornis,* Heller (**23**), p. 5.
1872. ,, ,, Fric (**24**), p. 220, fig. 13.
,, *gigas,* idem, ibidem, p. 220, fig. 14.
1875. ,, *brevicornis,* Hoek (**29**), p. 13, pl. I.. figs. 5, 6.
1878. ,, *gigas,* Brady (**32**), p. 105, pl. XX.
1880. ,, *viridis,* Rehberg (**33**), p. 540, and *C. gigas,* p. 541.
1882. ,, *ingens,* Herrick (**38A**), p. 228, pl. IV., figs. 1–8.
1883. ,, *viridis,* Cragin (**40**), p. 3, pl. IV., figs. 8–16.
1884. ,, ,, Herrick (**41**), p. 145.
1885. ,, ,, Daday (**44**), p. 214.

When engaged upon my Ray Society Monograph I was much puzzled to know whether the bulk of my seventeen-jointed "short-horned" specimens—evidently all belonging to the same species—ought to be referred to *C. brevicornis*, Claus, or to *C. gigas*, Claus. It did not occur to me that perhaps the two so-called species might not after all be distinct, as they were both admitted, though apparently with some hesitation, by G. O. Sars. But a further acquaintance with the animals, together with the figures and descriptions of various authors, convinces me that there is no sufficient ground for the separation of the two forms. *C. gigas* appears to be simply a very large variety of *C. viridis* (*brevicornis*). This opinion is held also by Herrick.

This species is common and widely distributed, being noted as occurring in Norway (G. O. Sars); Germany (Fischer, Claus, &c.); Holland (Hoek); Switzerland (Jurine); Hungary (Fric), Tyrol (Heller); North America (Herrick). In the British Islands it is very common, occurring chiefly in small sheets of water, such as ponds and ditches, but also amongst the vegetation of the margins of lakes. It occurs sometimes also in slightly brackish water—as at Lymington, Hampshire; and I have taken specimens which I cannot distinguish from it by the deep-net in Windermere.

c. *Anterior antennæ fourteen-jointed.*

10. **Cyclops insignis,** Claus (Pl. VI., fig. 5).

1857. *Cyclops insignis*, Claus (**13**), p. 209, pl. XI., figs. 8–12.
1868. ,, *Lubbockii*, Brady (**22A**), p. 127, pl. IV., figs. 1–8.
1863. ,, *insignis*, G. O. Sars (**20**), p. 38.
1863. ,, ,, Claus (**18**), p. 101.
1878. ,, ,, Brady (**32**), p. 108, pl. XXI., figs. 1–9.
1884. ,, ,, Herrick (**41**), p. 155, pl. T, figs. 11–14.
1891. ,, ,, Schmeil (**66**), p. 25.

This is one of the less common species of *Cyclops*. I have only to add to the two localities given in the Ray Society Monograph, one other,—Salt-marsh at Poole, Dorset, where it was found by the Rev. Dr. Norman, F.R.S. Herrick notices the species in his report on the Crustacea of Minnesota, but his remarks appear to refer only to specimens taken at Leipzig. It has been found by G. O. Sars in Norway, by Claus, Rehberg, and Schmeil in Germany, and by Fric in Bohemia.

D. *Anterior antennæ twelve-jointed.*

11. **Cyclops serrulatus,** Fischer (Pl. VII., fig. 1).

1838.? *Cyclops agilis*, Koch (**4**), H. 21, pl. III.
1851. ,, *serrulatus*, Fischer (**8**), p. 423, pl X., figs. 22, 23, 26–31.
1853. ,, ,, Lilljeborg (**9**), p. 158, pl. XV., fig. 12.
1857. ,, ,, Claus (**13**), p. 36, figs. 1–3.
1863. ,, ,, G. O. Sars (**20**), p. 45.
1863. ,, ,, Claus (**18**), p. 101, pl. I., figs. 1, 2; pl. IV., fig. 12; pl. XI., fig. 3.
1863. ,, ,, Lubbock (**19**), p. 197.
1871. ,, ,, Fric (**24**), p. 222, fig. 18.
1871. ,, ,, Heller (**23**), p. 6.
1875. ,, ,, Uljanin (**28**), p. 34, pl. VIII., figs. 1–8.
1878. ,, ,, Brady (**32**), p. 109, pl. XXII., figs. 1-14.
1880. ,, *agilis*, Rehberg (**33**), p. 545.
1883. ,, *pectinifer*, Cragin (**40**), p. 6, pl. IV., figs. 1–7.
1884. ,, *serrulatus*, Herrick (**41**), p. 157, pl. O., figs. 17–19.
1886. ,, *agilis*, Vosseler (**46A**), p. 190, pl. V., figs. 29–31.
1891. ,, *serrulatus*, Schmeil (**66**), p. 29.

C. serrulatus is, in the British Islands, certainly the commonest representative of the genus, few gatherings of Copepoda, from whatever elevation, whether from lakes, ponds, or smaller collections of water, being entirely without it. It is, moreover, remarkably constant in its characters and can scarcely be confounded with any other species. The American *C. pectinifer*, Cragin, seems to be only a variety and scarcely a well-marked one. Rehberg identifies this species with *C. agilis*, Koch, chiefly on account of the shape of the egg-sacs. Koch's figures may very probably be meant to refer to *C. serrulatus*, but it seems scarcely wise to discard Fischer's well-known specific name for one of only speculative propriety.

C. serrulatus is recorded by almost all continental authors:—Norway (G. O. Sars); Sweden (Lilljeborg); Germany (Fischer, Koch, Claus); Tyrol (Heller); Bohemia (Fric); Holland (Hoek); Turkestan (Uljanin), North America (Herrick).

12. Cyclops macrurus, G. O. Sars (Pl. VII., fig. 2).

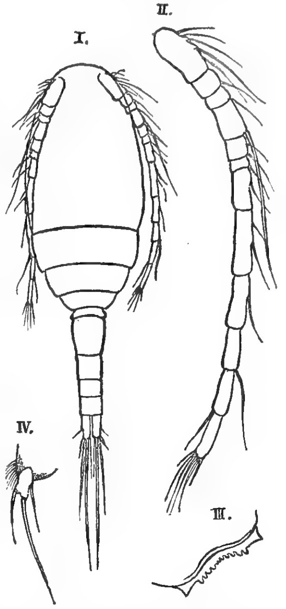
1863. *Cyclops macrurus*, G. O. Sars (**20**), p. 45.
1878. ,, ,, Brady (**32**), p. 111, pl. XXIV., figs. 1–5.

Crag Lake, Northumberland, was until recently the only known British locality for this species. But it occurs also very plentifully in collections made by the Rev. Dr. Norman in the Castle Loch, Lochmaben, Dumfriesshire, and in Loch Achray, Perthshire. It is recorded by G. O. Sars from Norway and by Rehberg from Germany. The last-named author identifies it with *C. spinulosus*, Claus, but as that species is described as having antennæ longer than those of *C. serrulatus* it is impossible to accept the identification.

13. Cyclops magnoctavus, Cragin.

1883. *Cyclops magnoctavus*, Cragin (**40**), p. 5, pl. III., figs. 14–23.

Cephalothorax subelliptical, widest in the middle, none of its segments angulated nor prominent laterally, the last segment slightly constricted in front and not wider than the abdomen; first segment very large, occupying about two-thirds of the entire length of the cephalothorax. Abdomen only very slightly tapering backwards, its first segment much the longest. Caudal rami about thrice as long as broad, closely approximated and not at all divergent; outermost seta short, spine-like, nearly as long as the furca, innermost about twice as long, very slender and inconspicuous; of the two median setæ, the inner is the longer, being more than equal in length to the whole abdomen; the outer is about two-thirds as long; the plumose character so delicate as to be scarcely discernible; the lateral setæ are short, and arise a little behind the middle of the furca. Anterior antennæ slender, of nearly equal thickness throughout, and reaching, when reflexed, almost to the anterior margin of the abdomen, rather sparingly clothed with setæ, though the fourth joint bears one of remarkable length: the length of the joints may be formulated thus:



Cyclops magnoctavus, *Cragin*.
I. Female, seen from above × 60.
II. Anterior antenna of same.
III. Labrum.
IV. Foot of fifth pair.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
16	5	4	10	6	3	12	18	14	11	12	12

The rami of the first four pairs of feet are all three-jointed, the spines of the external rami very delicately pectinated. The fifth foot is one-jointed and bears three setæ, the apical seta more than twice as long as the others: the side of the last thoracic ring near the margin of the fifth foot bears a fringe of fine hairs. Length ·85 mm.

For this interesting species I am indebted to my friend the Rev. Dr. Norman, F.R.S., by whom it was taken "in a ditch at the end of Lochaber Loch, Kirkcudbrightshire," in 1885. The only previous record of it is by Mr. Cragin, who found it at Cambridge, U.S.A., very abundantly "in the dirty water of the blind ditches connected with the artificial pond known as "Glacialis." It is curious that in both cases the animal was found in ditches immediately connected with large sheets of water.

I have had no opportunity of examining any but the spirit-specimens of Dr. Norman's collection, but the following characters may be added as having been noticed by Mr. Cragin in living specimens: "eye large, dark red; divided deeply by a median constriction posteriorly. Ovisacs small, sub-oval, nearly or quite meeting above the abdomen, and usually containing from five to eight eggs. Animal dirty blue-green; antennæ lighter. Dark green pigment masses are scattered beneath the integument in various places, particularly along the anterior side of the first antennæ."

Herrick, in his "Final Report on the Crustacea of Minnesota," identifies this species with *C. fluviatilis*, Herrick, but there are several characters which prevent my accepting this view; notably that in *C. fluviatilis*, "the terminal segment of the antennæ is slightly but evidently hinged, and together with the pair preceding, somewhat curved," and that the feet have the "terminal spines strongly toothed." "The antennæ," Herrick says, "are long and much modified so as to resemble superficially the antennæ of Diaptomus." This can scarcely be said of the British specimens which I ascribe to *C. magnoctavus*, and which agree in every respect with the figures and description given by Cragin.

E. *Anterior antennæ eleven-jointed.*

14. Cyclops affinis, G. O. Sars (Pl. VIII., figs. 1–6).

1863. *Cyclops affinis*, G. O. Sars (**20**), p. 47.
1875. ,, ,, Uljanin (**28**), p. 36, pl. XI., figs. 3–7.
1878. ,, ,, Brady (**32**), p. 112, pl. XV., figs. 11–14; pl. XXIVB., figs. 10–15.
1880. ,, *pygmæus*, Rehberg (**33**), p. 546, pl. VI., figs. 3–6.
1886. ,, *affinis*, Vosseler (**46A**), p. 192, pl. VI., figs. 1–3.
1891. ,, ,, Schmeil (**66**), p. 34.

This species occurs in a gathering made by the Rev. Dr. Norman in the River Till at Etal, Northumberland, and Mr. Scourfield records it from Wanstead Park, Essex, and from the River Lea at Tottenham. Mr. Thomas Scott has also recently sent me specimens from Raith Lake, Kirkcaldy, Fifeshire, and Dr. Norman others from Yetholm Loch, Roxburghshire; the previously recorded British localities being Peterhead, N.B., and Pwllheli, North Wales. Professor G. O. Sars found it near Christiania.

15. **Cyclcps Ewarti,** G. S. Brady (Pl. VII., figs. 4–7).
1888. *Cyclops Ewarti*, Brady (**58**), pl. VIII., figs. 1–6.

Female.—Anterior antennæ about as long as the cephalothorax, eleven-jointed; the first, seventh, and eleventh joints nearly equal and longer than any of the rest; second and fifth joints very short. The four pairs of swimming feet have both branches three-jointed; fifth pair of feet two-jointed, the basal joint bearing a single long seta at the inner angle, the last joint one long and one very short seta at the apex. Last thoracic segment narrower than the preceding one, dilated behind, and equal in width to the first abdominal segment, from which it is not separated by any distinct constriction. The first abdominal segment has at each side two small lateral setæ, one of which is spine-like. Caudal rami not divergent, in length rather more than equal to the two preceding segments; the longest tail-seta equal in length to the entire abdomen. Length 1·4 mm.

A considerable number of specimens of this species were taken by Mr. T. Scott, in November, 1887, in the tow-net in a small bay west of Charleston, about five miles above Queensferry, Firth of Forth. It is interesting as being the only undoubted member of the genus which has been found living in the sea. But the Forth at this point is subject to considerable admixture of fresh water, and it is possible that this *Cyclops* may have its real habitat in some of the streams or ponds whose contents find their way into the Forth. This is a matter to be decided by future investigation.

One is liable to look with suspicion on the validity of small species of *Cyclops* with eleven-jointed antennæ, seeing that the possession of that number of joints is characteristic of one stage in the development of the seventeen-jointed forms. But we have, in this case, the swimming feet all perfectly developed and three-jointed, and no examples of any seventeen-jointed forms were found in the gathering. For the present, therefore, I must look upon *C. Ewarti* as being a good species. The figure of the entire animal, given in the Fishery Board Report, is not quite satisfactory, and I reget that I am unable here to give a better one, no specimens having been preserved in a fit condition for that purpose.

16. **Cyclops longicaudatus,** Poggenpol (Pl. X., figs. 5–7).
1874. *Cyclops longicaudatus*, Poggenpol (**26**), p. 72, pl. XV., figs. 19–21; pl. XVI., figs. 5–6.

Female.—Body widest in front; tapering gradually and evenly to the furca; no distinct separation between thorax and abdomen. First cephalothoracic segment almost circular; a distinct constriction between it and the following segment, the sides of which are somewhat produced backwards, forming angular cusps; third segment constricted in front, lateral margins protuberant, rounded, not at all angulated; fourth segment somewhat narrower, constricted in front, but produced behind so as to form angulated, alæform lateral processes; last thoracic scarcely wider than the first abdominal segment, constricted in front, lateral margins rounded; first abdominal segment quite as long as the following three, tapering backwards, constricted in front; caudal rami about four times as long as broad; equal in length to the two preceding segments; caudal setæ short, delicately plumose; innermost of the two median setæ more than half as long as the abdomen, and only slightly longer than the next (outer) seta; bases of these two setæ dilated; the two secondary apical setæ are very short, the outer, however, distinctly longer than the inner; the lateral setæ are situated at about the middle of the outer margins of the rami and reach nearly to the apices. The abdomen, altogether, including the furca, is more than half as long as the cephalothorax. Anterior antennæ eleven-jointed, slender, much shorter than the first cephalothoracic segment, the first, seventh, and eighth joints being the longest; the second, fourth, and sixth the shortest. All the pairs of swimming feet have both branches two-jointed, and the last joint of the outer branch bears three lateral spines. The fifth foot is quite rudimentary, consisting, on each side, of two simple spine-like setæ with slightly dilated bases. Length 1·1 mm.

This very interesting form, which seems not to have been previously noticed except by Poggenpol (environs of Moscow), I have seen only in very small numbers, in a gathering made by Mrs. Tupper Carey, at Ebbesburne, near Salisbury, and communicated to me by my friend the Rev. Canon Norman. Poggenpol's measurement of length is rather greater than mine (1·39 mm.), but apart from this there does not seem to be the slightest discrepancy. The description of the Russian specimens, however, does not refer at all to the number of joints in the rami of the swimming feet: this is an important point, the two-jointed forms being of extremely rare occurrence. *C. bicolor*, G. O. Sars, is a very much smaller species, but, judging from the description, agrees very closely with *C. longicaudatus*, and has, moreover, the two-jointed feet: it disagrees, however, in some minor points, such as the arrangement and size of the caudal setæ, on which Professor Sars is very explicit. It may be added that, though I have seen no specimens with ovisacs, the Salisbury specimens have every appearance of perfect development, and I have no doubt at all that they are quite mature.

E. *Anterior antennæ ten-jointed.*

17. **Cyclops Kaufmanni**, Uljanin (Pl. VII., fig. 3).

1875. *Cyclops Kaufmanni*, Uljanin (**28**), p. 38, pl. XII., figs. 2–4.
1878. ,, ,, Brady (**32**), p. 113, pl. XXIV., figs. 6–12.

This is a very well-marked species, characterised chiefly by the ten-jointed antennæ and the strongly pectinated margins of the abdominal and posterior thoracic segments. The only British locality for it known to me, at the time of publishing the Ray Society Monograph, was Lambton Park, county Durham, where it was taken by the Rev. Dr. Norman; but I have recently (1890) found it in Minstead Mill Dam, Hants. It has not been noticed, so far as I know, by any other author since its publication by Uljanin.

18. **Cyclops phaleratus,** Koch (Pl. IX., fig. 2).

1841. *Cyclops phaleratus*, Koch (**4**), H. 21, tab. IX.
1851. ,, *canthocarpoides*, Fischer (**8**), p. 426, pl. X., figs. 24, 25, 32–38.
1853. ,, ,, Lilljeborg (**9**), p. 208.
1857. ,, ,, Claus (**13**), p. 37, pl. I., figs. 6–10.
1863. ,, ,, Claus (**18**), p. 102, pl. IV., figs. 1–4.
1863. ,, ,, Lubbock (**19**), p. 202.
1863. ,, *phaleratus*, G. O. Sars (**20**), p. 46.
1872. ,, *canthocarpoides*, Fric (**24**), p. 223, fig. 19.
1874. ,, *lascivus*, Poggenpol (**26**), p. 72, pl. XV., figs. 22–24; pl. XVI., figs. 7, 8.
1875. ,, *phaleratus*, Uljanin (**28**), p. 38, pl. IX., figs. 1–5.
1878. ,, ,, Brady (**32**), p. 116, pl. XXIII., figs. 7-13.
1882. ,, *adolescens*, Herrick (**38A**), p. 231, pl. VI., figs. 16–20.
1883. ,, ? *perarmatus*, Cragin (**40**), p. 7, pl. I., figs. 9–18.
1884. ,, *phaleratus*, Herrick (**41**), p. 161, pl. R., figs. 6–10.
1891. ,, ,, Schmeil (**66**), p. 36.

Mr. Thomas Scott has sent me specimens of this species from Raith Loch, Kirkcaldy, N.B.; and Mr. Scourfield notes it from Wanstead Park; Cuckoo Pits, Chingford; and the Royal Botanic Gardens, Regent's Park. These are the only localities which I have to add to the list given in the Ray Society Monograph. Though widely distributed it seems to be a scarce species. It has been recorded from Norway (G. O. Sars); Sweden (Lilljeborg); Germany (Koch, Fischer, Claus); Bohemia (Fric); Turkestan (Uljanin); North America (Herrick).

F. *Anterior antennæ eight-jointed.*

19. **Cyclops fimbriatus,** Fischer (Pl. IX., fig. 1).

1785. ? *Cyclops crassicornis*, Müller (**1**), p. 113, pl. XVIII., figs. 15-17.

1853. *Cyclops fimbriatus*, Fischer (**8**), p. 94, pl. III., figs. 19–28, 30.
1863. ,, *crassicornis*, G. O. Sars (**20**), p. 47.
1871. ? ,, *Gredleri*, Heller (**23**), p. 8, pl. I., figs. 3, 4.
1871. ,, *pauper*, Fric (**24**), p. 223, fig. 20.
1875. ,, *crassicornis*, Uljanin (**28**), p. 39, pl. VIII., figs. 9–16; pl. XII., fig. 1.
1878. ,, ,, Brady (**32**), p. 118, pl. XXIII., figs. 1–6.
1880. ,, *Poppei*, Rehberg (**33**), p. 550, pl. VI., figs. 9–11.
1882. ,, *crassicornis*, Herrick (**38A**), p. 232, pl. IV., figs. 9–14.
1884. ,, *fimbriatus*, Herrick (**41**), p.162, pl. R., fig. 11.
1886. ,, ,, Vosseler (**46A**), p. 192, pl. VI., figs. 4–8.
1891. ,, ,, Schmeil (**66**), p. 35.

The localities for this species given in the Ray Society Monograph are Bolam Lake, Northumberland, and Tresco, Scilly Islands. I have, however, recently (1891) found it in a ferruginous ditch by the side of the road between Haydon Bridge and Staward, Northumberland; in Balmer Lawn Pond, and at Castle Malwood, both in the New Forest; in pools near high water mark, Penmaenmawr, North Wales; also in gatherings by the Rev. Dr. Norman from Rainton Meadows, county Durham, and Loch Achray, Perthshire, and from Raith Lake, Kirkcaldy (*Mr. T. Scott*). Mr. Scourfield informs me that he has found it at Hackney Marsh; Hampstead; River Lea at Tottenham; Stanstead, Herts; Wanstead Park, Essex; and Higham Park, Woodford.

The specific name *crassicornis* is scarcely tenable. Müller's description is extremely vague, and his figures seem to indicate a much more robust species with very short furca. Fischer's figures, however, are quite sufficiently characteristic; I therefore adopt his name, *fimbriatus*, which has priority over all except that of Müller.

G. *Anterior antennæ six-jointed.*

20. **Cyclops æquoreus**, Fischer (Pl. X., fig. 1).

1860. *Cyclops æquoreus*, Fischer (**16**), p. 654, pl. XX., figs. 26–29.

1878. *Cyclops æquoreus*, Brady (**32**), p. 119, pl. XIX., figs. 8–10; pl. XXI., figs. 10–17.

Cyclops æquoreus occurs not uncommonly in the brackish pools of salt-marshes in many parts of the British Islands. The only localities which I have to add to those already recorded, are Lymington, Hants (*G.S.B.*); Poole, Dorset (*Rev. Dr. Norman*); Loch Stennis, Orkney (*Mr. T. Scott*).

[*Cyclops Helleri*, Brady.

In the many collections which I have examined during the preparation of this memoir, I have found no specimens which I could certainly refer to *C. Helleri*, while those upon which the species was originally founded have been lost by evaporation of the spirit in which they were preserved. It is perhaps more than probable that the types represented one of the stages of development of a seventeen-jointed species, and under this impression it seems best for the present to regard the species as one of doubtful validity.]

Family CALANIDÆ.

Genus DIAPTOMUS, Westwood.

(*Cyclopsine*, Fischer.)

1. **Diaptomus Castor** (Jurine), (Pl. XI., figs. 1–6).

1785. *Cyclops cæruleus*, Müller (**1**), p. 102, pl. XV., figs. 1–9.
,, *lacinulatus* (♀), idem, ibidem, p. 105, pl. XVI., figs. 4–6.
,, *rubens* (♂), idem, ibidem, p. 104, pl. XVI., figs. 1–3.
1820. *Monoculus Castor*, Jurine (**3**), p. 50, pl. IV.–VI.
1850. *Diaptomus Castor*, Baird (**7**), p. 219, pl. XXVI., figs. 1, 2, 2a–j.
1863. ,, ,, Lilljeborg (**9**), pl. XII., figs. 1–10; pl. XIV., figs. 1–4.
1863. ,, ,, Lubbock (**19**), p. 205, pl. 31, figs. 7–11.
1872. ,, ,, Fric (**24**), p. 225, figs. 22a, b.
1878. ,, ,, Brady, in part (**32**), p. 59, pl. VI., figs. 6, 8, 11.
1889. ,, ,, De Guerne and Richard (**62**), p. 11, fig. 1, and pl. II., fig. 1.

This, the first described, and for long the only known species of *Diaptomus*, needs no description further than to refer to a few salient characters which distinguish it from the rest of the genus.

The animal is stout and robust in build,—the female considerably larger and heavier than the male. The posterior extremity of the thorax is truncated, and in the *female* the lateral angles are strongly produced, and form mucronate cusps; in the *male* the thorax is more tapered posteriorly, and the angles are only slightly produced. The abdomen in the *male* is five-jointed, slender, and of nearly equal width throughout; in the *female* the segments are reduced to three, the first occupying half the length of the abdomen, and having its margins produced laterally so as to form two large truncated processes; the second segment is extremely small, and the last somewhat larger. The anterior antennæ are composed of twenty-five joints, and, in the *female*, reach, when reflexed, as far as about the middle of the first abdominal segment; in the *male* they are very nearly as long as the entire body of the animal. The right anterior antenna of the *male* is, of course, geniculated, but the antepenultimate joint is destitute of any special appendage or process. The basal joint of the posterior maxilliped has the anterior distal angle much produced, rounded, minutely crenulated, and bearing a series of very minute cilia, below which are three or four larger hairs, and, at the very extremity, one very long and stout seta. The fifth pair of feet in the *female* are alike on both sides, and composed of a two-jointed basal portion (protopodite) and two branches, each consisting of two joints. The first joint of the outer branch (exopodite) is simple, the second forms a stout, slightly curved claw, with dilated base, from which spring one long spine-like seta and two very much shorter ones: the inner branch (endopodite) is equal in length to the first joint of the exopodite, and is composed of two distinct joints, the second of which bears at its apex three setæ, one as long as the entire branch, another extremely short (almost imperceptible), and a third of intermediate length. In the *male* the inner branch of the right side is very small, slender, composed of two simple joints, and reaches scarcely to the middle of the penultimate joint of the outer branch: just above the origin of this branch, the margin of the protopodite is produced in the form of a hyaline lamina: the outer branch consists of three joints, the penultimate strongly angulated near the middle, to which is attached a rather long and stout seta; last joint simple, slender, and forming a long, falcate claw: inner branch of the left side simple, two-jointed, and about as long as the outer branch; terminal joint of the outer branch subglobose, ending in two short, sharp processes, between which there is a crenulated, disc-like surface; inner margin of the joint setiferous. Length of the female, 2·5 mm. (*circa*); of the male, 2 mm. (*circa*).

Diaptomus Castor is recorded by almost all European writers on the Copepoda, and though it is mentioned by Herrick in his memoir on the Crustacea of Minnesota, it does not appear that the genus has been examined by American authors with sufficient precision, so that it is uncertain as yet whether this species occurs on the American continent. In Scandinavia its occurrence is noted by Müller and Lilljeborg, in Germany by Poppe and others; in France by De Guerne and Richard, in Bohemia by Fric, in Switzerland by Jurine. In our own country it seems to be generally distributed, though by no means a very common species; very rarely occurring in lakes or large sheets of water, but generally in ponds or ditches where there is much vegetation. My notes embrace the following localities:—Ponds at Chester Road, Sunderland; Shotton, and Wardley, county Durham (*G. S. B.*); Broomley Lough, Northumberland (*Rev. Dr. Norman*); ponds in Wanstead Park and at Pavenham, Bedfordshire (*Mr. D. J. Scourfield*). Dr. Baird records it as being "common in the neighbourhood of London."

2. **Diaptomus gracilis**, G. O. Sars (Pl. XI., figs. 7–9; pl. XII., figs. 1–8).

1863. *Diaptomus gracilis*, Sars (**20**), p. 9.
1863. ,, *Westwoodii*, Lubbock (**19**), p. 203, pl. XXXI., figs. 1–6.
1888. ,, ,, Nordquist (**51**), p. 71, pl. IX., figs. 1–7.
1888. ,, *graciloides*, Lilljeborg (**53**), p. 156.

1889. *Diaptomus graciloides*, De Guerne & Richard (**62**), p. 36, pl. I., figs. 26, 27.
1889. ,, *gracilis*, De Guerne & Richard (**62**), p. 14, pl. II., figs. 12, 16, 20.
(? *Glaucia hyalina*, *G. cæsia*, *G. ovata*, Koch.)

Female.—Body slender; cephalothorax widest in the middle, and only slightly tapered towards either extremity; angles of the last segment much produced and mucronate; the first abdominal segment bearing near the middle of each side a similar but more slender spine: caudal laminæ short, setæ very divergent. Anterior antennæ very long and slender, when reflexed reaching considerably beyond the extremity of the caudal lamellæ. Outer branch of the posterior antennæ much longer than the inner, its last joint equal to half the length of the branch. Outer branch of the fifth pair of feet three-jointed, terminal process of the second joint stout, more or less bent; last joint small, rather indistinct, quadrate, bearing two apical setæ, the inner and larger of which nearly reaches the extremity of the claw of the preceding joint, while the outer forms only a minute spine: inner branch two-jointed, nearly as long as the first joint of the outer branch, bearing at the apex two or three delicate, translucent setæ. Colour variable; whitish, bluish-grey, or brown. Length 1·3 mm.

Male.—Angles of the last thoracic segments mucronate, slightly produced backwards but not at all laterally; caudal setæ adpressed. Antepenultimate joint of the right anterior antenna usually produced externally at the apex into a blunt hatchet-like process. Inner branch of the *right* fifth foot, one-jointed, stout, reaching nearly to the extremity of the last joint of the outer branch; terminal claw of the outer branch strongly curved, falcate or S-shaped: last joint of the outer branch of the *left* side bearing at the apex a rather long sub-acute process and a lesser spine-like appendage, and at the middle of its inner margin a papilliform process, which has an apical brush of hairs. (Pl. XI., fig. 9a.) Inner branch one-jointed. The second joint of the basal portion of the limb has its inner margin produced into a keel-like flange, which ends abruptly in a rectangular prominenee beyond the middle of the joint.

This species seems to be universally distributed through the British Islands, but is not found in waters smaller in extent than lakes or very large ponds, frequently in such situations occurring in vast numbers. By the deep-water net in depths of 50–80 fathoms it is often taken in abundance, and in one instance, at least (Talkin Tarn, Cumberland), I have seen the net come up from a depth of six or eight feet below the surface with a dense mass consisting almost entirely of *D. gracilis.* It is also taken quite commonly at the surface, but scarcely ever, in my experience, among weeds, though it occurs quite close to the shore on the stony margins of lakes and tarns. *D. gracilis* has been recorded as occurring in Norway (G. O. Sars), Sweden (Lilljeborg), Finland (Nordquist), and by various authors in Germany, Switzerland, and Italy.

That a species so widely distributed, and occurring often in numbers so enormous, should show a marked tendency to variation, is only what one would expect; and while hesitating to express an opinion different from that which has been arrived at by observers so careful and accurate as Sars, Lilljeborg, De Guerne & Richard, and Poppe, I cannot help believing that *D. gracilis* and *D. graciloides* certainly, and some other so-called species, very possibly, ought to be considered as referable to one only. I will briefly state my reasons for this view. The characters which are chiefly relied on to distinguish *D. graciloides*, Lilljeborg, from *D. gracilis*, Sars, may be stated as follows :—

	D. gracilis, Sars.	*D. graciloides*, Lilljeborg.
Inner branch of the fifth foot of the *female*	very short	long
Inner branch of the fifth foot in the *male* (right side)	long	short
Terminal claw of *fifth* foot in the *male*	simply falcate	sigmoid
Last joint of external branch of the *left* fifth foot of *male*	bearing on its internal margin a process with an apical bunch of hairs	bearing a simple ciliated seta
Antepenultimate joint of *right male* antenna	having an apical hook-like prolongation	simple—not produced

But, so far as my observation extends, these characters are by no means constant, individuals being frequently seen which present in some points the characters of *D. gracilis* and in others those of *D. graciloides*. One of the most remarkable characters of *D. gracilis* in its typical form is the brush-bearing lateral process of the outer branch of the left fifth foot in the male, but specimens from Floutern Tarn, Lough Nascrahoge, and Wanstead Park do not possess this appendage. Again, the males from Wanstead Park and Lough Neagh have the antepenultimate joint of the right anterior antenna destitute of any lateral prolongation (in this respect agreeing with *D. graciloides*), but those from Lough Neagh do possess the lateral brush of the fifth foot,—agreeing here with *D. gracilis*. The inner branch of the female fifth foot in *D. gracilis* is one-jointed, but in specimens from Talkin Tarn and other places we find it two-jointed. Lastly, as regards the terminal claw of the male fifth foot: this organ, in Talkin Tarn specimens and others, is S-shaped (a typical *graciloides* character), while the external branch of the foot possesses the characteristic setose brush of *D. gracilis*. Some of the more interesting of these variations I here figure. The character which seems to me most distinctive of *D. gracilis*, as I understand it, is the angulated projection on the inner side of the second joint of the protopodite of the left male fifth foot: this prominence occurs in all specimens, so far as I know, whether of *gracilis* or *graciloides* type, and I do not find that it occurs in any other species, though a more extreme form of a similar structure is figured by De Guerne and Richard from *D. Eiseni*, Lilljeborg. But, although not uniformly present, I should set down as *D. gracilis* any specimen possessing the minute setose papilla of the left male fifth foot or the short hatchet-shaped process of the right male antenna.

The localities from which I have notes of *D. gracilis* are as follows:—Ponds at Wanstead Park and Wandsworth Common, Surrey (*Mr. D. J. Scourfield*); Chartners Lough and Crag Lough, Northumberland, and most of the Lochs of the Scottish Highlands (*Rev. Dr. Norman*); Loch Leven, Kinross (*Mr. T. Scott*); Nostell Lake, Yorkshire; Ellesmere Lake, Shropshire;

most of the lakes and tarns of the English Lake District; Talkin Tarn and Tindale Tarn, Cumberland; Ormesby Broad, Norfolk; Loch at Rockcliff, Kirkcudbrightshire; Clearburn Loch, Selkirkshire; Phœnix Park Lake, Dublin; and several Loughs about Roundstone, Connemara (*G.S.B*).

There can, I think, be no doubt whatever that the species described by Sir John Lubbock as *Diaptomus Westwoodii* is identical with *D. gracilis*, G. O. Sars. Both names date from 1863, but as Sars' paper was "read" in 1862 it seems right to give the preference to his specific name.

3. **Diaptomus bacillifer,** Koelbel (Pl. XIV., figs. 9–13).

1882. *Diaptomus gracilis*, var. *β*, Wierzejski (**38**B), p. 20, pl. III., fig. 5.
1884. ,, *bacillifer*, Koelbel (**42**A), p. 312, pl. I., figs. 1–5.
1887. ,, *montanus*, Wierzejski (**50**A), p. 6, (*fide* De Guerne & Richard).
1889. ,, ,, De Guerne & Richard (**62**), p. 25, pl. IV., figs. 17, 23.

Body slender, widest in front; last thoracic segment not produced laterally, its angles rounded and bearing two small spines. First abdominal segment having a similar spine on each side. Anterior antennæ reaching about as far backward as the furca. Inner branch of the fifth pair of feet in the *female* indistinctly two-jointed, about half as long as the first joint of the outer branch; last joint of the outer branch very small, bearing two apical spines, the outermost of which is about half as long as the inner; spine of the second joint very stout, almost straight, finely pectinated towards the apex. "Antepenultimate joint of the right anterior antenna in the *male* bearing a slender styliform process, which is about equal in length to the following joint. Inner branch of the left fifth foot in the *male* coalescent with the basal joint, the internal margin of which is produced into a long spine: last joint forcipate. Inner branch of the fifth foot of the right side much exceeding in length the penultimate joint of the outer branch." Length of the *female* 1·4 mm.

Not having seen the adult male of this species, I have had to depend for that part of the description on De Guerne and Richard, from whose memoir the figures 10 and 13 in Pl. XIV. are likewise copied.

Females, and a few immature males, of *D. bacillifer* occurred somewhat sparingly in a gathering made by the Rev. Dr. Norman at Loch Earn Head, Perthshire, near the middle of the lake. In the same collection occurs also *D. gracilis* in great numbers, and it is by no means easy in the younger forms to separate the two species; but in the adult condition, *D. bacillifer* is easily recognized by its somewhat stouter build and by the shorter antennæ. *D. bacillifer* was described by Wierzejski in 1882 as a variety of *D. gracilis*, but in 1887 was re-named by that author as *D. montanus;* the term *bacillifer,* however, previously proposed by Koelbel having the claim of priority.

D. bacillifer is noted by Prof. Lilljeborg as having been taken in Siberia during the Nordenskióld Polar Expedition; amongst the Tatras (Carpathian) Mountains (*Wierzejski*); in the Balaton Lake, Hungary (*Koelbel*); in Finmark (*G. O. Sars*); and in the lakes of Gimont and Cristol, near Briançon, at a height of about 2,400 mètres (*Dr. R. Blanchard*).

There is so little, on a cursory glance, to distinguish this species from *D. gracilis*, that it is very likely it may have been often overlooked amongst lake gatherings from mountainous regions. I can scarcely doubt that I have done so myself, and that it will be found to occur not unfrequently in such localities.

4. Diaptomus Sancti Patricii, n. sp. (Pl. XIV., figs. 5–7).

Posterior angles of the last thoracic segment very much produced so as to form attenuated spines. Anterior antennæ reaching about as far as apex of furca: penultimate joint of the anterior antenna of the *male* entirely destitute of marginal process. Inner branch of the fifth pair of feet in the *female* indistinctly biarticulate, nearly as long as the first joint of the outer branch, and bearing three minute apical setæ. Last joint of the outer branch small, the larger apical seta not reaching as far as the extremity of the claw of the penultimate joint. Inner branch of the right fifth foot in the *male* simple, mucronate at the apex, and reaching beyond the middle of the last joint of the outer branch; terminal claw of the outer branch strongly falcate, and delicately ciliated on the inner edge; lateral spine attached near the middle of the last joint, long, slender, and finely ciliated. Fifth foot of the left side (*male*) terminating in a sub-crescentiform hyaline lamina, the inner edge of which is delicately crenulated. Length of male and female about 1·55 mm.

I regret that I am unable, owing to the small number of specimens obtained, and their imperfect preservation, to give a more copious account of this species. My specimens were taken in the year 1865, in two of the small peaty tarns of Connemara (Lough Doon and Lough Nawheelan), nearly on the sea-level. Amongst described species that to which they bear most resemblance is *D. laciniatus*, Lilljeborg. They come very near, indeed, to this, but scarcely close enough to allow of my identifying them with it. The species, however, requires further investigation with the help of better specimens than those at present available.

5. Diaptomus hircus, n. sp. (Pl. X., figs. 2–4).

Female.—Seen from above the body is widest across the front, thence tapering backwards to the hinder end of the thorax, which is but little wider than the abdomen. The posterior thoracic angles are mucronate but not very strongly produced. The anterior antennæ reach backwards as far as the posterior end of the thorax. Inner branch of the fifth foot two-jointed, more than half as long as the first joint of the outer branch, its apex clothed with a fringe of minute cilia: second joint of the outer branch ending in a stout, slightly curved claw, which is finely ciliated on the concave margin; last joint bearing at its apex a long, finely ciliated spine and one much smaller seta.

Male.—Antepenultimate joint of the right anterior antenna armed with a ploughshare-shaped process, which is nearly half as long as the following joint, and has an obscurely fimbriated free margin. Inner branch of the fifth foot of the left side very small; outer branch slender, ending in two subequal finely pectinated setæ: the last joint of the protopodite has a finger-like hyaline appendage on the inner margin, and there is a similar but smaller organ in the same position on the right foot. Inner branch of the right fifth foot very small, pyriform, one-jointed, acuminate: terminal claw of the outer branch long, slender, subsigmoid. Length 1·1 mm.

I took a few specimens only of this, which appears to be a quite distinct species, in Goat Water, a tarn lying at a considerable elevation on the side of Coniston Old Man. More recently (1891), Mr. Scott has sent me specimens from Loch Harray, Orkney, where he found it abundantly.

6. **Diaptomus serricornis,** Lilljeborg (Pl. IX., figs. 3–10).

1888. *Diaptomus serricornis*, Lilljeborg (**53**), p. 157.
1888. ,, *Wierzejskii*, Richard (**52**), p. 45.
1889. ,, ,, De Guerne & Richard (**62**), p. 35, pl. II., figs. 10, 22; pl. III., fig. 5.
1889. ,, *serricornis*, De Guerne & Richard (**62**), p. 37, pl. I., figs. 20, 21, 30.

Smaller and more slender than *D. Castor*, but larger than *D. gracilis*.

Female.—The posterior thoracic angles, seen from above, are rounded, moderately prominent, and furnished with (usually two) small mucrones. The first abdominal segment is broad at the base, and expanded laterally into more or less acuminate triangular processes. Anterior antennæ twenty-five-jointed, and reaching as far back as beyond the middle of the abdomen. Mouth-organs and first four pairs of feet as usual in the genus. Angle of the basal joint of the posterior maxilliped rounded, slightly crenulated, and bearing about six small marginal hairs but no long seta. Inner branch of the fifth foot small, one-jointed, simple, cylindrical, about half as long as the basal joint of the outer branch, bearing at its apex two very minute cilia; outer branch three-jointed; first joint simple, cylindrical; second, large at the base, but contracted distally, forming a stout curved claw, which is minutely ciliated on its concave margin; last joint extremely small, and having two apical setæ, one large and one small, neither of which reaches nearly as far as the apex of the second joint.

Male.—The right (geniculating) anterior antennæ is twenty-two-jointed, the antepenultimate joint bearing a large serrated lateral appendage, which reaches as far as the middle of the following joint, the number of serratures varying from seven to about twelve. Left antenna twenty-five-jointed, and reaching nearly to the extremity of the abdomen. Inner branch of the right fifth foot of moderate size, simple, one-jointed, truncated at the apex, and reaching as far as the apex of the second joint of the outer branch: first joint of the outer branch produced externally into a large acuminate process: terminal claw long, slender, somewhat flexuous or subsigmoid, and having part of the margin very finely (almost imperceptibly) pectinated. Inner branch of the fifth foot of the left side very small; outer branch about twice as long, slender, and terminating in two very slender, subequal, and very finely pectinated setæ. The second joint of the protopodite of the right fifth foot possesses a curious marginal hyaline lamina, communicating, apparently, with the interior of the organ; and the same joint of the left limb has a similar structure of an elongated pyriform shape. Length of the male, 1·6 mm.; female, 1·75 mm.

The description here given differs in some important particulars from that of Prof. Lilljeborg. The anterior antennæ in the Scottish specimens have, in the female, on both sides 25 joints, whereas Lilljeborg states the number of joints at 23: in the male the right attennæ has 22, the left 25 joints; the Russian specimens having respectively 23 and 24 joints. Again, in the male fifth foot of the left side I am unable to find the ciliated nodule described by Lilljeborg, while in the same organ of the female I find the inner branch to be composed of a single joint—not of two, as stated by Lilljeborg: he, however, adds that in imperfectly developed specimens there is only one joint. But notwithstanding these discrepancies I think there can be no doubt that the species referred to are the same.

D. serricornis was taken by Mr. T. Scott, F.L.S., of the Scottish Fishery Board, in Loch Mulloch Corrie, Sutherlandshire, where it occurred in considerable numbers. To his kindness I am indebted for specimens, and for the opportunity of describing the species. It was also taken many years ago (1867) by my friend Mr. David Robertson, F.L.S., in a pond near the North Loch at Lerwick, N.B., but the capture has remained until now unnoticed in print. Lilljeborg's specimens (*D. serricornis*) were taken in fresh-water lakes at Lumbowski, in Russian Lapland,—peninsula of Kola—on the 11th of August, 1877. The type-specimens of *D. Wierzejskii* were from the neighbourhood of Madrid and Valladolid; and it has more recently been taken abundantly at Zorbig, near Halle, in Saxony, by M. O. Schmeil.

I am quite unable to recognize any valid specific distinction between *D. serricornis*, Lilljeborg, and *D. Wierzejskii*, Richard. The number of serratures on the male antennal appendage is stated to be seven or eight in one form and about twelve in the other, but in the Scottish gatherings the number is very variable. As regards the fifth pair of feet of the male, I find that my drawing made from a Sutherlandshire specimen (Pl. IX., fig. 5) agrees almost exactly, even down to the peculiar shape of the hyaline laminæ, with De Guerne and Richard's figure of the same organ in *D. Wierzejskii*; but the Sutherland specimens have in almost every case only about seven or eight antennal serratures, in this respect agreeing with the typical *D. serricornis*. I have only in one or two cases been able to make out the ciliated bosses described and figured by De Guerne and Richard, as well as in this paper (Pl. IX., figs. 9, 10), but it is extremely difficult to get a good view of these minute structures, the parts of the limb being very apt to become mixed and to overlap one another.

GENUS EURYTEMORA, Giesbrecht.

(= *Temorella*, Claus.)

A subdivision of the old genus *Temora*, Baird, was proposed almost simultaneously in 1881 by two authors, Drs. Claus and Giesbrecht, the latter having apparently a slight advantage of priority. Giesbrecht, however, made his divisions sub-generic only, while Claus, retaining the name *Temora* for one group, assigned to his second group the generic name *Temorella*. In this way the genera *Temora* and *Temorella* of Claus coincide exactly with the sub-genera *Halitemora* and *Eurytemora* of Giesbrecht. The salient characters of the two divisions are expressed in the following table :—

	Halitemora, Giesbrecht. *Temora*, Claus.	*Eurytemora*, Giesbrecht. *Temorella*, Claus.
Right anterior antenna of male	destitute of spines	armed with spines
Distal portion of posterior maxilliped	five-jointed, elongated	four-jointed, feeble
Inner branch of first pair of feet	two-jointed	one-jointed
Fifth pair of feet of female	three-jointed, without a hooked process	four-jointed, having a hooked process
Fifth pair of feet of male	clawed; unlike on the two sides; foot of left side dilated, forcipate	unlike on the two sides; both sides having two-jointed prehensile claws
Serrations of terminal spines of swimming feet	large	small
Fifth thoracic ring	coalescent	free
Habitat	marine only	marine, brackish, and fresh-water

To the first group belong *T. longicornis* (Müller) and *T. armata*, Claus; to the second, *T. velox,* Lilljeborg; *T. inermis*, Boeck; *T. Clausii*, Hoek; *T. affinis,* Poppe; and *T. lacustris,* Poppe.

Quoting from the "Index Bibliographique" of Messrs. De Guerne and Richard, the paper of Dr. Giesbrecht in which he proposes the name *Eurytemora* was published on the 16th of May, 1881. I do not know not precisely the date of publication of Dr. Claus's memoir on "*Temora* and *Temorella,*" but inasmuch as it was "read" on the 12th of May, 1881, the date of its publication must necessarily be later than that of Giesbrecht. By virtue of priority, therefore, the generic name *Temorella* must give way to *Eurytemora;* and as it seems to me much better to divide the old genus *Temora* than to adopt Giesbrecht's plan of forming under it two new subgenera, I prefer (with Dr. Claus) to retain for the "*Halitemora*" group the old name *Temora*, adopting *Eurytemora* as the generic name of the remaining species.

The genus *Eurytemora* may be defined as follows:—Head distinct from thorax, conical in front and having a bifid rostrum; fourth and fifth body-segments distinct; the fifth segment in the female produced into pointed alæform processes. Abdomen of the male five-, of the female three-jointed. Anterior antennæ twenty-four-jointed, and bearing a well developed terminal papilla; eighth and ninth joints incompletely separated, in the male hinged between the eighteenth and nineteenth joints. Posterior antennæ and mandibles as usual in the Calanidæ: maxilla and maxillipeds relatively small. Distal portion of the posterior maxilliped four-jointed, short and slender. Inner branch of the first pair of swimming feet one-jointed, of the following pairs two-jointed. Outer branches of the swimming feet in both sexes three-jointed; terminal spines slender and finely serrated. Fifth pair composed of one branch only, in the female four-jointed, in the male unlike on the two sides and ending in two-jointed hooked claws.

1. **Eurytemora Clausii,** (Hoek) (Pl. XIII., figs. 1–5).

1853. *Cyclopsina lacinulata,* Fischer (**8**), p. 86, pl. II., figs. 4–17, 34.
1853. *Temora velox,* ♀ Lilljeborg (**9**), p. , pl. XX., figs. 2, 7.
1865. ,, ,, Boeck (**21a**), p. 17.
1865. ,, ,, Brady (**22**), p. 38, pl. I., fig. 16; pl. III., figs. 1–11.
1876. ,, *Clausii,* Hoek (**29**), p. 23, pls. IV., V.
1878. ,, *velox,* Brady (**32**), p. 56, pl. VI., figs. 1–5.
1881. ,, *Clausii,* Claus (**36**), p. 9, pl. II., figs. 1–7.
1885. *Temorella Clausii,* Poppe (**43**), p. 180, pl. IV., figs. 1–9.
1888. ,, ,, Nordquist (**51**), p. 59, pl. V., fig. 8; pl. VI., figs. 6–8.
1889. *Eurytemora lacinulata,* De Guerne & Richard (**62**), p. 82, figs. 44, 45.

Last segment of the thorax produced at the posterior angles into hook-shaped alæform processes; caudal rami abont four times as long as broad, setæ short, not exceeding the length of the furca. Caudal rami and last abdominal segment densely clothed with short rigid hairs. Anterior antennæ reaching to the posterior extremity of the cephalothorax. Terminal claw of the right fifth foot in the male not dilated at the base. Penultimate joint of the fifth foot in the female twice as long as the preceding joint, armed with one spine only on its outer margin, its inner margin produced towards the apex so as to form a large dagger-like spine, the base of this spine extending over less than one half of the margin of the joint. Length of the female 1·8 mm.

This species occurs commonly in salt-marsh pools and estuaries, and sometimes in fresh water. It has been recorded from the Neva, near Peterhof (*Fischer*); the Baltic (*Lilljeborg*); Finland, in brackish and fresh water (*Nordquist*); Bremen (*Rehberg*); Leyden (*Hoek*); N.W. Germany, frequent in fresh-water (*Poppe*); Abbeville, fresh-water, and Croisic, brackish (*De Guerne and Richard*).

In Britain I have notes of its occurrences as follows:—In salt-marshes at Hylton (county Durham), Seaton Sluice and Alnmouth (Northumberland), Cumbrae (Firth of Clyde), Pensarn (Merionethshire), in several of the broads of Norfolk and Suffolk; Whittlesea Dyke, Cambridgeshire; and in pools near the river Stour at Manningtree (*G.S.B.*); Higham Park, Essex, fresh-water (*Mr. D. J. Scourfield!*). In brackish pools fully exposed to the rays of the sun it seems to luxuriate, often fairly swarming in such places. The few specimens which I have recorded as being taken in the sea at Sunderland, must, I think, be looked upon as waifs and strays.

It seems to be taken for certain by some authors (Poppe, De Guerne & Richard) that Prof. Lilljeborg's original description of *Temora velox* must have been drawn up from the male of *T. affinis* and the female of *T. Clausii*; and no doubt the drawings given by him of the fifth pair of feet in the two sexes go to support this view. But the characters of these organs seem to be, to a certain extent, inconstant. In a gathering, for instance, of *T. affinis*, from Falmouth, there occur many examples of males which are without the characteristic dilatation of the claw of the fifth foot, while the fifth feet of the females from the same place have the characters of typical *T. affinis*. And, again, the drawing with which I myself illustrated *T. velox* in the Northumberland and Durham Deep Sea Dredging Report (1865), represents the male fifth pair of feet as in *T. affinis.* These figures were drawn from Hylton specimens, and there are, so far as I can make out, no examples of *T. affinis* in the gathering; nor have I been able, on further search, to find any specimens showing the characters of my drawing. I take it, therefore, that the specimen from which the drawing was made was an exceptional one, and had I at the time recognized its abnormal character it would not have been used; but the same thing may have happened to Prof. Lilljeborg. Further, amongst the Whittlesea specimens are some which have *two* external lateral spines on the female fifth foot—a character usually found only in *T. affinis.* The only unfailing distinctions between the two species seem to be (1) the relative size of the penultimate joint of the female fifth foot and its internal tooth; (2) the length of the anterior antennæ, and (3) the length and proportions of the caudal rami and their setæ. Frequently *T. Clausii* is tinged of a deep vinous red: this I have never seen in *T. affinis.*

2. **Eurytemora affinis,** (S. A. Poppe) (Pl. XIII., figs. 6–8).

1853. *Temora velox,* ♂ Lilljeborg (**9**), p. 177, pl. XIX., figs. 9, 10; pl. XX., fig. 1.
1865. ? ,, *inernis,* Boeck (**21A**), p. 16.
1881. ,, *affinis,* Poppe (**34**), p. 55, pl. III., figs. 1–14.
1881. *Eurytemora hirundo,* Giesbrecht (**35**), p. 4.
1881. *Temorella affinis,* Claus (**36**), p. 10, pl. II., figs. 8–14.
1881. *Eurytemora hirundo,* Giesbrecht (**37**), p. 152, pl. II., figs. 1, 7, 12, 19; pl. III., figs. 3, 10; pl. V., fig. 17; pl. VI., figs. 8, 20; pl. VII., figs. 5, 22; pl. VIII., figs. 21, 39, 40, 43; pl. IX., figs. 1, 31; pl. X., figs. 5, 38; pl. XI., fig. 3.
1884. *Temora affinis,* Herrick (**41**), p. 132, 182, pl. H., figs. 8–16.
1885. *Temorella affinis,* Poppe (**43**), p. 184, pl. VI., figs. 22–28.
1888. ,, ,, var. *hirundoides,* Nordquist (**51**), p. 48, pl. IV., figs. 5, 11; pl. V., fig. 5; pl. VI., fig. 3.
1888. ,, ,, var. *hispida,* Nordquist (**51**), p. 53, pl. V., figs. 1, 6, 7, 10; pl. VI., figs. 4, 5.
1888. ,, ,, Canu (**59A**), p. 13, pl. VII., figs. 1–4.
1889. *Eurytemora affinis,* De Guerne & Richard (**62**), p. 84, figs. 46, 47.

Posterior margin of the last thoracic segment produced backwards, and forming two large acutely angulated cusps. Caudal rami and last abdominal segment densely hispid; rami about seven times as long as broad; principal caudal setæ more than half as long as the abdomen, very flaccid and finely plumose; attachment of the lateral setæ distant from the apex about one third the length of the ramus; anterior antennæ reaching to the penultimate thoracic segment. Penultimate joint of the fifth pair of feet in the *female* scarcely longer than the preceding joint, produced inwardly and forming a large dagger-like spine which occupies the whole internal margin of the joint; external margin supporting two slender spines, and sometimes a third much smaller one. The fifth pair of feet in the *male* is not much unlike that of *T. Clausii*, but the terminal claw of the right side is dilated and bulbous at the base. Length 1·3 mm.

Eurytemora affinis appears to be a very widely distributed species, and sometimes occurs in immense profusion, constituting, it is said, at some seasons the almost exclusive food of certain fishes, as of the Shad in the Rhine and the Herring in the Baltic. Poppe has found it in many places in North Germany, both in fresh and brackish water. Nordquist records either the type or the varieties described by him under the names *hirundoides* and *hispida* from Helsingsfors in the Gulf of Finland, and from near Abo, at the entrance of the Gulf of Bothnia. M. Gadeau de Kerville has taken it in the Estuary of the Seine, and Herrick records a form either identical with or closely allied to *E. affinis* from the coast of Alabama.

In England *E. affinis* seems to be less common than the preceding species *E. Clausii*, but occurs in precisely similar localities. I have taken it in pools near Hartlepool Slake, county Durham; at Burgh Marsh, near Carlisle; and Beaulieu Lake, Hants. The Rev. Dr. Norman has sent me specimens from Swan Pool, Falmouth; and Mr. Thomas Scott has taken it in the surface-net in the Firth of Forth, near Alloa. My friend Mr. Isaac C. Thompson, F.L.S., of Liverpool, tells me that he found it plentifully in tow-net gatherings from the river Mersey in 1886, but has not taken it again until the present season

(1891), when he found the filter-beds of the marine baths at Bootle—close to the first-mentioned locality—swarming with it.

Genus ACARTIA, Dana.

1. **Acartia longiremis,** Lilljeborg (Pl. XIV., figs. 1–4).

1853. *Dias longiremis,* Lilljeborg (**9**), p. 181, pl. XXIV., figs. 1–13.
1863. ,, ,, Claus (**18**), p. 193, pl. XXXIII., figs. 6–14.
1878. ,, ,, Brady (**32**), p. 51, pl. V.
1881. ,, ,, Giesbrecht (**37**), p. 146; *idem* (**35**), p. 3.
1881. ,, *bifilosus,* Giesbrecht (**37**), p. 147; *idem* (**35**), p. 3.
1881. ,, ? *discaudatus,* Giesbrecht (**37**), p. 148; *idem* (**35**), p. 3.
1887. ,, ? ,, I. C. Thompson (**50b**), p. 36, pl. V., figs. 1–6.
1890. ,, *longiremis,* Bourne (**64**), p. 147, pl. XI., figs. 4–6.

It has been proposed by Dr. W. Giesbrecht to break up the forms hitherto considered as belonging to *Dias longiremis,* Lilljeborg, into two, or perhaps three, distinct species:—*D. longiremis* (restricted form), *D. bifilosus,* Giesbrecht, and *D. discaudatus,* Giesbrecht. The last-named may or may not be considered as having been previously included under the old term *longiremis.* The characters relied upon by Giesbrecht to uphold this separation are as follows:—

	longiremis.	*bifilosus.*	*discaudatus.*
Frontal filaments	absent	two	absent
Last thoracic segment	armed with two large & several smaller spines	unarmed	unarmed
Furca	long	short	short and (in the female) dilated
Fifth pair of feet (male)	small	large	very large
Fifth pair of feet (female)	large	small	very small

To me it appears that these characters—trivial even when displayed to the best advantage on paper—are of even less account when put to a practical test, their inconstancy even more than their intrinsic triviality being fatal to their acceptance as good specific marks. *First*, as regards the frontal filaments, which are relied upon as furnishing an important character, and even a name, to *D. bifilosus*. These organs are apparently merely the segments of a bifid, very finely divided rostrum: they are so extremely slender as to be (in spirit specimens, at any rate) often very difficult to see, and though in some few of the Burgh Marsh specimens I have succeeded in finding them, in most cases I quite failed to do so, and believe that they are usually absent, though in other respects the specimens from that locality entirely agree with *D. bifilosus*. Claus and Boeck, however, notice the occurrence of frontal filaments in "*D. longiremis*, Lilljeborg." *Secondly*, The spines of the last thoracic segment of (the restricted) *longiremis* are rarely (never, in my experience) developed so largely as represented by Giesbrecht; usually they are so small as to be very easily overlooked. *Thirdly*, The proportions of the furca are certainly very variable, and even in extreme forms (except in *discaudatus*) are not well enough marked to be of much diagnostic service. *Fourthly*, The diversity of size in the fifth feet of the two sexes cannot be looked upon as of much moment, and the differences of form of those organs in the three species are certainly by no means well marked. I therefore think that the two forms *bifilosus* and *discaudatus*, though presenting characters of very great interest, should be looked upon as races or varieties of the original type and not as separate species. And a nomenclature which retains such forms as varieties in direct connection with a central type, so preserving the idea of relationship and evolution, is not only truer to the actual facts, but adds a distinct and vivifying interest to the mere dry bones of classification.

I have no note of the occurrence of any species of *Acartia* in fresh or brackish water except in one locality, Burgh Marsh, Cumberland, where I took the *bifilosus* form abundantly many years ago. *Eurytemora affinis* occurred in the same pools and in equal abundance.

The generic name *Acartia* was proposed by Dana in 1846, and was undoubtedly meant to cover the forms more lately assigned by Prof. Lilljeborg to the genus *Dias*. Having the claim of priority, the term *Acartia* ought to be adopted in place of *Dias*.

The drawings in Plate XIV. were made from specimens taken at Burgh Marsh.

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EXPLANATION OF PLATES.

Plate I.

Cyclops elongatus.

Fig. 1. Female seen from above × 60.
2. Anterior antenna.
3. Labrum.
4. Maxilliped of second pair.
5. Foot of fifth pair.

Cyclops vicinus.

6. Male seen from above × 40.
7. Labrum.
8. Foot of fifth pair.
9. Vulvar openings.

Plate II.

Cyclops strenuus.

Fig. 1. Female seen from above × 80.
2. Posterior antenna.
3. Maxilliped of second pair.
4. Foot of fifth pair.

Cyclops signatus.

5. Female seen from above × 40.

Plate III.

Cyclops abyssorum.

Fig. 1. Female seen from above × 50.
2. Anterior antenna.
3. Posterior antenna.
4. Labrum.
5. Foot of first pair.
6. ,, second pair—outer branch.
7. ,, third pair.
8. ,, fourth pair.
9. ,, fifth pair.

Plate IV.

Cyclops Scourfieldi.

Fig. 1. Female seen from above × 80.
2. Posterior antenna.
3. Maxilliped of first pair.
4. ,, second pair.

5. Foot of first pair.
6. Second and third feet—last joint of inner branch
7. Foot of fourth pair.
8. ,, fifth pair.

Plate V.

Cyclops bicuspidatus.

Fig. 1. Female seen from above × 80.
2. Maxilliped of first pair.
3. Foot of first pair.
4. ,, fourth pair.
5. ,, fifth pair.

Cyclops viridis.

6. Female seen from above × 38.
7. Labrum.
8. Foot of first pair (male).
9. ,, fifth pair.
10. Appendage of first abdominal segment (male).

Plate VI.

Cyclops Thomasi.

Fig. 1. Female seen from above × 80.
2. Foot of first pair.
3. ,, fourth pair.
4. ,, fifth pair.

Cyclops insignis.

5. Female seen from above × 95.

Cyclops Scourfieldi, var.

6. Anterior antenna of female.
7. Foot of fourth pair.
8. ,, fifth pair.

Plate VII.

Cyclops serrulatus.

Fig. 1. Female seen from above × 53.

Cyclops macrurus.

2. Female seen from above × 53.

Cyclops Kaufmanni.

3. Female seen from above × 53.

CYCLOPS EWARTI.

4. Male seen from side × 54.
5. Anterior antenna of female.
6. Foot of fifth pair.
7. Abdomen of female.

PLATE VIII.

CYCLOPS AFFINIS.

Fig. 1. Female seen from above × 105 (Duddingston Loch.)
2. ,, ,, × 100 (Yetholm Loch).
3. Anterior antenna.
4. Foot of first pair.
5. ,, third pair.
6. ,, fourth pair.

PLATE IX.

CYCLOPS FIMBRIATUS (= CRASSICORNIS).

Fig. 1. Female seen from above × 80.

CYCLOPS PHALERATUS.

2. Female seen from above × 80.

DIAPTOMUS SERRICORNIS.

3. Last three joints of anterior antenna of male.
4. Distal angle of basal joint of posterior maxilliped.
5. Fifth pair of feet of male.
6. ,, ,, of female.
7. Posterior thoracic lobules and first abdominal segment (female).
(Figs. 3–7 drawn from Loch Mulloch Corrie specimens.)
8. Right antennal appendage of male.
9. Inner branch, right fifth foot of male.
10. ,, ,, ciliated appendages, more highly magnified.
(Figs. 8–10 drawn from Lerwick specimens.)

PLATE X.

CYCLOPS ŒQUOREUS.

Fig. 1. Female seen from above × 136.

DIAPTOMUS HIRCUS.

2. Foot of fifth pair of female.
3. ,, ,, of male.
4. Right antennal appendage of male.

CYCLOPS LONGICAUDATUS.

5. Female seen from above × 80.
6. Anterior antenna of female.
7. One of the swimming feet.

Plate XI.

Diaptomus Castor.

Fig. 1. Female seen from above × 40.
2. Last three joints of right anterior antenna of male.
3. Distal end of basal joint of posterior maxilliped.
4. Foot of fifth pair of female.
5. ,, ,, of male.
6. ,, ,, extremity of left outer branch, more highly magnified.

Diaptomus gracilis.

7. Abdomen and posterior thoracic angles (Wanstead Park).
8. Basal joint of posterior maxilliped.
9. Fifth pair of feet of male (Talkin Tarn).
a. Setiferous papilla.

Plate XII.

Diaptomus gracilis.

Fig. 1. Female seen from above × 80 (Coniston).
2. Last three joints of right anterior antenna of male (Floutern Tarn).
3. ,, ,, ,, (Talkin Tarn).
4. ,, ,, ,, (Lough Neagh & Wanstead Park).
5. Fifth pair of feet of female (Wanstead Park).
6. ,, ,, of female (Talkin Tarn).
7. ,, ,, of male (Wanstead Park).
8. Last thoracic segment and abdomen of male.

Plate XIII.

Eurytemora Clausii.

Fig. 1. Female seen from above × 55.
2. Apical joints of right anterior antenna of male.
3. Foot of fifth pair of male—left.
4. ,, ,, ,, —right.
5. ,, ,, of female.

Eurytemora affinis.

6. Female seen from left side × 55.
7. Abdomen and last thoracic segment of female.
8. Fitth pair of feet of male.
9. Foot of fifth pair of female.

Plate XIV.

Acartia longiremis, var. *bifilosus*.

Fig. 1. Abdomen of male.
2. Foot of fifth pair—female.
3. Fifth pair of feet—male.
4. Frontal tentacle.

Diaptomus Sancti-Patricii.

5. Fifth foot of female.
6. ,, of right side—male.
7. ,, of left ,, ,,
8. Apical joints of the same—more highly magnified.

Diaptomus bacillifer.

9. Female seen from above × 40.
10. Last three joints of right antenna of male.
11. Angle of last thoracic, and side of first abdominal, segment.
12. Fifth foot of female.
13. Fifth pair of feet of male.

(Figs. 10 and 13 are after De Guerne and Richard.)

ERRATA.

p. 75, line 9, read Cyclops Scourfieldi, G. S. Brady (Pl. IV; Pl. VI., figs. 6–8).

p. 75, line 10, read *Cyclops Leuckartii* (20) p. 30 (not *C. Leuckarti* Claus).

Plate IX., fig. 1. for C. CRASSICORNIS read C. FIMBRIATUS.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ FOR THE PRESIDENT, THE REV. CANON TRISTRAM, F.R.S., ETC., BY THE HON. SECRETARY, AT THE FORTY-FIFTH ANNIVERSARY, HELD IN THE LIBRARY OF THE MUSEUM, ON FRIDAY, MAY 22ND, 1891.

Ladies and Gentlemen,—I deeply regret that, in resigning for the fourth time in the course of forty years the honourable position in which you have placed me as your President, I have to begin by confessing my repeated short comings during my term of office, and also to apologize for addressing you by letter from the middle of the Indian Ocean instead of appearing before you in the chair.

I have, in the first place, to recall to the members of the Club the various excursions planned and successfully carried out during the year. As, on account of official engagements, I was unavoidably absent from many of the Field Meetings, I am much indebted for the following reports of these Meetings to our Honorary Secretaries.

The First Field Meeting was fixed for Friday, the 6th of June, and, there being every indication of a wet day, only a few members joined in this excursion. Leaving the Central Station by the 10.5 a.m. train they travelled to Darlington, and after a short stay for the Richmond train they soon reached Croft Station and crossed the Tees bridge to that pretty, unpretentious watering place in a pelting rain. But the party were not inclined to sadness, and took advantage of the heavy showers to refresh themselves at the Spa Hotel, and by the time lunch was finished the weather had also improved, and arrangements having been made for dinner, the party sallied out, and, under umbrellas, began to explore and enjoy the floral beauties and the spring vegetation of this rural spot. The broom, the lilac, laburnum, and other spring shrubs and flowers appeared all the gayer for the refreshing rain which had fallen, and the sun now bursting through the dense clouds that had seemingly accompanied us on our journey, brightened up the village and whole country side, and gave additional pleasure in our ramblings to the different points of interest round Croft. A visit was first made to the New Spa Well, pleasantly situated by the side of a small stream, which, now swollen with recent rains, was hurrying on to the Tees. Here a long conversation took place about the quality and the analysis of the mineral water, its strength and virtues. Comparisons made with Harrogate and other Yorkshire Spas led to the conclusion that though Croft was not so gay, yet, for invalids requiring strong sulphur baths and quiet perfect rest, the little village was much to be preferred to the gay bustling towns further south. A very pleasant walk through fields and woods, where woodmen were busy cutting down small oaks and peeling off and piling up the bark, led us by a circuitous course to the Old Spa Well, from which the water is conveyed in pipes to the New Bath Rooms, to which there is much easier access from the village. In the woods, most of the spring flowers were in bloom, as Anemones, Stellarias, and early violets in profusion. Some of the party struck off for a longer walk to Hurworth, while the rest enjoyed the village gardens and the stroll by the Tees, watching the rapid flight of the Martins and Swallows, and other *Hirundines*, which had just returned from their Southern migration, and were unusually active in capturing the insect food which the warm rays of the sun had called forth.

After enjoying the long country walk, ample justice was done to the excellent meal provided at the Spa Hotel. Under the guidance of the Rev. Mr. Moody, an exhaustive visit was made to the Church, embowered amid lofty and umbrageous trees. Much ecclesiastical lore, and long discussions on the age of some curiously wrought stone or piece of wood-work, were indulged in.

An attempt was afterwards made to visit those celebrated "swallow holes," the Hell Kettles, as they are popularly called. Only one or two of the more active pedestrians were able to reach the locality. The margins of these pools are now surrounded with a dense growth of water and bog plants, and they have the general appearance of ordinary ponds or pools. They are situated in a field near the road leading to Darlington.

Many legendary tales have been narrated about the origin of these remarkable "swallow-holes," and many lengthy papers written concerning them which need not be quoted here. These Kettles, or "swallow-holes," have no doubt had the same natural origin as many others, especially those in the neighbourhood of Ripon, which occur near the outcrop of the Triassic sandstones resting on the subjacent Magnesian-limestone. The decomposing and removal of salt, or the formation of gypsum from anhydrite in these low-lying beds which, from their position, are subjected to the action of a great supply of water, or the removal of loosed marl beds through fissures in the rocks beneath, would undermine the surface and eventually cause extensive subsidences, as we often see, in our own colliery district, when the props of shallow, old pit workings decay, and enormous "swallow-holes" are formed by the falling in of the unsupported roof. Large swallow-holes of this kind, and of a large size, were, in former times, numerous on the highest part of Newcastle Town Moor, caused by the falling in of the unsupported roof of the old coal workings.

The banks of the Tees at Croft are bordered, for the most part, by a flat piece of country, excepting here and there where remains of high-level beaches occur. Very few rock-sections are exposed, the most remarkable being the outcrop of red sandstone on which the buttresses of the Tees bridge are built, and small sections near the Spa Well. In other parts, a thick covering of alluvial deposits hides all trace of the underlying Triassic sandstone. During the day's ramble only one small boulder of Shap-fell Granite was observed, and that was placed at the corner of a road near the station.

The Second Meeting of this club was held at Kirkby Stephen on the 24th, 25th, and 26th June. After lunching together at head-quarters—the "King's Arms Hotel"—on their arrival, the members present walked to Stenkrith Bridge to view the very interesting "pot-holes" in the river Eden, where their formation may be seen in every stage of progress. Thence by the river side to Wharton Hall, once the seat of the notorious Duke of Wharton, to Lammerside Castle and to Pendragon Castle, said to have been built by Uther Pendragon, father of King Arthur. Next day they drove over Nateby Common, where were seen some remarkable fissures in the limestone rocks, varying from a few feet to several yards in length and depth, while only one or two feet in breadth. Proceeding down the river Swale to Keld, they visited the numerous and beautiful waterfalls on that river, and were charmed with the luxuriant valley, varied by bold cliffs and rocks, wooded slopes, and rich haughs, all closely shut in by wild fells and limestone precipices. Most of the characteristic plants of the district were found, but none not already recorded.

On the third day the party drove up the Mallerstang Valley to Hell Gill, through which runs the infant river Eden, while the twin river Ure or Yore runs parallel with it down the same hillside at a bowshot distance. Hell Gill may best be described as an English canon, being a deep fissure in the limestone cut out by the river. It is about half a mile long, from forty to fifty feet deep, and much wider below than on the surface, where, indeed, it may easily be leapt across in several places. Two of the party ventured down its hidden depths, and after an hour spent in various perilous scramblings down waterfalls, plunging into "pot-holes," and swimming through deep pools, emerged to the great relief of the few members who had anxiously awaited their return to the light of day. A pleasant drive homewards between the rugged cliffs of Wild Boar Fell and the long bleak slopes of Mallerstang Common ended the excursion—one of the most enjoyable of the recent field meetings.

The Third Field Meeting was fixed for Thursday and Friday, the 17th and 18th of July. About ten members, including one lady, attended. Several of these travelled north by train on the preceding evening, others left Newcastle by the early train to Chathill, and then by conveyances to North Sunderland and Sea-Houses, as the fishing village is called, in time for breakfast. The morning was unpropitious at starting, and, before arriving at our destination, rain began to fall and continued with little intermission till mid-day. After breakfast, the majority of those present determined to carry out the programme, and visit the Farnes, in the pouring rain. As soon as a boat could be floated in the harbour they left the shore, most of them wrapped up in oil-skins and other waterproofs and under umbrellas. Yet all enjoyed the passage to the Farnes, taken under somewhat unfavourable prospects; but the sea was calm, and the rain abated, and the voyagers were enabled to land at all the most interesting places and examine the breeding stations of most of the birds that frequent these islands.

The members who remained ashore, umbrella in hand, spent the time in exploring the coast section to the north of the village and botanizing along the sea banks. *Glaux maritima* and a few shore-loving plants were the chief species gathered. A large colony of Sand Martins occupied one portion of the cliffs, and several Rock Pipits were disturbed in their rocky haunts. Thin seams of coal have, in former times, been worked near to or under the sea, and we came upon an old circular shaft (now filled up with gravel) at some distance from the present coast line, shewing the rapid wearing away of land in comparatively recent times. A visit was also paid to Mr. McEwan's Fish-curing Establishment, and that gentleman kindly showed us the whole process of kippering Herrings which was then going on. The new harbour is a somewhat fearful looking place, cut out of the cliff close to the village, and more like a dock for ships than a haven for boats. This Deep Hole was partly filled with decomposing and rotten seaweeds, the stench from which was intolerable. It must be hoped that this costly harbour confers all the benefits desired by the fishermen; but its construction seems clumsy and dangerous, and in every way unpicturesque and out of keeping with the surrounding coast.

On the return of the party from the Islands an excellent dinner was served at the "Castle Inn," and afterwards several of the members left for Newcastle. The rest travelled by Monkhouse and Bamburgh to Belford. The weather was now fine, and the evening drive along the coast most enjoyable, affording beautiful views of the distant Farnes. The commanding Old Keep

"King Ida's castle huge and square,"

was seen to advantage from many points of view; and the neatly-kept and flower-covered cottages, the Rectory and the Church, with the surrounding basaltic mounds in the distance, all imbued with the warm rays of the setting sun, formed a continuous picture as we drove along skirting the shores of Budle Bay and Waren Mill, and enjoying the distant view of Holy Island, its Abbey and Castle, and the long stretch of sand and sand-hills near Ross, with the dark rugged sides of the Kyloe Hills forming a back-ground to the view such as can be seen in no other part of Northumberland, and associated with so much of legendary and historic lore.

The morning of the second day was very unpromising, and shewed every indication of more rain, yet after breakfast a start was made for Holy Island. By conveyances, all proceeded to the Beacons along Ross Links. Most of the party preferred to walk and botanize among the Sand Dunes, and many interesting plants were observed, among which were fine specimens of *Erythræa littoralis* and the Bog Pimpernel, *Anagallis tenella*, in full flower, and abundance of a dwarf Willow which spread itself widely over the grassy parts of the links. Rejoining the conveyances on the shore, the tide being out, a direct route was taken to the Beacons. A boatman soon made his appearance, and the whole party were quickly ferried safely over to the Island and landed on the rocks under the Abbey cliffs. Large Mallows, covered with a rich profusion of flowers, decorated the cliffs above high-water mark, and Goatsbeard and other coast-loving plants were abundant. The Abbey first attracted the attention of the party, and a prolonged stay was made within the ruined walls. The ruin, to many of the party, had a changed appearance. On a former visit, the entire floor and all the walls and wall-tops were beautifully ornamented with the fragrant wallflowers, now eradicated and replaced by coarse cement rather plentifully plastered on, and the appearance of the ruin had been completely changed. It now indeed "showed where the spoiler's hand had been," but "the pillars carving quaint" and "the rounded angles of each tower" had been well nigh plastered up, and the wild beauty of the ruin had been tampered with, and, for a time at least, destroyed. Then a short visit was made to the unique, historical, and beautiful little Church, which many of us had seen in bygone years, before the restoring rage had begun to efface the marks of time, and modern work had been made to replace the time-worn old and venerable.

On account of the heavy rain and rising tide, we were debarred from a visit to St. Cuthbert's Isle or a search for some of the "beads," which are still washed out of a shaly cliff adjoining the islet, where, according to the poet,

"On a rock by Lindisfarne,"
St. Cuthbert sits and toils to frame
The sea-born beads that bear his name.

The rain quickly drove the party to seek shelter and a luncheon at the adjoining Inns, the "Northumberland Arms" and "Iron Gates." The rain still continuing, the other parts of the island were left unvisited. An umbrella procession was made to the shore in search of boatman and boat. We were soon seated under numerous kinds of covering, ferried across the strait, regained our conveyances and hastened back to Belford. Despite the rain which came on at mid-day every one was pleased with this short visit. After dinner at the "Blue Bell" most of the party returned to Newcastle; but one or two remained for another day's excursion.

Very few birds were seen, as most of them were away at their breeding station. A pair of Herons, which were disturbed on our way home, flapped slowly along over the shallow water, keeping in sight for a long time, and a flock of Dunlins, driven in shore by the flowing tide, were the only birds observed.

One member, who had proceeded by way of Beal, and crossed in the early morning by the sands, missed our party entirely, and spent the first day in botanizing under an umbrella, and collected most of the rarer plants still growing on the island.

No one who had the good fortune to join in the Bank Holiday excursion to Wooler can ever forget the thoroughly enjoyable incidents of that expedition. Let me in the first place express my gratitude, both official and personal, to our zealous secretaries for the perfect arrangements, elaborated with so much care and success, by which our whole programme was carried out so successfully. It is only those who are a little behind the scenes who can fully appreciate the exertions and pains, too often thankless, of our secretaries in arranging the details of a two days' expedition. The weather was all that could be desired, when, at daybreak on Monday, most of our party left Newcastle and journeyed on from Alnwick to Wooler by that most beautiful line of railway so admirably adapted, by its windings and leisurely progress, to give the tourist a glimpse of the charms of North Northumberland. We all appreciated the quaint old hostelry where our quarters had been secured, and after breakfast drove or walked to Langlee Ford, where, in various detachments, we started to make the ascent of Cheviot. I can only report the progress of one party of which I was a member. The others took different routes, but did not reach the top of old Cheviot itself, though they had pure mountain rambles. One party went to the Scottish border, but did not see the Peregrine Falcon, which happily still exists there. We determined to face the east ascent of Cheviot, but near the top found ourselves enveloped in a thick mist, which shut out all view, and the only proof we could offer of our having reached the summit was the abundance of the Cloud-berry, *Rubus chamæmorus*, we gathered in fruit and the Alpine Club Moss. We were not fortunate enough to reach the N.W. end of the mountain. The habitat of the rare *Cornus* was concealed in the dense mist. We soon descended from the clouds, obtaining, occasionally, an extensive view over the lower hills of the Cheviot range. The wanderers of the various parties all found their way back to Wooler for dinner, after which some had to leave for Newcastle, while others remained to visit Flodden Field and Branxton Moor on the following morning, which, still favoured by fine weather, was successfully accomplished.

Enjoyable as was this trip, I cannot but feel that the primary object of our Club—the observations of the Natural products of the district visited—is not kept sufficiently in mind by many of our members. The Club has in days past contributed much to our knowledge of the natural history of the Northern Counties. May it never degenerate into a mere pic-nic club.

On the second day, Tuesday, an accession of members arrived by first train, and after breakfasting a start was made in conveyance for Flodden Field, Pallinsburn, Etal, and Ford, by way of Akeld and Millfield. The morning was splendid; and as the party drove along, the battle-mounds and border towers came in sight, and were pointed out by one or other of the party. Those huge buttresses of porphyry Humbledon, Akeld, and Yeavering Bell, as they came successively into view, beaming in the morning sunshine, rising up in purple sheen over the abundant foliage of the lower ground, gave unspeakable pleasure. At Akeld the road deviates to the right from the line of outburst of the porphyry, and the drive is continued along country lanes by Coupland Castle and other border towers to Millfield, where a turn of the road westward led us through that little village to Flodden edge, along narrow roads, and by the side of well-cultivated fields. No halt was made to examine historical sites till we arrived at the little church of St. Peter's, at Branxton, and here the President called for a halt, and a short visit was made to inspect the interior of the little church, some parts of which are remains of ancient date. From Millfield to Branxton we had crossed over two spurs of porphyry from the Northern part of the Cheviots, enclosing between them a large patch of Carboniferous-limestone, but, in this well-cultivated district, only one trace of outcrop of limestone was seen, at a distance from our route, and no trace of cliffs and scars were visible. The whole face of the country had, in Glacial times, been planed down, including the two long ridges of porphyry which extended from the west to the valley of the Till, and all covered with rich alluvial soil, and in a high state of cultivation.

From Branxton our route lay by the King's Stone and Pallinsburn, where a short stay was made to examine this classical spot, hallowed in church history, and much endeared to naturalists as the cherished home and breeding place of the Black-headed Gull, which finds here, with many other interesting water fowls, a safe and secure sanctuary to rear and nurse their young; and yet no stone wall, nor iron fence, nor lofty hedge row is needed to afford the necessary protection; on the contrary, there is only a low railing and wicket gates close at hand, and a well-kept footpath by the side of the pond, so that any pedestrian who wishes can easily leave the road and walk close to the haunts of these birds and observe them at leisure. At the time of our visit the gulls had left with their young and we saw only numerous broods of Ducks, Water-hens, and Coots. From Pallinsburn we proceeded by Ford Bridge to Etal, where rest for all, for an hour, was determined on, enabling us to see, at leisure, the neat cottages and gardens of this model northern village, and time to examine the remains of the old border keep, once ivy covered, and formerly almost impregnable, which stands by the side of the dark dull Till, whose waters below seem almost stagnant. The Wall-Pellitory, which grew abundantly on the old Keep at Etal, was the only plant observed in our day's drive that need be recorded.

Afterwards a short drive brought us to Ford, but time did not allow to do more than drive down this beautiful village and observe, in a few minutes, the unique character of this sylvan spot: cottages embowered among fruit trees and flowers; a village school in the midst of it, with pear trees in front laden with fruit, under which the children sported and played; the huge castle, surrounded with its splendid garden, at the head of the village; and an elaborate drinking fountain close by; and at the other end an elegant Jubilee cottage for the residence of convalescents from a distance who may require country air, erected by the Marchioness of Waterford. Our homeward route was by a pleasant road through the broad valley of the Till by Fenton and Doddington. Nothing could surpass the pure freshness of the westerly breeze coming down from the Cheviots, or the exquisite view of those mountain masses of porphyry bathed in blue and purple, which were ever present to our view all the day and from nearly all parts of our route. After an excellent dinner, served in time to enable us conveniently to catch the last train by which we were obliged to leave the splendid weather and our comfortable hostelry, we bid farewell to Wooler and the Cheviots.

Though a fine morning ushered in the day fixed for the Woodburn Meeting, not more than a dozen members left the Central Station. They were met at Scots Gap by one of the secretaries. As no one was inclined for an extended walk by Sweethope Lake and Wanny Crags, it was decided to proceed on by rail to Woodburn. After making arrangements for an early tea, a start was made for the Roman Camp at Risingham, or *Habitancum*, one of the two important stations between Corbridge and Chew Green, the Ad Fines Camp of the Romans. Placed in a deep valley at the lower end of Chesterhope (the Hope of the Camp), and surrounded, as it no doubt was, in Roman times, by impassable marshes, and exposed to inundations of the river and encompassed with natural woods, the site of this camp must have been most unhealthy. Strongly fortified, and raised above the surrounding swamp by massive stone walls above the general level of the valley, it was one of the most important stations between the Tyne and the Forth, and, if not destroyed by man for the sake of building material, would, probably, have presented its original features conspicuously until the present day.

Considerable time was spent in the Camp. The interior is very irregular, from excavations that have been made from time to time in search of relics or for building material. Many of the walls of the adjoining farm houses and the stone fences have been built from dressed stones obtained from the Camp, and it was not difficult to find traces of ornamental work and Roman dressed stones in some of the gateways and stone fences close by. From this camp southward the old line of the Watling Street led straight across Chesterhope moor, from Habitancum to the Dun Cow Inn, where there is still visible the remains of the walls of a small legionary camp by the side of the old Watling Street. Traces of this road are still visible on Broomhope common, flanked by deep fosses on each side.

From the Camp we ascended to the site of an old tumulus overlooking the station, from which an extensive view of the Redewater was obtained, and, passing by the picturesquely situated farm house at the Crag, walked by way of the old, disused Ironstone Quarries, extending more than a mile to the Steel Burn, where a short time was spent in search of fossils and examining the section from which the ironstone nodules were worked so extensively by the Redesdale Company, in former years, and, more recently, by the Elswick Firm.

The weather was so fine, and the balmy west wind so invigorating, that the walk through the old quarries was most enjoyable; but most of our time was now spent, and a rapid return to Woodburn had to be made, across Broomhope to Park Head, to have a look at what remains of Rab of Risingham, on our way.

Only the lower part of the effigy now remains; the lower part of the kilt and legs, and what appears to be a bow in one hand, and in the other some kind of game, as a hare or rabbit, cut on the side of a large block of stone perched on the slope of a hill-side, the work, probably, of a Roman mason or stone-dresser, ambitious to leave some memorial behind him. It was left to Sir Walter Scott, in later days, to clothe this rude figure with legendary lore—

> "And near the spot that gave me name,
> The moated mound of Risingham,
> Where Rede upon her margin sees,
> Sweet Woodburn's cottages and trees,
> Some ancient sculptor's art has shown
> An outlaw's image on the stone."
>
> Rokeby.

At Parkhead, we pass through the remains of a patch of natural wood of birk, oak, hazel, and Rowan tree, the latter covered with a profusion of bunches of the most brilliant scarlet berries. After an excellent tea at the "Fox and Hounds," a start was made for Newcastle by an early train, but not before every one present had expressed himself satisfied with this short visit to Redesdale.

The Last Meeting was held at Ryhope Dene and the sea-coast towards Seaham. About 25 members and friends alighted at Ryhope Station by train leaving Newcastle at 10.35 a.m. For late autumn, the weather was remarkably fine, and under the vice-presidency of Dr. Embleton, the party proceeded to the romantic and picturesque part of the dene situated nearest the sea. The upper part of the Dene, which is much more open, is now cut off from the lower part by a broad turnpike road, and the Seaham railway, which did not exist at the time of the Club's first visit in 1849. Perpendicular and beetling cliffs, covered with ivy and other evergreens; water-worn caves, ornamented with marchantia and moss, the whole almost concealed under over-hanging trees and shrubs; a small trickling stream winding its way towards the sea, and forming here and there deep pools, are the chief characteristics of this as of many other of the beautiful denes, which cut through the magnesian-limestone, in many parts of the Durham coast—a unique feature in our local physical geography—occurring in no other part of these islands, and peculiar to the magnesian-limestone.

In former years, and on the first visit of the Club, the Harts-tongue grew in the greatest profusion and size, some of the fronds being more than 20 inches in length, but soon after the Club's visit it was so entirely eradicated by fern-maniacs that not even a seedling was left. Although directly contrary to our Rule, it is to be feared that sometimes the meetings of our Club have, indirectly perhaps, led to the destruction of some of our rare plants, by pointing out and making known to the general public the places where they grow. Later in the day we were told that, though strictly protected, most of the Harts-tongue had been stolen from Seaham Dene, and this destruction has occurred in all the denes along our coast to which the public have free admission. Most of the stations for the Harts-tongue, Sea Asplenium, Black Spleenwort, and Wall-rue, which formerly grew vigorously and plentifully in the east of Durham, 40 years ago, are now more or less completely destroyed by the hand of man, or by the smoky atmosphere in some instances.

One half of the party descended the steep banks of the Dene, near the Railway Bridge, and worked their way along the bed of the stream; others proceeded along the top and entered the Dene by its narrow outlet on the coast. The Black Bryony, the Privet, and the Juniper still grow on the sloping banks, and many of the common autumnal flowers were still lingering in bloom near the coast. Some of our rarer land shells and plants occurred here to the earlier explorers of the district.

On the arrival of all at the mouth of the Dene, a halt was made for lunch, *sub Jove*, and the day being delightful, and the sea smooth as glass, the party spread themselves on the sands and rocks to enjoy the beauty of the coast scenery. Along this coast, when it was wilder and more picturesque even than at present, wandered the poet Byron, who may have been impressed by such a scene as this with those imperishable thoughts—

> "Time writes no wrinkles on thy azure brow;
> Such as creation's dawn beheld, thou rollest now."

At the present day, enormous heaps of shingle, composed of all kinds of rocks, native and foreign, a bewilderment of geological formations, which have been cast into the sea as ballast, are rolled on to the shore, and spoil the beauty of the sands. Much time was spent in examining the accumulations of exotic materials, mixed chiefly with a few washed out of the boulder clay of the sea banks. Some botanizing along the banks was also attended to. Many interesting plants are known to grow there, as formerly recorded by the older botanists and confirmed by more recent research.

Our Vice-president, the Rev. A. Bethune, met the party near Seaham Hall, and courteously conducted them through the church, the peculiar features and relative age of the different parts being pointed out. One member detected a Roman-dressed stone in the tower, a rather out of the way place to find Roman workmanship. We afterwards were shown the Marriage Registers, particularly that containing the signature of Lord Byron and Judith Millbanke, who were married in the drawing room of the Hall adjacent. After a vote of thanks for the kindness of our Reverend and respected Vice-president, a short visit, under the guidance of Mr. Draper, was made to the Hall gardens, which were in splendid autumnal dress and in readiness for the visit of His Royal Highness the Prince of Wales, who was shortly expected to visit Seaham. The party were shewn some fine specimens of *Valeriana Pyrenaica*, which had established itself in a neighbouring plantation, but has no right to be considered indigenous, being only a garden escape. After thanking Mr. Draper for his obliging attention, the members hastened to Seaham

Harbour to secure a cup of tea before the 5 o'clock train started for Newcastle. Mr. Cobb, of Sunderland, led the party through Ryhope Dene, and did most of the botanizing that was possible at this late season.

A joint Evening Meeting of the members of the Club and of the Natural History Society was held in the Library of the New Museum, on the evening of February the 27th. The chair was occupied by Mr. J. F. Spence. After the election of two members to the Club, Dr. Embleton read a most interesting Memoir of the Life of John Hancock There was a good attendance of members of both Societies. This was the first meeting held by the Club in the New Building.

Some members often complain that we have so few evening meetings during the winter months. If they would only kindly favour us with a few Natural History Notes, or some original paper on subjects which come within the scope of the Club's proceedings, it would be possible to have these pleasant gatherings more frequently, but, in the absence of such contributions, winter evening meetings cannot be held.

During the last year, the second and completing part of Volume X. has been issued to members. It is but bare justice to say that our Transactions not only sustain the character of the Club as a Naturalist's Society, but they still carry out, to some extent, the original object of the founders of this Society—which was to form reliable catalogues of the natural productions of these counties. There are still many interesting subjects remaining for future investigators, if such would only come forward and lend a helping hand towards the formation of a more complete set of catalogues of our local Fauna and Flora. There are still many large groups of organized beings whose local distribution requires working out. We have no complete list of the Diatoms, the Desmids, the Microscopic Algæ, Fungi, and many of the minuter groups of Insects, Spiders, etc., have yet to be catalogued. Fifty years ago, without, or with very imperfect microscopes, several of these subjects were almost unapproachable, or were undertaken at great disadvantage; but, in the present day, it is earnest and enthusiastic workers that are the desiderata, and not microscopic appliances. But, without doubt, such researches require much time, patient and painful labour, and do not bring the honest worker into much notoriety, and, as a consequence, such subjects are rarely undertaken except by some secluded, unknown, and enthusiastic naturalist, to whom notoriety and public approbation are matters of no moment. But it is satisfactory to know that there are some workers, still in our midst, carrying out their unobtrusive researches in thorough earnest; and that important contributions to our Transactions are still forthcoming. Prof Geo. S. Brady has kindly promised, and is busy with, a comprehensive paper on some minute families of the Ostracoda, a group of minute Crustacea, which will form part of the next volume of our Transactions. Mr. John E. Robson, of Hartlepool, kindly offered, some years ago, to prepare a full and comprehensive catalogue of the Macro–and Micro-Lepidoptera of our district. Mr. Robson has recently informed me that his MS. is now nearly ready for the press, and that he only requires the opportunities, which he hopes a few fine summer months will afford, to verify a few doubtful observations and to confirm others. Thus we have material in readiness for future volumes, as Mr. Robson's catalogue will extend to the size of a full-paged volume. To enable the Committee to issue these works without any unnecessary delay, it may not be out of place to mention here that it is very desirable that our members—those who live near and those who live at a distance—should forward their subscriptions to the Honorary Treasurer or Secretaries without delay, and this is the more desirable as we are at present without an appointed collector for the Newcastle district.

On this occasion we have to record, with much sorrow, the loss of several of our older contributors and more influential members. Though not a naturalist, Mr. John Clayton became a member of the Club in 1858, and, though seldom able to be present, except on the occasions of the Club's visit to the Chesters and at some of our evening meetings in former years, yet he always took a lively interest in our proceedings. On two or three occasions, when the members visited the Camp at the Chesters, Mr. Clayton acted as chief guide to the party, shewing them through all the newly-formed excavations, and explaining all the points of interest, which he understood so well, in the most affable and obliging manner; and when the explorations of the Camp were finished, the hospitable mansion was thrown open for the refreshment of the numerous visitors gathered together at this favourite meeting place. By Mr. Clayton's death, the Club loses another of its old and influential members—a loss which it will be difficult to replace.

Early in the beginning of the present year, and very unexpectedly, another of our older members was removed from us. Dr. Henry Bowman Brady, who died at Bournemouth, on January 10th. Dr. H. B. Brady was elected a member of the Club in 1854, and contributed to the Transactions several papers on his favourite and special subject—the Foraminifera. His first Papers, which appeared in the Tyneside Club Transactions, were:

Remarks on the Foraminifera. Vol. IV., p. 204.
On the Foraminifera Dredging Expedition, 1862. Vol. V., p. 291.
On the Foraminifera Dredging Expedition, 1863. Vol. VI., p. 193.

In the Transactions Northumberland, Durham, and Newcastle-on-Tyne :

Report on Foraminifera, 1862-4. Vol. I., p. 51.
Catalogue of Recent Foraminifera of Northumberland and Durham. Vol. I., page 83.
On Casts of Palæozoic Corals. Vol. I., p. 201.
On *Saccammina Carteri*, a new Foraminifer from the Carboniferous limestone. Vol. IV., p. 269.

Dr. Henry Brady was elected President of the Club in 1872, and was appointed to represent the Club at the Meeting of the British Association which was held at

Retiring in 1876 from business, he spent most of his winters in a warmer climate, and always in search of his favourite Forams. During this time his great work on the Foraminifera of the '*Challenger*' Expedition, and numerous other Papers on the same favourite subject were written. Dr. H. B. Brady was a Fellow of the Royal Society, and many of the other learned Societies of Britain.

Another of our old members, Mr. Tuffin West, died at Frensham, on the 19th of March last. His connection with Newcastle and our Club began while he was a pupil with Mr. Henry Brady, of Gateshead, at which time he was also a student at the School of Medicine in Newcastle. He soon abandoned the medical profession, and became celebrated in Naturalist circles for his elaborate and careful engravings of minute and microscopic organisms, which were represented with the greatest delicacy and faithfulness. One of his early works in 1858–9 was the Illustrations to "Blackwell's Spiders"—an important Monograph, published by the Ray Society. Many of the Illustrations in the earlier volumes of the Club were from his graver. He contributed also to our Transactions the following Papers:—

New Microscopic Algæ collected by Thomas Atthey, T.N.F.C. Vol. IV., p. 321.

On the Feet of Insects. Vol. IV., p. 17.

On the Seeds of Plants as Microscopical Objects. Vol. V., p. 163.

A few years ago, on account of failing health and living so far away from Newcastle, he ceased to be a member, but he never forgot his former connection with the Club, and the many enjoyable rambles he had with some of the members in his younger days.

Also we have had, during the past year, to mourn the removal from our midst of the last of that distinguished band of naturalists, who, 60 years ago, formed a galaxy which will ever give lustre to the city of Newcastle, as the mother and nurse of the votaries of Natural Science. In John Hancock, we mourn not only one of our original founders, but the man who, more than any other, for half a century, imparted to us a share of his own enthusiasm, and gave the Tyneside a prominent position among the Naturalist Societies of England. Well might it be so when we recall the illustrious band which supported him: his brother Albany, the gentle and lovable Joshua Alder, W. C. Hewitson, George Wailes, R. B. Bowman, and others, all devoted workers in their several departments. John Hancock still lives—and will live—rather by his works in your Museum than by the amount of his writings. Yet it is not the man who writes much, but the man who writes well on the subject of which he is master, whose fame will survive; and the volume of your Transactions, which we owe to his pen, will stand long as the model and type of what a local Fauna should be. John Hancock was the typical field naturalist. Behind the naturalist's eye he possessed the artist's soul, and this enabled him to ennoble the art of taxidermy. What I individually owe to him, it is difficult for me adequately to express. Considerably more than half a century ago, I recall the kindness with which he received the schoolboy and sacrificed a long afternoon, not merely in exhibiting his choice collection of eggs, but in explaining and enforcing the lessons in ornithology they taught, and in shewing how every environment of locality and position of the nest had a significance which illustrated the life of the bird. Who could watch John Hancock as he described, with an artless eloquence, the feats and actions of a falcon—every motion of his body, and the glance of his eagle eye, almost reacting the scene he depicted—without feeling that he was listening to a master of bird life? This, indeed, he was, and your Museum attests that he was as true a poet as any who ever wielded the sculptor's chisel or handled the artist's brush. His sympathy was with nature, and his groups are "vitalized by one who felt the life of birds as something kindred with his own, and, inspired with this sympathy and labouring to utter it, he recreated life as it were within the grasp of death." Nowhere has he shown his descriptive power more forcibly than in his description of a day's bird-nesting on Prestwick Carr, in those golden days when, even within reach of your city, there were nooks teeming with bird life as rich and varied as can be found in the wilds of Scandinavia.

I feel very strongly that the life work of John Hancock claims from us some permanent recognition; and I venture to suggest that this may fittingly be done by the establishment of an annual medal for the encouragement of Natural History studies in such a manner as a committee of subscribers may decide.

It is sometimes said that the day of Field Clubs has gone by, and that there is nothing left for us to do on our soil, marched through and through for so many years; and that the naturalist is no longer needed, but must give place to the biologist; that the field-glass and the lens must be abandoned for the microscope and the scalpel; and the studies of the laboratory supersede the observations of the field. I am too old to succumb to this latter day heresy. There is still room, I believe, for the worker in every branch of natural science, from the study and observations of life and habits down to the investigation of muscles, and the analysis of brain tissue. But for the busy toiler of the great city, for the hard-worked professional and business man, there is no relaxation or refreshment that can rival the change of gaze from the ledger or the law book, to the gem-studded turf or the path of the bird in the air. We gather at our meetings to enjoy nature. The work of the Tyneside Club is not accomplished till the enjoyment of nature by all its members is an intelligent enjoyment—till they have learned the story and the lesson of plant, bird, beetle, and butterfly; or have ceased to look on any of nature's gifts with an ignorant indifference, or an unintelligent wonder.

"O Lord, how manifold are Thy works; in wisdom hast Thou made them all. The earth is full of Thy riches."

The following gentlemen were elected members of the Tyneside Naturalists' Field Club during 1890–91 :—

At the Evening Meeting, Feb. 27th, 1891 :—James Drummond, Bradford, Yorkshire; Mrs. W. B. Wilson, Thornley House, Trimdon Grange.

The following places were selected for Field Meetings for 1891 :—

May 27th .... Lambton Park.
June 24th and 25th...... Ripon and Fountains Abbey.
July 18th .... Richmond in Swaledale.
August .... Jedburgh and Carter Fell.
September 19th .... Embleton and Beadnell.
October 9th .... Marsden.

ABSTRACT OF TREASURER'S ACCOUNT OF TYNESIDE NATURALISTS' FIELD CLUB.

Dr.

1890.		£	s.	d.
Jan.	To Balance	49	5	0
	,, Subscriptions	57	10	0
	,, Transactions	4	2	0
		£110	17	0

Cr.

1890.		£	s.	d.
	By Commission	3	7	2
	,, Postage	1	2	2
	,, J. Bell & Co.	78	6	0
	,, "Journal"	20	7	0
	,, Sundries	1	3	0
Dec. 31.	,, Balance	6	11	8
		£110	17	0

1891, May 6th.—Examined and found correct,

T. P. BARKAS, AUDITOR.

The following gentlemen were elected Officers of the Club for 1891–92 :—

PRESIDENT.

Prof. Geo. S. Brady, M.A., M.D., LL.D., F.R.S.

VICE-PRESIDENTS.

Joseph Blacklock.	William Maling.
D. O. Drewett.	Edward C. Robson.

D. Embleton, Esq., M.D.	Rev. J. E. Leefe, M.A.
Rev. Canon Tristram, F.R.S.	Rev. G. R. Hall, M.A., F.I.A.
Rev. Canon Norman, F.R.S.	G. H. Philipson, Esq., M.D.
Rev. J. C. Bruce, LL.D.	Rev. R. E. Hooppell, D.D.
Rev. A. Bethune, M.A.	A. S. Stevenson, Esq., J.P.
E. J. J. Browell, Esq., J.P.	H. C. Abbs, Esq., J.P.
Rev. R. F. Wheeler, M.A.	Rev. J. M. Hick, B.A.
Prof. G. S. Brady, F.R.S.	John Philipson, Esq., J.P.

HON. TREASURER.

R. Y. Green.

HON. SECRETARIES.

Richard Howse	Thomas Thompson.

Faraday Spence.

COMMITTEE.

T. W. Backhouse.	Rev. J. M. Hick.
Benjamin Barkus, M.D.	Rev. Wm. Johnson.
E. J. J. Browell.	G. H. Philipson, M.D.
Wm. Dinning.	John Philipson.
D. Embleton, M.D.	J. F. Spence.
John Glover.	Col. J. R. Young.

AUDITORS.

J. S. Forster.	T. P. Barkas, F.G.S.

TYNESIDE NATURALISTS' FIELD CLUB.

LIST OF MEMBERS, 31st DECEMBER, 1891.

Members are specially requested to inform the Secretaries of any change of address.

Elected.		
O.M.	Adamson, C. M.	Crag Hall, Jesmond, Newcastle.
1858	Adamson, Horatio	99, Howard Street, North Shields.
1877	Adams, W. E.	32, Holly Avenue, West Jesmond, N/C
1875	Addison, John George	17, North Bridge, Sunderland.
1888	Allison, Rev. J. W.	36, Grey Street, Blyth.
1882	Angus, W. M., Lieut-Col.	Fenham Hall, Newcastle.
1865	Appleton, A. M.	12, Elvet Bridge, Durham.
1886	Archer, Mark	Farnacres, Ravensworth, Gateshead.
1849	Armstrong, George	Amen Corner, Newcastle.
1876	Armstrong, J. F., M.D.	23, Victoria Terrace, South Shields.
1876	Armstrong, T. J.	Hawthorn Terrace, Newcastle.
1877	Arnison, W. C., M.D.	4, Fenham Terrace, Newcastle.
1866	Backhouse, T. W.	West Hendon House, B'pwearmouth.
1891	Bainbridge, G. B.	Claremont House, Newcastle.
1879	Barker, Thomas B.	Westoe, South Shields.
1859	Barnes, J. W.	Messrs. Backhouse & Co., Durham.
1861	Barron, Thomas W., M.B.	10, Old Elvet, Durham.
1874	Barwick, John S.	The Cedars, Sunderland.
1885	Bell, J. R.	4, Tankerville Terrace, Newcastle.
1884	Beck, W. E.	Slate Yard, Gallowgate, Newcastle.
1876	Benson, J. G.	12, Grey Street, Newcastle.
1851	Bewick, T. J., F.G.S.	Iddesleigh Mansions, London, S.W.
1889	Bidwell, Edward	1, Trigg Lane, Upper Thames Street, London.
1867	Bird, Rev. C.	Chollerton, Hexham.
O.M.	Blacklock, Joseph	11, Summerhill Terrace, Newcastle.
1872	Blair, Robert	Ocean Road, South Shields.
1886	Bone, W. J.	61, Linskill Terrace, North Shields.
1858	Booth, George R.	50, West Sunniside, Sunderland.
1876	Bowden, Thomas	Sheriff Mount, Gateshead.
1849	Brady, Prof. G. S., F.R.S.	2, Mowbray Villas, Sunderland.
1891	Brady, L. S.	„ „
1865	Branford W. E.	90, Grey Street, Newcastle.

Elected.		
1878	Branford, Mrs.	90, Grey Street, Newcastle.
1867	Brooks, J. C.	14, Lovaine Place, Newcastle.
1850	Browell, E. J. J.	East Boldon, Newcastle.
1872	Brown, Rev. Dixon	Unthank Hall, Haltwhistle.
1871	Brown, Rev. J. J.	Silksworth, Sunderland.
1860	Brown, John	69, Blenheim Street, Newcastle.
1877	Brown, M. Walton	Westmorland House, Gateshead.
1854	Bruce, Gainsford, M.P.	2, Harcourt Buildgs, Temple, London
O.M.	Bruce, Rev. J. C., LL.D., DC.L.	Framlington Place, Newcastle.
1890	Bryant, C. H.	19, Wentworth Place, Newcastle.
1872	Burnup, Edwin	60, Maple Street, Newcastle.
1860	Burnup, John	2, Devonshire Terrace, Newcastle.
1868	Charlton, Richard	20, Claremont Place, Newcastle.
1880	Clark, George	22, Belgrave Terrace, Newcastle.
1871	Clark, Isaac	Blaydon-on-Tyne.
1870	Clarke, H.	24, Dockwray Square, North Shields.
1881	Clarke, Mrs.	Chirton Cottage, North Shields.
1865	Clay, William	Abbotsford Terrace, Newcastle.
1860	Clephan, R. C.	High Bridge, Newcastle.
1869	Cobb, Joseph	Union Street, Sunderland.
1883	Collins, Ralph	Northumberland Sqr., North Shields.
1889	Conradi, Thomas M.	Roseville, Bensham, Gateshead.
1887	Cooper, William	11, Ridley Place, Newcastle.
1869	Corder, Alexander	1, Carlton Terrace, Sunderland.
1868	Corder, Francis	Princes Street, Sunderland.
1862	Cowen, Lt.-Col. J. A.	Blaydon Burn, Blaydon-on-Tyne.
1865	Cowen, Joseph	Stella House, Blaydon-on-Tyne.
1858	Cox, J. H.	33, Fawcett Street, Sunderland.
1860	Daglish	Rothley Lake, Cambo, R.S.O.
1864	Dance, J. W.	Shipcote Villa, Gateshead.
1867	Davison, Edwin C.	23, Park Place, Sunderland.
O.M.	Dees, R. R.	Pilgrim Street, Newcastle.
1865	Dickinson, I. G.	Nat. Prov. Bank, Newcastle.
1858	Dinning, William	43, Eldon Street, Newcastle.
1879	Dobson, James	17, Frederic Street, Sunderland.
1889	Dodd, Matthew H.	Holly Avenue, Newcastle.
1865	Dodds, Edwin	Low Fell, Gateshead.
1860	Drewett, D. O.	Riding Mill-on-Tyne.
1891	Drummond, Jas. J.	Bradford, Yorkshire.
1868	Dunn, Henry	2, Marianople Street, Newcastle.
1881	Dunn, Septimus	Quayside, Newcastle.

Elected.		
1879	Eccles, Edward	South Close, Gateshead.
1883	Ellis, Richard, M.D.	100, Rye Hill, Newcastle.
1891	Ellison, Rev., W.F.A., B.A....	Tudhoe, Spennymoor.
1870	Elsdon, W. B.	Grey Street, Newcastle.
O.M.	Embleton, D., M.D.	Claremont Place, Newcastle.
1890	Embleton, T. W.	The Cedars, Methley, Leeds.
1887	Emley, Fred	Ravenshill, Saltwell, Gateshead.
1881	Fawcett, William	(Fawcett & Waugh), Quayside, N/C
1861	Featherstonehaugh, Edward...	13, Park Place West, Sunderland.
1861	Fenwick, George	Percy Gardens, Tynemouth.
1860	Fenwick, John	63, Howard Street, North Shields.
1890	Field, Alfred	8, Esplanade, Whitley, R.S.O.
1850	Forster, J. S.	8, St. Mary's Place, Newcastle.
1884	Forth, R. Y.	Finney & Co., Mosley Street.
1858	Foster, G. B., M.A.	North Jesmond, Newcastle.
1860	Foster, Robert	The Quarries, Clifton Rd., Newcastle.
1868	Fothergill, J. M.	1, Norham Place, West Jesmond, N/C
1883	Fox, Rev. H. E.	South Bailey, Durham.
1888	Franklin, Rev. Canon	St. Mary's Cathedral, Clayton Street
1865	Fraser, Donald	Forth Goods Station, Newcastle.
1884	Garwood, Edmund J.	Tynemouth.
1891	Gayner, Francis..................	Beech Holme, The Cedars, Sunderl'd.
1851	Gibb, C. J., M.D.	Westgate Road, Newcastle.
1870	Gibson, Charles	16, Stanwick Street, Tynemouth.
1881	Gibson, H.	28, Northumb'land Sq., North Shields.
1881	Gilhespy, William	24, Cambridge Street, Newcastle.
1872	Gillie, John	Westoe, South Shields.
1867	Gillies, Alexander	9, Ravensworth Terrace, Gateshead.
1885	Gjemre, L.	3, West Avenue, Gosforth.
1881	Glendenning, G. H.	9, Grainger Street, Newcastle.
1878	Glendenning, William	9, Grainger Street, Newcastle.
1864	Glover, John	20, Holly Avenue, Newcastle,
1874	Grace, W. Percy..................	Fellside House, Whickham.
1867	Graham, John	1, John Street, Sunderland.
1862	Green, Edward	Beverley Terrace, Cullercoats.
O.M.	Green, R. Y.	11, Lovaine Crescent, Newcastle.
1854	Green, William	Dendron Lodge, Lillington Avenue, Leamington, Warwick.
1872	Greene, C. R.	Oakfield, near Gateshead.
1877	Greenwell, G. C.	Elmtree Cottage, Duffield, Derby.
1884	Greenwell, Winship	Bothal, Morpeth.

Elected.		
1877	Hadaway, George	21, Washington Ter., North Shields.
1865	Hall, Rev. G. Rome	Birtley, Wark-on-Tyne.
1858	Hall, James	Palmer, Hall, & Co., Quayside, N/C.
1862	Hall, John	Ellison, Place, Newcastle.
1880	Hardie, William	Osborne Road, West Jesmond.
1882	Harkus, George	9, East Parade, Newcastle.
1859	Haswell, F. R.	77, Tyne Street, North Shields.
1859	Havelock, Michael	Akenside Hill, Newcastle.
1886	Hedley, R. C.	Cheviot, Corbridge-on-Tyne.
1876	Hedworth, T. H.	Dunston, Gateshead.
1889	Henzell, George C.	Colwell, Barrasford-on-Tyne.
1878	Henning, H. B.	Nat. Prov. Bank, Gateshead.
1877	Heslop, George, Jun.	1, Rectory Terrace, Sunderland.
1868	Heslop R. Oliver	The Crofts, Corbridge-on-Tyne.
1874	Hick, Rev. J. M.	Vicarage, Trimdon Grange.
1859	Hodgkin, Thomas, LL.D.	Collingwood Street, Newcastle.
1864	Hodgson, W.	Elm Croft, Darlington.
1874	Hopgood, J. F.	Clive House, Tunstall Road, Sunderland.
O.M.	Howse, Richard	12, St. Thomas' Crescent, Newcastle.
1875	Hudson, Thomas	Thrift Street, South Shields.
1871	Humble, S. J.	West Street, Gateshead.
1858	Humble, Mrs.	Ashburn, Scarborough.
1881	Hunter, J. W.	24, Bewick Road, Gateshead.
1876	Hutchinson, Henry	1, Wylam Road, Newcastle.
1867	Hutchinson, Joseph	The College, Durham.
1880	Hutchinson, William	Roseworth Villa, Gosforth.
1872	Hutton, John	Eden Vale, Castle Eden.
1878	Hutton, J. B.	Claremont Place, Newcastle.
1876	Hutton, T. G.	North Hetton Coal Co., John Street, Sunderland.
1861	Irving, George	Central Station, Newcastle.
1878	Jackson, Joseph	25, Leazes Terrace, Newcastle.
1860	Jackson, Thomas	2, Camp Terrace, Tynemouth.
1865	Jackson, Thomas, Jun.	Percy Villas, Tynemouth.
1871	Johnson, Rev. A.	Healey, Riding Mill-on-Tyne.
1867	Johnson, A. W.	1, Elysium Place, Gateshead.
1875	Johnson, Rev. John	Hutton Rudby, Yarm.
1875	Johnson, Rev. William	9, Richmond Terrace, Gateshead.
1877	Joicey, James, M.P.	Longhirst, Morpeth.
1881	Jones, Thomas	Durham.

Elected.		
1885	Kelly, Bruce	2, Collingwood Street.
1891	Kerr, R. N.	19, King Street, Dundee, N.B.
1867	Kidson, John	66, John Street, Sunderland.
1869	Kirkby, James W.	Kirkland, Leven, Fife.
1869	Laidler, G. G.	Northumberland Street, Newcastle.
1871	Lebour, Prof. G. A.	College of Physical Science, N'castle.
1876	Losh, John	269, Westgate Road, Newcastle.
1859	Lowrey, Edward	Lombard Street, Newcastle.
1865	Lowrey, Richard	Lea Villa, Riding Mill.
1859	Lyall, George, F.G.S.	48, East Winchester St., South Shields
1887	Mackey, M.	8, Milton, St., Shieldfield, Newcastle.
1852	Maling, C. T.	Ellison Place, Newcastle.
1880	Maling, John Ford	25, Eslington Terrace.
1863	Maling, E. A.	John Street, Sunderland.
1865	Maling, William	Granville Road, Newcastle.
1871	Maughan, Rev. J. A. C.	The Vicarage, Prudhoe-on-Tyne.
1877	Mearns, Dr.	Bewick Road, Gateshead.
1870	Metcalf, J. S.	60, Percy Park, Tynemouth.
1867	Meynall, F. J.	Durham.
1881	Mills, Leighton	71, Lovaine Terrace, North Shields.
1888	Moffitt, Charles	Winlaton Iron Works.
1879	Moor, J. C.	Newcastle Journal Office, Sunderland
1846	Moore, John	Beckenham, Kent.
1862	Moore, J. M.	Market Place, South Shields.
1884	Moult, John	3, Gladstone Terrace, Gateshead.
1876	Nelson, R. C.	19, Roker Promenade, Sunderland.
1860	Noble, Capt., C. B., F.R.S.	Jesmond, Newcastle.
1860	Norman, Rev. Canon, F.R.S.	Burnmoor Rectory, Fence Houses.
1879	Oliver, Thomas, M.B.	7, Ellison Place, Newcastle.
1881	Ormond, Richard	24, Grainger Street West, Newcastle.
1879	Oswald, Septimus	Bright Side, Granville Road, N'castle.
1877	Page, John	4, Alexander Crescent, Newcastle.
1867	Park, A. D.	Bigg Market, Newcastle.
1858	Pattinson, John	The Side, Newcastle.
1853	Peacock, Septimus	Sunderland.
1872	Pearman, George W.	Mayfield, Sunderland.
1860	Peart, R. S., M.D.	22, Dockwray Square, North Shields.
1865	Peckett, J. C.	Sunderland.

Elected.		
1874	Peile, George	Shotley Bridge.
1860	Pemberton, R. L.	Hawthorn Tower, near Seaham.
1877	Peverley, R. B.	9, Akenside Hill, Newcastle.
1852	Philipson, G. H., M.A., M.D.	Eldon Square, Newcastle.
1854	Philipson, John	9, Victoria Square, Newcastle.
1866	Philipson, Joseph A.	15, Pilgrim Street, Newcastle.
1861	Pilkington, Edward	6, Humbledon View, Sunderland.
1880	Pinkney, Thomas	John Street, Sunderland.
1891	Potter, M. G., F.L.S., M.A.	College of Science, Newcastle.
1883	Potts, John, M.D.	Sunderland.
1865	Proctor, Matthew	Osborne Terrace, Newcastle.
1861	Punshon, N.	Oldstead, Oswaldkirk, Yorkshire.
1877	Pybus, W. M.	Post Office Chambers, Newcastle.
1879	Redpath, Robert	Linden Terrace, Newcastle.
1877	Reid, Edwin O.	4, North Terrace, Newcastle.
1867	Reid, W. B.	Leazes Brewery, Newcastle.
1879	Rhagg, Adamson	Haldane Terrace, Newcastle.
1876	Rich, F. W.	5, Eldon Square, Newcastle.
1880	Robson, A. H.	2, Esplanade, Sunderland.
1849	Robson, E. Capper	2, Esplanade, Sunderland.
1864	Robson, Fred	Dean Street, Newcastle.
1872	Robson, John E.	Sea View, Hartlepool.
1863	Robson, S. S.	13, Claremont Terrace, Sunderland.
1873	Robson, Shafto	Bewick Road, Gateshead.
1874	Robson, Stephen E.	8, Woodside, Sunderland.
1865	Robson, W. C.	166, Rye Hill, Newcastle.
1875	Rogers, Rev. Canon	Simonburn, Humshaugh.
1881	Rogerson, John	Croxdale Park, Durham.
1889	Ryle, Robert	Ravensworth Crescent, Low Fell, Gateshead.
1860	Sample, Thomas	Bothal Castle, Morpeth.
1870	Scorfield, E. S.	Quayside, Newcastle.
1872	Scott, George	Westoe Terrace, South Shields.
1877	Scott, Walter	Holly House, Durham Rd., Sunderl'd.
1874	Shaw, Benjamin, M.A.	Clayton Park Road, Newcastle.
1876	Shevill, W. H.	5, Avenue Terrace, Sunderland.
1880	Shewbrook, Edward	6, Lovaine Crescent, Newcastle.
1889	Simpson, Alfred	244, Westgate Road, Newcastle.
1855	Simpson, J. B.	Hedgefield House, Blaydon-on-Tyne.
1859	Simey, Ralph	1, John Street, Sunderland.
1876	Smart, Collin	18, John Street, Sunderland.

Elected.		
1879	Sopwith, H. T.	Tankerville Terrace, Newcastle.
1873	Southwell, Charles	Gurry Lodge, Kilburn, London.
1867	Spence, C. J.	North Shields.
1871	Spence, Faraday	Grey Street, Newcastle.
1858	Spence, J. F.	Chirton Cottage, North Shields.
1860	Spence, J. F., Jun.	Chirton Cottage, North Shields.
1881	Spence, R. F.	West Cramlington.
1874	Spencer, G. E.	3, Victoria Street, Newcastle.
1861	Spencer, Thomas	The Grove, Ryton.
1865	Steele, Thomas	John Street, Sunderland.
1882	Stephens, Rev. Thomas	Horsley Vicarage, by Otterburn.
1875	Stephenson, James	84, Aline Street, South Benwell.
1869	Stephenson, Thomas	3, Framlington Place, Newcastle.
1851	Stevenson, Alexander S.	Tynemouth.
1870	Storey, Samuel, M.P.	Sunderland.
1877	Storey, John, Mrs.	76, Lovaine Place, Newcastle.
1890	Strachan, R. A.	16, Ivy Road, Gosforth.
1868	Straker, Joseph H.	Stagshaw House, Corbridge.
1865	Sutherland, B. J.	Sandhill, Newcastle.
1859	Swan, J. W.	Bromley, Kent.
1858	Tate, R. M.	20, Camden Street, North Shields.
1891	Taylor, Henry E.	Whickham, R.S.O.
1867	Taylor, Hugh	Chipchase Castle, Wark-on-Tyne.
O.M.	Taylor, John	2, Lovaine Place, Newcastle.
1869	Temperley, N.	4, Carlton Ter., Low Fell, Gateshead.
1855	Temperley, W. A.	Hencotes Street, Hexham.
1889	Thompson, Mrs. George	Winlaton, Blaydon-on-Tyne.
1878	Thompson, George	18, Victoria Street, Newcastle.
1858	Thompson, Thomas	Winlaton House, Winlaton, Blaydon-on-Tyne.
1861	Tone, W.	58, Villiers Street, Sunderland.
1883	Tranah, Arthur	Eldon Street, Newcastle.
1850	Tristram, Rev. Canon, F.R.S.	The College, Durham.
1889	Turnbull, Joseph W.	Fenwick Tower, Stamfordham.
1879	Tweddell, George	Graingerville, Newcastle.
1865	Waddington, Thomas	Eslington Villa, Low Fell, Gateshead.
1866	Waite, James	16, Northumberland Sq., No. Shields.
1866	Waite, John	18, Latimer Street, Tynemouth.
1879	Walker, J. D.	15, Grosvenor Pl., Jesmond, N'castle.
1888	Walmsley, Rev. Henry	Annitsford, Newcastle-on-Tyne.
1853	Warwick, John	11, Ashfield Terrace West, Newcastle.

Elected.		
1869	Watson, Robert	Grey Street, Newcastle.
1879	Watts, Rev. Arthur	The Rectory, Witton Gilbert.
1867	Wheldon, John	58, Great Queen Street, London.
1891	White, Conrad	3, Kensington Terrace, Newcastle.
1876	White, W. H.	Killingworth House, Newcastle.
1863	Williamson, Sir H., Bart.	Whitburn Hall, Sunderland.
1878	Wilson, Edward	Pilgrim Street, Newcastle.
1880	Wilson, J. Straker	23, Grey Street, Newcastle.
1851	Wilson, Ald. Thomas	Riding Mill-on-Tyne.
1891	Wilson, Mrs. W. B.	Thornley House, Trimdon Grange.
1872	Winter, J. M.	Market Street, Newcastle.
1861	Wood, Lindsay	South-hill, Chester-le-Street.
1865	Youll, J. G.	Grainger Street West, Newcastle.
1881	Young, Charles G.	Dunkirk Terrace, Corbridge.
1874	Young, Col. J. R.	Windsor Terrace, Newcastle.
1864	Young, Miss	5, High West Street, Gateshead.

HONORARY MEMBERS.

Elected.		
1868	Baker, J. G., F.R.S.	Kew Gardens, London.
1861	Glaisher, James, F.R.S.	13, Dartmouth Terrace, London.
1861	Jones, Prof. T. Rupert, F.G.S.	Uverdale Road, Chelsea, London.
1863	Mennell, H. T., F.L.S.	Dunstan's Buildings, London.
1861	Oliver, Prof. D., F.L.S., F.R.S.	Kew Gardens, London.
1863	Perkins, V. R.	Wotton-under Edge, Gloucester.
1884	Hardy, James, LL.D.	Old Cambus, Cockburnspath, N.B.
1884	Miller, Hugh, F.R.S.E.	Geol. Survey, George IV. Bridge, Edinburgh.

NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

ANNUAL MEETING, 14TH OCTOBER, 1891.

REPORT OF THE COMMITTEE, 1890–1891.

The Sixty-Second year of the Society's existence closes with a roll of 319 members. Six members have died and six resigned, while 16 new members have been elected during the past year.

More than 27,000 visitors have paid for admission to the Museum during the year, of which number about one-third were juveniles, realizing rather more than £200 in entrance fees. Considering the many counter attractions of the present day, and the more than usually fine weather during the race week and the holidays, this result is on the whole very satisfactory, and compares favourably with other large towns in which admission to the Museum is free.

It will be seen from the balance sheet that the business of the Society has been conducted with the most rigid economy, and little or nothing has been expended in increasing the collections or completing the furnishing of the Museum.

During the year the Committee have had prepared and issued a printed circular calling the attention of the public to the collections exhibited in the Museum. Mounted copies of this have been sent to the principal works and factories in the neighbourhood, and to numerous Institutes and Reading Rooms in the two counties. The director of the Elswick Works, Capt. A. Noble, kindly offered to place this circular in all the eligible parts of their extensive works, and many other managers and secretaries have kindly offered to assist the Committee in their endeavour to make the Museum and its contents better known. Tickets of admission to the Museum can now be purchased by members in packets of 12 at the reduced price of two shillings and sixpence.

It is with much grief that the Committee record the great loss which the Society has sustained in the death, at the ripe age of 83, of their Vice-President, Mr. John Hancock, on the 11th October, 1890. At their next meeting in November, the Chairman, E. J. J. Browell, moved, and R. Y. Green seconded, that the following memorandum be recorded in the minutes of the Society.

MEMORANDUM.

The Committee of the Natural History Society desire to record the great loss which both they and the public have sustained through the death of their lamented Vice-President, the late Mr. John Hancock, to whose extensive knowledge of Natural History, and life-long devotion to its study, coupled with his untiring energy, and the instincts of a true artist, the Society are indebted for the most valuable part of their collections, as well as for the very existence of the noble building which they now possess, and which was undoubtedly the result of his personal influence with his fellow members.

The Chairman moved, and I. G. Dickinson seconded, "That the Secretaries be instructed to forward a letter of condolence to Miss Hancock, enclosing a copy of the above resolution."

The following letter was sent to Miss Hancock by the President, Lord Armstrong, enclosing a copy of the above resolution.

Cragside, Rothbury,
6th November, 1890.

My dear Miss Hancock,

As President of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, it is my duty to express the deep sympathy of the Society with you in your great loss through the death of your brother, Mr. John Hancock, who has rendered such unparallelled services to our Society.

The resolution, of which I enclose a copy, was put upon the minutes of the Committee at their last meeting, and you may feel assured that it expresses the feeling of every member of the Society.

Believe me, very truly yours,

ARMSTRONG.

By the death of Mr. John Hancock, the Society has lost its most influential and active member. Though brought up and actively connected with the older naturalists from boyhood, more especially with his brother Albany and W. E. Hewitson, Mr. John did not become a member and officer of the Society till 1859. Previous to that time he had assisted on many occasions, and had performed the laborious feat of stuffing the Walrus and the Polar Bear as early as 1833, and these still remain to attest his early skill in taxidermy, but they are trifling compared with the after work done for the benefit of the Society's collections. In 1862–3, when the old Museum building had been re-roofed and the interior refitted, he undertook the arrangement and re-casing of the collection of British Birds, which at that time were the ornament of the Old Museum, and also the best public collection of stuffed birds in England, preserved chiefly by R. R. Wingate. It was during this time he began to feel the narrow bounds and the crowded state in which the valuable collections now accumulated in the Old Museum were buried, so as almost to render them useless, and to see the pressing necessity there was for a larger, more commodious, and more eligibly situated place than the dark, obscure corner, concealed from public view, in which the old building was located, the only point of advantage it possessed, if that was a real advantage, being its proximity to the Central Station.

About this time Mr. Hancock's ability and skill in landscape gardening began to show itself, and his refined taste soon found full scope for development in laying out the grounds attached to the mansions of some of his most influential friends. The gratification they felt in the power of his genius in turning fields and bare hill sides into pleasant parks and woodland bowers, combined always with his enthusiastic zeal in his favourite study of ornithology and other branches of Natural History, gained for him the admiration and influence of his wealthy friends, many of whom felt only too glad to assist the man who had given them so much real and refined pleasure, and who felt gratified at being able to assist him in accomplishing what had really been his long desire, namely, to hand down to future generations, and for the benefit of his native town and the promotion of his favourite study, the unique collection of birds which, by his steady perseverance he had formed, and by his intuitive skill he had preserved in those inimitable and life-like forms that we now see represented in the extensive and remarkable collection in our Museum.

About this time he conceived the idea of collecting funds for the erection of a larger and every way more capacious structure, which would be worthy to hold his own collection of stuffed birds and also the other large and valuable collection of fossils, minerals, recent shells, and other objects, which had been formed by several local naturalists, and had been presented to the Society by kind friends. By the generous aid of his endeared friend, W. C. Hewitson, of Oatlands, Surrey, of Colonel and Edward Joicey, Sir Lowthian Bell, and especially of those devoted friends, Lord and Lady Armstrong, he was at length enabled to see his way to lay the foundation of the noble structure which the Society now occupies at the Barras Bridge—the most fitting monument to the memory, zeal, and talent of one of the last of a not large but a world-wide known band of self-taught, earnest, and enthusiastic naturalists, whose works and whose unpretentious lives and labours have earned for this city a renown for natural history pursuits which does not often fall to the lot of a provincial Town.

The Committee think that it must be the wish of every member of the Society to perpetuate the memory of Mr. Hancock, and, as undoubtedly the Museum building itself, and its ornithological collections form his true monument, they recommend to the Society that the Museum building be henceforth called "The Hancock Museum."

The Committee also recommend that a neat mural tablet be erected in the Entrance Hall of the Museum, bearing the following inscription:—

To the Memory of the Brothers
ALBANY HANCOCK, born 24th December, 1806; died 24th October, 1873;
AND
JOHN HANCOCK, born 24th February, 1808; died 11th October, 1890.

Albany was distinguished for his anatomical researches among the Invertebrata, and received in 1858 the Gold Medal of the Royal Society for his investigations of the Brachiopoda.

John was celebrated as an Ornithologist, and for the life-like character he gave to the birds which he preserved. It was through his personal influence that the funds were obtained for the erection of this Building, on the completion of which he presented his Ornithological collection to the Natural History Society.

The Committee have consulted Mr. R. J. Johnson as to the form of the proposed tablet, and have received a design from that gentleman which he proposes should be executed in coloured marbles. The cost of this tablet will be about £100, and the Committee propose to open a subscription list to defray the cost.

But, in recommending the erection of this tablet, the Committee are fully aware that these brothers are only the more prominent representatives of an earnest band of self-taught naturalists, of whom were the botanists, Winch and Robertson; the entomologists, W. C. Hewitson, Wailes, and Bold; the conchologists, Fryer, Adamson, and Gibsone, and the retiring, gentle, and lovable Joshua Alder, the accomplished friend and joint author with Albany of the Nudibranchiate Mollusca; and the geologists and mineralogists, Hutton, Charlton, and several others not unknown to the Scientific world, most of whom now rest in peace, and whose works only keep them in memory.

It should never be forgotten that the one great aim of Mr. John Hancock's later years was to secure a fitting and abiding resting place for his invaluable collections, and he strove earnestly, even to his last days, to obtain for the Society to whom he had entrusted and presented his collections, a permanent maintenance fund, so that there could not be any possibility of a chance of his works being transferred to any other body or Society, and to this end by deed of gift he vested his collections in the hands of the present Trustees of the Natural History Society and their future successors.

The Committee cannot close this part of their report without referring to the Biographical Sketch of the life of Mr. John Hancock, which has been written for the Transactions of the Society by his intimate friend, Dr. Embleton, with a portrait presented by Mr. J. W. Swan.

The Committee record with gratification, that during the past year the Museum has been permanently fitted with the Electric Light, and through the generous donations of Lord Armstrong, Lady Armstrong, the Northern Institute of Chartered Accountants and others, the whole cost has been defrayed. Mr. J. W. Swan most kindly presented the Society with the whole of the electric lamps required for the Entrance Hall, Ladies' Room, Committee Room, two Stair-cases and the Library. Since the Museum has been fitted with the electric light, the Committee opened it on Monday and Saturday evenings from 7 to 9 p.m. The attendance on Monday nights was so discouraging that the Committee have discontinued the opening of the Museum on that night. The attendance on Saturday evenings has been better, though the average sum taken at the doors has so far only been sufficient to meet about half the cost of the electric light. It is proposed, however, to continue to keep the Museum open on Saturday evenings for the present, in the hope that the attendance will increase; but, if that hope be disappointed, the Committee do not see how, having regard to the limited income of the Society, they will be justified in incurring the expense of keeping the Museum open on Saturday evenings.

The permanent installation of the Electric light enabled the Committee to grant the use of the Museum rooms for a Conversazione, held by the Chartered Accountants in the Autumn of last year, and on another occasion during the Spring the promoters of the Conversazione of the Associated Literary and Scientific Institutions of Newcastle obtained the same privilege.

To these large gatherings all the Members of the Natural History Society were invited, so that the chief benefit to the Society of such uses of the Museum Rooms has been the occasional entertainment of members during the Winter months, and perhaps also making the Museum and its contents known to many who would not otherwise be inclined to visit it.

The following is a List of the Subscribers to the Electric Lighting Fund:—

	£	s.	d.
Lord Armstrong	100	0	0
Lady Armstrong	100	0	0
F. R. Goddard, Esq. ...	5	5	0
J. C. Brooks, Esq.	2	2	0
Mr. Ald. T. P. Barkas...	1	1	0
C. J. Gibb, Esq., M.D...	5	5	0
R. Y. Green, Esq.	1	1	0
I. G. Dickinson, Esq. ...	2	0	0
R. R. Dees, Esq.	2	0	0
Edward Wilson, Esq. ...	1	1	0
Wm. Wilson, Esq.	2	2	0
Thos. Crawford, Esq. ...	1	1	0
N. G. Clayton, Esq.......	10	0	0
Col. J. P. O. Mitford ...	2	0	0
Thos. Simpson, Esq. ...	1	1	0
E. O. Reid, Esq.	1	1	0
W. J. Sanderson, Esq....	2	2	0
F. W. Rich, Esq..	1	1	0
C. M. Adamson, Esq. ...	1	1	0
M. J. Pelegrin, Esq. ...	2	2	0
T. G. Gibson, Esq.	5	5	0
Capt. Carr-Ellison	1	0	0
Sir B. C. Browne.........	1	1	0
Jas. S. Forster, Esq. ...	1	0	0
Wm. Patterson, Esq. ...	0	10	6
	£252	2	6
Brought up......	£252	2	6
Geo. Irving, Esq..........	1	1	0
Bainbridge & Co.	5	0	0
Lindsay Wood, Esq. ...	5	0	0
Alfred Wright, Esq. ...	0	10	6
Benj. Barkus, Esq , M D.	2	2	0
Capt. West, R.N..........	1	0	0
Miss Harvey..............	1	1	0
J. F. Spence, Esq.	2	2	0
G.H. Philipson, Esq., M.D.	2	2	0
John Sharp, Esq..........	1	1	0
U. A. Ritson, Esq.	1	1	0
G. E. Henderson, Esq...	1	1	0
Wm. Maling, Esq.	1	1	0
Richd. Welford, Esq. ...	1	1	0
Ralph Brown, Esq.	5	0	0
Joseph A. Philipson, Esq.	1	1	0
Robt. C. Clephan, Esq...	1	1	0
J. D. Walker, Esq.	1	1	0
Thos. Brady, Esq.	1	1	0
John Coppin, Esq.	5	0	0
The Northern Institute of Chartered Accountants	45	0	0
Mrs. Barnes	10	0	0
	£346	10	0

The Committee have also granted the use of the Committee Room to the North of England Microscopical Society, for their evening meetings during the Winter, upon condition that the Microscopical Society disburse all expenses for lighting and attendance at the Museum in connection with their meetings.

As mentioned in previous reports, it is the earnest wish of the Committee that the Society should continue to be the centre and promoter of Natural History Studies in the North of England, and therefore, with pleasure, they mention that the Council of the Durham College of Science have recently, on account of want of space in the College Buildings, asked if they can be allowed the use of the lower West Corridor (at present unfurnished) for the purposes of a Biological and Botanical Laboratory, (until such time as they are enabled to erect additional buildings of their own) on such terms and subject to such conditions as may be arranged. The Committee hope to be able to report shortly that definite arrangements have been arrived at with the Council of the College.

The following donations have been made to the maintenance fund during the past year:—

Mrs. Barnes, Whitburn	£10	0	0
Dr. Embleton	10	10	0

The Curator reports that the donations to the Museum and Library have been, on the whole, equal to former years. The exchanges of Transactions with Home and Foreign learned Societies shew about the same number of volumes and pamphlets received. The Trustees of the British Museum presented, during the year, a most useful collection of 58 volumes of their valuable catalogues of the British Museum's Natural History collections. These form a much-required addition to the reference library, and are of special use in the arrangement and naming of our collections. The executors of Mr. John Hancock have presented to the Society seven Water-colour Drawings, by R. Johnson, which are now hung on the walls of the Committee Room.

Very few donations have been made to the Ethnological Gallery during the last twelve months, but one contribution is of such importance as to require a special mention here. The Rev. R. Stewart Wright, of the London Missionary Society, has obligingly presented a large collection of Native weapons, implements, and other articles used by the natives of the Tanganika district of Central Africa, collected by himself during a long residence in the country, of which a detailed enumeration will be found in the list of donations.

Only a few additions have been made to the Geological Collections; chiefly minerals, which will be found recorded in the general list of donations.

Some interesting and rare birds have been presented to the Ornithological Collections by Capt. A. Noble, Mr. John Daglish, Mr. Alfred A. Straker, Mr. John Coppin, Erskine Macdonald, Mr. John Duncan and several other contributors; chiefly water-birds, many of which visited this district during the severe weather of last winter. Many of these which were desiderata have been stuffed by J. Jackson, and are now arranged in the bird room. Within the last few days, Mr. Wm. Brack, of South Byker, has presented a specimen of the Little Bittern, which had been killed against the telegraph wires, near the Railway Shops, at Gateshead. This is a very rare casual visitor—only three specimens are recorded in Mr. Hancock's Catalogue of Birds of Northumberland as having been killed in the district. Another example was captured alive about the same time, October, 1889, at Sheriff Hill, which was unfortunately destroyed by the ignorant people who had captured it.

A very fine living Huanaco, *Llama huanaco*, from Chili, was kindly presented by our friend Mr. Tripler, of Coquimbo, through Mr. Cameron Swan. Though exposed to the severity of an unusually hard winter, this creature has thrived vigorously since its arrival, and may now be considered acclimatized, and able to bear the rigorous winter of our climate. Many other acquisitions have been made to the collections, which will be found duly recorded in the Donation List appended to this Report.

The following gentlemen were elected members of the Society during the past year, from June 30th, 1890, to June 30th, 1891:

Bryant, C. H., 19, Wentworth Place, Newcastle.

Clavering, Sir Henry Augustus, Bart., Axwell Park, near Winlaton.

Carnegie, James, 8, Ridley Place, Newcastle.

Cowen, Joseph, Stella Hall, near Blaydon-on-Tyne.

English, Col., 3, St. Thomas' Place, Newcastle.

Gascoigne, F., 27, Eldon Street, Newcastle.

Hancock, Charles J., 2, Gresham Place, Newcastle.

Harker, William Ed., Tankerville Terrace, Newcastle.

Holmes, Robt. S., Blaydon Iron Works.

Holmes, W. H., Wellburn, Jesmond, Newcastle.

Hutchinson, William, 18, Poplar Crescent, Gateshead.

Lamb, Edmund George, M.A., 29, Great Cumberland Place, London, W.

Macdonald, Archd. Erskine, Stella Hall, near Blaydon-on-Tyne.

Prosser, W. H. Lindisfarne, Otterburn Villas.

Redmayne, R. Norman, 12, The Grove, Gosforth.

Stuart, Charles Edward, 29, Mosley Street, Newcastle.

ABSTRACT OF MINUTES.

LORD ARMSTRONG, PRESIDENT.

The Hon. Secretary read the Committee's Report.

Moved by W. B. Reid, and seconded by Mark Pybus :—

"That the Report now read be adopted." Carried unanimously.

The Hon. Treasurer's Financial Report for 1890–91 was read.

Moved by E. O. Reid, and seconded by the Rev. Canon Lloyd :—

"That the Treasurer's Financial Report be adopted."

Moved by E. O. Reid, and seconded by John Burnup :—

"That the following gentlemen be elected Officers of the Society for 1891–92. See List of Officers, page 168.

Mr. Thomas Thompson moved, and the Rev. Canon Lloyd seconded :—

"That the Museum be henceforth known as the Hancock Museum."

The resolution was formally put to the Meeting and carried unanimously.

It was proposed and agreed to that the design for the Hancock Memorial Tablet be left in the hands of the Sub-Committee.

It was proposed, seconded, and agreed to unanimously that the Rev. Canon Lloyd's name be added to the list of Vice-Presidents of the Society.

Sir Benj. Browne proposed, and Dr. Embleton seconded a vote of thanks to Lord Armstrong for his services in the chair, which was carried by acclamation, and suitably responded to by Lord Armstrong.

THE HONORARY TREASURER IN ACCOUNT

DR. CURRENT ACCOUNT FROM 30TH JUNE,

1891.	RECEIPTS.		£	s.	d.
June 30.	To Balance from last Account		156	16	10
	,, Members' Subscriptions		396	6	9
	,, Admission Fees		207	2	7
	INTEREST ON STOCKS—				
	,, Newcastle Corporation, $3\frac{1}{2}$ per cent. Stock, 1 year	£68 5 0			
	,, Wear Commissioners, $4\frac{1}{2}$ per cent. Stock, 1 year	21 18 8			
			90	3	8
	,, Guides to Museum sold		6	7	0
	,, Sundries, per J. Wright		0	10	9
			£857	7	7

WITH THE NATURAL HISTORY SOCIETY.

1890, TO 30TH JUNE, 1891. CR.

1891.	PAYMENTS.	£	s.	d.	£	s.	d.
June 30.	SALARIES AND WAGES—						
	By Rd. Howse	200	0	0			
	,, Joseph Wright	90	0	0			
	,, Jno. Jackson	78	0	0			
	,, Wm. Vout	62	8	0			
	,, Mrs. Atkinson	20	16	0			
					451	4	0
	INCIDENTAL EXPENSES—						
	,, Coal	5	19	4			
	,, Coke	22	2	3			
	,, Water	5	12	10			
	,, Gas	5	8	0			
	,, Advertisements	7	16	2			
	,, Taxes—Income, Land, and House	4	16	0			
	,, Insurances	15	4	0			
					66	18	7
	TRADESMEN'S ACCOUNTS—						
	,, Robson & Son	5	9	7			
	,, Dinning & Cooke	6	5	0			
	,, Thomas Waters	2	14	6			
	,, John Bell & Co.	6	3	0			
	,, Gurney & Jackson	1	10	0			
	,, Sopwith & Co.	5	11	6			
	,, G. G. Laidler	4	19	7			
	,, Beck & Sons	2	12	1			
	,, Mawson & Swan	5	6	8			
	,, Walker & Son	2	0	6			
	,, M. Sinel, for Fishes	3	19	6			
	,, J. Smart, for Glass	0	7	11			
	,, Corporation, for Drains	6	0	0			
					52	19	10
	,, Sundries, per Jos. Wright				27	12	8
	,, Cheque Book				0	5	0
	,, Balance in Bank				258	7	6
					£857	7	7

I. G. DICKINSON,
HON. TREASURER.

JOHN. D. SCOTT, }
E. O. REID, } AUDITORS.

THE HONORARY TREASURER IN ACCOUNT

ELECTRIC LIGHTING FUND

1891.	RECEIPTS.	£	s.	d.
June 30.	To Subscriptions to Electric Lighting Fund received..	320	4	0
		£320	4	0

MAINTENANCE FUND

1891.	RECEIPTS.	£	s.	d.
	To Balance from last year	25	9	2
	,, Mrs. Barnes, Whitburn	10	0	0
	,, Dr. Embleton	10	10	0
		£45	19	2

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1891.

1891.	PAYMENTS.		£	s.	d.
June 30.	By Paid to Electric Supply Co.—				
	,, Installation	£189 17 6			
	,, Electric Energy	29 15 3			
			219	12	9
	,, Ferguson, Stone Work		5	17	6
	,, Balance		94	13	9
			£320	4	0

I. G. DICKINSON,
HON. TREASURER.

JOHN D. SCOTT,
E. O. REID, } AUDITORS.

30TH JUNE, 1891.

1891.	PAYMENTS.	£	s.	d.
June 30.	By Cash in Messrs. Lambton & Co.'s Bank, Grey Street, as per Maintenance Fund Account	45	19	2
		£45	19	2

I. G. DICKINSON,
HON. TREASURER.

JOHN D. SCOTT,
E. O. REID, } AUDITORS.

THE HONORARY TREASURER IN ACCOUNT

CAPITAL ACCOUNT,

1891.	RECEIPTS.	£	s.	d.
June 30.	To Invested in $3\frac{1}{2}$ per cent. Newcastle Corporation Stock, as per last Capital Account	2000	0	0
	,, Invested in River Wear Commissioners' $4\frac{1}{2}$ per cent. Stock, as per last Capital Account	500	0	0
	,, Donations and Balance of Maintenance Fund, as per Bank Act	45	19	2
		£2545	19	2

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1891.

1890.	PAYMENTS.	£	s.	d.
June 30.	By Invested in $3\frac{1}{2}$ per cent. Newcastle Corporation Stock	2000	0	0
	,, Invested in River Wear Commissioners' Stock at $4\frac{1}{2}$ per cent.	500	0	0
	,, Balance of Maintenance Fund, as per Bank Account	45	19	2
		£2545	19	2

I. G. DICKINSON,
HON. TREASURER.

JNO. D. SCOTT, E. O. REID, } AUDITORS.

OFFICERS OF THE NATURAL HISTORY SOCIETY,

1891–92.

The following Gentlemen were elected Officers of the Natural History Society for 1891-92.

PRESIDENT.

The Rt. Honorable Lord Armstrong, C.B., F.R.S.

VICE-PRESIDENTS.

The Rt. Honourable the Earl of Ravensworth.
Sir W. M. Ridley, Bart., M.P.
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The Worshipful the Mayor of Newcastle.

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D. Embleton, Esq., M.D., F.R.C.P.
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George Hare Philipson, Esq., M.D., F.R.C.P., M.A., D.C.L.
Thomas Bell, Esq.
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John Rogerson, Esq.
J. W. Swan, Esq.
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I. G. Dickinson, Esq.

HON. SECRETARIES.

Wm. Dinning.
A. H. Dickinson.

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Mr. H. T. Archer.
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Mr. N. H. Martin.
Prof. G. A. Lebour, F.G.S.
Rev. Canon Norman, M.A., D.C.L., F.R.S.
Mr. John Pattinson.
Ald. J. F. Spence.
Mr. A. S. Stevenson.
Mr. Thos. Thompson.

AUDITORS.

John D. Scott.
E. O. Reid.

HONORARY CURATORS,

1891–92.

ZOOLOGY.

VERTEBRATA.

D. Embleton, M.D.
Samuel Graham.
C. M. Adamson.
Thos. Thompson.

INVERTEBRATA.

Rev. Canon Norman.
C. M. Adamson.
Wm. Maling.
N. H. Martin.
W. Dinning.
Prof. Jayme Batalha-Reis.

BOTANY.

Rev. Henry Fox, Durham.
Rev. Wm. Johnson, Gateshead.
C. E. Stuart.
M. G. Potter.

GEOLOGY.

E. J. J. Browell.
J. Daglish.
W. Dinning.
E. J. Garwood.
J. W. Kirkby.
Prof. Lebour.
Jno. Pattinson.

CURATOR.

Richard Howse

KEEPER OF THE MUSEUM.

Joseph Wright.

LIST OF EXCHANGES AND DONATIONS TO THE MUSEUM AND LIBRARY

OF

THE NATURAL HISTORY SOCIETY,

FROM JULY 1st, 1890, TO JUNE 30th, 1891.

AMERICAN SOCIETIES.

Boston:—American Academy of Arts and Sciences.

Proceedings, Vol. 16, New Series. May, 1888—May, 1889.

,, ,, 17, ,, May, 1889—May, 1890.

The Academy.

Boston:—Society of Natural History.

Proceedings, Vol. 24, Parts 3, 4. 1889—April, 1890.

Memoirs, Vol. 4, Nos. 7, 8, 9. *The Society.*

Cambridge:—Museum of Comparative Zoology, Harvard College.

Bulletin, Vol. 16, No. 9.

,, ,, 20, Nos. 1, 2, 3, 4, 5, 6, 7, 8.

,, ,, 21, No. 1.

Memoirs, Vol. 17, No. 1.

Annual Report of the Curator. 1889-90. *Prof. Alex. Agassiz.*

Meriden, Conn.:—Scientific Association.

Vol. 4. 1889-90.

Mineapolis:—Minnesota Academy of Natural Sciences.

Bulletin, Vol. 3, No. 1. *The Academy.*

New York:—Academy of Sciences and Lyceum of Nat. History.

Annals, Vol. 5, Nos. 4, 5, 6, 7. July, 1890.

,, Index to Vol. 4. *The Academy.*

Philadelphia:—Academy of Natural Sciences.

Proceedings, Part 3, 1889; Parts 1, 2, 3, 1890; Part 1, 1891.

The Academy.

Philadelphia:—American Philosophical Society.

Proceedings, Vol. 27, No. 131.

,, ,, 28, ,, 132.

,, ,, 28, ,, 133.

,, ,, 28, ,, 134. *The Society.*

Philadelphia:—Wagner Free Institute of Science.

Vol. 3. August, 1890. *The Institute.*

Rochester :—Academy of Science.

Vol. 1. Brochure 1. 1890. *The Academy.*

Salem :—American Association for the Advancement of Science.

Proceedings, 38th Meeting, Toronto. 1889. *The Association.*

Washington :—Smithsonian Institution.

Annual Report, 1886, Part 2; 1887, Parts 1, 2; 1888.
The Institution.

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

Proceedings, Vol. 12. 1890.
Bulletin, 38.
Report of U.S. National Museum. 1888.
Smithsonian Miscellaneous Collections, Vol. 34. *The Institution.*

Washington :—United States Geological Survey.

Monograph XV. Potomac or Younger Mezozoic Flora, Parts 1, 2. 1889.
,, XVI. Palœozoic Fishes of North America. 1889.
,, I. Lake Bonneville. 1890.
Mineral Resources of the United States, 1888. D. T. Day, 1890.
Bulletins, 54—66.
8th Annual Report. 1886-87; Vols. 1, 2.
9th ,, 1887-89. *The Director of U.S. Geol. Survey.*

Washington :—Department of Agriculture.

N.A. Fauna. No. 3.
,, 4. *The U.S. Department of Agriculture.*

SOUTH AMERICAN SOCIETIES.

Brazil :—Rio de Janeiro.

Archivos do Musen Nacional, Vol. 7. 1887.

BRITISH SOCIETIES.

Cardiff :—Naturalists' Society.

Report and Transactions, Vol. 21, Part 2. 1889. *The Society.*

Dublin :—Royal Society.

Scientific Proceedings, Vol. 6, New Ser., 7, 8, 9. *The Society.*

Edinburgh :—Botanical Society.

Transactions and Proceedings, Vol. 18; and Vol. 19, 2 Parts, pp. 1—87.
The Society.

Edinburgh :—Geological Society.

Transactions, Vol. 6, Parts 1, 2. 1890. *The Society.*

Edinburgh :—Scottish Meteorological Society.
Journal, 3rd Ser., No. 7. 1889. *The Society.*

Essex :—Field Club.
Essex Naturalist, Vol. 4, Nos. 4, 5, 6, 7, 8, 9, 10, 11, 12.
,, ,, ,, 5, ,, 1, 2, 3, 4, 5. *The Club.*

Glasgow :—Geological Society.
Vol. 9, Part 1. 1888–90. *The Society.*

Greenwich :—Royal Observatory.
Magnetic and Meteorological Results. 1888. *The Astronomer Royal.*

Leeds :—Philosophical and Literary Society.
Annual Report. 1889–90. *The Society.*

London :—British Astronomical Association.
Journal, Vol. 1, No. 1. *The Association.*

London :—British Museum, Cromwell Road, Kensington.
Fifty-eight volumes of Catalogues and Guides to the British Museum (Natural History). *The Trustees of British Museum.*

London.
Entomologists' Review, Vol. 1, No. 8. *The Publisher.*

London :—Geologists' Association.
Proceedings, Vol. 11, Nos. 7, 8, 9. *The Association.*

London :—Quekett Microscopical Club.
Journal, Vol. 4, 2nd Ser., Nos. 27, 28. *The Club.*

London :—Zoological Society.
Proceedings, Parts 2, 3, 4. 1890. *The Society.*

Leicester.
12th Report of the Town Museum Committee. March, 1888, to March, 1890.

Manchester :—Literary and Philosophical Society.
Memoir and Proceedings, Vol. 3, 4th Ser. 1890.
,, ,, ,, 4, ,, Nos. 1, 2, 3. *The Society.*

Newcastle-on-Tyne :—Institute of Mining & Mechanical Engineers.
Report of the French Commission on the Use of Explosives in Mines, Parts 1, 2, 3.
Transactions, Vol. 39, Parts 1, 2; Vol. 40, Part 1. *The Institute.*

York :—Yorkshire Philosophical Society.
Annual Report. 1890. *The Society.*

COLONIAL SOCIETIES.

AUSTRALIA.

Sydney, N.S.W.:—Australian Association for the Advancement of Science.

Report of 2nd Meeting, Melbourne, Vict. 1890. *The Association.*

Sydney, N.S.W.:—Department of Public Instruction.

Wattles (*Acacias*) and Wattle-barks, by J. H. Maiden.
The Department.

Sydney, N.S.W.:—Australian Museum.

Report of Trustees for 1889.
Records, Vol. 1, Nos. 3, 4, 5, 6.
Catalogue of Birds—Part 1, *Accipitres.* 1876.
Supplement ,,
Part 2, *Striges.* *The Trustees.*

Sydney, N.S.W.:—Royal Society.

Journal of Proceedings, Part 2, Vol. 23. 1889.
,, ,, ,, 1, ,, 24. 1890. *The Society.*

Victoria, Melbourne.

Prodromus of Zoology of Victoria, Decade, 20.
The Premier of Victoria.

CANADA.

Montreal.

The Canadian Record of Science, Vol. 4, Nos. 3, 4, 5.
The Natural History Society, Montreal.

Ottawa:—Geological and Nat. Hist. Survey of Canada.

Contributions to Canadian Palæontology, Vol. 3, Part 1, 4to.
Catalogue of Canadian Plants, Part 5. 1890.
List of Canadian Hepaticæ. 1890.
The Survey, per Dr. Alfred R. C. Selwyn, Director.

EUROPEAN SOCIETIES.

AUSTRIA.

Vienna.

Verhandlungen der K.K. Zool.-Botan. Geselschaft in Wein:
Jahrgang, 1890, Band XL., Quartal 1, 2, 3, 4. *The Society.*

BELGIUM.

Brussels:—Société Royale Malacologique de Belgique.

Annals, Tome 24, 4th Ser., 4.
Proces-verbaux. Aug., 1889, to Aug., 1890. *The Society.*

Copenhagen. DENMARK.

Videnskabelige Meddelelser fra Naturhistoriske Forening i Kjobenhavn for Aaret 1890. *The Society.*

Dresden :—Der Isis.

1889. Juli bis Dec.

1890. Jan. bis Juni. *The Society.*

Bergen. NORWAY.

Bergens Museums Aarsberetning, 1889. *The Director of the Museum.*

Christiania :—Royal Norske University.

Viridiarum Norvegicum, 3rd Band.

Christiania :—La Société des Sciences.

Forhandlinger i Videnskabs-Selskabet. 1887.

" " " 1889. Nos. 1—12.

Oversigt. 1889. *The Society.*

MISCELLANEOUS BOOKS, ETC.

Rhopalocera Exotica, Parts 13, 14, 15, 16. *Purchased.*

Notes by a Field Naturalist in the Western Tropics.
Presented by the Author, Rev. H. H. Higgins, M.A.

Knipe's Geological Map of England and Wales, 2nd ed., 1838.

Geographia antiqua, Antient Geography, 1759.

Fac-similes of Egyptian Relics discovered at Thebes in the tomb of Queen Aah-Hotep (circa B.C. 1800), 1863. *Presented from Mrs. Mountain.*

Seven Water-colour Drawings, by R. Johnson, viz.: Black Friars, Newcastle-on-Tyne; Newbiggin, near Hexham; Dilston Castle; Dukesfield Mill; and six groups of Figures, in frames. *Bequeathed by J. Hancock.*

A Cast, in Aluminium, of young, sleeping Leopards, by Jno. Hancock.
Bequeathed by J. Hancock.

Reports of the Natural History Society from 1829 to 1865. (Albany Hancock's copy.) *Miss M. J. Hancock.*

Three framed Photos of Groups of Birds, from specimens in the Museum.
F. R. Goddard, Esq.

1890. MAMMALS.

Sept. 16. Specimen of the Stoat, *Mustela erminea, Linn.*
Mr. H. T. Archer.

Oct. 11. Specimen of the Mongoose, *Herpestes griseus.*

1891.

May 28. " " " "
Mr. Ernest Scott, Riding Mill.

1890.

Nov. 29. A living Huanaco, female, from Chili, brought to Middlesbrough in steamer.
Mr. W. C. Tripler, per Mr. J. C. Swan.

1891.

Jan. 17. Specimen of the Stoat, *Mustela erminea*, from Haltwhistle.
Mrs. Page, Saville Row.

Feb. 25. Specimen of cream-coloured variety of the Common Mole, caught near Stannington. *Mr. John Duncan.*

Mar. 27. Two Weasels, *Mustela vulgaris*, shot near Dinnington.
Mr. J. D. Walker.

June 4. Long-eared Bat, from near Ross, Herefordshire.
Mr. Frederick V. Wallis, Coughton House, near Ross.

1890. BIRDS.

July 10. Young Eider Duck, in the downy state (hatched under a hen).
Mr. E. G. Wheler, Swansfield House, Alnwick.

,, 21. Red-breasted Snipe, *Macrorhamphus griseus*, Gmel.
Mr. Brownlow, Parker St., Byker.

,, 26. An interesting brown variety of the Common Rook, shot at Woodburn, Redewater.
Mr. Edward Newton, St. Mary's Place.

Aug. 20. Tufted Duck, *Fuligula cristata*, immature. ♀

Sept. 10. ,, ,, ,, ♂

Shot at Rothley Lake, Scots Gap. *Mr. John Daglish.*

,, 2. Two Eggs of Emu, *Dromæus Novæ Hollandiæ.*
Mr. J. F. Chambers, Melbourne, late of Newcastle, per Mrs. Chambers, Chester Crescent.

,, 10. Specimen of Ptarmigan, *Lagopus mutus*, shot near Aberarder, Kingussie, Inverness.
Miss N. Allhusen, per Mr. R. Y. Green.

Oct. 7. Two Eggs of the Australian Zebra Finch, *Amadina castanotis*, laid in captivity at Cullercoats.
Mr. F. W. Wyndham, Cullercoats.

,, 7. Two resplendent Trogons, *Trogon (Calerus) resplendens*, Quesal. Gould., from Guatemala, Costa Rica. *Mr. W. E. Beck.*

,, 18. Skin of a Toucan, *Rhamphastos*, and one of a Motmot, *Momotus.*
Mr. Wm. Dinning.

Nov. 7. Sixteen Skins of Indian Birds from Assam and Burmah.
Mr. Alfred H. Straker, Stagshaw House.

,, 7. Golden Eye, *Clangula glaucion*, shot at Rothley, (male) immature *Mr. John Daglish.*

,, 29. Goosander, young female, Northumberland.
Messrs. Phillips & Co., Barras Bridge.

1891.

Jan. 3. Golden Eye, mature female, shot on the Wear, near Leamside. *Mr. Alfred C. Chapman.*

,, 3. Eared Grebe, *Podiceps nigricollis*, ♀ shot at Holy Island. *Mr. W. E. Beck.*

,, 13. Golden Pheasant ♂ in very fine plumage, from Leazes Park. *Corporation of Newcastle, per Mr. Wilson, Leazes Park.*

,, 20. Red-necked Grebe, *Podiceps grisœgena*, ♀ immature, shot at Bamburgh. *Mr. Richard Howse.*

,, 23. Bernicle Goose, *B. leucopsis*, bred by Capt. Noble at Jesmond Dene House, 1885. (The same pair of birds had nested in 1884 and laid six eggs, which were addled. Nest and five eggs presented by Mr. C. M. Adamson to the Hancock Collection.) *Capt. A. Noble, C.B.*

,, 26. Red-necked Grebe, *Podiceps grisœgena*, ♂ shot at St. Mary's Island. *Mr. W. English, Langhorn Street, Heaton, per Mr. G. F. Smithson.*

,, 26. Tufted Duck, *Fuligula cristata*, ♀ mature. (This bird was kept at the Leazes Park about 12 years, and was drowned by getting under the ice.) *Corporation of Newcastle.*

,, 28. Scaup Pochard, *Fuligula marila*, ♀ mature, Holy Island. *Mr. J. Duncan.*

,, 31. Sternum of White-tailed Eagle, shot at Eshott, near Felton. *Master John Bainbridge.*

Feb. 19. A female Pheasant, in male plumage, shot at Gunnerton. *Mr. John Coppin, Bingfield.*

,, 20. Three Specimens of the Common Guillemot, *Uria troile*, shot off Tynemouth, one, var., *ringvia.* *Purchased.*

,, 23. Golden Eye, female, mature, shot near Elsdon. *Mr. J. E. Crawhall.*

Mar. . Snowflake, *Plectrophanes nivalis*, Eglingham, Feb., 1891. *Mr. C. H. Bryant.*

April 10. Two Zebra Finches, *Amadina castanotis*, from Australia. *Mrs. Noble, Jesmond Dene House.*

,, 16. A Hen's Egg containing two chicks well developed *Mr. Richard Fortune, Falmouth Road, Heaton.*

,, 16. A Black-headed Gull (with very rosy breast and primaries), from the Straits of Magellan. *Mr. Allan Hobbs.*

May 4. Two Lesser Black-backed Gulls, ♂ and ♀ mature, summer plumage.

,, 19. ,, ,, ,, females, one mature and one immature, and one Herring Gull, ♀ immature, Northumberland Coast, near Tynemouth. *Mr. John Duncan.*

1891.

May 28. Corn-crake, *Crex pratensis*, near Newcastle. *Mr. John Duncan.*

June 10. Nest and Four Eggs of Greenfinch, Moorlands, Gosforth. *Mr. J. G. Fenwick, Moorlands.*

,, 22. Three Nestling Black-headed Gulls, from Hallington. *Mr. E. O. Reid.*

,, 27. Little Bittern, immature. (This bird was picked up under the telegraph wires near Gateshead Railway Shops, November, 1889. Another was caught near Sheriff Hill about the same time.) *Mr. William Brack, Raby Street, South Byker.*

1890. FISHES.

July 10. Burn Trout, *Salmo fario*, from the Coquet, with the upper jaw malformed. *Mr. F. Schnitger.*

,, 26. Grey Gurnard, *Trigla gurnardus*, from the East coast. *Mr. John Jackson.*

Sept. 23. Three Sharks (two *Stegostoma tigrinum*, and a small Hammer-head), a Parrot Fish, and a Locust, from Aden, mouth of Red Sea. *Mr. Edward Chaston, Hotspur Street, Heaton.*

,, 23. Sundry Fishes and Shells in spirit, from Guernsey. *Mr. J. G. Dickinson.*

,, 23. The Cook Wrasse, *Labrus mixtus*, from the Channel Islands (preserved by Davidson process). *Mr. I. G. Dickinson.*

,, 30. A Collection of Twelve Fishes (preserved by the Davidson process by J. Sinel, Jersey) viz.:

1. Great Weever, *Trachinus draco.* 2. Bass, *Labrax lupus.* 3. Sea Bream, *Pagellus centrodontus.* 4. Black Sea-bream, *Cantharus griseus.* 5. Ballan Wrasse, *Labrus bergylta.* 6. Comber Wrasse, *Labrus comber.* 7. *Labrus lineatu.* 8. Corkwing, *Crenilabrus melops.* 9. Streaked Gurnard, *Trigla lineata.* 10. Grey Gurnard, *Trigla gurnardus.* 11. John Dory, *Zeus faber.* 12. Plaice, *Platessa vulgaris.*

Purchased, per Mr. I. G. Dickinson.

Dec. 21. Two Specimens of John Dory (small), from trawlers. *Mr. T. D. McArthur, New Bridge Street.*

1891.

Feb. 12. Twaite Shad, *Clupea alosa*, *Linn.*

Mar. 5. Head of Sturgeon.

,, 5. Three-bearded Rockling, *Motilla vulgaris*, from trawler, North Shields. *Mr. F. H. Phillips, Eldon Place.*

SHELLS, SPONGES, ETC.

1890.

Dec. . Specimens of *Pisidium fontinalis*, var. *cinerea*, from Winston-on-Tees, and var. *Henslowianum*, from Cheshire.
Mr. Oldham, Darlington.

1891.

April 16. A Specimen of the Magellan Volute, *Voluta Magellanica*, from the Straits of Magellan. *Mr. Allan Hobbs.*

1890.

Nov. 10. Three Specimens of Sea Fans.
Master R. Joseph Kay, Shieldfield Green.

,, 25. Specimen of Sponge, *Isodyctia palmata*, from Holy Island.
Mr. M. P. Ismay.

1891.

May 19. Two Sponges, from Tierra del Fuego. *Mr. Allan Hobbs.*

MISCELLANEOUS.

1890.

Nov. 28. Several Skeletons of Birds; Specimens of very small Shrew, *Sorex;* Casts of Egg of *Æpyornis* and Moa, *Dinornis;* Land Shells from Palestine; several large Shells and piece of Coral, *Dendrophyllia*, from Madeira; Horns of two species of Antelope; Specimens of Clionæ, &c.
Miss M. J. Hancock.

,, 27. Python's Skin, from the Sreekonah Jungle, Cachar, India.

,, 27. Boar's Jaw, ,, ,, ,,

,, 27. Skull of Muntjak, *Cervulus muntjak*, from Cachar, India.

,, 27. Apteryx Mantelli, New Zealand.
Mr. Erskine MacDonald, Stella Hall.

BOTANY.

1890.

Sept. . Specimens of Buckthorn, from Lincolnshire. *Mr. J. S. Forster.*

,, 30. Specimens of *Leersia oryzoides*, Banks of the Mole, near Riegate.

,, 30. ,, *Potamogeton nitens*, Weber, Canal between Trimbey and Benhurst.

,, 30. ,, *Alisma natans*, Lake near Dolgelly, Merionethshire.

,, 30. ,, *Eriocaulon septangulare*, Roundstone, Co. Galway.
Mr. H. T. Mennell.

Oct. . Plant of Butcher's Broom. *From Biddiek Hall.*

Nov. . Specimens of Indian Corn, from America.
Per Editor of Weekly Chronicle.

1891.

Jan. 26. Seed Vessels (capsules) of Nymphæa, from China.
Master R. J. Kay, Shieldfield Green.

,, 26. A Wagon Load of Peat, 7 tons, from Cragside.
Right Hon. Lord Armstrong.

1891.

April 25. 500 Plants of the Privet, for the Grounds.
Mr. John Dickinson, Park House, Sunderland.

May 2. A number of Herbaceous Plants, for the Grounds.
Mr. Thos. Charlton, Haddrick's Mill.

,, 2. A Piece of the Stem of the Sugar Cane, from the West Indies.
Master R. J. Kay, Shieldfield Green.

1890. FOSSILS.

Nov. 17. Fossil Fern, from coalpit near Morpeth, and *Stigmaria*, from Mitford. *Mr. C. Reid, Gloucester Road.*

1891.

Mar. 7. *Stigmaria* and Slickensides, from Beaumont Seam, Elswick Colliery. *Mr. John Liddle, Gluehouse Lane.*

May 11. A large fossil Echinoderm, from the Tertiary limestone of Egypt. *Mr. J. G. Fenwick, Moorlands.*

June 1. A Specimen of *Meyeria ornata* and several Ammonites, from the Speeton Clay, Filey Bay. *Mr. Wm. Dinning, Hon. Sec.*

,, 8. Several Specimens of *Posidonomya Becheri* and other species of Fosail Shells, from shale in Budle Bay.
Prof. G. A. Lebour.

,, 29. Several Coal-measure Fossil Plants, from the Yorkshire Coal Field. *Mr. E. Milling.*

1890. MINERALS.

July 14. Twenty, fine Specimens of Galena, or Sulphuret of Lead, rich in silver, from the Mines of Sierra Almagsera, Spain.
Mr. M. J. Pelegrin.

,, 19. Large Specimen of Arragonite, from a cave near Lorca, Spain.
Mr. M. J. Pelegrin.

Sept. 12. Specimens of seven kinds of Phosphate Rocks.
Langdale's Chemical Manure Coy.

Oct. 13. Specimen of Gold Quartz (with gold), Barberton, So. Africa.
Mr. Wm. Twiggs.

1891.

Mar. 7. Piece of Iron Pyrites. *Mr. Philip Hobbs.*

,, 13. Rhyolite (sphœrulitic), from Jersey, Channel Islands.
Mr. I. G. Dickinson.

June 30. A fine Specimen of Kish (Graphite), from iron furnace at Wingerworth; two Specimens of Sulph. of Strontia, from Yate; and a small collection of Rock Specimens, from West coast of Norway. *Mr. G. C. Greenwell.*

1890. ETHNOLOGY.

Nov. 7. Fish-hook, from the South Seas. *Miss M. J. Hancock.*

May 14. Native Productions, Utensils, and Warlike Implements, from Lake Tanganika and Central Africa, viz.:

Shield from Nyasa; four Spears, N'Konde; one Spear, Manyema; one Bow, Quiver, and Arrows; one Knobkerry, Mambive; one Spear, Zambesi; one Chickok; one Porridge Stick; two Pigmy Arrows; one Guitar; one Bark Bag; one Man's Hoe; one Woman's Hoe; one Basket, Mambive; one Working Axe, Mambive; one Battle Axe, Mambive; one Battle Axe, Manyema; one Stool; one Beer Strainer; one Earthen Cooking Pot; one Earthen Jar; two Bracelets; four Snuff-boxes; five Knives; two Razors; four Hair Pins; Pillow; Doll; four Girdles; Sandals; Rattle; Pipe; Pipe from Uguha; Small Bag; Head-dresses; Fly Whisk; Ujigi Basket; Bowl; Bark Cloth; Cloth, Uguha; Cloth, Manyema; Whistle, Pelele; Ear Block; Twine; forty-six Charms.

Rev. R. Stewart Wright, of the London Missionary Society.

,, 19. A Snare for Birds made of Whalebone, and a Net made of the Sinews of Quadrupeds, from Tierra del Fuego.

Mr. Allan Hobbs.

June 29. Stone Implements (Celts). *Mr. E. Milling, Framlington Place.*

Terms of Arrangement between the Natural History Society and the Tyneside Naturalists' Field Club.

The terms of this agreement, suggested in the committee of the Natural History Society, January 26th, 1864, and approved, were adopted by the Field Club at their anniversary meeting, March 10th, 1864, and finally sanctioned at a special general meeting of the members of the Natural History Society, April 6th, 1864.

1. Members of the Tyneside Naturalists' Field Club may become associates of the Natural History Society on subscribing each to the latter five shillings annually.

2. Associates shall have free access to the Museum whenever it is open to the public, and likewise to the evening and other entertainments or soirees, on the same terms as members.

3. Associates shall not attend the business meetings of the Natural History Society, or be elected to any of the offices thereof, except that mentioned in paragraph 4; nor shall they possess any interest in the collections, or other property of this Society.

4. Associates may be appointed to act as honorary curators of the collections of the Natural History Society.

5. The Natural History Society shall provide a meeting room for the Club, and shall warm, light, and clean the same; and shall also provide the necessary bookcases for, and take charge of the library of the Club. In consideration of which the Club shall pay Ten pounds annually to the Natural History Society; but if the contributions of the associates exceeds Twenty-five pounds per annum, then the rent of Ten pounds to be diminished by the excess; so that if the associates pay Thirty pounds the rent would be Five pounds, if Thirty-five pounds, it would be extinguished.

6. The books of the two societies shall be labelled with their respective labels, and shall be available for the use of the members of both. The books to be circulated under such restrictions as may be adopted by the joint committee. All copies of works presented to either society in return for copies of the Transactions shall belong to the Natural History Society.

7. The Transactions shall be published jointly by the two societies, under the title of "Natural History Transactions of Northumberland and Durham, being papers read at the joint meetings of the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne, and the Tyneside Naturalists' Field Club." The Natural History Society shall have one hundred copies, or such additional number, at cost of production, as may be required for distribution to its members; and shall contribute towards the expenses of the Transactions in proportion to the number of copies obtained for this purpose. It shall also defray the cost of all copies now presented, or hereafter agreed to be presented, to societies, public bodies, and distinguished individuals; and shall likewise contribute Ten pounds for extra illustrations. The cost of copies of catalogues and other papers, presented to the authors, shall be borne equally by the two societies.

8. A joint meeting of the committees of the two societies, or a sub-committee appointed at such joint meeting, shall determine what papers shall be read at the meetings, and which shall be printed in the Transactions; and shall also arrange all matters respecting the co-operation of the two societies.

9. All papers so approved of by the committees shall be read at joint meetings of the two societies, to be convened in the evenings during the winter months. But this shall not preclude the reading of all such papers at the Field meetings, if the committee of the Club shall so determine. Tea and coffee shall be be provided at the evening meetings, at the joint cost of the two societies; a small charge, however, may be made at the door to defray the expenses, if it shall be thought desirable by the joint committee. The expenses of calling the joint meetings to be equally borne by the two societies.

10. One of the presidents of the two societies, if either be present, shall take the chair at all such meetings; if both are absent, then one of the vice-presidents of either society shall preside; and in the absence of both presidents and vice-presidents, the meeting shall elect a chairman.

11. The secretaries of the two societies shall co-operate in transacting the business at all such meetings; and shall jointly edit the Transactions; or such one or more of them as they shall determine.

12. The address of the President of the Club, list of officers, and members, and the Treasurer's accounts, shall as usual be printed in the Transactions; and likewise the Report of the Natural History Society, together with its Treasurer's accounts, list of officers, members, etc.

13. The whole arrangement to be terminable by mutual agreement, or by six months notice in writing on the part of either society to the other.

X.—*Notes on Agrotis Ashworthii.* By LLEWELYN S. BRADY.

THE moth which forms the subject of this paper must be put down as one of the most interesting of its kind to those who are interested in the study of Lepidoptera. Though there are upwards of 6,000 species known to occur on the continent of Europe—or rather in what Dr. Staudinger in his Catalogue calls "the territory of the fauna of Europe," this including part of Asia and Africa—only 2,000 of these are to be found within this "half-starved corner of the universe," as the British Islands have been called; and thus it is a pleasure to find at least one moth which shows good enough taste to make our islands its exclusive home, and such is the case with *Agrotis Ashworthii*, the insect under notice. Even within these limits it has been very fastidious in its choice of a resting place, and, so far as is known, only occurs in two or three very restricted localities in North Wales. Running in a northerly direction through Shropshire, Denbighshire, and Flintshire to the sea is a range of Carboniferous Limestone hills, and it is on and about the cliffs which constitute certain parts of this range that *Ashworthii* occurs, and also in one place on the Silurian, a much older formation, viz., near Penmaenmawr, about five miles west of Great Ormes Head. Wherever limestone occurs the Entomologist is pretty certain to find plenty of good insects to claim his attention, and this case is no exception to the rule, as besides *Ashworthii* there are other rarities to be found in the district, but none that has so great an attraction to Entomologists.

The nearest allied species to *A. Ashworthii* is an insect which occurs sparingly on the Continent in similar localities, *Agrotis candelarum*, and our insect, though now perfectly distinct, is thought by some to have originally descended from this species. In general appearance *Ashworthii* is altogether dissimilar to its supposed ancestor, and is very true to the type, the specimens from each locality varying scarcely at all *inter se*, and showing no tendency to revert to the supposed original either in the imago or larva. On the other hand it seems to be considerably affected by the locality in which it is found, the Denbighshire specimens being both smaller and lighter in colour than those found on the Silurian, the latter having the dusky cloud in the centre of the wing nearly black, and the other markings clearly defined, while the former generally have all the markings somewhat indistinct. If such slight changes in locality and climate are enough to bring about these distinct differences, I think it is not impossible that much greater changes may in time have brought about correspondingly greater differences and modifications, until our present form has been the result.

In Wales the moth was first discovered near Llangollen by Mr. Ashworth, from whom it received its specific name; after his death the locality was lost, but was rediscovered about twenty-five years ago, and since then the insect has turned up in one two other places in the neighbourhood.

The moth seems to occur pretty freely in its chosen haunts, but owing to its nocturnal habits, and the character of its habitats, it is difficult to obtain by night, and this, together with the tedious work required to find it in the day time, will account for its comparative scarcity in collections. I had the good fortune last year to come across the locality at Penmaenmawr where it occurs, and thus had an opportunity of seeing something of its habits. Through the day it sits on the face of the cliffs, but its colour harmonizes so exactly with the rock, and it conceals itself so carefully in cracks and angles, that searching for it is a very tedious job. I spent the greater part of ten days in this occupation and only succeeded in taking eight specimens, but at the same time found several batches of ova. These are laid in nearly every case on the bare rock, in batches of thirty or forty, very often nowhere near any plant on which the young larvæ could feed on emergence, and unless they are gifted with great fasting powers I think many must die before finding the necessary food. The eggs hatch during the last fortnight of July, and the larvæ feed slowly on golden rod, various grasses, or thyme for about six weeks, at which period they are about half their full size. In this stage they proceed to stow themselves snugly away in holes and corners, where they remain through the winter, but as soon as spring has brought their food plants into leaf they come out of their retreats, and begin to feed again : in five or six weeks they have reached their full size, when they go under the surface of the earth and make a slight cocoon, in which they change to pupæ, the imago appearing at the beginning of July.

In keeping larvæ of this kind in confinement it is very difficult to supply them with the conditions to which they would be exposed in nature, and if it is attempted, by far the larger part usually die during the winter. These reasons induced me to try if the larvæ, by being kept very warm, could not be made to feed up and pupate during the autumn, and thus avoid the risks attending hybernation, and in this I was more successful than I anticipated, obtaining about thirty moths from some sixty eggs.

For the first week or two after hatching I allowed the larvæ to feed naturally, as they are very small, compared to the size they ultimately attain, and any extra heat might have proved fatal; but as soon as they had changed their skins once or twice I placed them in a temperature of about 80° Fah., and they quickly reached the stage in which, under natural conditions, they would hybernate. The increase of temperature evidently deluded the least discerning of them into the belief that the appointed time had not yet arrived, and they mostly continued feeding until matters had gone too far and they had perforce to complete the process. Some of them, however, were not to be imposed upon, and refused to feed after the proper time and ultimately died; and others, being suspicious that all was not as it should be, only got on slowly, some pupating successfully and others dying. By the end of September some twenty had pupated, and I got about ten more through during the next month. The first moths appeared in the first week in November, the rest coming out during the next four weeks, by which time I had about thirty fine specimens.

XI.—*On the Erosion and Destruction of the Coast Line from the Lowlights to Tynemouth and Cullercoats during the last Fifty Years.* By Robert M. Tate, North Shields.

The recession of the coast line of the Borough of Tynemouth is a fact very apparent to anyone who has been accustomed, during the last fifty years or so, to visit the line of cliffs and banks extending from the Lowlights to Tynemouth and Cullercoats Bay.

To commence at the Lowlights: I have known the outwork of Cliffords Fort, which consists of a thick and strong stone wall, to have been more than once broken through by the seas, and I saw, a few years ago, some strong timber breakwaters near the same place torn up by the waves and hurled up the Tyne.

A little north of the Salt Works the bank extended much further out than at present. A house, which was never finished, but which stood on the cliff as a monument of the ill fortunes of its owner, fell a prey to the waves many years ago.

The site of the Fever Hospital, a little further north, has been much encroached upon. The only thing that saves it from utter demolition is a low wall of good mason work at the foot of the cliff. This piece of wall is the only surviving portion of a large and strong structure that extended for a long distance eastwards at the foot of the cliff.

We now come to Percy Square which, perhaps, more than any other part of the Tynemouth Coast illustrates the destructive effects of the sea. Extending from the small piece of wall, above referred to, a massive stone wall supported the banks to a little beyond Percy Square. It was built of large blocks of sandstone, or coarse grit, which had been bound together with blue-lias lime, run in hot, and strong iron-cramps fixed with lead. This wall long withstood the action of the seas. To show the strength of the lime used in its construction we may mention that when the upper part had fallen, and the foundation blocks, after having been subjected to the wash of the waves and the grinding effects of the shingle and sand, were hollowed into dishlike depressions, the seams of lime stood up in sharp ridges, resisting the wasting influences to which the stones had succumbed. Huge timber breakwaters stood outside of this wall, but they also disappeared long ago.

Since the destruction of the wall and breakwaters, the lofty banks of boulder-clay, that had so long been protected by the breakwaters, quickly showed the effects of a species of sapping and mining, which went on summer and winter.

The waves hollowed out the foot of the banks and immense landslips took place, dislocating the system of brick drains that had formerly carried off the spring and surface water. Gradually the whole of the front row of cottages in Percy Square disappeared in the soft clay of the wasting banks. The house drains were broken and the sewage further helped the work of demolition. A public house at the north-east corner of the square and two cottages from each side of the square followed. Some of the residents of these cottages were so loath to leave them that they remained until they had to climb down and then up the face of the bank to get into their front doors. One of the occupiers told me at the time that he could feel his cottage creeping and creaking before he left it. Soon after he did leave the cottage fell.

Outside of the front row of cottages there were gardens; beyond that a foot road, and beyond that again a considerable stretch of grass to the edge of the bank. All have disappeared, including a very fair-sized garden which stretched seaward from the public house already mentioned. The road behind the front cottages and a large portion of the field, towards the railway line, have also gone.

The banks at Percy Square have receded up to the present year, 1892, almost 100 feet west of the front row of cottages. The edge of the cliff was eighty feet further seaward in 1827, and at least thirty feet about the year 1845. About 100 feet in length of the retaining wall existed up to about forty years ago, or perhaps later, and it extended to the little wall already mentioned in the year 1827. This massive wall was built by the then Duke of Northumberland in 1811. Between 1827 and

1892 the banks at Percy Square have receded 180 feet. In 1868 the commencement of the end of the front row of cottages had arrived. One of the cottages had at that time fallen down the bank.

From Percy Square to the Howling, or, what is called "Park" in Rook's Plan, four acres of land have disappeared—that is 19,360 superficial yards: this multiplied by 23, the height of the banks in yards, gives 445,280 cubic yards, and, giving 1¼ tons to the cubic yard of clay, produces 556,600 tons of clay that have fallen into the estuary of the Tyne in sixty-five years, or about 8,560 tons per annum.

Here, I may state that a project was mooted some years ago to protect the banks from the Lowlights to the "Howling" or Park. The plan was to construct a sea wall from the point reached by the Fish Quay Works at the Salt Pans to the Howling, following the curve indicated by the foot of the banks. On this wall a line of railway could be connected with the Fish Quay from the goods yard at Tynemouth with easy gradients.

In this work several interests might participate; the River Tyne Commissioners might join for the protection of their river from the falls of clay; the Tynemouth Corporation to facilitate a line of railway being laid to their Fish Quay; the Duke of Northumberland for the protection of his property; and the North Eastern Railway for the saving of their line from Tynemouth to Newcastle.

The protective works outside of the Spanish Battery have saved the little promontory, upon which the battery stood, from destruction by the sea.

From the Castle cliffs many serious falls of blocks of limestone have taken place during the last fifty years. Recently the War Office authorities have secured the eastern Castle cliff, but at the expense of its wild beauty. The place is now hideous with cement arches and pillars, and the interesting geological section is nearly obscured. The old Roman building or "Gingling Geordie's Hold" fell a few years ago, and several large masses of the Castle cliffs on the north side. The sea is now washing away the soil and clay at the north side of the Short Sands.

From the Short Sands to Sharpness Point great changes have occurred. There was no surface drainage until about six years ago, and the day water which fell on the road and flowed over the edges caused continuous falls of the banks and supporting rocks. I can distinctly recollect, about fifty years ago, a schooner running into a narrow creek or cove at a point about opposite to the present gardener's cottage at Percy Gardens. This cove must have been at least forty feet in depth from its seaward edges. The crew of the vessel clambered along the bowsprit and jib-boom and so got safe to land. Such a creek as that entirely disappearing shows how much of the cliff has fallen in the fifty years since the crew of the schooner stepped on shore. Sharpness Point has altered greatly since the time just referred to, although it is of hard sandstone and a range of large rocks outside protects it from the sea.

There have been serious falls near the site of the Two-gun Battery at the south end of the Long Sands. The road authorities have, however, built a protecting wall at the foot of the bank; but to the east of that the seas continue to encroach.

The seas recoiling from the North Pier have washed out the sand and shingle from the extreme north end of the Long Sands down to the clay. The waves seem to have been high enough to reach to and recoil from the bank, and so washed out the loose materials.

The Smugglers' Cave, south of Cullercoats Bay, has been much altered. The central pillar of rock at the entrance fell about two years ago, and it is probable that the cave, in the course of not many years, may be a thing of the past.

At the north side of Cullercoats Bay the cliff has suffered much, and costly cement walls have been built for the safety of the houses built on the cliffs that overlook the bay. This brings us near to the boundary of the Borough of Tynemouth.

During all the great changes in the cliff line, the sand dunes below the Grand Parade have, if anything, increased in mass. Sand seems to be the ordained barrier impassable by the sea.

One of the ancient Prophets wrote:—"Fear ye not me . . . which have placed the sand for the bound of the sea by a perpetual decree that it cannot pass it; and though the waves thereof toss themselves, yet can they not prevail: though they roar, yet can they not pass over it." The extensive sand-dunes on many parts of the coast of Northumberland form an almost impassable barrier to the encroachments of the sea, but boulder-clay banks are being gradually removed.

From the almost demonstrable deductions of geologists and astronomers it appears that the beds of clay between North Shields and Tynemouth must have been deposited when a mass of ice, probably two thousand feet in thickness, was pressing its way from the interior to the sea and grinding the earth and rocks in its course into the clay we now find on our coast.

Existing forces have attacked and dispersed in half a century huge masses of the clay that may have taken the Glacier Ice thousands of years to grind down and deposit in the state in which we find it in our cliffs. There seems to be no haste in the operations of nature in building up: the haste is in the process of disintegration and dispersion.

XII.—*On certain Surface-Features of the Glacial Deposits of the Tyne Valley.* By G. A. Lebour, M.A., F.G.S., Professor of Geology in the Durham College of Science, Newcastle-on-Tyne.

Travellers by the Newcastle and Carlisle Railway are familiar with the fine exposures of sand and gravel between Riding Mill and Corbridge, and with the short tunnel which pierces these deposits opposite Thornbrough Wood.

These sands and gravels are Glacial in origin and newer than the Boulder Clay on which, indeed, they lie. More than one opinion is held respecting their mode of formation and as to their exact age within the Glacial Period. Into these matters I do not propose to enter at present. It will be sufficient for my purpose to state that the series in question is of considerable thickness, reaching high up the slopes of the valley; that it is commonly carved into river-terraces, often sharp in outline even at the highest level above the present *Thalweg;* that much false-bedding is exhibited—coarse-boulder beds, moderate-grained gravels, and fine sands, rapidly alternating with no regularity of order—and that a large number of the rounded boulders which it contains appear to be of Scottish origin, a smaller number belong to rock-types of the Lake district, and the rest may be referred to local sources. Many of these boulders are polished and scratched.

The bluffs on both sides of the Tyne show excellent sections, but the points to which I am anxious to direct attention can be best studied on the northern or left bank of the river between Thornbrough Wood and the Styford alluvial flats or haughs.

The river is here rapidly eating back the land, and the cliff-like face is year by year receding further to the north. This ordinary denuding action is greatly facilitated by numerous irregular springs which are thrown off here and there by the more or less clayey layers common in the sands and gravels, as they crop out in the nearly vertical scarp. A more constant and better defined line of springs occurs at the junction of the sands and gravels with the underlying Boulder Clay.

I have been led of late to pay special attention to the variable, but by no means small, outflow of water which, by means of these many springs, takes place from the land to the river. Considering the incoherent character of much of the deposits and the steepness of the bluffs it is not easy to note with accuracy how much sediment *from within the hill* is carried away by the springs, or to distinguish such sediment from the exactly similar material which is merely washed down after the issue of the water. By repeated observation, however, both during drought and after heavy rains, and at different seasons of the year, I have satified myself that a very notable amount of sand and very fine gravel is continually being discharged at very varying rates from underground. In other words it is clear that the sands and gravels are being actively removed from within as well as denuded from without.

Once this fact is recognised certain features in the section, which it may at first seem difficult to explain, become, I think, easy to understand.

Thus towards the eastern extremity of the section the beds of sand and gravel are seen dipping at a high angle towards breaches in the continuity of the cliff; in one case forming a high-pitched anticlinal between two such breaches—an arrangement reminding one strikingly of the typical arched structure of *kames*. An examination of these dips shows them to be directed towards the centre of funnel-shaped hollows, now intersected by the river and forming the aforesaid cwm-like breaks in the section. It is evident that the withdrawal of matter from within, if concentrated towards certain spots, would, by the gradual sinking of the upper mass bereft of adequate support, and by subsequent slips of sides, produce such funnel-shaped hollows and such dips.

On climbing to the surface of the undulating terrace above the bluff, between the road and the river, there is to be found abundant confirmation of the truth of this explanation. Here, a few yards from the edge of the cliff, is to be seen at the present time (March, 1893) a roughly circular depression many yards in diameter and with an unbroken margin which has sunk within the last few months. Its depth is from five to ten feet in different parts, and it has so recently been formed that the sides are still vertical and vegetation has not yet had time to conceal the gravel bared by the slip. When the cliff is sufficiently worn back (as in a short time it inevitably must be) this hollow will be impinged upon by the river, and the action of surface denudation will be added to that of the underground springs. A deep funnel-shaped and breached cwm, towards the centre of which the adjacent sand and gravel beds will be seen to dip, will in due time be formed.

More remote from the cliff-top are several other enclosed but somewhat larger depressions. The sides of these are now gently sloped and covered with grass, nevertheless one cannot but see in them examples of the same kind of action, *viz.*: the abstraction of subjacent material by means of percolating rain-water finding its way, laden with sediment, to the river. Some of these concavities are as much as twenty feet in depth below the general terrace-level, but it is obvious that the farther they are from the cliff-face—*i.e.* from the point of outlet for the water—the slower must be the rate of sinking. Should the efferent channels become choked, as they often must, one would think, actual stoppage of the action may easily take place. Then, should the clayey constituents of some of the beds render them locally sufficiently impervious, the formation of peat-bogs or even of ponds would under favourable circumstances no doubt follow in these small lake-basins.

In the above description I have limited myself strictly to what is seen and to what may be with certainty inferred from the facts observed. The bearings of both facts and inferences will be evident to all who have paid attention to recent "Glacial" literature. It seems undeniable that underground erosion acting in the manner indicated is quite capable of producing hollows in superficial deposits having all the characters of "Kettle-holes."

True "Kettle-holes" are held by glacialists to be highly characteristic of kames and of terminal moraines. They are regarded as original surface features left when the ice under which they were moulded last melted.

That the bowl-shaped depressions of the surface of the Sand and Gravel Drift of the Tyne Valley, as exhibited near Corbridge, are now in process of constant formation and destruction, and that they therefore cannot be in any way attributed to ice action—this, I think, is sufficiently proven. The point is not unimportant, since on it hinges to some extent the question of the amount of denudation which has taken place since Glacial times and the date of last Great Ice Age. I cannot regard any part of the present surface-contour of the Drift that so largely fills our larger Northumbrian valleys as original—*i.e.*, as practically unchanged in form since the disappearance of the glaciers. On the contrary, all such features must, I believe, be referred to very extensive post-Glacial denudation.

Incidentally I think a second point has been established, *viz.*: that an anticlinal or arched bedding in Drift sands and gravels, such as is often stated to be typical of kames or eskers, may also be caused by slipping due to the eroding action of water below ground.

In bringing this subject forward I, of course, do not intend to throw any doubt on the Glacial origin of true "Kettle-holes" or of kames, and still less upon that of the sands and gravels themselves. My intention is simply to show that some of the tests commonly relied upon for the recognition of such products of glaciation may be misleading, since they can be and are even now sometimes imitated by another of Nature's many methods of work.

P.S. Subterranean erosion has recently been treated in several papers, and the subject, if followed up, seems likely to yield valuable results. I would especially refer to a paper by Mr. W. Shone in the *Quarterly Journal of the Geological Society*, Vol. XLVIII. (1892), p. 96, and to another by Mr. H. B. Woodward in *Natural Science*, Vol. II. (1893), p. 124.

Voracity of Cuttlefishes.—During a short stay at Cullercoats in May, 1890, my attention was directed to a great number of Haddocks among the fishermen's lines, which had been partially eaten after they had been hooked. At first, I thought this had been done by the Spiny Dogfish, but was told by a fisherman that it was done by the "Ten-tails," the name given by fishermen to all kinds of Cuttlefishes. After the fishes are hooked they are seized by the Cuttlefish, which winds its long tentacles round the fish and tears off the flesh all along the back with its parrot-like beak. The Cuttlefish holds on tenaciously till brought alongside the boat, when it it beaten off, as the fishermen object to handling them as they squirt a jet of black fluid into their faces when they attempt to land them. Probably this mischief is done by *Ommastrephes todarus*, the commonest Cuttlefish on our coast.—*Richard Howse.*

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, GEORGE S. BRADY, M.D., LL.D., F.R.S., ETC., PROFESSOR OF NATURAL HISTORY IN THE DURHAM COLLEGE OF SCIENCE, NEWCASTLE-UPON-TYNE, AT THE FORTY-SIXTH ANNIVERSARY, HELD IN THE LIBRARY OF THE MUSEUM OF THE NATURAL HISTORY SOCIETY ON TUESDAY EVENING, MAY 17TH, 1892.

Ladies and Gentlemen,—To decide upon a subject which is to form the corner-stone of an anniversary address is seldom a very easy task. And although, in the case of the Tyneside Field Club, the difficulty is to a certain extent overcome by the rule which prescribes to the President, in somewhat peremptory terms, the duty of furnishing a report of the Meetings which have been held during the year, it yet seems desirable that this *resumé* should be kept within somewhat narrow limits. Our Club is now forty-six years old, and successive Presidents have during all these years, mostly in very able fashion, been disburdening their minds of such observations and reflections as occurred to them in respect to the various places which have been, over and over again, visited by the Club. But it is evident that a tale so often told tends to become wearisome. There is nothing to be said respecting most of the Club's familiar haunts—and what pleasant corner in and around the two counties is *not* by this time familiar to us?—which has not already been said time and again. Sometimes the orator has approached his subject from the prosaic and matter-of-fact side, contenting himself with recording the actual doings of the Club, their botanical or zoological or geological, or even gastronomical exploits, at the places of meeting; sometimes he has been saturated with folk-lore, and has imparted to his address a flavour of this character; he may have been an antiquary and crammed us with inscribed stones and altars and monumental brasses,—a student of history, and told us of some of those stirring incidents which fill the records of these border-counties "with sounds that echo still," or a naturalist, who has recounted the doings of individual members of the Club in days when—may I be allowed to say ?—we had more working members than now. Bearing all this in mind, I do not propose to weary you with a lengthy account of our various expeditions, in whieh I am sorry to say I have been able to take very small part—a part indeed so small that I must here beg you to excuse my many and very unwilling absences.

The First Field Meeting was held at Chester-le-Street and Lambton Park on the 27th of May. There was a gathering of about seven members, who were kindly allowed by Lord Durham's agent, Mr. Stobart, to see the Castle and grounds. The park is one of the most beautiful in the country, and at this time of the year when the woods are gay with Anemones and Wild Hyacinths, is worth a long pilgrimage to see. It is needless to say that the visit was much enjoyed,—the afternoon having belied the expectation of the morning and turned out beautifully fine. The party dined at Chester-le-Street, and an interesting paper on "Bird Life at the Farne Islands" was read by Mr. W. E. Branford.

On June 24th the members met for their Second Field Day at Ripon and Fountains Abbey. The party numbered fourteen, amongst whom were several ladies. Leaving Newcastle at 7.35 a.m., Ripon was reached at 9.54. After luncheon at the "Unicorn," traps were put in requisition to take the party to Fountains. The day was beautifully fine—quite a model day, indeed, to show off the wood-and-water-works of Mr. "Capability" Brown, the stately ruins of the old Abbey, and the almost equally interesting architecture of Fountains Hall, an old Jacobean mansion built out of the material of the Abbey walls. Excepting *Dianthus plumarius*, growing upon the crumbling old masonry, nothing of special zoological or botanical interest was observed during the day, nor were any papers read.

The Third Field Meeting was arranged for an excursion to Richmond, in Swaledale, on Friday, July 17th. Most of those who attended proceeded to Richmond on the previous afternoon and enjoyed an evening's walk in the outskirts of this pleasantly situated town. After the arrival of the first train from Newcastle, the morning being very fine it was arranged to have a long drive up the Swale valley to the little mining town of Reeth, in preference to visiting the points of interest about Richmond, which most of those present had seen on former visits. About two miles up from Richmond the valley suddenly becomes contracted, and lofty cliffs of sandstone, shale, and limestone rise high above the river on each side—the more abrupt cliffs on the north being generally capped with a prominent stratum of grey limestone. The sides of the valley also become densely wooded, and the Swale winds its tortuous course, concealed for the most part and embedded among the thick umbrageous foliage. The valley maintains this character for several miles, so that very little can be seen but the hanging woods and the topmost moorland cliffs, and the traveller might easily suppose himself at times surrounded by an amphitheatre of hills clothed with thick woods almost to the top. Several miles before arriving at Reeth the valley widens a little, side streams enter the main valley, and the hills on each side are rounded down. The slopes on each side are less covered with wood, and stretches of meadow land intervene and vary the features of the dale. In our rapid drive there was little to be seen but the dense woods on either side and the tops of the moorland cliffs. Space was left on the banks for very few wild flowers—those observed were several of the St. John's Worts, the Giant Harebell, and the Hackberry, now in fruit, the tops of its branches covered with the large webs of one of the Geometer Moths, the larvæ of which had now passed into the pupa or cocoon stage. The total absence of the Foxglove in this limestone district was remarkable, as not a plant was seen in the whole distance traversed. At the base of the old walls on the outskirts of Reeth, as in most other lonely villages, there was a plentiful crop of the old-fashioned spinach *Chenopodium Bonus-Henricus.*

The mining town of Reeth is situated at the junction of a large tributary stream which drains the wild and lonely mining district of Arkendale. Being built of grey sandstone, with roofs made of flagstones of the same colour and material, it has at a distance a cold and uninviting appearance, and the quiet loneliness of the village did not seem to promise a cheerful welcome to strangers, but these external appearances were deceptive, for a short rest at the inn brought forth the best cheer and the best welcome that could be desired for both man and beast.

Marrick Abbey ruins, about a mile below Reeth, and the ruins of Ellerton Abbey another mile further down, built of the same cold, grey sandstone, were visible from the main road, but time did not permit of an inspection of the ruins of those old religious dwellings, formerly the highest points of civilization in the dale. Great was our enjoyment of the balmy west wind and the pure air of this upland village and of our drive up the valley.

In the evening the party started for a stroll down the river to Easby, but loud peals of thunder gave warning of an approaching storm which had been raging further down the valley, and so this part of the day's excursion was soon abandoned.

On the day following several members visited Catterick Bridge and the site of the supposed Roman Station *Caractonium*. Very little of the site of the camp can now be traced, as it seems to be all covered by the fine park of Brough Hall. After a pleasant walk through the park and site of Brough Hall our route took us through the village of Catterick and back to the Station by the Old Roman Watling Street. It was gratifying to observe a profusion of Wall-rue growing on some old walls in Catterick, where it had evidently escaped the eyes of the fern collectors.

Though at this meeting no serious scientific investigations were planned or thought of, yet all the members present were engaged in conversation on subjects connected with a naturalist's pursuits. They were observing the natural beauties of a new district and had their eyes wide open for any new feature or fact that might be presented, and this is about as much as can be successfully attempted or accomplished at any Field Meeting of members who have no special subject, but take only a general interest in natural history studies. The genial founder of Field Clubs, Dr. George Johnston, never supposed or wished that more than this would be accomplished at Field Meetings, not even when the whole party consisted almost entirely of naturalists, as it often did in the early days of the Berwickshire Club.

The Fourth Field Meeting was held at Melrose on August 24th and 25th. One of the secretaries and two or three members and friends visited Melrose on this excursion, but as the parties travelled by different trains and did not meet till returning home, each member carried out his own programme.

The Fifth Field Meeting—if that can be called a meeting when one member met himself or his thoughts—was at Beadnell, on Monday, September 21st. The weather was fearfully rough and stormy, and it is not wonderful that even the attractions of that interesting piece of our coast-line failed to draw. Our energetic Secretary, Mr. Thos. Thompson, constituted the party, and he tells me that he carefully carried out his own directions as conveyed to the members by circular,—including, I suppose, the eating of the dinner,—but the state of the weather prevented his seeing his co-secretary, Mr. Howse, who was somewhere thereabouts.

The old favourite resort, Marsden Rock, was the scene of the Sixth and Last Meeting, on Thursday, October 17th. The atmospheric conditions were "no that bad," but only four members put in an appearance,—the indefatigable Mr. Thompson, Mr. Pybus, Mr. Cobb, and myself. We had to ourselves the questionable enjoyment of Marsden tea, ham and eggs, notwithstanding which we got to the train safely,—in due time to South Shields, and then by various methods to our respective homes. But one would willingly forego even the luxury of a ride by the Marsden Railway to have the place restored to its pristine simplicity, such as we remember when pits and railways were not, and when Peter Allen's raven chattered on the beach.

On Tuesday, the 5th April, of the present year (1892) a joint Evening Meeting of the Natural History Society and the Tyneside Field Club was held in the Library of the Museum, about thirty ladies and gentlemen being present. Two new members of the Field Club were elected, and papers were read as follows:

1. A revision of the British Species of Freshwater *Cyclopidæ* and *Calanidæ*, by G. S. Brady, M.D., LL.D., F.R.S.
2. On *Agrotis Ashworthii*, a rare British Moth, by Llewelyn S. Brady.
3. In what time does the Peewit lay her clutch of four eggs? by Richard Howse.

These papers will appear in the "Transactions." Conversation, tea and coffee pleasantly brought the evening to a close.

And now, if you are willing to extend your patience towards me for a short time longer, I propose to bring before you some recent developments and achievements of biological science, which I think can scarcely fail to have an interest even for those who may be in no sense students of science. I refer to the subject of Helminthology—the study of internal parasites, and more especially to a branch of Biology so highly specialised that it may almost be called a separate science under the name of Bacteriology. There can scarcely be a finer example of the blessings which follow the pursuit of science for its own sake than the history of the results which have followed the development of this youngest-born of the family of biological sciences. For, from the study of minute organisms known as Bacteria, and of creatures closely allied to them, has sprung all our present knowledge of the nature of many forms of disease affecting not only man but also the lower animals and plants. It is perhaps scarcely too much to say that few forms of disease are entirely dissociated from these all-pervading beings, or that when our knowledge of their life-history and character becomes complete, we shall have approached nearer to an ideal system of curative and preventive medicine than could have been dreamed of even so short a space as twenty years ago.

It has long been known that most decaying substances, and more especially organic infusions, when exposed to the air under favouring conditions are certain very soon to be found swarming with countless myriads of animated beings, mostly very minute and each consisting of only a single cell, though doubtless creatures of higher grades may now and then likewise be found. The study of these organisms, long a favourite one with microscopists, received some thirty years ago a fresh impetus from the researches of Dr. Charlton Bastian, who believed that he had demonstrated that monads might and did constantly in such solutions arise *de novo* by a process of so-called "spontaneous generation," apart altogether from the presence in the fluid of any pre-existing germs. It is needless to describe here the details of Dr. Bastian's experiments. He exposed solutions or infusions of various kinds to a boiling temperature in glass flasks, which during the boiling process were hermetically sealed, and in many cases he found that notwithstanding these precautions living organisms made their appearance in the flasks. Whether the most rigid precautions were always used we need not stop to enquire, but one fact unknown at that time, though now sufficiently established, is enough to vitiate the whole series of experiments,—namely, that the germs of some of these monads, if not the adult creatures themselves, may be submitted for a considerable time to a boiling temperature and yet retain their vitality. Moreover, Professor Tyndall has shewn, by a series of well devised and beautiful experiments, that previously sterilized infusions may be kept from developing life, even though exposed to a current of air, by the simple expedient of filtering the air of its floating impurities. So that, while it cannot be said that "spontaneous generation" has been proved to be impossible, it is quite certain that the balance of evidence is in favour of such a belief, and that the experiments which have been thought to weigh greatly in the opposite direction are so clouded with doubt as to render them of comparatively small account. There is, in fact, nothing in the science of to-day contradictory of the old axiom *omne vivum ex vivo.** It consti-

* Such, certainly, is the conclusion to which experiment leads us. Whether, from a purely speculative standpoint, the same conclusion is tenable may admit of doubt. The origin of life is, for the present, involved in mystery: but is there any valid reason for belief that the conditions under which life originated, and the causes of that origin, are now non-existent? All living matter consists of a combination of inorganic elements, and must in some way have been built up in its beginning out of those elements; a like synthesis is going on constantly under our eyes through the agency of already organised beings:—does it ever go on, as it must once have done, apart from that agency? The last word is far from having been said on that question.

tutes, if nothing more, an admirable working hypothesis, on the truth of which much of the fabric of biological science, and still more of the medical science of the future, almost entirely depends. If the minute organisms which we believe to constitute the virus of so many diseases are capable of arising *de novo*, where are our hopes of being able to stamp out any of these diseases,—where the use of those elaborate precautions which we now take against the spread of them by direct contact or atmospheric infection? But before saying anything of these smallest of microbes, let me attempt to epitomize some of the knowledge which of late years we have gained respecting the larger entozoa.

Parasitic diseases, such as those resulting from the presence of entozoa,—of which, perhaps, the most familiar example is the tape-worm,—have been known and recognised, if not thoroughly understood, from the very earliest times; but the life-histories of the various animals concerned, have for the most part been unknown until a comparatively recent period. These form certainly one of the most curious chapters in the whole range of biological science. But amongst the earliest contributions of microscopic investigation to practical medicine was the discovery of the parasitic nature of ringworm and of the fungus to which that disease is due. The hair, in this complaint, is seen to be filled with a fungus which grows and reproduces itself in the shaft of the hair itself with great rapidity, the hair becoming brittle and breaking off very near the skin. The true pathology of the disease having been thus ascertained, the treatment of it became comparatively simple and certain, though still in many cases sufficiently troublesome. It is obvious that the proper line of treatment is to destroy the parasite—an end which may be attained by the use of various agents, into the details of which I need not now enter. Nor shall I dwell at all upon those only too numerous external insect parasites, which are familiar to every one, which are commonplace in their history, and may usually be dealt with by short and easy methods.

Let me, however, endeavour to place briefly before you the present state of our knowledge as regards some of the more interesting internal pests—Entozoa. The creatures known in their adult condition as tape-worms are in all cases derived from the flesh of some animal other than that in which they attain their mature form, so that to complete the life-cycle of any one of these creatures, successive residence is necessary in the bodies of two distinct species of animal, which are thus called the "intermediate host" and the "final host." And the worm passes through two marked changes of form,—a "cystic" or bladder-like form in the first or "intermediate" host, a "cestoid" or flattened, tape-like form in the final host. The tape-worms which in the adult form infest the human animal in our country are chiefly two, *Tænia solium*, which is derived from the flesh of the pig, and *Tænia mediocanellata*, from that of the ox. Other rare forms may be left out of the account. In the mature, tape-like form the animal consists of a vast number of segments, each of which contains a complete armamentarium of reproductive organs, and an opening or pore through which the fertilized ova are thrown into the digestive canal of the host. These are produced in enormous numbers, but are incapable of further development except in the internal economy of some other animal. Taking the case of *Tænia solium*, some of these multitudinous ova must, in order to develop, find their way into the alimentary tract of the pig. The changes which then happen are these; the hard and resistent external wall of the egg becomes softened or dissolved, the contained embryo is set free, and develops a set of sharp spicular or needle-like appendages, by means of which it is enabled to perforate the coats of the intestine, thus finding its way into a blood-vessel. In this way great numbers of ova may be conveyed into the blood circulation: through the coats of the blood-vessels they again bore their way into the flesh of the pig, where they enter upon the "cystic" stage of existence. In this stage there is developed a head, armed with suckers and a crown of hooklets, but without a mouth, the whole nourishment of the animal throughout life being carried on by simple absorption through the general body surface. Behind the head there is a large vesicle or cyst, the whole being ensconced amongst the muscular fibres of the host. In this condition the creature awaits the chance of further development in the alimentary track of some unfortunate man: should it fail to find its way thither it ultimately dies, undergoing a process of calcareous degeneration. But if it should, in the form of insufficiently cooked pork or bacon, be taken into the human stomach it then enters upon its final metamorphosis; the cyst is detached and the head begins to develop from behind an almost interminable series of egg-producing segments or "proglottides," and so its cycle of existence is completed. The prophylactic, in the case of all Tæniæ, is to have meat thoroughly well cooked throughout and thus to destroy whatever encysted scolices it may contain. Sometimes, however, man becomes, not the *final* but the *intermediate* host, as in the case of *Tænia echinococcus*—a parasite which in its mature form infests the dog, but in its cystic condition causes in man the very serious disease known as "hydatids," —a complaint not, happily, very common in England, but much more so in Iceland and other countries where dogs are allowed to feed unchecked upon uncooked offal, and so to perpetuate the existence of the parasite.

Another extremely interesting Entozöon, belonging to the group *Nematelmia* or round-worms, is a small species called *Filaria sanguinis hominis*,* which is found in very large numbers in the blood of the human subject, but is restricted in its geographical distribution to the tropical and subtropical regions of both hemispheres. The female of this worm attains a length of three inches and a half, is very slender and hair-like, and is formed singly in some vessel of the lymphatic system, where it seems to lie quiescent, and produces viviparously very large numbers of young Filariæ, which find their way readily into the blood vessels. The history of this creature has been carefully investigated by Dr. Patrick Manson, of Amoy, China; by Dr. T. R. Lewis in India, by Dr. J. Silva Lima in Brazil, as well as by other observers. The animal as met with in the human blood system is immature, and measures on an average about one twenty-fifth of an inch in length. Dr. Lewis calculated that in one of his cases there existed in the blood 140,000 of these

* *Filaria Bancrofti*, Cobbold.

Filariæ,—an estimate probably not erring on the side of excess. Within its geographical range the parasite attacks very large numbers of persons, but in most cases without producing serious symptoms; in others, however, it seems to be the exciting cause of several diseases, such as elephantiasis, chyluria, etc. In Bahia it has been stated that 8⅓ per cent. of the population are affected by it. To the biologist the chief interest of the animal is centred—as with so many other parasites—in its life-history, and it is to Dr. Manson that we owe most of our knowledge of the subject. One very remarkable fact is that the creature seems to forsake the superficial blood vessels during the day, and can rarely be seen until after seven o'clock in the evening. Dr. Manson was thus led to suppose that if the worm passed any part of its life in the body of an "intermediate" host, that host would probably be some night-feeding, blood-sucking creature like the mosquito. He accordingly got a Chinamen, known to be affected with Filariæ, to shut himself up with some mosquitos and submit to their blood-thirsty attentions. On examination of the insects afterwards their blood was found to be swarming with Filariæ. It seems probable that some of these may be digested by the mosquito, but that others find their way from the stomach into the surrounding tissues, and there pass into a higher stage of development. The mosquito betakes itself to some pond or reservoir, as the habit of its tribe is, there deposits its eggs, and speedily dies, decomposes, and of course liberates the embryo Filariæ, which doubtless find frequent access to the human organism in drinking-water. That Europeans are less frequently affected than natives must be owing to the greater care taken by them as to filtration of water. Such precautions are unknown to the native races, and it seems wonderful, not that so many should be affected but that any should entirely escape.

Another round-worm which, for us in England, has a more personal interest is *Trichina spiralis*. This creature passes its encysted existence, often in immense numbers, in the muscles of the pig, though its true host is said to be the rat. For its further development the flesh of the pig must be eaten by some warm-blooded vertebrate, in whose alimentary canal it undergoes its final development and becomes sexually mature. The young are produced viviparously, perforating the coats of the stomach and intestines, and ultimately reaching the muscles, these processes giving rise to a train of symptoms closely resembling those of rheumatic fever,—more or less severe according to the number of the parasites, and not unfrequently fatal in their results. The length of the male *Trichina* is one-eighteenth of an inch, of the female one-eighth of an inch, and each mother is probably capable of producing from ten to fifteen thousand young. It is stated that an ounce of pig's flesh may contain as many as eighty thousand *Trichinæ*, and one pound of such flesh might, according to Dr. Cobbold, produce a crop of four hundred millions. No wonder that the migration of such an invading host is liable to be attended with disastrous results.

With one other instance of transmigration,—more wonderful than those of Indur—I will leave the consideration of the larger Entozoa. The disease called "rot" in sheep arises from the presence of a flat trematode worm known as the liver-fluke, a parasite which is found sometimes, though rarely, in the human organism. The migrations of this animal during development are perhaps even more astonishing than those which have just occupied our attention. The adult fluke—*Distoma hepaticum*—lives in the liver and gall-ducts of sheep which feed in damp or marshy pastures: in dry, upland pastures it is unknown. It is an ovate, leaf-like animal, about half an inch to an inch or more in length, with a distinct mouth and two suctorial discs, by means of which it attaches itself to the interior of the bile-ducts. It produces numerous ova—ovate bodies with a long diameter of about $\frac{1}{200}$th of an inch—which pass into the intestine and are expelled with the contents of that canal. The ova cannot hatch except in water, but if this is reached they at once give rise to small embryos which, being ciliated, swim about freely for a few hours, ultimately dying unless they find access to the body of the intermediate bearer, *Limnæa truncatula*, a common fresh-water snail. Attaching itself to the *Limnæa*, the embryo bores into the tissues of its host, and enters the body cavity or pulmonary sac, at the same time losing its cilia and developing on its interior one or more secondary embryos called "rediæ." The redia, when mature, is set free from its enveloping cyst, bores again into the tissues of the mollusc, and produces a number of tertiary embryos of different kinds called "cercariæ" and "daughter-rediæ." The cercaria is a curious tadpole-like creature, with a long tail and an anterior and posterior sucker and a distinct mouth and gullet. Having worked its way once more out of its host, the cercaria leads for a time a free life, swimming actively in the water. Then, attaching itself by its suckers to some piece of grass or herbage it casts off or loses by absorption, its tail, and becomes enveloped in a horny capsule or cyst. In this condition it may of course be readily eaten by a browsing sheep, and when taken into the body of that animal speedily assumes its adult form. Dr. Cobbold states that in the season of 1830–31 "the estimated deaths of sheep from rot were between one and two millions, representing a money loss of something like four million pounds sterling," and that "in the neighbourhood of Arles alone, during the year 1812, no less than 300,000 sheep perished, and at Nimes and Montpellier 90,000. In the inner departments, during the epidemic of the years 1853-54, many cattle-breeders lost a fourth, a third, and even three-fourths of their flocks. * * * On the estate of Mr. Cramp, of the Isle of Thanet, the rot epidemic of 1824 'swept away £3,000 worth of his sheep in less than three months, compelling him to give up his farm.' Scores of cases are on record where our English farmers have individually lost three, four, five, six, seven, and even eight hundred sheep in a single season; and many agriculturalists have thus become completely ruined." These statistics refer chiefly to the first half of the present century, and since that time much has doubtless been done, by drainage of swampy land, to remedy the evil, for on dry ground it is apparent that the disease cannot maintain itself.

To follow this part of our subject further would try your patience and carry me far beyond the limits of my allotted time. Much remains to be done in tracing out the life-histories of the various enteric parasites, especially amongst the lower vertebrates. Scarcely any animal is exempt from some peculiar entozoon of its own; even birds have their tape-worms: whence do they come? and what animals act as their intermediate hosts? There is a little round-worm, *Ascaris nigrovenosa*, which passes its adult life in streams, but in a less mature condition, inhabits the air-passages of the frog. How many similar "romances of Natural History" remain to reward the researches of a painstaking investigator?

As long ago as the year 1675 the presence of bacteria in various parts of man and other animals was made out, and the organisms admirably described by the Dutch microscopist, Leuwenhoek. And the idea that these bodies were the real cause of diseases was eagerly seized by many pathologists. This idea, in fact, was never entirely lost sight of, and a vast amount of work was done amongst the monads by numerous observers, among whom may be especially mentioned Plenciz, O. F. Müller, Spallanzani, and Needham. But it was not until a much more recent date that the true fertilising impulse was given,—chiefly by the wonderful researches of Pasteur and Sir Joseph Lister,—to the study of Bacteriology, the first great research of Pasteur resulting in a thorough comprehension of the nature of *pébrine*, —a silk-worm disease which at one time threatened utterly to destroy the great silk-industry of France; while the brilliant experiments and observations of Sir Joseph Lister may be said to have almost revolutionized the art and science of Surgery, and to have conferred inestimable benefits upon the whole human race. The ultimate effect of these researches, continued and supplemented by a host of able workers all the world over, it is impossible as yet to forecast, but it is safe to say that the sister science of Medicine must eventually reap as rich a harvest of good as has already fallen to Surgery. It may be interesting, before attempting to discuss the more recent advances of Bacteriology to notice briefly the classical research of Pasteur as to the nature of *pébrine*.

One of the earliest, if not quite the earliest, of researches into the life-history of morbific microbes was that undertaken by

Pasteur in 1865, as to the origin and best means of prevention of the silkworm disease called *pébrine.* This disease, which first came prominently into notice in the year 1853, was one which threatened by the alarming proportions which it assumed, to ruin the silk-industry of France and even of the world. In that year (1853) the quantity of silk manufactured in France was computed at 26,000,000 kilos of cocoons,—in 1865 at only 4,000,000 kilos, this reduction being entirely attributable to the ravages of *pébrine.* The amount thus lost to France and Italy in thirteen years is estimated at no less than £120,000,000 sterling. It would be a mistake, however, to suppose that the disease exerting this baneful effect was by any means a new one, for M. Pasteur found that the oldest specimens which he could procure from museums and elsewhere contained the germs of the disease, and that animals even from Japan, in which country the breed remained in a practically healthy state, were likewise tainted. There can, in fact, be no doubt that the highly artificial conditions of silk culture in Europe had so far debilitated the constitution of the moth as to make it an easy prey to the morbific germs. The disease shows itself in the form of black spots on the larva of the moth, the eggs of which do not hatch out well. The larvæ themselves may die off, or if not the resulting moths are weak and the next generation still worse, the silk of the cocoons being at the same time poor both in quantity and quality. A disease affecting so important an industry had naturally attracted the attention of naturalists, and in 1849 M. Guérin Méneville observed in the bodies of the affected worms minute organisms which he described as "vibratory corpuscles." These were also noticed and described more fully by Signor Cornalia, but nothing resulted from the researches. It was not until 1865, when M. Pasteur accepted from the French Government a commission to investigate the nature of the disease, that the true nature of the microbes became known. He shewed conclusively that these corpuscles were not only a symptom but were the actual cause of *pébrine,* that they were parasitic organisms, and that they were communicated to successive generations of insects by direct contact or by their consumption of infected leaves. He found also that worms originally infected retained sufficient vitality to produce a cocoon of good silk, but that the next generation became worthless, the disease being infallibly transmitted and thus deteriorating the offspring. The conclusion was obvious;—the larvæ were to be examined and no infected specimens were to be used for breeding purposes. This precaution, together with the substitution of a more natural condition of life by breeding in the open air, has been found sufficient to re-invigorate the stock and to keep it in good condition. No wonder, then, that this splendid achievement of M. Pasteur gave an immense impetus to the investigation of microbes and of their share in the causation of disease. A new literature devoted to the subject soon sprang up and we became familiarised with many minute organisms found to be co-existent with various kinds of disease; but it was still uncertain whether those organisms were the real cause of disease or only concomitants of the diseased processes. It was not until the quite modern methods of Bacterium-cultivation were perfected—chiefly through the laborious researches of Professor Koch—that we were enabled to say "with no shadow of doubt whatever" that Bacteria were really the *fons et origo mali*—not of a few diseases only, but probably of a very large proportion of the ills which flesh is heir to.

The minute monads known as Bacteria present a considerable variety of form and size, and there was, up to a quite recent period, considerable doubt as to their place in nature,—whether animal or vegetable. It is, however, now generally admitted that they belong to the vegetable kingdom and to the group Schizomycetes or "fission-fungi." This conclusion has been arrived at chiefly from the character of their reproduction, which closely coincides with that of the fungi. Though so extremely small—varying from about 1-6,000th to 1-25,000th of an inch in diameter, their reproduction is extremely rapid, and it has been estimated by Cohn (*fide* Woodhead) that a single bacterium, if placed under favourable conditions, might in the course of three days produce a mass of similar organisms weighing no less than seven thousand five hundred tons, the number of individuals being 4,772 billions. It is fortunate that the conditions favourable to such extremely rapid development are rarely or never found. Still, it would be a mistake to look upon Bacteria as altogether noxious beings. They are indeed the great scavengers of nature, seizing speedily upon dead and effete material, and by the various fermentive and putrefactive processes which they set up reducing the highly complex constituents of organic beings to their primitive inorganic elements. Without the help of bacteria it wonld seem impossible that the cyclical changes inseparable from the course of nature could go on — that there could be that never-ceasing decay and rejuvenescence which are inseparable from life itself. This has been put very emphatically by Duclaux: 'whenever and wherever there is decomposition of organic matter, whether it be the case of a herb or an oak, of a worm or a whale, the work is exclusively done by infinitely small organisms. They are the important, almost the only, agents of universal hygiene; they clear away more quickly than the dogs of Constantinople or the wild beasts of the desert the remains of all that has had life; they protect the living against the dead; they do more: if there are still living beings, if, since the hundreds of centuries the world has been inhabited, life continues, it is to them we owe it."*

To make sure that the Bacteria found in any particular disease are the actual cause of it, it is necessary to separate the suspected species from all others,—for many forms are often found living together—to cultivate it, and by inserting these cultivations into the body of some animal, to ascertain whether the disease in question can be so produced. And it is only within quite recent years that we have been enabled to fulfil these requirements. To avoid sources of error which would be constantly arising by the entrance of germs from the external air, it is indispensable that the apparatus and material used should be sterilised by boiling or by other exposure to sufficient heat, and cf course that all tubes or apertures leading into the air should for the same reason be hermetically sealed or sufficiently plugged. Several methods of cultivation are in use, but the most general

* Woodhead: Bacteria and their Products, pp. 68, 69.

is that of inoculating with the bacillus slips of prepared gelatine, which affords a suitable nidus for the growth of the organisms.

The variety of form presented by Bacteria is very great, and it was at one time believed by not a few observers that these variations indicated only phases of the life-history of a small number of species, or even that the whole series represented embryonic conditions of the higher Algæ or Fungi. The reproductive process in some of the Bacteria has now, however, been sufficiently observed, and there can be no doubt that they are really mature organisms, that there are large numbers of species, and that though the same species is often capable of adapting itself to varied conditions, their vital requirements are yet very diverse. Thus some forms need oxygen for their nourishment, others live and multiply entirely without it: some are destroyed by small traces of acid in their nutrient fluid, others require the presence of acid: the products of their vital activity are also, chemically, very various, and are doubtless in many cases the chief cause of their deleterious effects on the animal organism. The reproduction of the Bacteria, apart from growth by fission which is constantly going on with extreme rapidity, consists in the formation of a spore which becomes encased in a tough and dense envelope, and is thus enabled to resist adverse conditions such as drought and heat, which would speedily destroy the parent form. It has been proved that spores will, at any rate in some cases, resist temperatures of 100°, or even 130° C. (212°—266° Fahr.). But it appears that the formation of spores does not occur so long as the environment is favourable to the growth of the Bacteria; when these conditions fail and there is a prospect of death and extinction before the adult, then the case-hardened spores begin to be produced; and the fact of their great resisting power as to heat and other agencies is a sufficient explanation of the apparent success of many experiments in what has been called "spontaneous generation."

The classification of Bacteria presents very considerable difficulty, many systems having been proposed, based upon the form of the organism, its mode of reproduction and nutrition, or the products of its vital action. It will be sufficient here to state that the various forms may be referred roughly to four typical genera, *Micrococcus*, a spherical cell; *Bacillus*, a short rod-like form; *Leptothrix*, a long, slender thread; *Spirillum*, a spirally coiled thread. But in addition to these there are numerous forms of intermediate or doubtful position. Perhaps the most generally accepted primary division of the group is that indicated above, dividing it into four corresponding families under the names *Sphæro-bacteria, Micro-bacteria, Desmo-bacteria, Spiro-bacteria.*

That alcoholic fermentation is the result of the vital activity of the "yeast-fungus" was clearly made out long ago, but it is no less certain that changes of a somewhat similar nature are brought about by the purely chemical action of certain "ferments." Such is the action of diastase and ptyaline upon starches, converting them into a soluble "grape-sugar," and of pepsine upon the various proteids, turning them into soluble peptones. So that, although the suspicion was strong that many diseases might be produced by the vital action of microbes, there was yet room for the belief that simple chemical changes were the more common cause of morbid manifestations. Modern researches, however, clearly show that the organic chemical poisons,—tox-albumens and the rest—which are so hurtful to the animal economy, are themselves produced for the most part by the growth of microbes. One of the simplest and most intelligible forms of bacterial disease is the ordinary decay or caries of teeth. It has long been known that various kinds of non-pathogenic Bacteria may be found in the mouth, teeth and gums. Some of these produce lactic acid from the sugars of the food, and this acid, acting upon the teeth, softens them and allows of the penetration of certain thread-like forms (*Leptothrix*) which by their growth rapidly disintegrate the tooth.

Still more recent researches have proved to demonstration that many diseases—such as have been called "zymotic," as well as others—are caused by the attacks of special microbes, each disease having one peculiar to itself. These microbes have, in many cases, been separated, cultivated, and shown to be capable of producing their special diseases when introduced into the animal economy. Among the diseases which have been shown to depend upon such agency, are Asiatic cholera,* typhoid fever, tetanus, anthrax, tuberculosis, leprosy, and diphtheria. Such being the case the very interesting and important question arises: How is it, the germs of these organisms being so subtle and so easily diffusible, that more of us do not fall victims to their attacks? In answering this question we must remember, in the first place, that the morbific organisms cannot live and multiply except under certain strictly limited conditions. Some of them, as for instance the typhoid bacillus, are killed by exposure to light, others by contact with acid or alkaline fluids, and all of them, probably, are subject to very rigid limitations as to environment. Secondly, an extremely interesting series of observations by Metschnikoff and others have shown it to be probable that, in the healthy condition of the body, the tissue cells are capable of destroying,—eating up, as it were, and assimilating,—any bacteria that may obtain a lodgment about them. And not only this,—by the irritant action of the parasites, the healthy tissue cells are stimulated to extra growth, throwing out round the affected centres numerous active "phagocytes," which thus form a sort of advanced guard ready to attack any fresh battalions of the enemy. And in this way, supposing the assaulted organism to possess sufficient vigour for an unwonted cell-proliferation, the attacking force is destroyed and driven out. But, on the other hand, if the system is enervated at the outset, its cells below par in point of vitality, and especially if the invading host be too numerous,—then the phagocytes become an ineffective force, they die or degenerate, incapable of coping with their antagonists, and the fortress may have to surrender at discretion. And though the observations on which these ideas are built still need repetition and confirmation—though they may indeed be proved to be to a considerable extent erroneous, it seems nevertheless likely that they contain germs of truth. They at any rate enable us to understand how it is that a body in vigorous health is able to repel the attacks of infectious Bacteria, and how, when the microbes have effected a lodgment, perfect rest of body and the maintenance of animal heat constitute the most important

* This is disputed, however, by Dr. Klein.

aids to recovery, inasmuch as they lessen organic waste, and so minimise the drain of nutriment, leaving more of it available for that cell-proliferation which is essential to the destruction of the invading microphytes.

One of the most interesting points brought out by the study of Bacteria is connected with the causation of the formidable disease known as tetanus or lock-jaw. It is well known that Bacteria of various kinds exist abundantly in earth, and especially in the superficial layers of soil: among these is found a peculiar species of "drum-stick" shape, which has been shown to be the active cause of tetanus. This bacillus occurs most abundantly, it is said, in woods and cultivated gardens, but appears to be somewhat capricious in its distribution. It is one of the "anærobic" bacilli—that is to say, it grows only when excluded from contact with the air; and artificially it can be cultivated only in an atmosphere such as that of hydrogen gas. That tetanus can be produced by the insertion of particles of bacilliferous soil beneath the skin of various animals has been abundantly proved, and it has long been known that, in the human subject, the injuries most likely to result in tetanus are deep, penetrating wounds produced by such bodies as rusty or dirty nails, or wounds into which foreign matters have been roughly conveyed. In the one case the deep character of the wound secures the absence of air, thus allowing the growth of the organism; in the other, the suppuration produced on the surface of the bruised and disorganised tissues protects the *materies morbi* by its purulent film from aerial contact. With this information it is easy to account for such cases as the following—of which I have had personal knowledge:—A person in paring the edge of a toe-nail produces an apparently trivial wound between the side of the nail and the overlapping skin: neglecting the ordinary precautions of cleanliness, and going about as usual, the wound shortly inflames, tetanic symptoms appear, and the patient dies. Again, a man is thrown violently from a trap, alighting on his hands at the side of the road; the palm of one hand is greatly bruised and lacerated, and the earth of the road is inextricably driven in among the torn tissues.

Here also fatal tetanus supervened. It surely is not too much to hope that with our present knowledge of its pathology cures may be effected, at any rate in some of the less severe cases of this dreadful complaint. It seems certain that the poisoned arrows used by savages owe their lethal effects to an earth-poison, and that the symptoms they produce are usually tetanic in character. Bishop Patteson and Commodore Goodenough died in this way, and Dr. Ledantic gives the following interesting description of the arrows: "They are about three feet in length; the shaft is made of a reed, then comes a middle portion composed of hard wood, and lastly a point which is usually composed of a fragment of human bone, which is carefully sharpened to a very fine point, and is so fixed that it readily snaps off on the slightest shock. With a sticky substance obtained from an incision made in the bark of a tree, the point composed of the fragment of bone is smeared. This fluid, on exposure to the air, becomes thicker and of a more viscid consistence. Thread is then wound in a spiral direction round and round the sticky point. A quantity of soil from the edge of a mangrove-swamp is taken in a cocoa-nut shell, or some similar vessel, and into this the arrow-head is plunged. It is then carefully dried in the sun, after which the thread is removed, when a roughened point covered with a film of dry mud and dust is left. In this mud there are probably both septic vibrios and tetanus bacilli; the former, however, are rapidly killed by exposure to the sun, whilst the tetanus bacillus of Nicobaier, which developes a well-formed spore at one extremity, may remain active for months and even years, although, as the savages well know, the poison generally becomes more and more attenuated, until old arrows are known to become entirely inoffensive, except as mere mechanical weapons of warfare or hunting."*

To bring before you, even in the most superficial manner, anything like a complete account of recent researches amongst Bacteria, or even to epitomize the more interesting amongst such observations, would lead me far beyond the limits which can be allowed to this already too long address.

* Woodhead; Bacteria and their Products, pp. 294, 295.

The practical outcome of the matter is that, although we can scarcely hope at present to compass the complete destruction of bacilli within the human body, we may at any rate do very much to prevent their dissemination and to destroy them outside of the organism. And it is possible that the practice of inoculation, on which Pasteur's treatment of hydrophobia depends, may be found applicable in other diseases. Hydrophobia has not indeed been proved to depend upon the presence of a microbe, but the general course of the disease leads to the belief in such an origin; and it seems certain that it is not the mere presence of the microbes, but the presence of morbid products produced by their growth which is really the proximate cause of disease and death. Such is certainly the case, for instance, in diphtheria. And it has been found that pure cultures of bacilli grown outside of the human body, lose gradually in the course of generations much of their poisonous character. Acting upon this knowledge Pasteur begins his treatment of hydrophobia by injecting in the first place a weak culture of the hydrophobia virus—whatever that may be—gradually increasing the strength of the injection, time after time, until, as it is supposed, the system acquires a tolerance of the poison, and in this way any ill effects which might have resulted from the previous bite of a rabid animal are nullified. Whether the treatmeut has been actually successful does not appear to me quite certain. It is a matter which from its very nature must be difficult of proof, while the possibility of inoculating a patient with so dreadful a disease is a thing almost too hideous to contemplate.

Leaving the subject of disease, it is interesting to note that Bacteria seem also to be the cause of the colour-stains which frequently make their appearance in decaying substances such as bread, milk, and gelatine; and that they are probably to a large extent the active agents in the phenomena of phosphorescence.

The following gentlemen were elected members of the Club during the year 1891–2 :—

At the ANNIVERSARY MEETING, May 22nd, 1891 :—Henry E. Taylor, Whickham, Newcastle; L. S. Brady, Mowbray Villas, Sunderland; Francis Guyner, Beech Holme, Sunderland; M. C. Potter, F.L.S., Durham College of Science, Newcastle; Rev. W. F. A. Ellison, B.A., Tudhoe, Spennymoor; G. B. Bainbridge, Claremont House, Newcastle.

At MARSDEN MEETING, October 15th :—R. N. Kerr, Secretary, Dundee Naturalists' Society, Dundee.

At EVENING MEETING, April 5th, 1892 :—Arthur Herbert Hoffman, L.R.C.P., Linden House, Humshaugh, North Tyne; Wilfred Lawson, 1 Durham Street, Elswick Road, Newcastle.

The following places were selected for FIELD MEETINGS, 1892 :

JUNE 6TH	Embleton and Dunstanbro'.
JUNE 23RD AND 24TH......	Knaresborough and neighbourhood.
JULY 21ST	Hedgeley and the Breamish.
AUGUST 22ND	Barnard Castle and Bowes Museum.
SEPTEMBER 21ST..........	Lanchester and Creencroft.
OCTOBER	Tynemouth.

ABSTRACT OF TREASURER OF TYNESIDE NATURALISTS' FIELD CLUB'S ACCOUNT.

Dr.

1891.		£	s.	d.
Jan.	To Balance	6	11	8
	,, Subscriptions	99	15	0
	,, Sale of Transactions	8	11	10
		£114	18	6

Cr.

1891.		£	s.	d.
	By Secretaries' Expenses, 1890..	12	3	3
	,, Do. Do. 1991..	10	9	10
	,, "Journal" Office	22	6	3
	,, Commission	2	16	4
	,, Postage..................	1	14	5
	,, Sundries	0	6	1
Dec. 31.	,, Balance..................	65	2	4
		£114	18	6

21st March, 1892.—Compared with Vouchers and found correct,

Signed, J. S. FORSTER.

The following gentlemen were elected Officers of the Club for 1892–93 :—

PRESIDENT.

Prof. G. S. Brady, M.A , M.D., LL.D., F.R.S.

VICE-PRESIDENTS.

Joseph Blacklock, Esq.
D. O. Drewett, Esq.
William Maling, Esq.

EX-OFFICIO.

D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
Rev. Canon Norman, F.R.S.
E. J. J. Browell, Esq., J.P.
Prof. G. S. Brady, F.R.S.
Rev. G. R. Hall, M.A., F.I.A.
G. H. Philipson, Esq., M.D.
A. S. Stevenson, Esq., J.P.
Rev. J. M. Hick, B.A.
John Philipson, Esq., J.P.

HON. TREASURER.

R. Y. Green.

HON. SECRETARIES.

Richard Howse
Thomas Thompson.
Faraday Spence.

COMMITTEE.

T. W. Backhouse.
E. J. J. Browell.
Wm. Dinning.
D. Embleton, M.D.
John Glover.
Rev. J. M. Hick.
Rev. Wm. Johnson.
G. H. Philipson, M.D.
John Philipson.
Edward C. Robson.
J. F. Spence.
Col. J. R. Young.

AUDITORS.

J. S. Forster.
Arthur Tranah.

NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

ANNUAL MEETING, 28TH SEPTEMBER, 1892.

REPORT FOR 1891–1892.

THE Committee, in presenting their Report for the past year to the members of the Natural History Society, have to mention in the first place that the general work of the Museum and the increase of the collections—the number of members and the financial position of the Society—the attendance of the general public and the amount of fees taken at the door for admission—have been much the same as in the preceding year.

The amount of fees for admission is £196 : 18 : 10, which is a slight decrease from the receipts of last year. This deficiency occurred at Whitsuntide, when owing perhaps to the remarkably fine weather at that time, and also partly to the long-continued strikes in the neighbourhood, the receipts for the week shewed a decrease of £14 compared with the receipts for the same week in former years. The total number of admissions from June 30th, 1891, to June 25th, 1892, was about 30,000. This number compares favourably with the attendance in former years, though it indicates the attendance of a greater number of young people.

The permanent installation of the electric light into all the rooms of the Museum was mentioned in the last report, and a list of subscribers to the Electric Lighting Fund was given in full, as also the recommendation of the Committee to continue the opening of the Museum on Saturday evenings from 7 o'clock to 9 p.m. This has been continued through the year with the following result:—The cost of lighting for two hours is about 18/6. The fees taken for admission vary from 1/3 to (on one occasion only) 17/10, the average being 6/3. The loss for the Saturday evenings during the year amounts to about £18 : 0 : 0, excluding the heavy charge of £14 : 0 : 0 for the annual rental of the transformers. Having regard to the continued loss on the evening lighting of the Museum the Committee feel that they cannot recommend its continuance during the coming winter.

Mention was made in the former Report of a recommendation by the Committee and other officers of the Society to erect a Mural Tablet to the Memory of John and Albany Hancock in the Entrance Hall of the Museum. This resolution was formally endorsed and approved of at the last General Meeting of the Society, when it was agreed that the design for the Hancock Memorial Tablet should be left in the hands of the Sub-committee previously appointed to report on this subject.

The following is the Report of the Sub-committee appointed to consider the details of the Memorial Tablet.

Report read 2nd December, 1891 :—

"The Sub-committee appointed 7th February, 1891, to consider and report on the details of the proposed Hancock Memorial, beg to say that they first consulted Mr. R. J. Johnson respecting the form of the Memorial Tablet and received several designs from him, one of which, with modifications of the style of ornamentation, they have agreed to recommend for adoption.

They found it also desirable to have the advice and assistance of Mr. Craggs on various points of their enquiries, and he has furnished them with a full-sized drawing of the proposed Tablet with the style of ornamentation recommended. They consulted him also on the kind of stone to be used; and he has undertaken to submit to the Committee a full-sized drawing of the lettering and the inscription.

The Sub-committee recommend that the full-sized design now presented be adopted, and that the Tablet be made of clear Sicilian marble and the ornamental frame of variegated alabaster. They also recommend that the Tablet be supported on two corbels of sandstone similar to the walls of the building, and that the inscription be in plain letters, cut in and gilt.

Finally they recommend that Mr. Cragg's estimate for £100 be accepted and that the commission be given to him to carry out."

This report was formally adopted by the Committee. They also decided to accept Mr. Cragg's estimate for the execution of the same, which, with the approved alteration in size of the Tablet, amounts to the sum of £100.

After mature consideration, and the expression of a wish on the part of many members of the Society to subscribe to a Fund for the erection of a Memorial Tablet, it was determined to issue a circular to all the members. The sum already subscribed amounts to £154 : 8 : 6, which has been readily contributed by the following members :—

LIST OF CONTRIBUTORS TO THE HANCOCK MEMORIAL.

	£	s.	d.
W. L. Anderson	5	0	0
H. T. Archer	0	10	6
Lord Armstrong, C.B., F.R.S.	10	0	0
Lady Armstrong	10	0	0
Wm. Watson-Armstrong	1	0	0
E. M. Bainbridge	5	0	0
Thos. H. Bainbridge	1	0	0
Benj. Barkus, M.D.	1	0	0
Mrs. Barnes	10	0	0
Sir Lowthian Bell, Bart., F.R.S.	5	0	0
Thos. Bell	0	10	6
Joseph Blacklock	1	1	0
	£50	2	0

	£	s.	d.
Brought up	£50	2	0
Thos. Brady	0	10	0
J. C. Brooks	2	2	0
E. J. J. Browell	1	1	0
Sir B. C. Browne	2	2	0
L. Brunel	1	1	0
John Burnup	1	1	0
Adam Carse	0	10	0
R. C. Clephan	0	10	6
Wm. Cochrane	1	1	0
John Coppin	1	1	0
R. R. Dees	2	0	0
I. G. Dickinson	1	1	0
Wm. Dinning	1	0	0
Carried over	£65	2	6

	£	s.	d.
Brought over......	£65	2	6
Sir Raylton Dixon.........	1	1	0
Waynman Dixon	1	1	0
Edwin Dodds...............	0	10	6
Mrs. Drewett	1	0	0
Capt. Carr-Ellison.	1	0	0
D. Embleton, M.D.	5	0	0
Thos. W. Embleton	10	10	0
Geo. A. Fenwick	2	0	0
Geo. Freeman...............	1	1	0
A Friend, per W. D.	0	10	0
J. S. Forster	1	0	0
C. J. Gibb, M.D.	1	1	0
Saml. Graham	0	10	6
R. Y. Green..................	1	0	0
Miss A. Hancock	1	1	0
Chas. J. Hancock	2	2	0
John Hancock	1	1	0
John H. Hancock	2	2	0
T. A. Hancock	1	1	0
John Harvey	1	1	0
Miss Harvey	1	1	0
Armorer Hedley............	0	10	6
Thos. Hodgkin, D.C.L....	1	0	0
W. H. Holmes	1	0	0
Richd. Howse...............	0	10	6
James Joicey, M P.	2	2	0
John Lamb............... ..	1	1	0
Rev. Canon Lloyd, D.D..	1	1	0
Richd. Luckley	0	10	6
Wm. Maling	1	1	0
N. H. Martin	1	1	0
Mrs. Mawson	2	2	0
	£113	16	0

	£	s.	d.
Brought up......	£113	16	0
H. T. Mennell	1	1	0
H. N. Middleton	3	3	0
C. W. Mitchell	1	1	0
Thos. Morgan...............	1	1	0
Capt. Noble, C.B., F.R.S.	10	0	0
John Pattinson	1	1	0
M. J. Pelegrin	1	1	0
G. H. Philipson, M.D. ...	2	2	0
W. B. Reid..................	1	1	0
Miss S. A. Richardson ...	1	0	0
Robert Robson	1	1	0
John Rogerson	1	0	0
W. J. Sanderson	1	1	0
Henry Scott	1	1	0
John D. Scott	0	10	6
Miss Shaw	1	1	0
Prof. Somerville............	1	1	0
J. F. Spence	1	1	0
H. C. Swan..................	0	10	0
H. F. Swan..................	1	1	0
John G. Swan	1	1	0
Jos. W. Swan...............	3	3	0
John Taylor	2	2	0
Thos. Thompson..	5	0	0
John D. Walker............	0	10	6
H. B. Watson...............	1	1	0
Mrs. Watson	1	1	0
J. S. Watson	1	1	0
Richd. Welford	0	10	6
Capt. West, R.N.	1	0	0
John A. Woods	2	2	0
Col. Young........	2	2	0
	£166	8	6

In order further to perpetuate the memory and recognize the skill and labours of Mr. John Hancock, the Rev. Canon Tristram proposed to the Committee the desirability of establishing a Hancock Prize or Medal, to be awarded periodically by the Natural History Society for original memoirs or essays on some local subject connected with the Natural History of this district. The Reverend Canon undertakes to obtain the amount necessary to form a Fund for this purpose, if the Committee will undertake the duty of awarding the prize by appointing a Sub-committee of its members or others to adjudicate on any essays that may be communicated. The Committee have cordially endorsed Canon Tristram's proposal, and as this matter is still in course of arrangement, it need only be mentioned at present that the sum of £60 has already been promised for this purpose.

Since the date of the last Report an arrangement has been made with the Council of the College of Science for the temporary use, by the Professor of Agriculture, and the Demonstrator in Biology and Botany, of the Lower West Corridor and one of the workrooms. These have been fitted up by the Council of the College in accordance with an agreement with this Society. The lectures and demonstrations connected with both these departments of the College have been conveniently and satisfactorily conducted in these rooms during the last two sessions.

During the year the Society has had to mourn the loss of another of its older and influential members, John Coppin, Esq., of Bingfield, Northumberland. Always a lover of Natural History and an encourager of others in the same pursuits, Mr. Coppin at all times gave his warm sympathy and generous assistance towards the objects the Society had in view. So much so was this a matter of importance with him, that he has with much foresight and noble generosity bequeathed the sum of £2,000 to the Trustees of the Society to form a Fund towards the maintenance of an efficient Curator for the Museum.

Several important and valuable donations have been made during the year to the Museum collections, which call for special mention in this report, and the thanks of the Society.

The Ornithological collections have been further enriched through the generosity of Frederic Raine, Esq., formerly of Durham, who has lately presented his most valuable and extensive collection of the eggs and nests of British and European Birds contained in five large cabinets. Only a few years ago Mr. Raine presented his splendid collection and Cabinet of British

Lepidoptera. These Cabinets will be all arranged in the Upper West Corridor, and will form Cabinets of Reference for students and others engaged in active Ornithological studies.

For many years the Society has been much indebted to Mr. Chas. M. Adamson, one of the Honorary Curators of the Museum, for the gift of a collection of Foreign Lepidoptera from Upper Burmah, collected by his son, Major Adamson.

These specimens were not only presented but mounted and arranged in the cases in the Zoological Room by the same gentleman.

Mr. Thomas J. Bewick has obligingly presented a large case and specimens illustrating the process of washing and dressing lead-ore and the manufacture of lead, which will shortly be placed in one of the corridors. A remarkably large and fine specimen of Hæmatite or Kidney Iron-ore from the Whitehaven district has also been presented by the same gentleman.

Mr. George Allan, a former donor to the collections, who is at present travelling in South Africa, has recently presented an interesting collection of Antelope Horns from Swazieland, and a few implements and articles of dress and other curiosities from the same district for the Ethnological collections.

A few months ago Hugh F. Boyd, Esq., of the Temple, London, on behalf of the executors of his late sister, Miss Julia Boyd, offered to the Society a large collection of native implements, carvings, and manufactures from New Zealand and other islands of the South Seas, and a collection of corals, minerals, and plants collected by Miss Boyd, who expressed a wish that her collections should find a resting place in the Newcastle Museum. The collection has now been accepted. It contains a fine series of some of the rarer New Zealand Bird-skins, large fragments of rare Maori carving, a collection of New Zealand plants, chiefly ferns, some interesting minerals from the Volcanic district of Tarawera in the North Island, and a large collection of native mats, cloth made of the bark of trees, flax, etc., and also a large assortment of corals and shells. A detailed account of these will be found among the general donations, a list of which will be appended to the Report.

The Hon. Treasurer's Financial Report shews a balance in hand at the end of the year of £139 : 11 : 10. This balance compares favourably with former years when it is shewn that some large items have been paid for the painting of the outside of the building and for cases for the gallery of the Central, Bird Room.

The Committee regret that the Hon. Treasurer, Mr. I. G. Dickinson, who has lately left this city to reside in the South of England, has in consequence been obliged to resign the office which he has so advantageously held for the benefit of the Society during the last four years.

Twelve new members have been elected during the year. The Society has lost five by resignation and five by death, leaving a total of 321 members. The following were elected members between June 30th, 1891, and June 30th, 1892:—

Barkas, Charles, Grainger Street.
Brady, Dr. G. S., M.D., F.R.S., etc., 2, Mowbray Villas, Sunderland.
Gillespie, J. J., Eskdale Terrace, Newcastle.
Gillespie, Thos., Winton House, Morpeth.
Laidlaw, Percy Oban, 1, Portland Terrace.
Milling, E., 14, Framlington Place.
Morrison, James Gordon, 212, Portland Road.
Richardson, James Alaric, South Ashfield.
Robinson, N. Johnson, Preston Tower, North Shields.
Sisson, James A., Ascog Villa, Ryton.
Somerville, Dr. William, Durham College of Science.
Spence, C. J., South Preston Lodge, North Shields.

ABSTRACT OF MINUTES.

J. F. SPENCE, Esq, Chairman.

The Hon. Secretary read the Committee's Report for 1891–2.

Moved by the Chairman and seconded by Mr. J. Pattinson:— "That the Report now read be adopted."

In the unavoidable absence of the Hon. Treasurer the Secretary read the Financial Reports, pp. 230–235.

Moved by Mr. G. R. Brewis and seconded by Mr. J. Philipson: "That the Financial Reports be adopted."

Mr. E. O. Reid moved and Mr. H. T. Archer seconded:— "That the following gentlemen be elected officers of the Society for 1892-3." (See List of Officers, page 236).

Moved by Mr. J. Philipson and seconded by Mr. R. Y. Green: "That the thanks of the Society be given to the late Hon. Treasurer, I. G. Dickinson, Esq., for his valuable services to the Society, and that he be elected a Vice-President of the Society." Carried by acclamation.

The following resolution, proposed by Mr. J. Pattinson:— "That as Lord Armstrong had expressed a wish that the experiment of keeping open the Museum on Saturday evenings should be continued, his Lordship's wish should be agreed to."

A vote of thanks, moved by Mr. J. Pattinson and carried unanimously, was given to the Chairman for his services in the chair.

THE HONORARY TREASURER IN ACCOUNT

DR. CURRENT ACCOUNT FROM 30TH JUNE,

1892.	RECEIPTS.		£	s.	d.
June 30.	To Balance of last Account		258	7	6
	,, Members' Subscriptions		327	8	0
	,, Admission Fees		196	18	10
	,, Interest on Stock :—				
	Newcastle Corporation, £2,000, 3½ per cent. Stock, less Income Tax..	£68 5 0			
	Wear Commissioners, £500, 4½ per cent. Stock, less Income Tax ...	21 18 8			
			90	3	8
	,, Guides to Museum sold		4	14	0
	,, Donation, Durham College of Science		25	0	0
			£902	12	0

WITH THE NATURAL HISTORY SOCIETY.

1891, TO 30TH JUNE, 1892. Cr.

1892.	PAYMENTS.	£	s.	d.	£	s.	d.
June 30.	By Salaries and Wages :—						
	Richard Howse	200	0	0			
	Joseph Wright	90	0	0			
	Jno. Jackson	86	10	0			
	Wm. Voutt	65	8	0			
	Mrs. Atkinson	24	4	0			
					466	2	0
	,, Incidental Expenses :—						
	Bowes & Co., Coal	6	7	6			
	Gas Co., Coke	26	2	9			
	,, ,, Gas	7	1	4			
	Water Co., Water	6	10	4			
	Electric Supply Co.	30	9	2			
	Insurances	23	3	0			
	Taxes—Income, Land, and House	4	16	0			
	Advertisements	2	2	8			
					106	12	9
	,, Tradesmen's Accounts :—						
	John Bell & Co., Printing	28	0	0			
	Robson & Son, Cabinet Work	4	2	3			
	Gurney & Jackson, Books	1	10	0			
	Wilkinson & Simpson, Chemicals	4	10	2			
	Walker & Son, Hardware	1	11	0			
	Dinning & Cooke	12	3	7			
	G. G. Laidler, Painting	73	0	8			
	Sopwith & Co., Cases	25	4	0			
	Ferguson, Cartage	8	0	10			
					158	2	6
	,, Joseph Wright, Sundry Accounts				21	12	11
	,, ,, ,, Gratuity				10	0	0
	,, Cheque Books				0	10	0
	,, Balance in Bank				139	11	10
					£902	12	0

I. G. DICKINSON,
Hon. Treasurer.

24th September, 1892.

Examined and found correct, 30th Sept., 1892.

JNO. D. SCOTT, }
E. O. REID, } Auditors.

THE HONORARY TREASURER IN ACCOUNT

ELECTRIC LIGHTING FUND,

		£	s.	d.
1892.				
June 30.	To Balance from last Account	94	13	9
	,, Microscopical Society, for lighting	0	11	0
	,, Subscription, per J. Wright	1	1	6
		£96	6	3

HANCOCK MEMORIAL FUND,

		£	s.	d.
1892.				
June 30.	To Subscriptions received	132	2	6
		£132	2	6

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1892.

1892.			£	s.	d.
June 30.	By Electric Supply Co.	£5 19 0			
	,, ,, ,, ,,	13 16 8			
			19	15	8
	,, Dinning & Cooke, Gas Fittings		69	2	10
	,, Balance		7	7	9
			£96	6	3

30TH JUNE, 1892.

1892.		£	s.	d.
June 30.	By Advertisements	3	10	8
	,, Balance in Bank	128	11	10
		£132	2	6

I. G. DICKINSON,
Hon. Treasurer.

24th September, 1892.

Examined and found correct, 30th Sept., 1892.

JNO. D. SCOTT, } Auditors.
E. O. REID, }

THE HONORARY TREASURER IN ACCOUNT

CAPITAL ACCOUNT,

1891.		£	s.	d.
June 30.	To Invested in $3\frac{1}{2}$ per cent. Newcastle Corporation Stock, as per last Capital Account	2000	0	0
	,, Invested in River Wear Commissioners' $4\frac{1}{2}$ per cent. Stock, as per last Capital Account	500	0	0
	,, Balance of Maintenance Fund, as per Bank Account...	45	19	2
		£2545	19	2

MAINTENANCE FUND,

	£	s.	d.
To Balance from last year	45	19	2

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1892.

		£		.
1892.				
June 30.	By Invested in $3\frac{1}{2}$ per cent. Newcastle Corporation Stock	2000	0	0
	,, Invested in River Wear Commissioners' Stock at $4\frac{1}{2}$ per cent.	500	0	0
	,, Balance of Maintenance Fund, as per Bank Account	45	19	2
		£2545	19	2

I. G. DICKINSON,
HON. TREASURER.

Examined and found correct, 30th Sept., 1892.

JNO. D. SCOTT,
E. O. REID, } AUDITORS.

30TH JUNE, 1892.

		£	s.	d.
1892.				
June 30.	By Cash in Messrs. Lambton & Co.'s Bank, Grey Street, as per Bank Book	45	19	2

I. G. DICKINSON,
HON. TREASURER.

24th September, 1892.

Examined and found correct, 30th Sept., 1892.

JNO. D. SCOTT,
E. O. REID, } AUDITORS.

OFFICERS OF THE NATURAL HISTORY SOCIETY, 1892–93.

The following Gentlemen were elected Officers of the Society for 1892-93.

PATRONS.

His Grace the Duke of Northumberland.
The Right Rev. the Lord Bishop of Durham.
The Right Rev. the Lord Bishop of Newcastle.

PRESIDENT.

The Right Honourable Lord Armstrong, C.B., F.R.S.

VICE-PRESIDENTS.

The Right Honourable the Earl of Ravensworth.
Sir M. White Ridley, Bart., M.P.
Sir Lowthian Bell, Bart., F.R.S.
The Worshipful the Mayor of Newcastle.
Lieut.-Col. Potter, C.B.

T. W. Embleton, Esq.
R. R. Dees, Esq.
D. Embleton, Esq., M.D., etc.
J. A. Woods, Esq.
G. H. Philipson, Esq., M.D., etc.
Thomas Bell, Esq.
John Daglish, Esq.
John Rogerson, Esq.
J. W. Swan, Esq.
Capt. A. Noble, C.B., F.R.S.
Joseph Blacklock, Esq.
D. O. Drewett, Esq.
Wm. Maling, Esq.
H. N. Middleton, Esq.
Rev. Canon Lloyd, D.D.
Alex. S. Stevenson, Esq.
C. M. Adamson, Esq.
I. G. Dickinson, Esq.

HON. TREASURER.

Thomas Thompson, Esq.

HON. SECRETARIES.

Wm. Dinning.
A. H. Dickinson.

COMMITTEE.

Mr. H. T. Archer.
Mr. E. J. J. Browell.
Mr. Robt. C. Clephan.
Mr. Samuel Graham.
Mr. R. Y. Green.
Mr. N. H. Martin.
Prof. G. A. Lebour, F.G.S.
Rev. Canon Norman, F.R.S., etc.
Mr. Frederick Page.
Mr. John Philipson.
Mr. John Pattinson.
Mr. J. F. Spence.

AUDITORS.

John D. Scott.
E. O. Reid.

HONORARY CURATORS,

1892–93.

ZOOLOGY.

VERTEBRATA.

D. Embleton, M.D.
Samuel Graham.
C. M. Adamson.
Thos. Thompson.

INVERTEBRATA.

Rev. Canon Norman.
C. M. Adamson.
Wm. Maling.
N. H. Martin.
W. Dinning.

BOTANY.

Rev. Henry Fox, Durham.
Rev. Wm. Johnson.
C. E. Stuart.
M. G. Potter.

GEOLOGY.

E. J. J. Browell.
J. Daglish.
W. Dinning.
E. J. Garwood.
J. W. Kirkby.
Prof. Lebour.
Jno. Pattinson.

CURATOR.

Richard Howse.

KEEPER OF THE MUSEUM.

Joseph Wright.

LIST OF EXGHANGES AND DONATIONS TO THE MUSEUM AND LIBRARY

OF

THE NATURAL HISTORY SOCIETY,

FROM JULY 1ST, 1891, TO JUNE 30TH, 1892.

AMERICAN SOCIETIES.

Boston :—Society of Natural History.

Proceedings, Vol. 25, Parts 1, 2. May, 1890—Dec., 1890.

The Society.

Cambridge :—Museum of Comparative Zoology, Harvard College.

Bulletin, Geol. Ser., Vol. 2; Whole Ser., Vol. 16, No. 10.

,, Vol. 21, Nos. 2, 3, 4, 5.

,, ,, 22, Nos. 1, 2, 3, 4.

,, ,, 23, Nos. 1, 2.

Memoirs, Vol. 17, No. 2.

,, ,, 14, No. 2.

Annual Report of the Curator. 1890-91. *Prof. Alex. Agassiz.*

Mineapolis :—Minnesota Academy of Natural Science.

Bulletin, Vol. 3, No. 2. *The Academy.*

New York :—Academy of Science and Lyceum of Nat. History.

Annals, Vol. 5, Nos. 1, 2, 3, extra. February, 1891. *The Academy.*

Philadelphia :—Academy of Natural Sciences.

Proceedings, Parts 2, 3, 1891; Part 1, 1892. *The Academy.*

Philadelphia ;—American Philosophical Society.

Proceedings, Vol. 29, No. 135.

,, ,, 29, ,, 136. July—Dec., 1891.

,, ,, 30, ,, 137. Jan., 1892.

List of Members, 1892. *The Society.*

Rochester :—Academy of Science.

Vol. 1. Brochure 2. 1891. *The Academy.*

Salem :—American Association for the Advancement of Science.

Proceedings, 39th Meeting, Indianapolis. 1890. *The Association.*

Springfield :—Geological Survey of Illinois.

Geology and Palæontology, Vol. 8. *Mr. Alexander Batters.*

Trenton, New Jersey :—New Jersey Natural History Society.
Journal, Vol. 2, No. 2. Jan., 1891.

Washington :—Smithsonian Institution Bureau of Ethnology.
Omaha and Ponka Letters. J. O. Dorsey. 1891.
Catalogue of Præhistoric Works East of Rocky Mountains, by Cyrus Thomas. 1891.
Contributions to American Ethnology, Vol. 6. 1890.
Algonquian Languages, by J. C. Pilling.

Washington, Smithsonian Institution.
Annual Report, 1889, 1890–91.
Contributions to Knowledge (No. 801), Vol. 27.
Smithsonian Miscellaneous Collections, Nos. 594, 663, 785.
The Institution.

Washington :—Smithsonian Institution, U.S. National Museum.
Proceedings, Vol. 13. 1890.
Bulletin, 41, 42.
Report of U.S. National Museum. 1889. *The Institution.*

Washington :—United States Geological Survey.
Bulletins 62, 65, and 67–81.
10th Annual Report, Vols. 1, 2. *The Director of U.S. Geol. Survey.*

Washington :—Department of Agriculture.
N.A. Fauna. No. 5. *The U.S. Department of Agriculture.*

BRITISH SOCIETIES.

Berwick-upon-Tweed :—Berwickshire Naturalists' Club.
Vol. 12, No. 3. 1890.
„ 13, No. 1. 1892. *The Club.*

Cardiff :—Naturalists' Society.
Report and Transactions, Vol. 22, Part 2. 1890.
„ „ „ 23. 1891. *The Society.*

Dublin :—Royal Society.
Scientific Proceedings, Vol. 6, New Ser., 10.
„ „ „ 7, „ Parts, 1, 2.
Transactions, Vol. 4 (Ser. 2), Parts 6, 7, 8. *The Society.*

Edinburgh :—Botanical Society.
Transactions and Proceedings, Vol. 19, pp. 89, 190, and 191–231.
The Society.

Edinburgh :—Geological Society.
Transactions, Vol. 6, Part 3. 1892. *The Society.*

Edinburgh:—Meteorological Society.
Journal, 3rd Ser., No. 8. 1890.

Essex, Buckhurst Hill:—Essex Field Club.
Essex Naturalist, Vol. 4, No. 2.
,, ,, ,, 5, Nos. 6, 7, 8, 9, 10, 11 12.
,, ,, ,, 6, Nos. 1, 2, 3, 4, 5. *The Club.*

Glasgow:—Natural History Society.
Proceedings and Transactions, Vol. 3, New Ser., Part 2, 1889–90.
The Society.

Liverpool:—Naturalist Field Club.
Reports, 1867, 68; 70, 72–77; 79, 80. *Per R. Y. Green, Esq.*

Leeds:—Naturalists' Union.
Transactions, Parts 10–16. 1885–90. *The Union.*

London:—British Museum, Cromwell Road, Kensington.
Catalogue of Birds, Vols. 19, 20.
,, Fossil Birds.
List of British Oligocene and Eocene Mollusca.
The Trustees of British Museum.

London:—Ealing Microscopical and Nat. Hist. Society.
Proceedings for 1891. *The Society.*

London:—Geologists' Association.
Proceedings, Vol. 12, Nos. 1, 2, 3, 4, 5, 6, 7. *The Association.*

London:—Nature.
From June 30th, 1891—June 30th, 1892. *The Publisher.*

London:—Natural Science.
Vol. 1, No. 2. April, 1892. *The Publisher.*

London:—Quekett Microscopical Club.
Journal, Vol. 4, 2nd Ser., Nos. 29, 30. *The Club.*

London.
Rhopalocera Exotica, Parts 17, 18, 19, 20. *Purchased.*

London:—Zoological Society.
Proceedings, Parts 1, 2, 3, 4. 1891.
,, Part 1. 1892.
Transactions, Vol. 13, Parts 1, 2, 3, 4.
Index. 1881–90. *The Society.*

Manchester:—Literary and Philosophical Society.
Memoir and Proceedings, 4th Ser., Vol. 4, Nos. 4, 5. 1890-91.
„ „ „ Vol. 5, No. 1. 1891-2.
The Society.

Manchester:—Microscopical Society.
Transactions and Report. 1891. *The Society.*

Newcastle-on-Tyne:—Institute of Mining & Mechanical Engineers.
Transactions, Vol. 38, Part 6; Vol. 40, Parts 2, 3, 4; Vol. 41, Parts 1, 2.
The Institute.

Plymouth:—Plymouth Institute.
Report and Transactions, Vol. XI., Part 1. 1890-91. *The Institute.*

Northampton:—Northamptonshire Nat. Hist. Soc. and Field Club.
Nos. 30-48. June, 1887—Dec., 1891. *The Society.*

COLONIAL SOCIETIES.

AUSTRALIA.

Sydney, N.S.W.:—Australasian Assoc. for the Advan. of Science.
Report of 2nd Meeting, Christchurch, N.Z. Jan., 1891.
The Association.

Sydney, N.S.W.:—Australian Museum.
Report of Trustees for 1890.
Records, Vol. 1, Nos. 7, 8, 9, 10. Index to Contents, Feb., 1892.
„ „ 2, No. 1.
Catalogue of Birds—Part 3, *PSITTACI.*
Cat. No. 12. Descriptive Catalogue of the Nests and Eggs of Birds found breeding in Australia and Tasmania, by A. J. North, F.L.S.
Catalogue of Marine Shells of Australia and Tasmania, Part 1.
The Trustees.

Sydney, N.S.W.:—Royal Society.
Journal of Proceedings, Vol. 24, Part 2. 1890. *The Society.*

CANADA.

Halifax, Nova Scotia:—The N. S. Institute of Natural Science.
Proceedings and Transactions, Vol. VII., Part 4. *The Institute.*

Montreal:—Natural History Society.
Canadian Record of Science, Vol. 4, Nos. 6, 7, 8.
„ 5, No. 2.
The Natural History Society, Montreal.

Ottawa ;—Geological and Nat. Hist. Survey of Canada.
Contributions to Palæontology, Vol. 1, Part 3, 4to.
The Fossils of the Devonian Rocks of the Mackenzie River.
Annual Report, 1888–89, Vol. 4, New Ser. 1890.
Contributions to Canadian Micro. Palæontology, Part 3.
The Survey, per Dr. Alfred R. C. Selwyn, Director.

EUROPEAN SOCIETIES.

Vienna. AUSTRIA.
Verhandlungen der K. K. Zool-Botan. Gesellschaft in Wein:
Jahrgang, 1891, Band XLI., Quartal 1, 2, 3, 4. *The Society.*

BELGIUM.

Brussels :—Société Royale Malacologique de Belgique.
Annals, Tome 25, 4th Ser.; Tome V., Armée, 1890.
Proces-verbaux. Sept., 1890, to June, 1891. *The Society.*

Copenhagen. DENMARK.
Videnskabelige Meddelelser fra Naturhistoriske Forening i Kjobenhavn for Aaret 1891. *The Society.*

Bergen. NORWAY.
Bergens Museums Aarsberetning, 1890. *The Director of the Museum.*

Christiania: La Sociétié des Sciences.
Fordhandlinger i Videnskabs-Selskabet. 1890. Nos. 1–9.
The Society.

RUSSIA.

Helsingfors, Finland :—Societas pro Fauna et Flora Fennica.
Acta III., 1886-88; IV., 1887; VI., 1889-90; VII., 1890.
Meddelanden, Häft 14, 1888, and Häft 16, 1888–91. *The Society.*

Kieff :—Memoirs of the Society of Naturalists.
Tome X., Parts 3 and 4; Tome XI., Parts 1, 2.

MISCELLANEOUS BOOKS, ETC.

Buller's Birds of New Zealand, 2nd ed., 2 vols., 4to.
The Executors of Miss Julia Boyd.

Three large Photos of Palms from Colombo (shewing Ceylon vegetation).
Edward C. Chaston.

Miniature of William Charnley, a friend of Thos. Bewick.
F. C. T. Challoner, Esq., London.

The "Naturalist," a Journal of Natural History for North of England. Three volumes, 1887, 1888, 1889. *Dr. Embleton.*

Willughby's Ichthyologia. *In exchange for Yarrell's Fishes, 1st ed.*

Type Fossils of the Woodwardian Museum, Cambridge.
The Director of Woodwardian Museum.

1891. MAMMALS.

July 31. Common Bat, *Vespertilio pipistrellus*, near Ross.
Mr. F. V. Wallis, Coughton House, Ross, Herefordshire.

Sept. 12. Lesser Horse-shoe Bat, *Rhinolopus hipposideros*, near Ross.
Mr. F. V. Wallis, Coughton House, Ross, Herefordshire.

,, 19. Two Arctic Foxes, *Canis lagopus*, Linn , jun., ♀ from Iceland.
Major E. Anne, Blenkinsopp Castle.

,, 19. Common Fox, *Canis vulpes*, young.
Mr. Thos. Thompson, Winlation.

Oct. 7. Norwegian Lemming, *Myodes lemmus*, Linn., from Norway.
Rev. Canon Norman, Burnmoor Rectory.

,, 7. Skeleton of *Homo sapiens*, female. *D. Embleton, Esq., M.D.*

Nov. 2. Skull of *Homo sapiens*, found in sand-bank at Tynemouth.
Mr. Wm. Dinning.

Two Skulls of *Homo sapiens*. *Mr. J. H. French, Gateshead.*

1892.

Feb. 9. Three specimens of the Bank Vole, *Arvicola glareola*, from Kirkgamzyon, Kirkcudbrightshire, and six Field Voles, *Arvicola agrestis*, from Loch o' Lowes, Selkirkshire.
Mr. G. Deans Ritchie, Clover Hill, Biggar, N.B., and Dr. W. Somerville.

,, 22. Porcupine, *Hystrix cristata*, Linn.
Purchased from Travelling Menagerie.

Mar. 7. Horns of Chamois, *Rupicapra tragus*, Gray.
Mr. G. R. Rome, Eldon Street.

Apr. 18. Field Vole, *Arvicola agrestis*, Archbank, near Moffat, Dumfries.
Mr. Geo. Irving.

June 16. A live Coati, *Nasua* sp. ?—from America.
Mr. John Hesketh, Arnside House, Grosvenor Road.

,, 21. Skull of young Otter, *Lutra vulgaris*.
Major E. Anne, Blenkinsopp Castle.

,, 21. One Bat.
Jaw of Lizard? *The Executors of Miss Julia Boyd.*

1891 BIRDS.

July 13. Young Corn-crake, one from a nest of seven caught in a hay-field near Newcastle, July, 1891. *Mr. John Jackson.*

,, 14. Young of Golden Pheasant hatched in Newcastle.
Mr. Bolton, Northumberland Street.

Aug. 22. Guillemot, *Lomvia troile*, Linn., var. *ringvia*, beginning to change from summer to winter plumage.
Mr. F. P. Johnson, Eldign, Dunvegan, Skye.

1891.

Aug. 22. Nest and three Eggs of Kestrel from Haltwhistle.
Mr. W. M. Pybus.

,, 28. Two Piebald Rooks, *Corvus frugilegus*, var., ♂, shot on the Cathedral Banks, Durham, 21st May, 1891, by Mr. Richardson Peile. *Mr. Richardson Peile, Durham.*

Sept. 5. Two Lesser Black-backed Gulls in first plumage.
A Ringed-Dotterel, shot at St. Mary's Island, Sept. 4, 1891.
Mr. John Duncan.

,, 19. Two Herring Gulls, one, ♀ changing plumage, the other in first plumage, shot near Kyloe, Northumberland.
Mr. John Duncan.

Nov. 2. Sparrow Hawk, mature male, Sniver Wood, Wass, Yorkshire, 12th June, 1888, skinned by Mr. John Hancock.
Miss M. J. Hancock.

Buffon's Skull, *Stercorarius longicaudatus*, Brisson, found dead at Shotley Bridge. *Mr. John Jackson.*

,, 20. Skin of Cape Pigeon, *Daption Capense*, and a Black-bellied Storm Petrel, *Thalassidroma melanogaster*, Gould; Indian Ocean. *Capt. Sergent, Lovaine Place.*

Dec. 10. Tawny Owl, *Syrnium aluco*, Linn., ♀ from Herefordshire.
Mr. F. V. Wallis, Coughton House, near Ross, Hereford.

,, 26. Two Shieldrakes, ♂ and ♀ immature, from Dumfries-shire.
Purchased.

1892.

Jan. 10. Sparrow Hawk, ♂ immature. *Mr. J. D. Walker.*

,, 18. Leach's Petrel, found in Dumfries-shire, Dec., 1891.
Black-headed Gull, immature ♂. *Mr. John Duncan.*

,, 18. Skins of Birds and Animals from Uruguay.
Mr. Douglas Dickinson.

Feb. 16. Two Willow Grouse, *Lagopus saliceti*, ♂ ♀ in winter plumage, from Norway. *Mr. R. C. Clephan.*

,, 22. Golden Pheasant, young male, 8 months old, bred and presented by *Mr. Bolton, Northumberland Street.*

,, 22. Black-throated Diver (for skeleton). *Mr. J. Duncan.*

,, 26. Nest of Longtailed Tit, Aymestry, Wilts. *Mr. S. Graham.*

,, 26. Two specimens of *Tetrao tetrix*, ♂ immature, ♀ mature, and two of *Perdix cinerea*, S. Norway. *Mr. R. C. Clephan.*

Mar. 9. A large collection of British and European Birds Nests and Eggs formed by Mr. Frederic Raine, formerly of Durham.
Mr. Frederic Raine, Hyères, Var., France.

,, 10. Specimen of Canada Goose, *Anser Canadensis*, ♂ from the Leazes Park.
Corporation of Newcastle, per Mr. J. Wilson.

1892.

Mar. 30. Australian Piping Crow, *Gumnorhina tibicen* (for skeleton). *Mr. J. Duncan.*

April 29. A fine specimen of *Vultur monachus*, Linn., and two of *Larus gelastes*, ♂ ♀, shot in Spain, May 8th, 1883. *Mr. Abel Chapman, Sunderland.*

May 9. Two Herring Gulls, *Larus argentatus*, immature, near Cullercoats, May 7, 1892. *Mr. John Duncan.*

,, 18. Two Nests of Thrush, built close together in a shrub one foot from the ground, close to a house in course of erection at East Bank, Corbridge, four eggs in each. *Mr. Wm. Turnbull, jun., Corbridge-on-Tyne.*

,, 18. Snowy Owl (for skeleton), died in Menagerie at Gateshead. *Presented by the Proprietor.*

,, 19. Two Black-headed Gulls, *Larus ridibundus*, ♂ near Stamfordham. *Mr. John Duncan.*

June 1. Nest and Eggs of Thrush built in a Tree in front of 19, Claremont Place. *D. Embleton, Esq., M.D.*

,, 16. Head of Small Hornbill, *Lophoceros nasutus*, shot on the river Gambia, S. Africa, 400 miles from the mouth. *Mr. Wm. Cooper, Baltic Chambers, Quay.*

,, 16. Starling in first plumage, Cross House, Leazes. *Mr. E. O. Reid.*

,, 16. Five Silver Pheasants and five Common Pheasants, young, bred in Newcastle. *Mr. Alfred Hume, Burdon Terrace.*

,, 16. Young of Golden Pheasant, 10 days old. *Mr. Bolton, Northumberland Street.*

,, 16. Two Lories from Malekula, New Hebrides. *Surgeon D. McNabb, R.N., Newcastle-on-Tyne.*

June 18. Specimens of New Zealand Birds—

Three Owl Parrots, *Stringops habroptilus.*
Two Brown Parrots, *Nestor meridionalis.*
Three Owen's Kiwi, *Apteryx Owenii.*
One *Apteryx australis.*
Two Wekas, *Ocydromus australis.*
Two Fruit Pigeons, *Carpophaga Novæ-Zealandiæ.*
One Starling, *Sturnus vulgaris*, introduced into N.Z.
One Orange Wattled Crow, *Glaucopis cinerea.*
Two Kingfishers, *Halcyon vagans.*
Two White Herons from Tonga.
One Bittern, *Botaurus pœciloptilus.*
Two Black Oyster-catchers, *Hæmatopus unicolor.*
Two Pied Oyster-catchers, *H. longirostris.*

Four Tropic Birds, *Phaeton rubricauda*, from Kermadec Islands.

One Gannet, *Dysporus serrator.*

One Sooty Petrel, *Procellaria fuliginosa.*

Two Caspian Terns, *Sterna Caspia.*

Two Paradise Ducks, *Casarca variegata.*

One Blue or Mountain Duck, *Hymenolœmus malacorhynchus.*

Two Crested Grebes, *Podiceps cristatus.*

One Crested Penguin, *Eudyptes chrysocomus.*

Four Swamp-hens, *Porphyrio melanotis.*

Bones of Moa.

Three Eggs of Tropic Bird, *P. rubricauda*, Kermadec Islands, 1891.

One Egg of Penguin, sp.?

Two Eggs of Wideawake Tern.

Two Eggs (very small) laid by common Hen Pullet, five months old, Auckland.

The Executors of Miss Julia Boyd.

FISHES, ETC.

1892.

Jan. 13. Jaw of a large Ray (foreign). *Mr. N. H. Martin.*

Feb. 26. Specimen of the Tope, *Galeus canis*, Willughby, ♀ from the Trawlers, North Shields. *Prof. M. G. Potter, M.A.*

Mar. 3. Specimen of Trifurcated Hake. *Mr. E. H. Birchall, North Shields.*

,, 4. Specimen of *Scorpœna* ——— ?, from Trawl Boats. *Mr. F. H. Philips, Eldon Street.*

,, 28. Part of a Rabbit Fish, *Chimœra monstrosa*, ♀. (Two specimens of this species, ♂ and ♀, were taken out of the stomach of a Ling about 12th March, brought to the Tyne by a Trawler). *Purchased.*

April 14. Bloch's Topknot, *Zeugopterus punctatus*, from the Trawlers, North Shields. *Mr. F. H. Phillips, Eldon Street.*

May 7. Large Spotted Dogfish, *Scyllium canicula*, Linn. *Mr. James Read, North Shields, per Ald. J. F. Spence.*

,, 31. Californian Toad, *Phrynosoma cornutum.* *Mr. Alex. Batters, Gillespie, Ill., U.S.A.*

MOLLUSCA.

June 18. A large collection of Marine Shells from New Zealand, Fiji, etc.

Nautilus, two sp.; *Argonauta tuberculata, etc., etc.*

Helix Hockstetteri, near Picton, and a variety of *Helix (Paryphanta) Busbii.* *The Executors of Miss Julia Boyd.*

CRUSTACEA, ETC.

1892.

June 30. Two Cocoa-nut Robber Crabs, *Burgo latro*, from Tahiti; two Prawns; two Scorpions; one Waking-stick Insect.
The Executors of Miss Julia Boyd.

CORALS AND SPONGES.

June 30. About forty specimens of Corals from the South Sea Islands—a few specimens of Gorgonia; *Euplectella aspergillum*, and a few other small Sponges.
The Executors of Miss Julia Boyd.

INSECTS, ETC.

1891.

Aug. 12. A Locust from Constantinople. *Mr. Robert Scott Blair.*

Sept. 18. Scorpions, Beetles, and other Insects from Bechuanaland.
Capt. Ralph H. Carr-Ellison.

Oct. 7. Two Insects—Sawfly, *Sirex juvencus*, and Longicorn Beetle, Ebchester. *Mr. John Duncan.*

1892.

Feb. 1. Three boxes of European Butterflies containing about 95 Species (1286 specimens) from South of France.
Collected and presented by Mr. Frederic Raine, Hyères.

1884 to 1892. Collection of Butterflies, chiefly from Burmah, collected by Major C. H. E. Adamson, Madras Staff Corps.
Mr. C. M. Adamson.

Feb. 26. Intestinal Worms from Stomach and Intestines of the Lesser Dogfish from the English Channel.
Prof. M. G. Potter, M.A.

June 21. Two Butterflies and two Sphinges, from the New Hebrides.
Surgeon D. McNabb, R.N., Newcastle-upon-Tyne.

FOSSILS AND MINERALS.

1891.

July 3. A few specimens of Upper Cambrian Trilobites from North Wales, and several Rock specimens. *Mr. E. J. Garwood.*

Sept. 5. Branch of *Lepidodendron Sternbergii* from the roof-shale of the Yard-seam, Deckham Colliery, Gateshead Fell.
Purchased.

Oct. 5. Collection of Marl-Slate Fishes from the shaft sunk at Deaf Hill, Trimdon, *Pygopteris* and *Palæoniscus* in fragments.
Mr. Thos. Bell, Durham.

,, 10. Three specimens of *Stilbite* and one of *Mesole* or *Faroelite*, and one of Sphærostilbite on Mesole, from the Faroe Islands.

Oct. 10. A Coral (*Cladocora dichotoma*) from the Upper Chalk (Danian), Faxoe, Denmark. Shells from the raised Beach of Santa Catalina Las Palmas, Grand Canary, Canary Islands. Oysters, etc., from the Kitchen Middens of Meilgard, near Grenad, Jutland, Denmark.
Miss Caroline Birley, Sudley Terrace, Pendleton, Manchester.

Nov. . Collection of Carboniferous Footprints from Otterburn and Coal-measure Fossils from Newsham, being a portion of Mr. Ald. Barkas' Collection, containing several types of Fossils named and figured by him in his Illustrated Guide to the Fish, etc., remains, of the Northumberland Carb. Strata, 1873.
The Executors of the late Ald. T. P. Barkas, F.G.S., per Mr. Chas. Ed. Barkus.

1892.

Jan. 13. Proximal portion of Tusk of a Mammoth; large specimen of Malachite and Azurite from the Burra-Burra Mines, South Australia. *Mr. N. H. Martin.*

Feb. 17. Specimen of Rock Salt from Cordova, Spain.
Mr. M. J. Pelegrin.

,, 17. Three Fossil Fishes from Carboniferous Strata, Burdie House, and Waliford, N.B., and one from Trias, Mass., U.S.A.
Mr. Wm. Dinning.

,, 24. Specimen of *Isastræa Murchisoni* from Lower Lias (Infra Lias, Judd), Skye. *Prof. G. A. Lebour.*

,, 24. Hazel Nuts dredged out of bed of the Tyne, 30 feet below Low Water. Quay, near the Milk Market. *Mr. Wm. Geo. Laws.*

April . Hazel Nuts, covered with Pyrites and fragments of wood, from the Silver Nut Well near Otterburn.
Mr. G. E. Crawhall.

May 17. Collection of Rock Specimens of Minette, Skiddaw Slate, Dolerite, Saccharine, and Altered Limestone, from High Teesdale and Weardale. *Mr. E. J. Garwood.*

,, 31. Sundry Fossils from the Silurian, Carboniferous, and Coal-measures of U.S., America. *Mr. Alex. Batters.*

,, 31. Case of specimens of Lead Ore, shewing the processes of dressing ore, etc. *Messrs. Bewick & Partners, Lim., London.*

,, 31. A large specimen of Hæmatite from the neighbourhood of Whitehaven, Cleator Moor. *Mr. Thos. J. Bewick.*

June 30. Several specimens from the Whinsill at Embleton, and of Plumpton Grit, S. of Knaresboro'. *Mr. Richd. Howse.*

,, 30. Rock specimens from Guadarama, and fragments of large Fossil Oysters, Spain. *Mr. M. J. Pelegrin.*

June 30. A large series of specimens from the volcanic district of Taupo, the North Island, N.Z.; Silica, Sulphur and specimens from the Mud fumaroles; Obsidian and Rock specimens from the same district; Opaline Quartz with Jasper, Otago; Coal from near Auckland—Quartz—Crystalline Limestone.

Specimens of Coal (Cretaceous) from near Auckland, New Zealand, Gold Quartz, Jaspery Quartz, a large series of specimens from the Pink and White Terraces, also of Obsidian and Lava from Tarawera district, Pumice from Lake Taupo district, and Sulphur specimens from White Island, etc. Collected by the late Miss Julia Boyd, 1891.

The Executors of Miss Julia Boyd.

BOTANY.

1892.

Jan. 21. Portion of the fructification of *Cycas revoluta* grown at the Cedars, Methley, Leeds.

Mr. T. W. Embleton, per Dr. Embleton.

June 30. Four Portfolios of Plants from South of France; European and British Ferns; American Flowering Plants and Ferns; and Yorkshire Plants chiefly from Arncliffe. Small Book of Fijian Ferns. Bundles of New Zealand Ferns and Flowering Plants unarranged: Swiss Plants mounted and unmounted, and some unarranged European Plants. Tooi Grass; Bark and Cone of Kauri Pine. Kauri Gum, two Cocoa Nuts; Vanilla from Tahiti; Pods of Silk Cotton, Tahiti; Paper Mulberry Bark; part of Tree Fern from the Hut near Sophia's House, Wairoa, destroyed by eruption of Tarawera, 1886. Baskets made of Palm Leaves.

The Executors of Miss Julia Boyd.

ETHNOLOGY.

1891.

July 31. A Cingalese Surf-Boat from Colombo, Ceylon.

Mr. Edward C. Chaston, Heaton Grove.

Dec. 12. Flint Arrow-head found near Haltwhistle.

Mr. Joseph Elliott, High Town, Haltwhistle.

1892.

Feb. 17. A Moorish Gun, or Espingarda, taken from a Moor killed in war with Spain. *Mr. M. J. Pelegrin.*

May 31. Indian Pipe, from the White Cloud Agency, U.S.A.

Mr. Alex. Batters, Gillespie. Ill., U.S.A.

June 21. Figure of a man with human Skull modelled on a frame of wood with clay, etc.; Image formed out of Rhizome of Tree

Fern, Model of a man carved in wood; five Masks for concealing the face; two modelled Heads fastened on the top of long sticks; Skull of native from Mulikula, New Hebrides.

Surgeon D. McNabb, R.N., 19, *North Terrace, Newcastle-on-Tyne.*

1892.

June 30. Collection of Ethnological specimens from New Zealand, Fiji, and other South Sea Islands, collected by the late Miss Julia Boyd, in 1891-2, containing the following South Sea Implements, Clubs, Manufactures, etc.:—

CLUBS, ETC.

1. Ra Turaga's Club, captured at Nubu Tau Tau, Colo, in mountain war under old Fiji government.
2. Club belonging to *Na Daki Bitu*, Quali Tala Ba Mountains, Fiji.

3, 4. *Na Malumu* Clubs, Fiji.

5. *Kea Kavu* Club, Fiji.

6. *Sumi dra*, Drink blood Club, Fiji.

7. Ai-ula, Hand Club.

8, 9, 10. Small Hand Clubs for throwing.

11, 12. Long Spears from Fiji.

13. Wooden Pillow from Vau-vau, Fiji.

14. *Kali*, Pillow of Bamboo cane, Fiji.

15. Stone Axe (handle new).

16. Kava Bowl, 30 in. diam., Fiji.

17. Small Kava Bowl, from Samoa.

18, 19. Wooden Pestle and Mortar, Fiji.

20-26. Stone Axes, unmounted.

26B. Wooden Implement for stirring Kava.

27, 28. Santo Clubs, Samoan Clubs.

29. Hand Club, Samoan.

30, 31. Malicoso Clubs, Pentecost Isld.

32A. Drinking Cup, half Cocoa Nut, inlaid, Santa Cruz, Solomon Islds.

32B. Four Drinking Cups, Santa Cruz, Solomon Islds.

32C. Half Cocoa Nut.

33. Bundle of Bows and poisoned Arrows, Solomon Islds.

34. Long Spears (poisoned), Solomon Islds.

34A. Two Combs (*Ai Seru*), ,,

35. Gourd Bottle, New Caledonia.

36. Old Paddle.

37. Model of Canoe?

38. Cannibal Fork from Fiji.
39. Chief's Neck Ornament, Whale's Tooth, Fiji.
40. Lime Bottle (gourd), Solomon Islds.
41. Ditto (Bamboo-stem).
42. Jade or Nephrite Mere, N.Z.
43. One *Paoi*, Stone Pounder, N.Z.
44. One Stone Implement.
45. Stone-sinker (*Mahi*), Piha, Auckland.
46. Stone-beater (*Tuki Muka*), Piha, Auckland.
47. Part of broken Mere (basalt), N.Z.
48. Cutting end of Stone Chisel (*Whao*), Piha, Auckland.
49. Stone Adze found at Marshland by Edward Chater, Esq.
50. Club, a stone disc on long stick.
51. A Chief's Bowl, inlaid with pearl shell, Solomon Islds.
52. One Wooden Beater, used in making Tappa cloth, Tonga, Friendly Islands.
53. One Body Band, Santa Cruz, Solomon Islds.

53A. War Ornaments, Flying Fox Teeth, New Guinea.

54. Circlets made of Cowry Shells, New Guinea.
55. Necklace, banded black and white, Santa Cruz.
56. Child's Rattle, Santa Cruz.
57. Ten Wreaths of Land Shells, Tahiti.
58. Beads of Red Seeds of leguminous plant, Friendly Islds.
59. One Basket for brains, Fiji.
60. One earthen Pot (*Kuro*), Fiji.
61. Glazed Pottery without handle?

Seven pieces of Maori Carving:—

1. Carved Stern of War Canoe, *Rapa*.
2. Carved Prow, *Tete*.

3, 4. Two Carved Wooden Figures, *Teko teko*.

5, 6, 7. Three Carved pieces of Wood, *Pataka*, etc., used in Native Houses, from New Zealand.

Small Canoe from Tahiti.

Drawing of Maori House by Miss Julia Boyd, 1891.

Japanese Sword (bought in Fiji).

MANUFACTURES.

1. War Jacket and Leggings of Cocoa-nut fibre, Fiji.
2. Tappa Cloth, dark brown (triangular pattern) ,,

3. Tappa Cloth, red parallel lines, Fiji.
4. Tappa Cloth, white, plain, ,,
5. Grass Basket, long handles, ,,
6. Fly Whip, made of Cocoa-nut fibre, ,,
7. Basket, made of grass and flax, ,,
8. Hat, made of ,, ,, ,,
9. Three (Cooking) Fans, ,,
10. Female Dress (*Liko*), black colour, ,,
11. Female Dress, with Shells, ,,
12. Grass Waist-band, ,,
13. Specimens of Flax and Bark, ,,
14. Flax Mat, Whakatipu, rare, N.Z.
15. Thin Shawl of fibre, brown colour, N.Z.
16. Two Flax Petticoats (Maori), ,,
17. Two Maori Native Sleeping Mats from *Oranui*, Taupo district, N.Z.
18. Maori Kit (flax), from *Orokokoraki*, Taupo district, N.Z.
19. Tapore Mat for covering, N.Z.
20. Flax Shawl, ,,
21. Maori Flax Cloak (*Korowai*), N.Z.
22. Flax Bag, Santa Cruz, Solomon Islds.
23. Mat and Tappa from Atiu, Harvey Group Islds.
24. War Belt, Santa Cruz, Solomon Islds.
25. Neck-band (grass), ,,
26. Wreath of Grass, ,,
27. Head Dress, Santa Cruz, ,,
28. Tappa Cloth, ,, ,,
29. Three pieces Tappa Cloth, Samoa, Navigators' Islds.
30. Tappa (best, diamond pattern), Samoa, ,,
31. Kit or Basket (flax), Nalua, Bank's Group Islds.

Sundry Antiquarian Remains, including

Three Celts, Pottery Fragments of Roman period, etc.

Net Sinker, from Lac Bouget, Savoy.

Turned Pottery ,, ,, ,,

Three Celts from Briene, Cote du Nord.

Two Celts, Wm. Henry, Lake George; U.S.A.

Four Celts, Yorkshire Wolds.

Wooden Spoon from foundations of Sherburn Hospital, near Durham.

Etc. *The Executors of Miss Julia Boyd.*

XV.—*A series of five lectures given in the Museum of the Natural History Society on Saturday evenings, commencing Feb. 4th, 1893,* by D. Embleton, Esq., M.D., Prof. M. C. Potter, M.A., Dr. Wm. Somerville, B.Sc., F.L.S., etc., Prof. G. S. Brady, F.R.S., etc., and H. De Haviland, Esq., M.A. The second lecture, given extempore by the Rev. Canon Tristram, on the Migration of Birds, cannot unfortunately be included.

Introduction by D. Embleton, Esq., M.D.

With an earnest desire to encourage the study of Natural History in Newcastle and neighbourhood, and at the same time to utilize the stores treasured in our Museum, it has been thought by the Committee of the Natural History Society advisable to offer to the members of their society, to those of the Tyneside Naturalists' Field Club, and to the juvenile public, a few popular lectures descriptive of objects in the Museum. The first of these lectures it is my privilege to deliver this evening. Had the financial position of the Natural History Society been equal to it, we might have had a professor of natural history of our own who would give regular yearly courses of lectures. Let us truly hope that some future committee may be enabled to offer such an advantage to the community.

At the commencement of this, the first of a course of lectures, chiefly intended for the young, a few words of introduction may not be out of place. The study of natural history is one of the best and most agreeable educational exercises for the youthful mind; it awakens new interests, enlarges and strengthens the faculties; it is healthful and productive of many advantages and of the purest pleasure. It is, like every other study, at first somewhat arduous, but gradually the difficulties lessen, the pleasures augment, and a habit of study, of correct observation, judgment, and memory is eventually established, and the brain becomes a store of varied knowledge which is experience.

The question is still sometimes asked—what is natural history? To this it may be answered it is the history of nature, or natural things from the highest to the lowest; it consists of the description of the life, the structure and functions of all things in nature, from man to the simplest protoplasm, of minerals, vegetables, as well as animals, of the earth itself, the sea, and the sky. The study of a small portion only of any one of these divisions is work enough for most men of talent, though some have distinguished themselves by the intellectual grasp they have taken of the greater part of the realm of nature. Who that knows anything of natural history has not heard of the great names of John Ray, Linnæus, Lamarck, De Blainville, and Cuvier, and their more recent successors in England—Owen, Huxley, Darwin, and others, men who have spent long lives in the study of nature, and achieved world-wide distinction and honour. The ranks of science have lost all these great men and many more, with the exception of Huxley. Only quite recently the venerable anatomist, Richard Owen, has been followed to the grave by the elite of the scientific men of England. These men are to be held up for the imitation of the rising generation of naturalists.

For the successful pursuit of natural history a student can hardly begin too early in life, and ought to be imbued with a love of nature for its own sake, a love like that which possessed and impelled the founders of the Natural History Society and our late lamented friends, Albany and John Hancock, to whose deserved memory the elegant tablet in the vestibule of our Museum has been recently erected. It is to the labours of John Hancock, and his kindly influence over the honoured benefactors of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, that we owe this, our stately Museum building, and the greater part of its ornithological contents, which together form one of the glories of our city, and the envy of other societies and other cities.

A student should choose that branch of our great subject that is most suited to his powers and his love, and must expect to pass years of steady work in the open air and the cabinet before he can know all that is known in his chosen branch of the subject. When he has accomplished this, he will have done much to advance himself and promote his own happiness; but if the successful study of the known be "a continual feast of honeyed sweets where no crude surfeit reigns," how much greater will be his delight, his abiding satisfaction and profit, if he can, out of the dark unknown, discover some new fact or facts which may advance his science and augment the welfare of mankind; that of itself will be a sufficient reward for all his toils and labour of love.

Natural history studies whilst they educate the mind, refine it, keeping it in association with the goodness, truth, and beauty, everywhere to be seen in Nature, and will lead their devotee to a due admiration and correct appreciation of the goodness and power of the Author of this immeasurably wondrous universe.

> "For wonderful, indeed, are all His works,
> Pleasant to know, and worthiest to be all
> Had in remembrance always with delight:
> But what created mind can comprehend
> Their number, or the wisdom infinite
> That brought them forth, but hid their causes deep."

It is not the science, falsely so called, of which St. Paul speaks, that we labour to elucidate; it is no chimera of the imagination that we strive to understand—it is the truth of nature that we search after to bring to human cognizance, and the truth in nature is the truth of God. I appeal to my fellow-students in corroboration of the truth of the lines of the poet of all time, who sings—

> "That this our life, exempt from public haunt,
> Finds tongues in trees, books in the running brooks,
> Sermons in stones, and good in everything."

Lecture 1.—*On the Egg.* By D. Embleton, M.D.

But we must pass on to the subject of this evening's lecture, which is "The Egg." As the Romans believed that at their feasts it was of good augury to begin with an egg and to end with an apple, to pass *ab ovo ad malum*, so we also may not inappropriately begin our short course of intellectual food with an egg—the commencement of life, and end it with an apple or some other form of vegetable life.

The word *egg* is of Northern origin—it was hatched among the Teutonico-Scandinavian hordes in ancient days, perhaps before they came to their present homes. It is the same word *egg* in Icelandic, Danish, Swedish, and Anglo-Sax., with a little difference in spelling. In Ger. and Flemish it is *ei*, and in Early English *ei*, *ay*, *eie*, *egge*. In Southern Europe the name is—in Gr. ᾤὸν, or ὀιον, one, a hen laying commonly one only each day; in Latin *ovum* perhaps related to *avis*, a bird; in Ital. *uovo*, Sp. *huevo*, Port. *ovo*, old Fr. *uef*, pl. *oes*, mod. *œuf*, *pl. œufs*. The Northern and the Southern names are really the same.

The object we call *egg* has been from the earliest times, one of universal and absorbing interest, and that for various reasons, religious and other. It has always been regarded as a wonderful—miraculous thing (which indeed it really still is), mysterious, apparently inscrutable, and with a halo, even of divinity about it, and these feelings were transferred to the author of the egg—the cock and the hen. They were all, indeed, in early ages worshipped or were sacrificed to other idols. Socrates, before his death, reminded his friends that they owed a cock to Æsculapius. Various were the superstitions and legends current among the ancient, and still are, even among modern nations, that have clustered around the egg, which, if collected from various quarters, would fill volumes, and form subjects of great interest and considerable value. The world was an egg to the ancients. The mundane egg was represented on a coin of Tyre, surrounded and protected by the serpent, which also was an object of worship, and was considered typical of the wisdom and power of the Supreme Being. The hen of the fairy tales that lays the golden eggs rerepresents the mythical sky which day by day gives birth to its egg—the sun. The Easter, Paschal, Paste egg was a symbol of the celestial egg, of abundance, of the sun, of the spring time, etc.; but since the Christian era began has been an emblem of the Resurrection, and of Him who died and rose again from the dead. But we have no time this evening to go further into the subject of the mythological egg, and so must proceed to consider the physical properties of the hen's egg.

In size, eggs in general vary a good deal; if the Avifauna, in far remote ages, when the now extinct colossal birds roamed over certain islands of the Pacific Ocean and laid eggs there of the magnitude of the casts on this table, were now living, the average size of birds eggs would be much greater than at present. At the present time the biggest egg is that of the ostrich, and the smallest that of our own dear little golden-crested wren, which is less than the eggs of the smallest humming bird in our collection. Perhaps a good sized hen's egg may not be very far from being an average egg as to size. How dreadfully thoughtless and improvident were these savage Maori who deprived the world of such eggs as these casts represent. It was really a calamity to man when the last pair of the *Moa*, or, as Professor Owen named them, *Dinornis*, were speared and eaten. After that sad event, and in consequence of it, or as some would say, as a punishment, the savages were compelled to take up the horrid habit of cannibalism. The cast of the egg of the *Æpiornis* of Madagascar measures in long circumference 2 ft. 11 in., in short or transverse circumference 2 ft. 5 in., in long diameter 13 in., short diameter 9 in. The Dinornis or Moa's egg has a long diameter of $8\frac{3}{8}$ in. and a transverse diameter of $6\frac{5}{8}$ in. The Ostrich's egg has a long diameter of 5 in., short diameter of $4\frac{1}{4}$ in., long circumference 16 in., short circumference $14\frac{1}{2}$ in. The Cassowary's egg has a long diameter of $5\frac{1}{4}$ in., a short diameter of $3\frac{3}{10}$ in. The Rhea's has a long diameter of $5\frac{1}{4}$ in. and a short diameter of $3\frac{1}{2}$ in. The Emu's has a long circumference of $14\frac{1}{8}$ in., a short circumference of $11\frac{1}{2}$ in., long diameter 5 in., short diameter $3\frac{1}{2}$ in. A Humming bird's is in length half an inch, in breadth $\frac{3}{5}$ of an inch. The Golden-crested Wren's is in length half an inch, breadth $\frac{4}{10}$ of inch. Of the common Hen, the length is $2\frac{1}{8}$ in., breadth $1\frac{1}{2}$; long circumference $6\frac{3}{8}$, transverse circumference $5\frac{1}{2}$. The weight of an ordinary hen's egg is about two ounces.

The form of an egg is one of beauty and strength. The terms, *oval*, *ovate*, and *ovoid* are derived from the Latin *ovum*. The egg shape for ages has been imitated by architects and decorative artists. The cornices of buildings and rooms were and are beautiful with the egg and tongue or the egg and arrow device. The lantern on the tower of our Cathedral of St. Nicholas stands on intersecting arches which subtend the form of the sharp end of a hen's egg. Many so-called Gothic windows terminate above in an egg-shaped arch. Our drains for sanitary purposes are made not square-bottomed as formerly, but egg-shaped, with the sharp end downwards so as to allow of sewage being carried down more rapidly and completely—an unsavoury but eminently useful adaptation of form and beauty. In writing correctly the letters of the alphabet, the form of either end of the hen's egg is the model to be imitated. The copper-plate copy-heads for schools have all their letters formed on the model of an egg. The original form of all creatures is that of an egg. Harvey, the great discoverer of the circulation of the blood declared and with truth, more than 270 years ago, *Omne vivum ex ovo*. Further, the bodies of mammals, birds, insects, mollusca and many of the still lower animals, are more or less egg-shaped in whole or in part. Of plants likewise, in some cases the whole plant, in most, the leaves, the fruit, the seeds, participate in exhibiting more or less of the same beautiful form.

We may safely carry this investigation further, and even to individual parts of the external and internal organization of man and animals. Many of our own external organs present in their general outline a form more or less exact of an egg, for example, the head, the face, the eye, the ear, the tongue, the hand, the foot, and so forth. The same can be said of the internal organs for example the heart, the two lungs taken together, the glands, and other internal parts. In short, this curious form pervades the whole of nature.

Now, birds' eggs present almost innumerable modifications of the form we are considering, from the almost round or orbicular egg of the ostrich, and sparrow hawk, to the elliptical eggs of the emu, rhea, and cassowary, which are rounded at each end alike, and to the markedly pyriform ova of the plovers and other wading birds and guillemots.

The colour is one of the properties of eggs that excites considerable interest, and which, in its beauty varies greatly. Whilst the eggs most in use and estimation are white,—though there are some white eggs that are not eaten—others have a uniform ground colour of blue, green, yellow, pink, red, orange, or brown, or, in short, of almost any shade of colour but without any spotting or marking. Others again, whether white or of any ground colouring, are variously spotted or streaked or blotched. Now, these colours are exactly the same as we see on our own skins that have been violently bruised with effusion of blood; for example, witness what occurs in case of a black eye in its course towards recovery,—at first it is "black and blue" and may be bloody, and by degrees passes through the same series of colouring that may be observed in a series of coloured eggs of birds, ending in the faintest yellow,—a succession of colours known to the fighting school-boy. As these colours in the human skin are due to blood effused from ruptured blood-vessels, to the inflammation or congestion caused by the blow, and to the changes undergone in the blood and serum effused, during their absorption, so the colours of the eggs of birds are due to the inflammation or congestion of the mucous membrane of the oviduct and to the effusion of blood from ruptured blood-vessels upon the plaster covering, or shell of the egg.

We now come to the making up of the egg of a hen or other bird. The parts immediately concerned in this process are the *ovarium* and the *oviduct*. The ovarium is a most delicate transparent membranous bag attached to the spine of the bird, and is full of yellowish-orange coloured cells or globules of different sizes, or ova in different stages of development. These are incipient yolks of future eggs, and in each ovum when mature there is to be found a very small vesicle, but one much larger than the rest of the globules with which the coloured yolks are filled. In this small vesicle is another still smaller. The former is named the "germinal vesicle," the latter the "germinal spot." These are the essential—the living parts of the egg in which evolution commences. Below the ovarium and attached to it is the top of the oviduct, which is a starlike opening into a rather tortuous tube, extending to the posterior part of the body, where it ends in a dilatation that leads to the exterior. The oviduct is a muscular contractile tube, lined by delicate mucous membrane richly supplied with blood-vessels and nerves, and performs a truly remarkable part in the process of egg-making. It is divided, but functionally only, into three parts, continuous with each other, each giving out a distinct and peculiar secretion as the egg passes down it. The little globular ova in the ovarium, which are really the seeds of the bird, enlarge, develop, and ripen one after another at the rate of one, or sometimes even two, in twenty-four hours during the laying season. When one has become mature, it bursts the general wall of the ovary, and drops into the expanded upper end of the oviduct, which receives, embraces, and presses it on gently into the tube. The nerves and blood-vessels of the oviduct become excited, the nervous impressionability is heightened, more blood rushes into the part, and the whole oviduct becomes largely swollen, reddened, and prepared for action. Now, the ovum, which is the yolk of the future egg, is no sooner fairly lodged in the oviduct than it is flooded over by an albuminous liquid rushing out from the excited walls of the oviduct. This is the white of the egg, and it is laid on in successive strata. The ovum thus enlarged distends the oviduct. This excites contraction of its muscular wall, which drives the ovum onwards to the second part of the duct. There, a different secretion is poured out by the mucous membrane, and which is scanty as compared with the previous one. It resolves itself into minute filaments, which are interlaced in every direction, forming a fine fibrous membrane, which completely encloses the white. A first layer being thus finished, another, exactly like it, is laid over it, and the two constitute what is called the membrana putaminis, or shell-membrane—a first defence of the fluids within, and a platform on which the shell may be safely laid down. This rougher, and quasi-foreign body, excites the mucous membrane, which had produced it, to rouse the muscular wall to contract and push the more than half made egg further down, and into the third division of the oviduct. There the excited mucous membrane gives out a third secretion, which is copious, covering over the shell-membrane, and consisting almost altogether of a solution of carbonate of lime. Layer after layer is given forth till the supply is exhausted; this being so, and the plaster having thoroughly and firmly set, the shell is formed and the egg is completed, and is thrust down into the receiving pouch beneath, and is ready to be laid.

Now, it is during the third part of this truly wonderful process—the egg-forming—that the coloration and the exact form of the exterior of the egg are determined. The shell is generally smooth on the surface, but the cormorant's white eggs are rough, and long and narrow. When the egg is smooth and slender, and the oviduct moderately excited and vascular, the egg may pass easily down the oviduct and be laid pure white. Some few are quite as if polished. The uniform ground colour of eggs, whether these are spotted or not, is owing to the state of the circulation and innervation of the mucous membrane of the oviduct at the time the egg is passing down the third part of the oviduct. If that part be congested at the time, the liquid plaster may be tinged more or less deeply with blue—pale as in the egg of the heron and kingfisher, darker as in that of the hedge-sparrow, thrush, and starling. If more congested or inflamed, the plaster may get a yellow tinge as in the egg of the grebe; a green in the emu, or a pink tinge; in a still higher degree of congestion the egg may be stained less or more with red, and blood be effused in varying quantity, forming spots or blotches in some cases almost covering the whole surface of the egg, and patches assuming even a black colour, as in most of the eggs of the Falconidæ. If in addition to the quasi-inflammatory state (which is evanescent) of the mucous membrane, if the egg be bulky and the blood vessels numerous and turgid, and the grip of the egg by the muscular wall of the oviduct be tight, one or more of the blood vessels may be wounded, and the blood escaping, must fall on the abrading part of the egg, giving rise to one or another form of spotting or streaking or blotching. And this may occur either with white eggs or with those of any ground colour, as we find in nature. Spots that are round have been deposited when the egg was not moving, streaks when the egg has been moved by the contraction of the muscular wall in various directions, and it is apparent that, from the evidence to be gathered from some eggs, as those of the crane, snipe, sandpiper, and others, the course of the egg down the lower part of the oviduct is spiral.

The spots, streaks, and blotches are as a rule much more commonly found at the big end of eggs—the part that offers the greatest resistance to expulsion. Caps of black blood and rings of the same are every now and then found, as on the eggs of the titmouse, robin, and especially the razorbills, guillemots and gulls and others, which are of varied ground colour and much spotted. The sharp end is occasionally marked more than the big end. Whichever end is very much more spotted or blotched than the rest of the egg is that which passes first down the oviduct. The big end being far the most marked end, passes therefore most commonly first down, and it is first born or laid. Now there seems every probability that the big end of an egg is the male end, and we know that in the higher animals—the Mammalia, it is the head which is the part first born. Sometimes under the superficial layer of the shell bloodstains and blotches can easily be detected.

At one end of the egg, most commonly at the big end, there is a cavity formed by a division, or separation of the two laminæ of the shell membrane. One continues to the end of the egg, lining the shell; the other crosses the interior, bounding the white and separating it from the cavity. This is provided for containing air, which is to serve for a short time the respiration of the embryo before it is hatched. The air contained in it is said to contain more oxygen than the air external to it. This however has not been confirmed.

An egg, then, coloured or not coloured, consists of shell, shell-membrane, white, and yolk. The last is the principal or essential part of the egg, the others only accessory, and which in the eggs of some of the lower animals, as fishes, etc., are wanting. The shell is composed almost altogether of carbonate of lime, mostly smooth, and is porous, allowing of the passage of air. The shell membrane adheres to both shell and white, and is beautifully fibrous. The white is composed of concentric layers, which can be shown by careful boiling when they become coagulated and may be separated. It is entirely composed of albumen, which is tasteless. In the midst of the white lies the yolk, suspended at its poles by twisted membranous filaments, called *chalazæ*, formed from the albumen, and twisted by rotations of the yolk. The yolk is composed mainly of a series of cells or globules filled with oily nutritious matters for the sustenance of the embryo.

The edibility of eggs: Hunger must first of all have impelled man in his quest for food to break an egg. The most of birds' eggs are edible, but all are not agreeable. Which are the best? Those of the common fowl; and of them, those that are large, long, and fresh. How good these are at table who will deny? Next to them are the eggs of the pheasant, the partridge, the quail, the turkey, the guinea fowl, and pea fowl; the pigeon (tame and wild), the duck, the goose, the plovers, and the guillemots. Doubtless the eggs of the Æpiornis and Moa were delicious, judging from the clean feeding of the birds.

The eggs of the various races of *Silkworms* vary in colour and shape, being round, elliptical or oval. (Darwin, "Variation of Animals and Plants under Domestication"). Ant's eggs are white or yellowish and somewhat elongated. (Sir J. Lubbock, "Ants, Bees, and Wasps").

In conclusion, to give some idea of the value of eggs imported into Great Britain.—I quote from the "Economist:" "In the year 1892 the value was £3,793,018." The value of those laid in Great Britain I do not know.

Lecture, No. 2.—*Frogs and Tadpoles.* By Prof. M. C. Potter, M.A., F.L.S., etc., Feb. 18th, 1893.

Perhaps some of the most interesting problems of Natural History are those connected with the study of Embryology; that is, the study of the gradual evolution of animal and vegetable forms from their initial stage to the time of their complete development.

Frogs and Tadpoles have been chosen as the subject of this evening's lecture, partly because they are fairly low in the scale of organization and exhibit a well defined series of changes; but more especially because they are common and familiar to everyone, and many facts can be studied in the metamorphosis of a Tadpole to a Frog, which show clearly and distinctly the true conception of the Unity of Creation and the gradual progression from the lowest to the highest forms of animal life.

The great charm of Natural History springs from the fact that it leads to the habit of observation, creating an interest and diverson in our country walks such as no other subject can supply. No organism is too small or too humble for our notice and the information derived from our own observations, even though previously well-known, unlike the greater part of book-knowledge, is never second-hand, often leading to the clear appreciation of some little fact which had before escaped us, and now partaking of all the delight of a discovery.

In a few week's time every pond and stream will be found to contain large masses of a kind of jelly with black specks, familiarly known as frog-spawn. We will therefore, to-night, trace the changes which take place in this spawn, through the young, fish-like forms swimming in water, until the mature frog appears, and finally takes up his semi-terrestrial existence. These necessary changes occupy sometime,—about thirteen weeks, the duration being somewhat determined by the temperature and supply of food, so that the young frogs make their appearance about July, and have the remainder of the warm weather in which to grow and get fat, and store up a reserve of food before the winter's cold sets in.

If some of this spawn be placed in a glass of water and held up to the light to examine, each black speck will be found to be surrounded by a white, jelly-like mass, the whole appearance exactly resembling that produced by a number of eggs when they are broken together without the yolks being disturbed. In fact, each black speck is the yolk, and the white jelly the white, of a frog's egg; the chief difference being that the frog's eggs never have any shells, while those of birds always possess this covering. It is from the yolk that the young frog will be developed, the albuminous substance supplying the nutriment to be used as the changes proceed, in the same manner as the albumen of the hen's egg provides the nourishment for the development of the chick. We must regard the yolk as a single cell, that is, a unit of living substance, or a unit of life. The frog commences life as a single cell and all organisms, whether plants or animals, commence life from this very humble origin; the lowest persisting in this stage throughout their whole existence, while the highest are gradually constructed by a most wonderful series of changes. The frog's eggs at first are spherical, but if we continue to observe them, in about a week they may be seen to become ovoid, and afterwards to increase in length, until about the tenth day they have a slight appearance of division into head, body, and tail. With a pocket lens these changes could be more closely followed; very soon the black speck would be seen to divide vertically into two halves and this division is repeated in a plane perpendicular to the first, so that the original cell has now become four cells. The next division will be a horizontal one, but nearer the upper pole, which, it will be observed, is much darker than the opposite extremity. The segmentation proceeds regularly until sixty-four cells have been formed, and the black dot now resembles a number of black heads fastened together, enclosing a hollow space, the upper cells being smaller and more numerous than the lower ones. The second stage, known as the *Blastula-stage* is now reached, namely a number of cells congregated together at the circumference of a sphere.

Now, there are many organisms which advance to this point but never procced any further; such for instance as the *Volvox globator*, a plant which is familiar to every microscopist. These are merely cell-colonies in which all the cells are exactly similar and equal in all respects. The blastula-stage is found in nearly all, if not all, animals, at an early period of their development.

The next period is commenced by the cells at the upper end (which we remember were smaller and darker than those at the opposite extremity) gradually increasing and surrounding the larger ones with the exception of one small spot, until the yolk cells are nearly completely enveloped.

The significance of this process is best understood from a parallel case in the Lancelet (*Amphioxus*). In the blastula of this animal, the lower cells are similarly larger, they become flattened and then arch upwards, and finally come into contact with the upper cells; at the same time the lower opening closes, all but a narrow pore. In the frog, on account of the great preponderance of yolk cells, this process is not so simple; the cells on the upper side grow over the lower ones, and the central cavity commences to grow inwards from the point which was left uncovered—the *blastopore*. This cavity is the future alimentary canal.

The third stage is now reached,—the *gastrula*—which may be described as a sac, open at one end. In this condition also, many animals persist throughout their entire existence, such as *Sea-anemones* and *Hydra*, etc., which belong to a group known as *Cœlenterata*, which have only one body-cavity,—merely sacs open at the mouth, round which a number of tentacles are arranged.

The next development is the elongation of the embryo, so that it becomes ovoid. The changes we have just described will take about a week, but in about three to four days more, slight constrictions are formed, which indicate the division into head, body and tail, though as yet none of these organs are formed. The changes which now set in are very important and complicated. The ovoid embryo elongates considerably, the brain and spinal cord are formed along the dorsal surface, and just beneath these the backbone takes its origin. A number of parallel ridges or folds next appear on each side of the head—these are known as the visceral arches, and are six in number. The last four of these are the branchial arches; and from the first, second, and later the third of these branchial arches, the skin grows out into tufts, forming the external gills. During this time the whole embryo has begun to assume a fish-like form, the tail begins to grow rapidly, the external gills are fully developed and the tadpole is now ready to emerge. It is set free from the gelatinous mass in about a fortnight from the time that the eggs were laid—it has eyes, but as yet no mouth, it breathes by means of the external gills and swims with its long tail, in the water. A sucker is developed, beneath where the mouth will appear, by means of which the tadpole can attach itself to weeds or other objects in the water. A few days after hatching, the mouth is opened, and it now feeds on vegetable matter the previous development having been sustained from the reserve food in the white and yolk.

This brings us to the fourth stage. Again we find many animals which persist in this stage, having external gills, and although perfect in all respects must be regarded simply as Tadpoles. The Tadpole, however, does not long remain in this condition, soon four gill-slits make their appearance on each side of the neck. These are openings leading from the outside into the throat, and are developed between the four branchial arches. The sides of these slits become folded to form the internal gills, and as this process takes place the external gills wither away and the Tadpole becomes a true fish.

By a fish, of course, we do not mean any animal which happens to live in the water, but an animal possessing certain specific characters, namely:—a backbone; breathing by gills; the course of the circulation of the blood.

The circulation of the blood is very characteristic in the fish. The heart pumps the blood directly into the gills, where it is purified, it is then collected into the artries and distributed over the body, the mammalian method being for the *heart* to directly distribute the blood over the body. The tadpole exactly corresponds with the fish, its heart pumps the blood at first into the external gills, where it is aerated, and a little later into the internal gills. The gill-slits are now no longer exposed, a fold of skin grows from the sides of the head, and proceeding backwards, forms a chamber into which the gills open externally, and which itself opens by an aperture on the left side of the tail.

The tadpole feeds very freely and as a consequence increases very much in size. Its tail, too, lengthens considerably and becomes a powerful swimming organ. While still in the fish-stage, the limbs begin to appear. The hind limbs are first apparent and are formed on each side of the root of the tail. The fore-limbs are formed inside the gill chamber and have to force their way out. They are therefore a little later in making their appearance. The tadpole thus masquerades for a short period as fish with legs. It has not yet reached its full development, but continues to grow for some time longer, and about two months from the laying of the egg, lungs commence to be formed. The details of the alteration of circulation necessitated by the change from a Gill-breather to a Lung-breather are important. As the lungs get larger and larger, the gills decrease in importance, and towards the close of another three weeks a distinct metamorphosis takes place,—the fish condition is abandoned and the mature amphibian stage adopted.

The Tadpole ceases to feed.

It casts off its outer skin, as well as the horny jaws.

The mouth becomes wider and the tongue larger and longer.

The eyes come to the surface.

The front legs become apparent.

The stomach and intestines become adapted for carnivorous existence.

The gills gradually become absorbed and the gill clefts close. As the gills become of less and less importance a pair of bladder-like lungs are formed.

The tail is gradually absorbed.

The Tadpole becomes a carnivorous feeder and is now a veritable Frog.

We have thus traced the development of a frog through successive changes from a single cell, showing how any animal, in the various stages of development which it undergoes, simply repeats the ancestral history of its race, or, as Prof. Marshall neatly puts it, "Climbs up its own genealogical tree." It must therefore be supposed that it has sprung originally from an ancestor living in a unicellular condition throughout its life. But if you ask me whether I consider a Frog is descended from a Jelly-fish or from a Hydra, I must answer, "Certainly not." This would be as absurd as to say that Man is descended from a Monkey, whereas the only contention is that both are descended from a common ancestor.

It will be allowed, that the condition of the earth when life commenced, was very different from that we enjoy at the present time; and, in fact, that condition would have precluded all possibility of the existence of Life as we find it to-day. We must assume that the earliest forms of life were unicellular, and that a gradual development has taken place from this humble beginning; and as the earth gradually changed and became more favourable to life, so higher organisms would be able to subsist.

The first variation from the primitive type would be the *blastula*, or, a colony of equal and similar cells; and then the *gastrula*, when a division of labour sets in,—certain cells being protective, others nutritive—and as each stage in progression is reached it would be the starting point for innumerable new developments. Some of these might attain further advancement; while others, perhaps failing to make the most of their opportunities, or the force of circumstances, rendering further progression impossible, their higher development is limited, and they either remain stationary or drop out of existence. They are merely branches from the main trunk, from the summit of which only continuous growth and development is possible.

The Lecture was illustrated by a series of lantern slides showing the stages in the development of the Frog, together with various persistent unicellular, blastula, gastrula, and perennibranchiate forms, and the changes in the circulation from the Tadpole to the Frog, concluding with illustrations of various kinds of allied forms—Edible frog—Flying frog—Flying dragon—Surinam toad, etc.

LECTURE, No. 3.—*The Structure of Timber.* By Prof. WILLIAM SOMERVILLE, Ph.D., B.Sc., F.L.S., etc., Feb. 25th, 1893.

WHEN asked to contribute a lecture to the present course, I thought it might not be uninteresting if I endeavoured to give a general sketch of the structure and mode of formation of an economic product that ministers greatly to our comfort and necessities. My object, however, is not to enter much into the minute anatomical peculiarities of the different varieties of timber, but rather to describe in plain language how a bit of wood has been produced, and to call attention to some of its more prominent features.

Wood is a product of the growth of a tree in two directions, namely, in height and in thickness. The height-growth of a tree is entirely confined to that portion of the stem which is represented by the youngest annual shoot. Further back in the stem the tree is undergoing no vertical extension, and the tale that is sometimes told us of the boy being unable to pass erect beneath a certain branch, while fifty years afterwards the man has no difficulty in so doing, may be explained by the surface of the ground having been worn down or depressed, but not by the base of the branch having been elevated.

During the winter there is no growth in height, and all the tissues that will form the height-growth of the tree during the following season of growth are at that time confined within the bud which usually terminates a stem or branch.

Perhaps the clearest idea of how growth in height really takes place may be obtained by examining a young shoot of a tree in the middle of the growing season, after vertical extension has begun but before it has been completed. For this purpose the shoot may be regarded as divided into three regions or zones. At the extreme apex we have a portion of tissue where the cells are very small, of nearly the same diameter in all directions, possessed of very thin walls which are easily extensible, and full, or nearly full, of that vital substance common to all plants and animals which bears the name of protoplasm. It is in this portion of the shoot that new cells are being formed by the process known as cell-division. A fresh cell-wall cuts across a cell and divides it into two equal portions, and these two new cells may subsequently undergo the same change, so that from one cell we get two, from two, four, from four, eight, and so on. But it is quite evident that if nothing more than cell-division were going on in a young shoot we might have indefinite multiplication of new cells without, however, obtaining any absolute increase in the volume or weight of the shoot. We may compare this division of cells to the bisection, quartering, and so forth of an orange. We may cut up an orange into any number of parts, but we do not thereby increase the quantity of material with which we are dealing. Similarly in the case of young vegetable cells. Cell-division is entirely responsible for increase in numbers, but we must look elsewhere for increase in size and increase in weight.

To return, then, to the extreme apex of the young growing shoot, we have there cell-division going on energetically, and especially in the front or upper margin of that region. In the lower portion cell-division is not so active, that is to say, the young cells show less disposition to re-divide, or in other words, they show a greater tendency to maintain their individuality. This then introduces us to the second region of our shoot, which lies below the zone or region of cell-division, and which is designated the zone of cell-elongation. There is no sharp line of demarcation between these two regions, that is to say, we have cell-elongation taking place in the zone of cell-division, and cell-division taking place in the zone of cell-elongation, but for the most part the cells are dividing above and elongating below.

In the zone of cell-division we noted that the cells were practically full of protoplasm, that they were more or less spherical in shape, and that they had very thin walls consisting entirely of that most elastic substance called cellulose. In the second zone, namely, that where cell-elongation is taking place, we find that the cells differ somewhat in appearance from those in the first. The main points of difference are that they are very much longer than broad, and that they are not nearly full of protoplasm. The difference in shape is accounted for by the passage of water through the cellulose walls into the inside of the cells, and the consequent internal pressure that is developed. This osmotic pressure, as it is called, causes great distension of the cell-walls and results in the cells, which were originally roundish, becoming oblong in shape. So far, however, the character of the cell-walls has not altered. They are still composed of thin elastic cellulose, and it is for this reason, in fact, that any distension is possible.

The comparative scarcity of protoplasm in these elongated cells is the natural consequence of the volume of the cell increasing without any corresponding increase taking place in the protoplasmic contents. Instead of these filling up the cell they now form a thin pellicle on the inside of the wall, like the plaster in a room, with, in most cases, a few threads running across from one wall to the other.

It is in this part of the shoot that most of the height-growth of the tree takes place, and it is there that the cells assume the shape which they are permanently to retain. But so far the cells are limp and pliable if the osmotic pressure, or turgidity as it is called, is relieved, as for instance it is by cutting off a shoot and allowing the water to escape by evaporation. To ascertain how permanent rigidity in woody cells is secured, we must examine the shoot a little further back than the region where cell-elongation is chiefly taking place. This portion we may call the zone of internal development of the cells. Of course there is no hard and fast line between the portion of the shoot where the cells are elongating under the influence of osmosis and the portion where such elongation has practically ceased, but it is convenient to look at the subject as though there were. The cells, then, having attained to their full size, begin to pass over into the condition of permanent and durable tissue. This condition is induced by the protoplasm, which sets about thickening and impregnating the elastic cellulose cell-wall with lignine or woody substance. When this process has fairly begun the cells lose their elasticity, for lignine being inelastic prevents any further stretching. The whole of the cell-walls are not covered or impregnated with lignine, for thin spots are left at numerous places to permit of osmotic communication between adjoining cells, but with the exception of these spots, which ultimately appear as depressions and are frequently known as "pits," the cell-walls become hard and rigid. When all the protoplasm has disappeared the cells are dead, and it is cells in this state that form the great bulk of all timbers.

Summing up what has been said, it amounts to this, that the height-growth of a tree is entirely confined to the youngest shoot, and that it chiefly finds expression in the vertical elongation of the cells that are produced by division in the region of the shoot close to the apex. The ultimate lignification of such elongated cells induces firmness and rigidity, but does not occur until distension has practically ceased.

Coming next to diameter-growth, or growth in thickness of a tree, we find that it occurs all over the outside of the wood of the stem and branches. Passing outwards from the wood to the bark of a tree, we come to a point where it is difficult to say whether the tissues are wood or what is popularly called bark. It is in this thin layer of cells known as the cambium that all the wood and all the bark are formed. Here we have energetic cell-division going on, the cells produced on the inside ultimately thickening and lignifying to form wood, those on the outside remaining more pliable and forming the so-called bark. The exact position of this cambium layer may be best determined by taking a branch or stem during the period of growth and peeling off the bark. The separation takes place along the zone of cambium, which is practically destroyed by the operation.

As in the case of growth in height, so in the case of growth in thickness, no activity is manifest except during the genial weather of spring, summer, and autumn. Taking a typical tree such as the Scotch pine, and speaking perfectly generally, we have the following points to note in connection with growth in thickness. In spring, whenever the climatic conditions become favourable, the cambium becomes active and starts to manufacture fresh wood cells. This process goes on during summer, to cease only when the autumnal weather becomes unfavourable for its continuance. During the period when the cambium is active it manufactures a sheet of wood which is disposed all over the tree, and which, when viewed on a cross section, is known as the annual wood ring. Now, although this ring of wood is so far alike throughout that it contains the same kind of cells in all its parts, it presents some notable differences in appearance according as the portion is produced in an early or a late period of the season of growth.

The portion which is formed first is known as the spring-wood, and is characterised by the cells having comparatively large internal chambers and rather thin walls, whereas the autumn-wood formed later is much denser, the cells having much smaller internal spaces and thicker walls. That is the reason why, on examining the cross-section of a tree, we have usually no difficulty in saying where a ring begins and ends. The dense autumn-wood of one year abuts on the porous spring-wood of the succeeding year, and the variations in colour which these different degrees of density produce enable us to determine, even by the naked eye alone, the exact limits of an annual ring.

We come next to consider the causes which are accountable for the variations of the spring and autumn-wood. The more generally accepted theory is Sachs', according to which the cells of the spring-wood are large and those of the autumn-wood small, simply because in spring less resistance is offered to the cambium than in autumn. The pressure on the cambium in spring is less than in autnmn owing to the mollifying influences of rain and frost during winter, whereas in autumn the new wood formed earlier in the season has filled up all empty spaces and induced considerable pressure on the cambium mantle. It can be shown experimentally that increase or decrease of pressure on the cambium influences the production of wood and, to some extent, the shape of the cells, and on the whole the theory of Sachs explains the variations in the wood ring very satisfactorily. Hartig, on the other hand, holds that the porous character of the spring-wood is due to deficient nourishment of the cambium, and that the greater density of the autumn-wood is the result of the cambium being better provided with the materials requisite for the maintenance of activity in its cells. No doubt in spring and early summer the tree cannot have the maximum amount of food to offer to the cambium, for leaves being scarce and the days being cold and comparatively short assimilation is somewhat slow, and moreover much of the products of assimilation are required at that time to build up new shoots and leaves. Later on in the season the products of assimilation being more abundant more food is placed at the disposal of the cambium, which responds by producing firmer and more durable wood. It seems to me that these rival theories both assist in explaining the state of things that we find in a wood ring, that of Sachs' being necessary to account for the variations in the shape of the cells, while Hartig's more satisfactorily explains the different degrees of thickness of their walls.

This cambium mantle, which produces practically all the wood and bark of a tree, could never display so much energy were it not well provided with nourishment, and to a certain extent the amount of wood annually produced—in other words the breadth of the ring—stands in intimate relationship to the nourishment at the disposal of the cambium. Trees growing in good soil and in a good climate grow faster, and their wood possesses broader rings than trees reared under opposite conditions. But it is not the nutritive substances which move up a tree from the roots, but those which come down from the leaves that enable the cambium to do its work, as a simple experiment will easily convince us. If we remove a ring of bark from the bole of a tree some inches in diameter, we shall in many cases find that the tree continues to grow for years apparently as if nothing had happened. If, after a few years, we fell the tree and examine a longitudinal section we shall find that, after ringing, growth was entirely confined to the stem above the point where the band of bark was removed. Now, this simple experiment throws light on a variety of points. It shows, in the first place, that the ascent of the water and mineral matter must be through the wood and not through any of the tissues of the bark, and it demonstrates too that this ascending stream is incapable of supplying the energy to the cambium that results in the formation of wood. And, again, the production of new wood above the ringed portion proves that it is something that comes down from the leaves which feeds the cambium, and that this nourishing stream must descend through the bark and is incapable of utilizing the wood for its passage. And such, in point of fact, is the case. No elaborated plant food could be sent down from the leaves if crude food did not flow up from the roots, but it is well to bear in mind that it is only the descending stream that has any power *directly* to influence the production of wood. This holds true as well of the roots as of the stem, for the former can no more increase in thickness in the case of a tree that has been ringed, than can the stem below the point of rupture of the bark.

Having thus briefly sketched the manner in which wood is formed, let us look a little more closely at its structure, especially where this may be made the means of enabling us with ease to identify the timber produced by some of the commoner genera of forest trees.

When examined under the microscope many timbers may be identified readily by the characteristic markings or sculpturings that are met with on the cell walls; but one of the objects of this paper is to call attention to certain peculiarities that are sufficient in many cases to decide the kind of timber without having recourse to the microscope. A pocket lens is a useful aid in this work, but still nothing more than good eyesight is absolutely necessary.

Nearly all timber is the produce of the growth of trees belonging to two great divisions of the vegetable kingdom, the conifers and the dicotyledons. The former term is now freely used in popular language, while the latter includes the trees that are commonly called hardwoods, or deciduous, or broad-leaved trees. It is immaterial which term we make use of so long as we understand exactly what we mean, but "deciduous" cannot be correctly used as opposed to conifer, because certain conifers, notably the larch, are also deciduous, and many trees that would, under this loose system of nomenclature, be included in the deciduous group, do not annually shed their leaves, as, for instance, the holly and evergreen oak. The "hardwoods," too, do not all furnish wood that is hard, and the wood of certain conifers is much harder than that of many trees that bear the name. It is a better division of arboreal vegetation to arrange trees into two groups according to the prevailing form of the leaves; the one, "needle-leaved" trees, corresponding to the conifers, and the other, "broad-leaved" trees, corresponding to the dicotyledons.

A piece of timber yielded by a conifer can at once be distinguished from that of a dicotyledon by the fact that it contains no vessels, if we except a few in the immediate neighbourhood of the pith. Vessels are long tubes, so long in fact that they may extend from the leaves to the roots, and are usually sufficiently large in the bore to be easily recognizable with the naked eye. If any doubt exists as to their presence the point may usually be decided by taking a thin transverse slice with a sharp knife and holding it up to the light. Amongst the conifers the most important genera are *Abies* or true firs, *Picea* the spruces, *Pinus* the pines, and *Larix* the larches. Timber furnished by the first two genera possesses many points of similarity. It is light in colour, of uniform colour throughout—that is to say, from the pith right out to the bark—and about the same specific gravity. But there is always this distinction between specimens of wood yielded by these genera of trees. If a thin cross section be taken from a spruce (*Picea*) and held up to the light numerous small brown spots will be noted, whereas no such marks are met with in the wood of the firs (*Abies*) These spots are ducts in which resin is manufactured, and are known as resin canals or resin ducts. Not only does one fail to find them in the wood of *Abies*, but they are also absent from the wood of the juniper, cypress, yew, and some other conifers. We have next to distinguish between the wood of spruces, pines, and larches, and this is a matter of no difficulty, because, as has already been said, the wood of the spruce is of uniform colour throughout, whereas the wood of pines and larches has a more or less red centre. The red, brown, or black heart-wood that one meets with in many trees is technically known as the duramen. It differs in colour from the lighter sap-wood or alburnum situated nearer the circumference, owing to some oxidation changes having occurred in the resin or gum that it contains. These materials are deposited in the cells and in the cell-walls in a solid form, and so plug up the organs that they are incapable of conducting sap. The central wood of most trees is, in fact, to all intents and purposes dead, and that it is not essential to the life of a tree is proved by the fact that hollow trees live for years and, it may be, centuries. The absence of duramen, then, separates the wood of the spruces from that of the pine and larch, and these two latter genera may be distinguished by the duramen of *Pinus* not occupying so much space and not being so deep-coloured as the same portion of the wood of *Larix*. Moreover, in some pines the heart-wood does not become dark till the tree has been felled for some time, whereas in the larch it is always dark even in growing trees.

And now we come to the great division of the dicotyledons, which all agree in possessing vessels. In many of these trees we find that the vessels are so very much larger in the spring-wood of a ring than in the autumn-wood, that we require to examine a cross section somewhat carefully to detect their presence in the outer portion of the wood-ring at all. Amongst trees possessing a well-marked porous zone of spring-wood we find such important examples as the oak, elm, Spanish chestnut, and ash. In order to classify the wood of these trees we require to call to our aid the important organs in trees that are known as medullary rays. These are met with in all trees, and consist of bands of cells which radiate from the centre, or from some other point in the wood, out to the bark. In some trees they are so fine as to be observed with difficulty on a cross section with the naked eye. This is the case with all conifers, and also with such dicotyledons as the willow, poplar, pear, etc. In other trees, such as the plum and true plane tree, they are comparatively large and striking, while in others, such as the oak and beech, we find both broad and narrow medullary rays.

As regards the disposition of the vessels the oak and Spanish chestnut bear a close resemblance to each other, and the timbers of these trees are often confounded. In both cases we find a porous zone of large vessels in the spring-wood, while in the autumn-wood the smaller vessels are arranged in somewhat radially running lines. But whenever we come to examine the medullary rays the points of similarity in the woods of these two trees vanish. In the oak many of these organs appear like thick lines running out towards the bark, while in the Spanish chestnut all are barely recognizable. In the ash the medullary rays are also very thin, but here there is no appearance of a radial arrangement in the vessels of the autumn-wood. The very dark and large duramen of the elm is of great service in distinguishing the wood of that tree, and if another characteristic feature is wanted, it is found in the peculiar wavy lines in which the vessels of the autumn-wood are disposed. These do not run radially as in the oak and Spanish chestnut, but more or less peripherally, that is to say, parallel to the circumference.

Woods whose identification frequently causes some difficulty are the beech, the hornbeam, the sycamore, and the alder. In all of them the vessels are very small and fairly equally distributed throughout the ring, and none has a true duramen. In the sycamore all the medullary rays are distinctly visible, and of about an equal size. In the alder some of the rays are broad and prominent, while the finer ones can scarcely be made out. Moreover, in this tree one usually meets with small brown patches throughout the wood called pith-flecks, which are due to the borings of a larva in the cambium. The wood of the beech is usually somewhat darker in colour than that of the hornbeam, and the broad medullary rays are more sharply defined. Besides, the wood of the hornbeam may almost be said to be characterized by the undulating course of the wood rings, which usually dip in slightly towards the centre of the tree whenever they are crossed by the broad medullary rays.

Without the aid of carefully prepared illustrations it would scarcely be possible to direct attention to the minute points of distinction that enable us to distinguish such woods as birch, poplar, willow, etc. From what has been said, however, it will be seen that if carefully looked for certain peculiarities will be found in the structure of many timbers that are most useful in assisting us to their identification. Anyone who has good eyes and observes carefully will easily detect those to which I have alluded, and will doubtless discover others which the scope of this paper prevents my referring to.

The lecture was copiously illustrated with lantern slides and specimens.

LECTURE No. 4.—*Parasitism in Plants and Animals.* By Prof. GEORGE STEWARDSON BRADY, M.D., LL.D., F.R.S., 4th March, 1893.

THE subject of parasitism is so extensive that we might well occupy not only one, but a great many evenings in the consideration of it. Possibly it may not have presented itself to many of you in this light, but a moment's reflection will suffice to show that I have not overstated the matter. In the first place, all animals are pestered with parasites, both internal and external;—most animals having one or more species peculiar to themselves, besides others which are less restricted in their range. Cobbold enumerates 120 species as being found in the interior of the human body, but a rigorous investigation of this list would lead us to exclude probably about one-half as being merely accidental interlopers. Still a tale of sixty is sufficiently disquieting. Among parasites of the frog we may reckon about twenty species, and of the cockroach a like number. And then these creatures are not restricted to pairs like the unclean beasts of the ark, but are found sometimes in countless swarms and very frequently in numbers which, if not countless, are yet considerable. Thus in a single stork there were found, in the respiratory tract, forty worms of different kinds, besides one hundred similar creatures in the stomach, while from other parts of the animal were got one hundred flukes and many hundred Holostoma, besides external parasites. So that it is evident that the number of species of parasitic animals must be greatly in excess of the non-parasitic, while if we take into account the number of individuals the discrepancy will be vastly larger. And this without considering vegetable parasites at all.

There are many kinds and degrees of parasitism, but in its most pronounced form we may say that a parasite is a plant or animal which derives its entire nutriment from the organism in or on which it lives. But between this extreme condition of dependence, and that not infrequent condition in which certain animals are associated together in a state of mutual interdependence, without being actually parasitic, we find numerous gradations—instances in which the nutrition may be carried on partly by absorption from the juices of the host, and partly from extraneous sources. That curious association of different forms of life, where two species of animals are constantly found living together, and evidently, in some unexplained way, helpful to each other, has been called by Professor Van Beneden, *commensalism* or, more recently, by the perhaps preferable term *symbiosis*. Of this condition I shall have to speak more fully further on.

Looking upon this all-pervading mass of parasitic life, one is apt to think—What is the cause of it all? how and why did it come into being? as to the use of it,—that is a knotty question. By what standard are we to measure use? We are too liable to think as if we ourselves—the human race—were the sum and crown of creation, to which every other thing has to minister. But we are only one item in the great crowd of life; we have fought our way upward from a poor estate, and still have to do battle against all manner of adverse circumstances—parasites among the rest. So that in this way, at least, parasitic life is an aid to our development and progress. No organisms can advance socially, morally, or physically without waging a continual war against evil. A life of lassitude and inactivity is death. And have we not here part, at any rate, of the answer to the oft-repeated question of the origin of evil. Evil is but comparative good,—the good of to-day may be, and must be, if development is to go on—the evil of to-morrow.

As to *how* parasitic life arose and flourished, the answer is tolerably clear. It is simply a result of that fierce struggle for existence which results in the filling up of every available chink or cranny or vacant spot in which life can find a foothold. To begin with, some creature on the verge of starvation or suicide, pursued by bloodthirsty enemies, or from some cause or other "between the devil and the deep sea," has found itself, accidentally no doubt, in a position which afforded it shelter and sustenance. May be a small crustacean has been driven into the gill-chamber of some fish, or the egg of some worm has been swallowed by a creature in whose alimentary canal it has found a suitable place for its development. Circumstances like these have doubtless initiated the complex phenomena of parasitic life, and creatures so situated have adapted themselves to altered conditions by corresponding, but gradual alterations of their own structure. Some examples of the changes which have been so brought about I shall have briefly to point out to you this evening.

Let us, in the first place, glance at some of the phenomena of parasitic growth in plants. If we look at the stem of a forest tree entwined by a beautiful growth of ivy, we naturally get the idea that the ivy derives its life from the encircled tree. This is not so. Those familiar root-like fibres which are given off so abundantly from the ivy-stem are not roots in the proper sense of the term; they draw no juices from the supporting tree, but are mere anchors or hold-fasts: a stone wall will serve them as well as a tree-stem. The vivid green of the ivy is of itself sufficient to contradict the idea of its parasitism, for in perfectly parasitic plants the green colouring matter gives place to brown or some neutral shade. The presence of chlorophyll or green material in leaves is not only refreshing to the eye, but it is of the utmost importance to the whole creation, animal as well as vegetable. It is the part of this substance to decompose the carbonic acid of the atmosphere under the influence of sunlight, setting free oxygen, and fixing the carbon in the tissues of the plant itself. On this decomposition depends almost entirely the growth and well-being of the plant, and seeing that animals are dependent for the means of subsistence either directly or indirectly upon the vegetable world, it is clear that without chlorophyll there would be a general collapse of life upon the earth. But this function of chlorophyll the confirmed parasite is incapable of performing. The degree of parasitism attaching to any particular plant or animal may be pretty accurately estimated by noting the amount of structural degradation which it has undergone. In plants the chief signs of these are the absence of green colour, and the disappearance of leaves and of woody or vascular tissue. In the mistletoe, for instance, which is more than half parasitic in its habit, the leaf-green has undergone much alteration, the leaves have become leathery and inactive, while at the same time rootlets are developed which suck up nutritive juices to the great detriment of the supporting tree.

But there is an interesting group of plants which, while not parasitic, have yet taken on something of the habit of parasites in deriving their support from organic matter instead of from the air and the earth, like ordinary vegetables. These go by the name of "saprophytes," and comprise such "carnivorous" plants as the sundews and butterworts, which live largely upon insects caught by the viscid secretions of their leaves. Here also we may recognize degenerate structure in a scarcity of green colouring and poorly developed roots. Fungi form, so far as mode of nutrition goes, a closely allied group.

Among truly parasitic plants there are none more interesting or, in this country, more familiar than the Broom-rapes (*Orobanche*) and the Dodders (*Cuscuta*). The Broom-rapes grow exclusively upon the roots of certain shrubs or herbaceous plants such as the Broom, Whin, Ivy, etc., pushing up through the earth, brown, withered-looking flower-spikes, which are beset with scales instead of ordinary leaves. The Dodders are very different in habit, entwining their thread-like, wandering stems often in very rampant fashion about furze-bushes, clover, and other plants—the threads being festooned with beautiful little bosses of flesh-coloured or greyish bloom. In this way the parasite lives entirely detached from the earth and drawing its nourishment from the supporting shrub. Its mode of growth is said to be this:—the seeds of the two plants, host and parasite, ripen together, fall into the soil and germinate. Should the young Dodder begin its growth beyond reach of a host its existence soon comes to an end, but if in contact with a host it sends out rudimentary roots or "haustoria" which penetrate the tissues of the larger plant and provide it with the nourishment necessary for its continued growth. Other interesting examples of plants now known to be at any rate partly parasitic are the Yellow Rattle (*Rhinanthus Crista-galli*), the Eye Bright (*Euphrasia officinalis*), and the Red Rattles or Louseworts (*Pedicularis palustris* and *P. arvensis*). These grow upon the roots of various grasses, and every one must have remarked that where those pretty but noxious weeds abound the grass crop is usually poor and stunted.

Time will not allow of more than a very brief reference to the numerous parasitic organisms known as bacteria, and which are so fruitful a source of disease. Recent additions to our knowledge of these minute "fission-fungi" have shown not only the truly vegetable nature of the organisms themselves, but have placed beyond doubt the fact that they are the actual causes of many of the most serious diseases to which man and other animals are subject. I shall show you on the screen photographs of some of the most familiar of these bacilli—those found in such diseases as tetanus (lock-jaw), Asiatic cholera, and consumption. Pray understand that these bodies are of the most extremely minute dimensions, quite invisible except by high powers of the microscope and measurable only by thousands of an inch. They grow with the most astounding rapidity, by a process of repeated division or fission, and after a time this process is supplemented by the formation of spores, or specialised reproductive bodies—comparable to the seeds of ordinary plants. Somewhat larger examples of parasitic forms amongst fungi are the growths (*Empusa*) which attack the common house-fly at the end of autumn, forming white, mildewy patches upon its body,—the fungus of salmon and potato-disease (*Saprolegnia* and *Phytophthora*), and that which attacks the human skin and hair, producing ringworm. In this disease the hair is seen to be filled with the mycelium or thread-like filaments of the fungus, producing abundantly spores or reproductive bodies. The hair thus becomes quite disorganised and breaks off short, leaving bald patches.

Among the most interesting episodes of animal life are the histories of the development and migrations of internal parasites such as the numerous worms and flukes which are found inhabiting the stomach, intestines, respiratory organs, and various tissues of the higher animals. Only in a few cases has the entire life-history of these creatures been fully made out, but wherever this has been done we find that the parasite, before attaining maturity, passes an intermediate stage of imperfect development in the body of some entirely different animal, which is therefore called an "intermediate host," the creature in whose body the mature stage is reached being the "final host." The parasites in which these changes have been most carefully studied are the common tape-worms and flukes. Let us take as an illustration the liver-fluke of the sheep, an animal not only zoologically interesting, but of the greatest economic importance as the cause of that wide-spread and fatal disease called "rot" in sheep. From the ravages of this pest, it is said that there has been, in some years, a loss to British farmers of as much as a million pounds sterling. The fluke, which in its adult condition inhabits the liver and bile-ducts of the sheep, is a flattened leaf-like animal, almost an inch and a half in length and somewhat oval or pear-shaped in outline: it has a couple of suckers near the front of the body, through one of which comes the gullet, opening externally by a simple mouth and leading backwards into a much ramified alimentary canal, the branches of which are imperforate. The animal produces an immense number of very minute eggs, which, being thrown into the ducts, emerge into the intestine of the host and so into the external world. Unless, however, they find their way into water or on to very moist ground the eggs are incapable of development, and so, for want of a suitable environment, the vast majority of them must doubtless perish. But supposing the ovum to reach a pool of water it immediately sets free its contained embryo in the form of a minute ciliated, free-swimming creature, which moves about actively for the space of about four hours, but if before the end of that period it does not find the means of further development, it straightway dies. On the other hand, should chance bring it in the way of a particular little fresh-water snail, *Limnæa truncatula,* it at once makes its way into the breathing-cavity of that animal and there undergoes its next transformation, developing in its interior germs of two different kinds. Some of these germs have tails and suckers, and are able to work their way into the liver or the muscular tissue of the snail, ultimately emerging from the animal into the outer world. They then take on an inactive condition, attach themselves to blades of grass, and become "encysted" or covered with a dense external envelope. Here again they fail to complete the cycle of their existence unless they be swallowed along with their blade of grass by some browsing sheep. Should this occur they again become active, bursting through the tough outer coat of the cyst, and perforating the sheep's tissues are carried by the blood current into the liver, where they undergo their final metamorphosis into the adult fluke. It is clear, then, that at every stage of this parasite's existence there are many chances against its finding conditions suited to its needs, and were it not for the enormous number of ova produced—not only by the fluke but by all parasitic worms—the species would have little chance of survival. The ordinary tape-worm of man is stated to live two years and to produce 85,000,000 ova. It is certain that only one ovum out of many thousands passes through the ordeal to its final stage of development. The study of this life-history shews that the cure for "rot" in sheep must be sought in the prevention of the disease, and that this can certainly be attained only by keeping the animals in dry pastures where the "intermediate host," necessary for the growth of the fluke, cannot exist.

I have already mentioned the degradation of structure which is observed in vegetable parasites: this is even more remarkable amongst animals. Some of the most extreme cases are met with amongst the small Crustaceans known as fish-lice. These creatures are found, often in considerable numbers, attached to the skin, gills, eyes, or other organs of fishes, to which in many cases they adhere, not merely by suckers but by root-like growths, which are inserted deeply into the body of the host and by means of which its nutritive juices are absorbed. In this adult form the animal may be little more than a mere misshapen bag of eggs or spermatozoids, and it would be impossible, except by a study of its development, to determine its true place in nature. But the first days of its existence, after emergence from the egg, are spent very actively: in that phase it is provided with several pairs of swimming feet, and it is only after attaching itself to the body of its future host that it loses its limbs and its activity, takes to a sedentary life, and devotes its energies solely to the reproduction of the species. Examples of such a "retrograde development" are numerous amongst the Crustacea, this class possessing a remarkable plasticity, by virtue of which their organs appear to be capable of almost infinite modification so as to meet the varied pressure of outward circumstances. An interesting example of similar degradation in another class of animals, the Acarida or mites, is seen in a little parasite which occurs in the sebaceous follicles of the human nose: a follicle becomes inflamed and fills with a curdy or purulent fluid, wherein is found a minute, worm-like creature with eight very rudimentary legs,—a character which shows it to be a degenerate mite. Another parasite of the same order is that which gives rise to the complaint called "itch." This is a fairly-well developed and active acarus, which makes small burrows beneath the skin and there deposits its eggs.

The condition called by Van Beneden, "commensalism," was referred to briefly at the outset, and now let me explain more at length the nature of the association;—parasitism it can scarcely be called. Well-known illustrations may be found amongst the sea-anemones and hermit-crabs. Most of you, no doubt, are aware that "hermit-crabs," being very soft and ill-protected in the hinder parts of the body, have the habit of ensconcing themselves in the dead and empty shells of univalve molluscs, such as whelks and periwinkles, removing themselves, as they grow, into larger and still larger tenements according to their need. Some of these crabs are found invariably in company with anemones, which attach themselves round about the lips of the shell occupied by the crab. To British naturalists the most familiar instance is that of a very pretty anemone, *Adamsia palliata*, which is constantly found attached to shells tenanted by the hermit, *Pagurus Prideauxii*. It is very rarely that either of the two animals is found separately, but in what way they are serviceable to each other it is not so easy to say. Possibly the anemone may be a protection to the crab by virtue of its stinging power, for it belongs to a group of animals, all of which are richly provided with urticating cells similar to those which often sting the feet of the unwary bather treading upon a jelly-fish. Fishes readily swallow hermit-crabs, and it is quite possible that the presence of an *Adamsia* round the mouth of a shell might deter even a hungry cod.

The following observation of Mr Gosse on the habits of these animals is of extreme interest :—

"On the 10th of January, 1859, I obtained, by dredging, in Torbay, a specimen of *Adamsia palliata*, about half-grown, on a rather small shell of *Natica monilifera*, tenanted by a *Pagurus Prideauxii*, which seemed already too big for his habitation. Having put them into a well-established tank of large dimensions, the contents of which were in excellent condition, I succeeded in doing what I had never done before, domiciliating both crab and *Adamsia*. Both continued in the highest health and became quite at home." But as the hermit seemed to be getting too large for his shell and the anemone not looking well, Mr. Gosse placed in the tank a larger *Natica* shell in the hope that the crab would appropriate it and that the anemone would also shift his quarters. What happened was this,—the crab presently found the new shell, and "having turned it mouth upward, took hold of the outer and inner lip, each with a claw, and began to drag it about the tank. After about an hour's absence," continues Mr. Gosse, "I returned to the examination. The *Pagurus* was comfortably lodged in his new abode and the old one lay deserted at some little distance. The *Adamsia* also was adhering to the lips of the new shell, but partly also to the thorax of the crab, a condition which is never seen under ordinary circumstances. It seems probable, therefore, that as soon as the crab had found the new shell to be suitable for exchange, the *Adamsia* also was made cognizant of the fact; and that during the two hours which followed, the latter loosened its adhesion to the old shell, and laying hold of the bosom of its protector, was by him carried to the new house, where immediately it began to secure the like hold to that which it had just relinquished."

Then again, owing apparently to the ill-health of the anemone, it once more detached itself from the shell, but the crab seized it with his claws and applying it to the shell kept it firmly pressed there for about ten minutes, at the end of which time it drew away first one claw and then the other; and beginning to walk away it was seen that the *Adamsia* was once more fairly adhering and in the right place.

It is evident, then, from these observations, that the hermit-crab appreciates the companionship of the anemone and doubtless finds it in some way conducive to his health or safety, nor can we reasonably doubt that the advantage must be reciprocal, though in what way it is not very easy to see.

The tenancy of the living mussel-shell by a little pea-crab has been known since the time of Pliny, who supposed the crab to act as a sentry, warning the mussel of approaching danger, and by a tweak of his claws causing him to shut up. Deep-sea sponges are often found completely riddled by colonies of intricately branched polyps, and one genus of sponges (*Hyalonema*), known as the glass-rope sponge, is constantly so encrusted externally by a polyp, that until very recently the sponge itself was looked upon only as an adventitious growth.

Lastly, let me mention very briefly an interesting case of the presence of vegetable parasites—or perhaps commensals—in minute animals of the very lowest grade. There is a very numerous family of minute, often microscopic, floating marine animals, each of which consists usually of a spherical or radiated and beautifully perforated central shell, the shell being filled with and surrounded by a soft gelatinous flesh. These belong to the Class Radiolaria. In the soft parts may almost always be seen numerous little yellow spheres, which have been shown to be of a vegetable nature and are looked upon as parasitic algæ; and the way in which plant and animal are mutually benefited by the companionship is thus explained by Professor Geddes:—

After confirming Haeckel's discovery of the presence of starch and the observations of others on the survival of the yellow cells after the death of the radiolarian, Geddes demonstrated the truly algal nature of these cells from their cellulose walls, the identity of their yellow colouring matter with that of diatoms, and the evolution of oxygen under the influence of sunlight. It was pointed out that the animal matter covering these cells must benefit by absorbing a part of the dissolved starch and from the digestion of the dead bodies of the algæ. On the other hand the carbonic acid and nitrogenous waste produced by the animal cell constitute the nutritive return made to the alga, which in removing them performs the function of a kidney.

"Thus, then, for a vegetable cell no more ideal existence can be imagined than that within the body of an animal cell of sufficient active vitality to manure it with abundance of carbonic acid and nitrogenous waste, yet of sufficient transparency to allow the entrance of the necessary light. And, conversely, for an animal cell there can be no more ideal existence than to contain a sufficient number of vegetable cells, constantly removing its waste products, supplying it with oxygen and starch and being digestible after death."

We see, then, that parasitism fills a very large space in the economy of nature, but we may recognize at the same time that it is not an unmixed evil,—that the creatures preyed upon generally possess a reserve of vitality sufficient to protect them, for a long time at any rate, from serious disaster, and that in the most confirmed cases the ill-results are often even more apparent in the parasite itself than in the animal attacked. May I draw a "parable from nature" and say that thus it must be morally even amongst ourselves, that those who look to the activities of their neighbours for support—the incurably idle, thieves and gamblers,—undergo a constantly progressive degradation of their moral nature?

And if we give a little play to fancy, may we not say that we ourselves—the whole human race—are but parasites on the bosom of our mother Earth, draining the juices which she bountifully supplies, she, who we may rightly regard but as our intermediate host. For who can say but that the Poet's words may be true,—

> Our birth is but a sleep and a forgetting,
>   The soul that rises with us, our life's star,
> Hath had elsewhere its setting,
>   And cometh from afar.

However this may be, we are permeated with the faith that we shall one day be released from the material bonds in which we are here "cribbed, cabined, and confined," that we shall throw off the tough envelopes of this mundane, transitional existence, and breathe at last "an ampler ether, a diviner air."

Abstract of Lecture, No. 5.—*Germs.* By H. De Havilland, Esq., of Cambridge University.

If a potato plant be grown in the dark, a white shoot is the result, and when the store of food laid up in the potato is used up, the existence of the white plant is at an end. The obvious inference is that white plants are incapable of forming their own food from such materials as are sufficient for their green relations, whose chief food is the carbonic acid gas in the atmosphere.

When men ascend great heights they find a difficulty in breathing, the air is becoming more and more scarce; there is thus evidently only a certain quantity of air available for animals to breathe. How is it then if, as we know is the case, the air is being continually contaminated by the carbonic acid exhaled from the animal lungs that the whole air, in the long course of the centuries during which life has been on the earth, has not become overwhelmingly carbonic acid in constitution, and all animal life at an end. The answer is found in the fact already mentioned, that green plants absorb the carbonic acid for their own use, and—this is the important point—return the pure oxygen to the air. Sunlight is a necessity for this process of purification; without it plants behave as animals. So that while plants in the day time may be of distinct value in a sitting room as purifiers of the air; in the bed room they are in their wrong place, especially if in any quantity.

Examples of white plants or fungi are very numerous: the mushroom flower, the toadstool, puff balls among the larger ones; the well-known moulds appearing on damp pairs of boots, the mould so frequently found on badly preserved jams, and the mildew of wheat are only a few of the better known ones of medium size. While of the still smaller varieties the common bacillus of cholera and the rod-shaped curse of consumption have become household words during the last ten years, and it is known that the souring of milk is produced in a similar way. It was more particularly about these minutest of living plants that are to be found on almost any coin we have in our pockets that my lecture was intended to speak; and the main idea one has to bear in mind is that these bacteria being, like the white potato seedling, unable to make use of the carbonic acid in the air, are driven to seek for the carbon they require in some animal or plant which may be either living or dead. In doing this they frequently, but by no means always, manufacture certain chemicals which act in a poisonous way on their host, producing according to the nature of the bacterium (minute white plant) a definite disease.

These bacteria are exceedingly small, in many cases one hundred million would have to be laid side by side to make a square inch of film, which was but one ten-thousandth of an inch in thickness. Their minute size, coupled with the fact of their being universally present wherever dust makes its appearance, made them the last battle ground of the believers in spontaneous generation or the theory of life springing from dead matter.

A most interesting account of the theory may be read in Tyndall's "Floating Matter of the Air," where the author traces the idea backwards to the ancient times when the Britons, seeing a moist ditch in spring teeming with tadpoles, accounted for their presence by the belief in the spring sun having power to warm the dead mud of the ditch into a wriggling swarm of life, just in the same way as the Egyptians relegated the power of forming eels to the slimy oose of their own river, the Nile.

The method of preserving meat in tins is one of the outcomes of this possibility of preventing the formation of bacteria, and the belief that life only comes from life. If meat is left in contact with the air, it is a well-known fact that especially under suitable conditions of temperature, as in summer, it will very quickly go bad, the cause being a particular kind of bacterium. Now if these latter can spring spontaneously from meat which contained none to start with, it is useless to try and preserve it in any other way than by keeping it at such a temperature or soaked with such bodies as shall utterly destroy the plants as fast as they are generated, neither of which conditions are present in ordinary tinned meats. For these consist simply of boiled meat in air-tight tins, which were sealed while at the boiling temperature. Now there being no living bacteria in the meat, it keeps so long as the tin remains closed and bacteria from outside prevented from coming in, which may be for twenty or thirty or more years. The same object is obtained by the Esquimaux when they grind their beef up with spices and make pemmican, the spices killing any bacteria that may be present and preventing the presence of fresh ones.

Of all men who have studied these white plants or bacteria, the chief is Pasteur, a chemist by profession, who pursued his studies even in youth with such ardour that on his marriage day they had to send from the church, so it is reported, to remind him of the event. Among his earlier works was the study of yeast, the plant that causes fermentation in sugar, making alcohol. Pasteur first shewed that the formation of vinegar in wines and beer was due to the uninvited presence of a second plant, *Mycoderma Aceti*, which fed on the alcohol, turning it into vinegar, and showed the reason for the necessity of absolute purity of working if the brewers and wine merchants hoped to obtain good fluids with any degree of certainty.

From a study of the silk worms he showed the cause of the disease which was ruining tens of thousands to be a bacterium, and in one district alone, near Trieste, by following his instructions, the people were enabled to make a profit of 26,000,000 francs the very year after they had had an actual dead loss. For this the Emperor nominated him a senator for life, but the Franco-German War breaking out soon after he was never gazetted.

Later he discovered a method for dealing with anthrax or woolsorters disease, by inoculating the cattle and sheep with a weakened poison obtained by exposing the rod-shaped anthrax plant at certain temperatures, and then being able practically to repeat the results in the case of anthrax what Jenner obtained in small pox. The method was so successful that in 1888, 269,599 sheep and 34,464 oxen were inoculated, and now the insurance companies insist on the preventive measure being taken before they will insure oxen or sheep, so strong is their conviction of the efficacy of this method for stamping out what is believed in Egypt to be the direct descendant of one of the plagues which afflicted their country in the time of the Pharaohs.

As to the great work Pasteur has been enabled to do from a study of these minute plants in the case of chicken cholera, cholera, and hydrophobia, and now, though unable to find the plant for the latter yet from his immense previous knowledge of the methods which bacteria work, he came to be as certain that they were there as he was certain there were stars in the heavens which he could not see. All this would take too long to repeat, besides the fact of their history is being repeated month by month in the current periodicals.

But I will take up no more time than to say that the study of the small plants which, unable like their green companions to form their bodies from carbon in the form of carbonic acid, are compelled to look for ready-made food, has become a belief, and that a very general one among men of science, that it is in these plants that the cause of many a disease is to be found.

And that the results obtained hitherto, though magnificent, are as nothing compared with what we have a right to look forward to in the future, that we are within measurable distance of seeing these enemies of our race turned by education to their own destruction by the inoculation into their victims of their own weakened poison. While it should not be forgotten that Sir Joseph Lister struck, by a study of Pasteur's discoveries, with the idea that the putrefaction so often setting in after amputation might be due to bacteria, introduced the carbolic acid spray, now or till very lately universally used for washing wounds, destroying bacteria and allowing of the healthy healing of the wound.

ADDRESS TO THE MEMBERS OF THE TYNESIDE NATURALISTS' FIELD CLUB,

READ BY THE PRESIDENT, GEORGE S. BRADY, M.D., LL.D., F.R.S., ETC., PROFESSOR OF NATURAL HISTORY IN THE DURHAM COLLEGE OF SCIENCE, NEWCASTLE-UPON-TYNE, AT THE FORTY-SEVENTH ANNIVERSARY, HELD IN THE LIBRARY OF THE MUSEUM OF THE NATURAL HISTORY SOCIETY ON TUESDAY EVENING, MAY 16TH, 1893.

LADIES AND GENTLEMEN,—When, last year, you did me the honour to re-elect me as your President, I believe I made one promise,—and one only. That one I rather think I am going deliberately to break. I said that I would not again put upon you the pain of listening to a long anniversary address, and, at the time, I meant it. I, for one, had had enough of it,—but I have recuperated,—and perhaps I am attaining also to something of the garrulity of age. But the fact is that the subject of our fisheries has come before me with a good deal of interest during the past year, and I think it may serve a good purpose if I ask you to spare me an hour or so for the consideration of it.

My first duty, however, is to present to you a short account of last year's meetings.

The FIRST FIELD MEETING of the year (1892) was held on Whit Monday, the 6th of June, at Dunstanborough and Embleton. The day was beautifully fine and there was a good muster of members,—about thirty, amongst whom were several ladies. The party left Newcastle by the 8.20 a.m. train and alighted at Little Mill Station, where they were met by Mr. Howse, who had been spending some days in the neighbourhood and had previously explored the route, which lay by Cullernose and Craster to Dunstanborough, and thence to the adjacent village of Embleton. The basaltic crags of this part of the coast are of great interest and at Dunstanborough are wonderfully picturesque, being not only lofty but very much broken and irregular in outline, and distinctly columnar. An interesting paper on the history of the place was read among the crumbling ruins by Mr. Adamson. Several noteworthy plants were seen, as for instance, *Astragalus hypoglottis*, *Scilla verna*, *Geranium sanguineum*, and *Asplenium marinum*. At the foot ot Embleton Burn cowslips were in great abundance and in profuse flower, many of the stems bearing double sets of flowers. By the older botanists Dunstanborough is given as a station for the "Scottish Lovage," but one of the party who has searched for the plant has been unable to find a trace of it. Nevertheless, it may have been overlooked. As this is the only recorded station for this plant on the East Coast of England, it is much to be hoped that it will be found still present on our coast. Though early in the season, a few specimens of that beautiful butterfly, the Painted Lady (*Vanessa cardui*), were seen,—tempted out, doubtless, by the unwonted warmth of the sun. This insect is fitful in its appearance in our district, many years passing without its being seen at all, whilst at other times it occurs in great abundance, usually on the sea-coast. The specimens seen on this occasion had, no doubt, hybernated here. After dining at the "Hare and Hounds," Embleton, the party were very courteously shown over the church and the charming garden of the Rectory by the Rector, the Rev. Canon Osborne. This concluded a very delightful excursion, and left us time to walk comfortably to Christon Bank for the return train at 6.35.

Though the weather for 1892 was remarkably fine, only four or five members attended the SECOND MEETING at Knaresborough on June the 24th. An early start had to be made from Newcastle and the North, and it was nearly eleven before the work of the day was begun. The party first examined the site and the picturesque remains of the old castle and the extensive views to be obtained from that elevated situation. A descent having been made to the river, several fine sections were examined of the Magnesian limestone resting on the Plumpton rocks, a member of the Millstone Grit series,—the Coal measures in this part of Yorkshire either not having been deposited or else denuded prior to the Permian period, thus shewing a marked contrast between the superposition of these rocks in Yorkshire and Durham, where the Magnesian limestone rests on the denuded edges of the Coal-measure strata. Proceeding along the bank of the river and crossing the Low Bridge a visit was paid to the Dropping Wells and Mother Shipton's Cave. The appearance of the Dropping Wells is quite spoilt by the incongruous assemblage of all sorts of things hung up, in front, to be turned into petrifactions. Hats and gloves, cocks and hens, shoes and stockings, and rubbish of all sorts and sizes are suspended in front to catch the dripping water. To us, the chief interest of the Dropping Well is its geological position, as it occupies exactly the same horizon as the Magnesian limestone rocks on the coast of Durham at Frenchman's Bay, and it is worthy of remark that at Frenchman's Bay there is a petrifying spring which unites into a conglomerate all the objects washed up on the coast near it; but this spring is not so powerful as the Dropping Wells and has not perhaps been so well cultivated, and is not so conveniently situated for passing observers. Our walk was pleasantly extended along the banks of the river as far as the site of Knaresborough Priory. We were not, however, attracted to spend our time in St. Robert's Chapel and Cave, but preferred to enjoy the river scenery and rock sections, returning to the town for refreshment before train time. Several interesting plants were observed, including an abundance of specimens of *Orchis ustulata,* a species formerly common on our Durham coast, though now rare in that district.*

On Thursday, the 21st of July, a very small contingent of members met for the THIRD FIELD DAY at Hedgeley Station. On the invitation of Captain John Carr-Ellison the party proceeded to Hedgeley, where they were most kindly received, and after seeing various objects of interest about the place, walked through the grounds and fields to the Roman (or British?) Camp and Crawley Peel Tower,—a relic of the old turbulent times, whose practice was that

> They may take who have the power
> And they may keep who can.

The walls of this stronghold are in parts nine feet thick, and

* Not extinct, however,—I have, since the above was written, gathered it near Blackhall Rocks.

from it extensive views are obtained over the river Breamish and to Glanton Pike and Ross Castle. From the tower the party walked back to Hedgeley, thence over to the cottage at the foot of Beanley Woods, and walked up the steep hill on which an old British Camp is situated. From this point the Doddington Hills and the North-Sea in the far-off distance are distinctly seen. Resuming their conveyance, they drove on to Old Bewick, where they examined the remains of an old Camp, and where luncheon was very kindly provided for them by Captain Carr-Ellison. One new member was elected,—Mr. James Yates of Leeds. The excursion was altogether a most interesting and pleasant one; the only pity being that so few members were there to enjoy it.

The August Meeting was arranged for Barnard Castle chiefly to enable members to visit the Bowes Museum. About a dozen members availed themselves of the opportunity. On the arrival of the first train a start was made for the Museum, and we were met by Mr. O. S. Scott, who had kindly promised to guide the party through the rooms. Most of the time was profitably spent in examining the superb collections of china and earthenware, and afterwards the picture galleries were visited. Many of the members left the Museum early for a walk down the river to Rokeby, returning by Eglistone Abbey. Visits were also made to the Old Castle and gardens adjoining. In the afternoon the members met for dinner at the "King's Head Hotel," an early dinner being arranged for members leaving by the early train. Mr. Cobb gathered several interesting plants growing on the walls of the Castle and its neighbourhood, and Mr. Thompson observed the Kingfisher on the Tees near Eglistone Priory. The weather was remarkably fine.

On the following day two of the members made an excursion along the Roman Road through Bowes to examine a Roman Camp, laid down in the Ordnance maps on the Westmorland edge of Stainmoor. The old road, rough enough and straight as a line, runs along the southern boundary of Stainmoor. From this road an extensive view was obtained of the hills that enclose Arkengarthdale and the head streams of Swaledale—the lake district was concealed in mist. We found no definite trace of a Roman station on the site where they are marked on the Ordnance map, but confused heaps of stones, indicative of an old quarry. There was a small, almost square, camp distinctly visible, close to the road before reaching the Westmorland boundary, and a stone not far from this camp, surrounded by an iron railing, recording some event unknown to us. The day was fine, and the wildness and loneliness of Stainmoor gave perfect enjoyment—such enjoyment as it is impossible to meet with elsewhere than in such elevated, moorland situations.

The Fifth Meeting was held at Lanchester on Wednesday, the 21st of September, and proved to be a very interesting and pleasant one, although the attendance was only small. The party left Newcastle at 9.42, and walked from Consett under the guidance of Mr. W. Riven across the fields to Crook Hall, Iveston, and Greencroft Woods. The Roman Camp at Lanchester was then visited,—a very interesting relic, notable for its six gates, its baths, forum, and other adjuncts, familiar to us in the excavated camps on the line of the Roman Wall. The same pains, however, have not as yet been taken in the laying bare of the Lanchester camp. A visit to the church concluded the day's proceedings.

The Sixth and last Meeting of the season took place at Tynemouth and North Shields on Thursday, the 6th of October. The members were met at the North Shields Station by the Mayor of Tynemouth (Ald. J. F. Spence), and as a commencement of the day's proceedings went under his guidance to the Fish Quay, where they had the opportunity of examining the "refuse" of some of the deep-sea trawlers, consisting of a rich haul of zoophytes, star-fishes, echini, barnacles, medusæ,—in fact a heterogeneous jumble of deep-sea life, such as the late Edward Forbes tells us is classed by the Shetland fishermen under the two great heads of "pushen and combustibles." Thence by way of the Low Lights and Black Middens the party scrambled along the shore to Tynemouth,—the way beguiled by many interesting reminiscences by the Mayor and others of what things were in that region in the days when they were young. Certainly the busy and somewhat grimy activity now displayed on both sides of the river's mouth is in strong contrast to the idyllic picture, drawn by Harriet Martineau some three-quarters of a century ago, of the view from her house on the Cliff across the river to Trow Rocks and the Lizard. On arriving at Tynemouth the ruins of the Priory were visited, Mr. Adamson, the Town Clerk, acting as guide and reading a short paper descriptive of the place. The party were very hospitably entertained to tea in the Life Brigade House by the Mayor and Miss Spence, and papers were read on "The Disintegration of the Coast Line" by Mr. Tate and on the "Immigration of the Tortoise-shell Limpet" by Mr. R. Howse.

The death of Edward Capper Robson, only a week ago, has deprived the Club of one of its oldest and most valued members. Up to a very few years back Mr. Robson was one of the most regular attenders of our field meetings, at which his unfailing geniality and good humour, his lively wit, and his thorough enjoyment of nature in all her forms, made him an ever welcome associate. Though scarcely a scientific naturalist, he had an excellent knowledge of our native plants, while his general literary culture and well-stored mind made him one of the most delightful of companions. None that have had the good fortune of his friendship will be likely to lose their memory of days spent with him in rambles about the regions of Tyne and Wear. Mr. Robson was a Vice-President of our Club, and it was only his too modest estimate of his attainments as a naturalist which prevented his occupying the Presidential chair,—an honour which was repeatedly offered to him.

During a short autumn holiday spent last year in the neighbourhood of Dumfries I had the opportunity of visiting the very interesting fish-hatchery of Mr. J. J. Armistead,—the "Solway Fishery," near New Abbey. The success which, after many years of patient experiment and investigation, has attended the labours of Mr. Armistead and others, together with the scientific interest and economic importance of the subject, leads me to think that some account of the present state of fisheries and fish-culture in Great Britain may not be out of place in an address of this kind, more especially as both sea and fresh-water fisheries constitute an important part of our local industries. The subject indeed comes home to each of us individually, for who is not interested in the maintenance of an abundant and cheap supply of so important a food as fish?

We have been used to hear much of the decay of fisheries,—of the constantly decreasing fruitfulness of the fishing grounds both in sea and river, but until recently it has been impossible to form a sound judgment as to the facts upon which these complaints were based. Statistics as to the actual amount of fish caught were not forthcoming, or at any rate not in a very trustworthy form, and so far as the statements and opinions of fishermen themselves go, there is probably no class of men less given to a scientific consideration of the facts of every day life. Moreover it would almost appear that the fisherman's art has something in it which impels to the "drawing of the long bow," and that the statements of the members of the craft must be taken with perhaps more than the ordinary *granum salis*.

The complaints as to decline of fisheries are by no means new. In 1883 the House of Commons appointed a Select Committee to enquire into the alleged decline, which, it was said, had continued from the peace of 1815, and was attributed to the encroachments of the French fishermen.* This kind of complaint, indeed, appeared to have become chronic, and several commissions have investigated the matter. There can, I suppose, be no doubt that fishes have become increasingly difficult to catch by the old-fashioned methods, but whether the difficulty arises from an increasing scarcity of the animals or from the competition of larger numbers of men with better equipped boats, may be open to dispute. And if fishes have actually become more scarce, it may be asked, has this arisen from over-fishing, from the use of

* Dr. M'Intosh; a Brief Sketch of the Scotch Fisheries. 1892.

improper or destructive tackle, from the deterioration of spawning beds, the fouling or poisoning of waters, or from other causes which need not now be enumerated? Many such questions may be answered now which could not have been answered when Professor Huxley's commission began its labours. At that time little was known of the migration of fishes, of their habits as to spawning, or even of their food and growth: much still remains to be learnt, but during the last ten years—thanks to the constant labours of naturalists connected with the various Fishery Boards—a vast amount of knowledge has been gained—not only about the life-histories and food of fishes, but as to their distribution, and as to the effects of the various appliances which are in use for their capture.

Upon information of this kind must, of course, depend the decision as to whether sea-fishing should be carried on without any restriction, or whether stringent regulations as to close times and fishing machinery should be enforced. Professor Huxley and other authorities have held that the fecundity of fishes is so great that no restriction of any kind is necessary,—in fact that it is impossible for any human agency materially to interfere with the supply. But notwithstanding this it seems certain that there is a decrease of productiveness, at any rate in the North Sea, and that this decrease is to a large extent due to over-fishing. The following table, given by Dr. T. Wemyss Fulton, in the Tenth Annual Report of the Fishery Board for Scotland, will illustrate this fact:—*

Year.	Tonnage.	Fish caught in cwts.	Cwts. per ton of Vessel.
1888	2,689	250,000	92·9
1889	3,608	252,524	69·9
1890	4,705	291,812	62·0
1891	6,404	323,046	49·8

It is thus shown that though in three years the weight of fish caught rose from 250,000 to 323,046 cwts., the tonnage of the vessels employed had increased from 2,689 in 1888 to 6,484 in

* The table refers to beam-trawlers.

1891, thus reducing the catch per ton from 92·9 in 1888 to 49·8 in 1891. It seems, then, impossible to doubt that this rate of depletion is much more than the area can sustain without serious deterioration. The falling-off illustrated in this table occurred chiefly in the larger and more valuable flat-fish, but was common to all kinds. Very few halibut are ever caught in the trawl-net,—only about 0·17 per cent. of the total catch: but the beam-trawl is the great instrument by which supplies of turbot and other flat-fish are obtained. And notwithstanding the constant increase in the number and efficiency of trawling vessels the quantity of flat-fish caught is diminishing. As evidence of this let us take another of Dr. Fulton's valuable tables, referring to the quantities of flat-fish landed on the East Coast of England:—

Year.	Turbot.	Soles.	Prime Fish not separately distinguished.	Totals.
	CWTS.	CWTS.	CWTS.	CWTS.
1887	57,561	67,874	109,424	234,859
1888	48,760	52,151	105,057	205,968
1889	44,272	47,747	25,848	117,867
1890	40,763	46,187	46,137	133,087
1891	47,594	61,287	43,728	152,609

Dr. Fulton remarks that the increase in the last year may be due to the substitution of steam for sailing vessels,—but in any case the falling-off since 1887 is very conspicuous, and this, notwithstanding the increased area and greater distances compassed by the modern boats. To quote again from the Scotch Fishery Report:—Mr. John Bain, the fishing officer for the Peterhead district, says that "any increase that has taken place in the quantities of fish landed must be largely, if not wholly, attributed to the increased appliances in operation. A large depletion has taken place on the inshore fishing grounds, and the boats are now, to a large extent, fishing on what may be called virgin soil. Some large quantities of halibut were got on these new grounds, but after a time a large decrease took place in the catch. * * * All our fisheries—lines and nets—have of late years been prosecuted with a diligence and to an extent quite unprecedented in past times. Larger boats, more and finer nets, more and better lines, and a larger area of fishing ground, seem to be requisite in order to keep up the supplies of fish." And the use of these larger and better boats tends to bring about the same result in another way: the fishermen are able to go right out to sea in weather which, not long ago, would have kept them in-shore. Mr. James Gow, the officer of the Banff district, says that, in February last, for two weeks, the boats were daily at sea and landing large quantities of fish, when with the same weather ten years ago there would not have been a boat out in the district. Testimony of this kind might be quoted *ad libitum.* It can scarcely be doubted, then, that fish is scarcer than it was, and that this scarcity depends, in part at any rate, upon the great increase of the fishing industry and the more deadly character of the machinery now in use.

But before attempting to consider any of the means which might be adopted for the conservation or improvement of fisheries, let us glance for a moment at some of the advances which have recently been made in our knowledge of the life and habits of fishes. First, as to the spawning and development of the ova. Professors M'Intosh, G. O. Sars, Prince, and many others have within the last few years laboriously investigated these subjects, and it may now be taken as certain that the spawning of most of our valuable food-fishes takes place chiefly outside of territorial waters, that the ova speedily rise towards the surface, are hatched within a week or two of fertilization, and are for the most part gradually drifted shorewards by the influence of currents. So much may be affirmed of all the flat-fishes, of the cod, haddock, whiting, and many others. There are others whose ova are "demersal"—or permanently attached to some stationary basis; but these may here be left out of consideration. In most cases the deposition of ova takes place during the earlier months of the year, and the young, when hatched, find their way or are carried by currents, apart from any volition of their own, into shallower waters, where their development is aided not only by a greater abundance of food, but by the higher temperature of the water. The risks to which ova and young fishes are exposed in the struggle for existence are immense—chiefly no doubt arising from the fact that they are preyed upon by all kinds of creatures, great and small; and it may be taken as a zoological law that the fecundity of creatures so circumstanced is enormous. Fishes form no exception to the rule, and we find that a single turbot may produce in a single season nine or ten millions of eggs; a cod, six or seven millions; a haddock, one million; and with these facts in his mind the eminent Belgian naturalist, Van Beneden, says "the fecundity of fishes is so great, the quantity of immature fish destroyed"—by man's agency he means—"is so small in comparison with the immensity of the sea, that it does not matter where or when the fishing is carried on or with what engines, man is unable to disturb the equilibrium which the Creator has established between destruction and reproduction,—between life and death." But with all respect to so great an authority it must be asserted that man is constantly interfering, to his own great detriment, with the equilibria of nature, and it is more than probable that he is doing so in this very case. Consider for a moment what is the natural destiny of the twenty million eggs produced by the female ling. In the order of nature, supposing the equilibrium to be maintained not more than about two of these would need to live in order to fill the place of the parents—the remaining 19,999,998 never attaining sexual maturity. Therefore, seeing that the ravages of man are exercised only upon the mature fish—upon only two out of twenty millions,—the remainder having been already swept out of existence,—it is by no means difficult to imagine a great disturbance of the natural equilibrium.

Looking at the facts of the case, the general aspect of which I have endeavoured to lay before you, it is evident that a national control ought to be exercised over fisheries. And with this view, under the Fisheries Acts of 1888 and 1891 ten Sea Fisheries districts have been formed, comprising a large part of the coasts of England and Wales. But on the East and South Coasts considerable areas have not yet been formed into districts. The powers conferred by these acts upon the local authorities are very extensive: they can close mussel and oyster beds, can determine the methods of fishing and the instruments which may be used, and the form and size of such instruments; they can prohibit the deposit of deleterious substances, and can either fix an annual close season or can close beds in rotation for a specific number of years. By obtaining a Regulating Order under the Act of 1868 they can fix the minimum sizes for mussels and cockles, receive power to plant beds, etc. In many districts these new powers have been largely utilized.

It is satisfactory to know that the regulation of fisheries in foreign countries and in our own colonies is receiving close attention. The immense importance of these colonial industries can scarcely be exaggerated, but it seems that much requires to be done yet in the way of legal enactments. Thus it is stated that "at eight lobster-canning factories in Canada 35,157 berried females are captured daily, carrying about 703,140,000 eggs. The number of ova consigned to the boiling vats of the canneries in violation of law is said to be about 17,578,500,000 during the short season of two months at these eight factories alone, and since there are some five hundred canning factories on the shores of the maritime provinces, at which the same method seems to be practised, it is clear that the destruction of lobster ova is enormous," and complaints are made both in Canada and Newfoundland of the shrinkage of the lobster fisheries. Various proposals have been made to remedy this state of things, but up to this time nothing effectual appears to have been done, excepting in the establishment of artificial hatcheries, to which I shall refer further.

The measures which have been proposed or adopted by various European countries to protect and improve the fisheries, are, according to Dr. Fulton, as follows: (1) the total or partial prohibition of certain modes of fishing deemed injurious; (2) the enforcement of close times; (3) prohibition of the capture, landing, or sale of immature fish; (4) protection of spawning grounds; (5) destruction of the enemies of the food fishes, as seals, porpoises, &c., in certain Continental fisheries; (6) the establishment of hatcheries on the coast for sea fish and edible shell-fish.

Hatcheries already exist in the United States, Canada, Newfoundland, Norway, and Scotland, and it is proposed to establish them in Belgium and France. In Newfoundland last season 551,469,000 young lobsters and 36,650,000 young cod were hatched and planted on the fishing grounds; this season (1892) 207,000,000 young cod were hatched in Norway and planted in the inshore waters. Dr. Fulton has kindly supplied me with the following statistics as regards the hatcheries of Canada and the United States:—

"*Fish Hatching in Canada.*—Since 1874, when first begun, 911,771,000 fry—salmon, trout of various kinds—"whitefish" (*Coregonus*), pickerel, &c., have been hatched and planted. Last year (1891) the numbers were over 115,770,000 at the fourteen hatcheries supported by the Government, which spends annually about 40,000 dollars on fish-breeding.

United States.—Besides the Central Fish Commission, most of the States have hatcheries. The Fish Commission has thirteen. In 1888 (the last year for which figures are published) 238,986,000 fry and ova were distributed by the Fish Commission. In 1890 the State hatcheries of the State of New York hatched nearly 40,000,000,—probably in U.S. nearly 500,000,000 annually. The money grant is very large, but I have not been able to ascertain it.

Shad-hatching is prosecuted on a very large scale, 153,890,000 in 1888, and very successful results claimed. The Atlantic Shad Fisheries had sunk to a low point. In 1880 the catch was 4,149,968, and each year it has increased; in 1888 the catch being 7,660,474,—85 per cent. greater than in 1880, the money value of the increase being $704,101."—*U.S. Fish Commission Report for 1887, published 1891.*

It is evident, then, that artificial fish-hatching is obtaining a fair trial across the Atlantic, and we may hope that its further development in Europe is only a question of time, for it seems certain that the present demand for fish must put too great a strain upon the natural productiveness of the sea, and that unless this productiveness can be reinforced by other than mere protective measures, the supply cannot possibly keep pace with the demand. In our own country the only sea-fish hatchery, I believe, is that now in course of development by the Scotch Fishery Board at Dunbar. But the importance of the subject is such that I propose to give you a short account of the processes now in use at the Norwegian hatchery, and in the fresh-water hatchery of Mr. Armistead at New Abbey.

First, as to the Norwegian hatchery at Flödivigen. This is situated on a small bay on the outside of the island of Hiso, about two miles from the open sea, and at a similar distance from Arendal. The establishment is of very considerable extent and comprises—(1) a spawning pond of the following dimensions: length 19 metres, breadth 6 metres, depth 3 metres. This pond is enclosed on three sides by strong granite walls and on the fourth by a perpendicular cliff. It is roofed over to keep out snow and to moderate the light, and about two feet from the bottom is a flooring with spaces an inch or an inch and a half in width between the planks, and underneath are pipes by means of which the foul water at the bottom can be drawn off. There is space enough for 1,000 to 2,000 large fishes, but the water must be continually renewed. (2) A rearing pond 34×22 metres, with a maximum depth of 5 metres. (3) The hatching house. (4) The spawn-collector. (5) The engine house. (6) Live boxes for the spawners. (7) Ice house with freezing apparatus.* (8) Hatching apparatus.

Dr. Fulton has recently visited this establishment, and has given me the following brief but interesting account of its working:—

"The fish are procured alive and confined under a wharf in large wooden compartments, being fed from time to time with herrings and sprats. At the approach of the spawning period

* The engine is used for the purpose of pumping, so keeping a constant current of water through the various ponds and hatching troughs,—the water never being allowed to rest but being kept in a constant whirl. A store of ice is necessary, because at some seasons it is impossible to procure fresh food for the fish: they are then fed upon herrings and sprats which have been preserved in ice.

they are transferred to a "spawning pond" built against a cliff with granite blocks, and which is at a slightly higher level than the hatching house. Into this the water is pumped, and the overflow of the water carries off the floating fecundated eggs (for males and females are kept in the pond), and these eggs are separated by a large horse-hair cloth and transferred to the hatching apparatus. The eggs are thus fecundated *naturally*, and the fish require no handling. The expense, Donnevig told me, when large quantities are produced, is one penny for 8,000 or 10,000 fry; that includes all expenses, wages, coals, etc. The adult fish are kept from year to year. In this country we would be able to hatch many more fish, for the reason that in Norway they have not the flat-fish fisheries, soles, turbot, etc., which we have, and as many of the fish spawn in different months a succession of them could be employed."

The stocking and preservation of our rivers and lakes is certainly not, from an economical point of view, so important a matter as the maintenance of the sea-fisheries. It is nevertheless both important and interesting, and the methods adopted at establishments like that of Mr. Armistead—the result of many years of experiment—are well worthy of our attention.

Mr. Armistead's hatchery is located about eight miles south of Dumfries, in a most picturesque spot on the northern slope of Criffel. There are sixty fish-ponds and a number of buildings adapted for the various operations connected with the business. I cannot do better by way of description than read some extracts from a newspaper account of a visit to the hatchery:—

"The sources of water supply, which form the driving power of the works, are as varied as they are plentiful. At least four different streams flow through the estate, and from each of these a supply of water is drawn, as well as from springs innumerable, several of which, collected into one focus, supply the driving power of the main hatchery, which takes a hundred gallons por minute of clear, sparkling spring water. A good deal of hatching has, however, now to be done in other buildings, and some considerable extensions are now in contemplation. In the main hatchery a considerable number of eggs are already (November,

1892) in process of incubation, consisting of some excellent breeds of trout (*S. fario*), Loch Leven trout (*S. levenensis*), and American trout or char (*S. fontinalis*), and in addition to these the first sea trout (*S. trutta*) eggs of the season have been laid down. A few of these fish are now acclimatised in the ponds where they have been reared from the egg, and have in turn yielded their ova without ever going to sea. The eggs are arranged on glass grilles, and looked the essence of cleanliness, as indeed did the entire hatchery, and herein lies one of the great secrets of successful fish culture.

Having finished our inspection, a net was run through one of the ponds, and those who were privileged to witness the result became convinced that the fish culture of the present day has become a very real thing indeed. To see the masses of fine, healthy trout, composed of individuals averaging several pounds each, as the net was repeatedly brought to bank, is a sight of no ordinary kind, but it was certainly to be seen to perfection here. In skilful hands the fish were rapidly sorted, and then the spawning operations began. Mr. Armistead has hitherto made a practice of spawning every fish himself, and the amount of labour entailed is very great. This may be understood more fully perhaps when it is mentioned that after dinner on Saturday evening he went out and stripped 74 trout which had been brought up from one of the ponds and placed in the tanks, and it was 11 p.m. when he went to smoke the pipe of peace before retiring to rest. A pile of spawning dishes being at hand, one of them is taken and carefully wiped dry with a towel. Being placed upon the spawning table, a fish is handed by an attendant in a suitable landing net. It is adroitly seized by Mr. Armistead, the left hand being placed just above the tail, which is grasped by the thumb, while the head of the fish slips into and is grasped by the right hand. Holding it in an oblique position with the back downwards, the right thumb of the right hand is passed along the abdomen, and the eggs are rapidly expelled into the dish. The fish is then pitched skilfully over the end of the table, and performing a somersault as it passes through the air, it alights safely in a tank, and at the same instant another fish held up by the attendant is seized and treated in a similar manner, and thus the ova of several fish are taken in much less time than it takes to write a description of the operation. A male fish is then handed up and the milt expressed on to the ova, both being carefully mixed by the hand, and a little water added. In this way dish after dish is filled with ova until all are occupied, when the contents of half the dishes are ready for washing, and these are shot into a tank with a perforated outlet, in which they are subjected to a current of water. The spawning then goes on, and by the time the dishes are again filled the contents of the rest are ready for washing. And so the work goes on, gallons of ova being taken and got ready for the hatching-boxes in a very short time. They are then decanted by means of a measure, which holds enough to fill one grille, and thus the latter are rapidly filled, and become the resting places of the ova until "fully eyed," when they are packed and distributed to all parts, being largely and successfully used for planting in artificial hatching beds and streams. This, if properly done, Mr. Armistead considers the most economical method of stocking waters, and the eggs are sold in large quantities at very low rates to facilitate this important work.

Leaving the work of the hatchery, we again took a walk amongst the ponds, and were just in time to witness the sorting of a splendid mass of delicious-looking Loch Leven trout. The late fish were pitched into an empty pond adjoining the one from which they had been taken, whilst those nearly ripe were put into a carrier on wheels—a very convenient looking thing—and hurried off to one of the spawning ponds to wait for a few days before being operated upon. A few fully ripe fish (some 50 or 60) were carried off to a waiting tank ready to be operated upon by Mr. Armistead as soon as practicable. A pond full of American trout specially engaged our attention in passing, many of the fish being distinctly visible, their resplendently prismatic colours and the deep orange and white of the under parts and fins being distinctly seen, even while in the water. Several botanical ponds were noted, some of the specimens in them being great rarities. A fine specimen of the Cape Water Lily (*Aponoge-*

ton distachyon) was still in bloom notwithstanding the frost. A walk of a quarter of a mile brought us to the nursery or yearling ponds, in which the fry are placed in April or May, and here we saw a nice show of yearling fish. These ponds occupy the side of a hill, so that there is considerable fall from one to the other, and the various supplies of water after passing through them are united into one focus, and do duty in some larger ponds lower down. The yearling house is on a lower level than the fry ponds, and the fish can either be carried in tanks or allowed to swim down into it, the advantage of the latter process being apparent. Here in a comfortable building they can be sorted, counted, placed in the numerous preparation tanks, and when the time appointed for their departure arrives, 2,000 yearlings can be packed and loaded on to a wagon in less than ten minutes."

Some remarks of Mr. Armistead on the success which has been attained in the artificial hatching of fish may fitly conclude this part of the subject:—

"Whereas, twenty-five years ago," Mr. Armistead writes, "we were working very much in the dark, and had many difficulties to contend with, which were little understood, we now look upon the everyday work of a fish farm as calmly as the agriculturist does upon his daily labours. Still, there is a vast deal to learn; but we are sure of our ground, and the rest is simply a matter of time. In glancing at the work which has been done, the difficulties that have been overcome, the improvements that have been introduced, there is much cause for satisfaction at results. In the beginning trout ova were collected by hundreds, and it was a common thing for three men to be occupied in spawning a trout; and some of the earlier writers describe one holding the head, another the tail, while a third operator took the ova, which often took nothing bigger than a saucer to hold them. Now hundreds of fish are spawned by one man in a few hours at the Solway fishery, and piles of dishes are required to contain the eggs, which are measured by gallons; and, as the season goes on, are counted by the million. For a long time it was supposed that the gravelly bed of a stream was necessary for the successful hatching of the ova of the *Salmonidæ*.

Then hatching boxes were invented, with all their paraphernalia, and we have since gone on improving the various appliances. One rather striking fact which comes to the front, however, is that we have largely gone back to the gravelly bed of a stream for the purpose of hatching ova for stocking waters; and it is by far the most economical method, in many cases, by which to manage this sowing of the seed, as it were. When the lowest price of ova was 50s. a thousand, sowing liberally was hardly to be entertained; but now that magnificent 'fully-eyed' eggs all ready for hatching can be bought—taking a quantity—at 7s. 6d. per 1,000, the cost of sowing is comparatively trifling. These 'eyed' trout-eggs may be sown in artificially prepared beds, very much as a farmer or gardener sows his seeds. The beds can easily be made where there is a good trout stream, though they should not be made in the stream itself, but alongside of or near it, or in a race way where they are not liable to be destroyed by floods. They can be made in a variety of different ways, but the simplest plan is perhaps to make them of wood. I shall be very glad to send one or more of these wooden beds to anyone who may desire it. When once the principle is understood, more wooden ones may be made by any local carpenter; or brick, stone, or concrete may be used, if greater permanency is desired. The trout-eggs, when within a week or so of hatching, are placed among gravel in the beds, and left to themselves—no further care being necessary, except to be sure that the water supply is not cut off."

To us, as a local Club, the practical outcome of the facts which I have thus briefly put before you lies in the question,—what should we be doing in our district to help in maintaining and improving our fisheries? For, if nothing be done, I take it as certain that the yield must persistently decrease, except in so far as we may be beneficially affected by the efforts of neighbouring districts. But that, I trust, is scarcely a *solatium* to be calmly accepted by the Northumbrian spirit.

Besides the exercise of the various regulating powers belonging to local authorities,—on which I need not further dwell,—there are at least two directions in which it might be desirable for the County Councils to invoke the aid of Biologists. First, by means of systematic observations, to make out accurately the geographical and seasonal distribution of the various food-fishes in our district, and their habits as regards breeding, food, migration, etc.* *Secondly*, by the establishment of a hatchery, to aid in keeping up and improving the supply of fish. I might, perhaps add a third clause, to include the establishment of oyster, cockle, and mussel beds, etc. Measures of this kind must, of course, involve considerable expense, but the resulting advantage could scarcely fail to be more than commensurate with the outlay. To deal with these matters in detail would be beyond the bounds of my time and space for this evening, and would moreover be premature. I will only add that if a hatchery should sooner or later be established in our district, as I hope it may, there should be associated with it, in the shape of a Biological station, some facilities, however humble, for the scientific study of our marine fauna. A work of this kind comes fairly within the powers of the County Councils, which have already shown a commendable care for the interests of Agriculture, and a desire generally to help forward technical and scientific education. They could scarcely employ themselves more usefully, or more materially benefit the whole community, than by taking in hand the whole question of the preservation and improvement of our local fisheries.

* The species of fishes inhabiting our local waters are fairly well-known,—thanks to the persevering observations, extended over many years, of various naturalists and anglers,—notably of the late Mr. John Hancock, Dr. Embleton, and our excellent Secretary, Mr. Howse. In the last volume (Vol. X.) of the "Natural History Transactions of Northumberland and Durham," Mr. Howse published a Catalogue of the local fishes,—complete, so far as our present knowledge goes, and containing much of interest as regards the Natural History and habits of the various species.

The following gentlemen were elected members of the Club during the year 1892–3 :—

May, 1892.	Francis, Wm., 20, Collingwood Street, Newcastle.
June, 1892.	Balden, John, jun., Dilston, Corbridge-on-Tyne.
June, 1892.	Wood, Jas. Scott, Wood's Buildings, Walker Gate.
1892.	Yates, James, Public Librarian, Halton, nr. Leeds.
May, 1893.	Clay, Thomas R., Elswick Lodge, Newcastle.
June, 1893.	Martin, N. H., Windsor Crescent, Newcastle.
June, 1893.	Peart, Andrew M., Cleveland Villa, North Shields.
June, 1893.	Peart, Robert, ,, ,,

The following places were fixed for FIELD MEETINGS, 1893 :—

MAY 29TH	Staward Peel.
JUNE 19TH	Keeldar changed to Bellingham.
JULY 17TH, 18TH	Dumfries and New Abbey.
AUGUST 22ND, 23RD, 2 DAYS.	Sedberge changed to Staward Peel.
SEPTEMBER 21ST...........	Wycliffe-on-Tees.
OCTOBER	Black Halls, near Castle Eden.

ABSTRACT OF TREASURER'S ACCOUNT OF TYNESIDE NATURALISTS' FIELD CLUB.

Dr.

1892.		£	s.	d.
Jan.	To Balance in hand	65	2	4
	,, Subscriptions	60	15	0
	,, Transactions Sold	1	11	0
		£127	8	4

Cr.

1892.		£	s.	d.
Jan.	By Printing	99	8	6
	,, Secretaries' Expenses	7	0	0
	,, Evening and Anniversary Meetings	2	1	6
	,, Postage	1	11	8
	,, Commission	3	1	2
Dec. 31.	,, Balance	14	5	6
		£127	8	4

May 3rd, 1893.—Exmined and found correct,

ARTHUR TRANAH, AUDITOR.

The following gentlemen were proposed and elected as Officers of the Club for 1893–94 :—

President.

J. F. Spence, Esq., Chirton Cottage, North Shields.

Vice-Presidents.

Joseph Blacklock.
D. O. Drewett.
William Maling.

Ex-officio Vice-Presidents.

D. Embleton, Esq., M.D.
Rev. Canon Tristram, F.R.S.
Rev. Canon Norman, F.R.S.
E. J. J. Browell, Esq., J.P.
Prof. G. S. Brady, F.R.S.
Rev. G. R. Hall, M.A., F.I.A.
G. H. Philipson, Esq., M.D.
A. S. Stevenson, Esq., J.P.
Rev. J. M. Hick, B.A.
John Philipson, Esq., J.P.

Hon. Treasurer.

R. Y. Green.

Hon. Secretaries.

Richard Howse
Thomas Thompson.
Faraday Spence.

Committee.

T. W. Backhouse.
Dr. G. S. Brady.
E. J. J. Browell.
Wm. Dinning.
D. Embleton, M.D.
John Glover.
Rev. J. M. Hick.
Rev. Wm. Johnson.
G. H. Philipson, M.D.
John Philipson.
Col. J. R. Young.
Joseph Cobb, Sunderland.

Auditors.

J. S. Forster.
Arthur Tranah.

NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE.

ANNUAL MEETING, 30TH AUGUST, 1893.

REPORT FOR 1892–1893.

In presenting the Annual Report to the members of the Natural History Society, the Committee have in the first place to mention that the total receipts from subscriptions, fees, and other sources for the past year amount to £696 : 19 : 7, and the total expenditure has been £779 : 8 : 4. The excess of expenditure over income has been met in this and the previous year (1891-2) by the reduction of the substantial balance of 1891 from £258 : 7 : 6 to £57 : 3 : 1, the balance on hand at the end of the present financial year. The increase of expenditure during the last and previous year has arisen chiefly from the repairs done to the Museum building, painting the outside, and furnishing the Upper East Corridor and the gallery of the Bird Room with new cases, and partly from the expense of the electric lighting of the Museum on Saturday evenings.

Though the strictest care in outlay has been exercised, this statement shews the necessity for the continuance of the same rigid economy, and for renewed exertions on the part of the officers and members in their endeavours to increase the list of subscribers. During the year only nine new members have been elected, and the Society has lost by death and resignations about the same number, so that the total membership remains about the same as last year.

About 22,250 persons have paid for admission during the past year, being a decrease of upwards of 7,000, which diminution is not easily explained, but may have been due to the finer weather prevailing during the holidays, as the receipts have fallen off chiefly at those periods.

In the direction of increasing the membership the Committee would suggest that it seems most desirable to make a direct appeal to the numerous county gentlemen of Northumberland and Durham, very few of whom appear on the present list of subscribers. It could be pointed out that the advantages of having a first-rate provincial museum, so conveniently situated for the rural populations of both counties, is a matter of interest to all influential persons and worthy of their permanent support, especially as the Museum is a great source of interest to visitors from the country and instruction to all the inhabitants of this district.

The work of the Society has been steadily and carefully carried on in the Museum during the past year, and as fully as the limited funds at the disposal of the Committee would permit. Additional wall-cases have been furnished for the Ethnological Room in order to exhibit the large collection of South Sea implements and manufactures collected by the late Miss Julia Boyd, of Moor House, Durham (presented, according to her wish, by her executors to the Museum). In these and adjoining cases the bulk of her collections have now been arranged. New bird-cases have also been obtained and have been used for many of the fine series of the rarer New Zealand birds collected by Miss Boyd, as well as in carrying out the formation of a typical and generic collection of foreign birds round the galleries of the Bird Room. In this considerable progress has been made, but the want of funds to provide a full set of cases will for a time at least prevent the completion of the arrangement of this part of the Museum collections.

The legacy of £2,000 bequeathed by the late John Coppin, Esq., of Bingfield, Northumberland, has been received and invested in Tyne Improvement Commissioners' Stock at 4 per cent. per annum.

The Mural Tablet erected to perpetuate the memory of Albany and John Hancock and their lifelong devotion to the study and advancement of different branches of Natural History has now been completed and placed in the Entrance Hall of the Museum. The balance of the Memorial Fund has been expended in the purchase of an excellent portrait of Mr. John Hancock, from the pencil of F. H. Michael, of London.

The Committee have to regret that, in consequence of the very small attendance of visitors on Saturday evenings and the great expense consequently incurred for the Electric Lighting, they have considered it advisable to discontinue the opening of the Museum on Saturday evenings, at least for the present.

At the suggestion of Dr. Embleton, and through the obliging co-operation of himself, the Rev. Canon Tristram, Prof. M. C. Potter, Prof. W. Somerville, Prof. G. S. Brady, and Mr. De Havilland, who gave their services gratuitously, the Committee were able to arrange a short series of Saturday-Evening Lectures on various subjects of Natural History in the months of February and March of the present year. These lectures were delivered in the Museum, and were well attended and so much appreciated by members of the Society and numerous visitors that the Committee look forward to being able to arrange for another series during the coming winter. The following is a list of the lectures delivered:—

Feb. 4.—On the Egg	D. Embleton, Esq., M.D.
,, 11.—On the Origin and Causes of the Migration of Birds ...	Rev. Canon Tristram, F.R.S.
,, 18.—On Frogs and Tadpoles ...	Prof. Potter, M.A.
,, 25.—On the Structure of Timber ...	Prof. Somerville, F.R.S., Ed.
Mar. 4.—On Parasitism in Plants and Animals	Prof. G. S. Brady, F.R.S.
,, 11.—On Germs	H. De Havilland, Esq.

During the past year the Microscopical Society have as usual held their evening meetings in the Museum, and the College of Physical Science still continue to hold the classes in connection with the departments of Agriculture and Biology in the Lower West Corridor until suitable rooms are provided for them in their new building now in progress towards completion. The use of the rooms has also been granted to the Mayor and Corporation of Newcastle-upon-Tyne for a Conversazione during the visit of the British Medical Association to Newcastle in August.

In the last Report it was mentioned that the Rev. Canon Tristram had suggested the desirability of establishing a Hancock Prize Medal for original essays on local Natural History subjects. Since that time the Rev. Canon has formulated his scheme and issued a circular, a copy of which is included in this Report. It is thought that about £200 would form a sufficient fund, if carefully invested, to give annually, or as often as it is fixed, to award a prize to successful competitors. About one-half has been promised towards this sum.

COPY OF CIRCULAR.

JOHN HANCOCK MEMORIAL MEDAL.

"It is proposed to establish, under the auspices of the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne, a Medal or Prize to be given annually for the encouragement of Field Observations in Natural History, whether Botany, Ornithology, Entomology, Molluscan or other invertebrate forms of Life, or Geology.

The object is not to foster a passion for collecting, but to stimulate observation and consequent research. It is, therefore, proposed that the Medal or a Prize of Books should be offered for the best account of a ramble, with especial reference to the common objects noticed in the fields or the woods, on the moors, or by the sea shore.

Competitors shall be residents in the counties of Northumberland or Durham, and the prize shall be awarded not for Technical Knowledge or Literary Research, but for observation such as can be exercised by persons of ordinary education, without special training, with a special view to the encouragement of the study of Natural History among clerks, assistants in houses of business, engineers, and apprentices.

The Medal shall be awarded by Examiners nominated by the

Committee of the Natural History Society, and the Trustees of the Natural History Society shall be the Trustees of the Fund.

It seems fitting that the Medal should bear the name of John Hancock, who, more than any other man, for more than half a century imparted to the Tyneside a share of his own enthusiasm, and gave our Society a prominent position among the Naturalist Societies in England, and who lives still by his work in our Museum. John Hancock was the typical field naturalist. Behind the naturalist's eye he possessed the artist's soul, and this enabled him to ennoble the art of taxidermy. Who could watch him, as he described with an artless eloquence the feats and actions of a falcon, every motion of his body and the glance of his eagle eye almost reacting the scene he depicted, without feeling that he was a master of bird life? This indeed he was, and Newcastle Museum attests that he was as true a poet as ever wielded the sculptor's chisel or handled the artist's brush. His sympathy was with nature, and his groups are vitalized by one who felt the life of birds as something kindred with his own; and inspired with this sympathy and labouring to utter it, he recreated life as it were within the grasp of death.

It is sometimes thought that the days of field work are gone by in a soil searched through and through for so many years; that the field-glass and the lens must be abandoned for the microscope, and the studies of the laboratory supersede the observations of the field. But there is still room for the worker in every branch of natural science, from the study and observation of life habits, down to the investigation of muscles, and the analysis of brain tissue.

For the busy toilers of the great city, for the hard-worked professional or business man, there is no relaxation or refreshment that can rival this change of the gaze from the law-book or the ledger to the gem-studded turf, or the path of the bird in the air. But the enjoyment of nature must be an intelligent enjoyment. We must learn the story and the lesson of plant, bird, beetle, and butterfly, till we cease to took on any of nature's gifts with an ignorant indifference or an unintelligent wonder."

"The works of the Lord are great, sought out of all them that have pleasure therein."

SUBSCRIPTIONS ALREADY PROMISED.

Lord Armstrong	£50	0	0
H. Seebohm, Esq., Sec. R.G.S., London	10	0	0
Rev. H. E. Fox, M.A., Durham	10	0	0
Rev. Canon Tristram, F.R.S., Durham	10	0	0
A. P. Harrison, Esq., Newcastle-on-Tyne	5	0	0
J. H. Gurney, Esq., F.Z.S., Keswick Hall, Norwich	2	0	0
G. H. Philipson, Esq., M.D., Newcastle-on-Tyne	2	0	0
R. Y. Green, Esq., Newcastle-on-Tyne	1	1	0

Subscribers' names will be received by Rev. Canon Tristram, College, Durham, and Mr. Wright, The Museum, Barras Bridge, Newcastle-on-Tyne."

The additions to the Library during the year consist of about 130 parts and volumes of Transactions which have been received in exchange with other Societies. Miss Smith, of Long Benton, has obligingly presented a very valuable collection of Books forming the library of the late Thomas J. Bold, of Long Benton. Mr. Bold was a well-known Coleopterist and Naturalist of our district, and the books contained in his library, consisting chiefly of works on Insects, form a very important addition. Mr. Bold's extensive and valuable collection of Local Coleoptera was presented shortly after his death by his brother Edwin Bold, of Long Benton. The other donation that may be specially mentioned is a fine copy of Curtis' "Flora Londinensis," presented by Mr. R. Y. Green.

In Zoology, Mr. George Allan's Swazieland collection, consisting of horns of the Kudu, Pallah, Reitbock, Burchell's Gnu, etc., has been received, and these horns are now all arranged in the Entrance Hall. About seventy other specimens of Mammals, Birds, Fishes, and Reptiles have been added to the collections, chiefly presents from F. Wallis, Esq., Ross, Herefordshire; R. C. Clephan; George Crawhall; R. L. Proudlock; Charles Liddell, Esq., Sandhoe; John Robinson, North Shields; F. H. Phillips; John Duncan; J. Jackson, and others. A full list of the New Zealand birds and also of the South Sea curiosities collected by Miss Julia Boyd, and ethnological presents by Mr.

George Allan and others will be found in a previous list of donations. A detailed list of all the donations and presents received during the year is appended to this report.

The Hon. Treasurer's Financial Statement shews a balance in bank of £57 : 3 : 1. The reduction in balance from former years has been caused, as mentioned before, by the extra outlay for wall-cases in the Upper East Corridor and bird-cases and other items as shewn in Treasurer's Account.

The following gentlemen were elected members during the year 30th June, 1892, and 30th June, 1893 :—

Armstrong, C. F., 4, Fenwick Terrace, Jesmond, Newcastle.
Blackett, James Foster, 6, Windsor Crescent, Newcastle.
Currie, Archibald, 41, Eldon Street, Newcastle.
Deacon, Thomas F., 10, Claremont Place, Newcastle.
Oliver, A. M., 18, Eslington Terrace, Newcastle.
Pattinson, Hugh Lee, jun., 7, Windsor Crescent, Newcastle.
Percival, Arthur Blaney, 20, Claremont Place, Newcastle.
Smith, Clarence D., 34, Lovaine Place, Newcastle.
Smith, Lancelot E., 34, Lovaine Place, Newcastle.

ABSTRACT OF MINUTES.

ANNUAL MEETING, 30TH AUGUST, 1893.

THE RIGHT HON. LORD ARMSTRONG, C.B., F.R.S., IN THE CHAIR.

The minutes of last meeting were read and confirmed.

The Hon. Secretary read the Committee's Report for 1892–3.

Moved by the Chairman and seconded by Mr. W. Cochrane:—
"That the Report now read be adopted."

The Hon. Treasurer's Financial Reports were read.

Moved by Mr. Knowles and seconded by Mr. W. Cochrane:—
"That the Treasurer's Report be adopted."

Prof. Potter moved and Mr. Knowles seconded:—
"That the gentlemen now proposed as officers of the Society for 1893–4 be elected." (See List of Officers, p. 332).

Moved by Mr. J. Pattinson and seconded by Mr. R. C. Clephan:
"That a cordial vote of thanks be given to Lord Armstrong for his services in the chair."

THE HONORARY TREASURER IN ACCOUNT

DR. CURRENT ACCOUNT FROM 30TH JUNE,

1893.	RECEIPTS.		£	s.	d.
June 30.	To Balance of last Account		139	11	10
	,, Members' Subscriptions		352	12	6
	,, Admission Fees		174	4	3
	,, Interest on Stock:—				
	Newcastle Corporation, $3\frac{1}{2}$ per cent. Stock (less Income Tax)	£68 5 0			
	Wear Commissioners, $4\frac{1}{2}$ per cent. Stock (less Income Tax)	21 18 8			
			90	3	8
	,, Guides to Museum, sold		4	8	5
	,, Balance from Electric Lighting Fund		35	13	9
	,, Donation, J. W. Barnes, Esq., Durham		10	0	0
	,, Donation, College of Physical Science		25	0	0
	,, Interest on John Coppin's Legacy, from Nov. to Dec. 31st, 1892		4	5	6
	,, Sundries, per Joseph Wright		0	10	3
	,, Error in Cr. Sundries, April 15th, 1893		0	1	3
			£836	11	5

WITH THE NATURAL HISTORY SOCIETY.

1892, TO 30TH JUNE, 1893. CR.

1893.	PAYMENTS.	£	s.	d.	£	s.	d.
June 30.	By Salaries and Wages:—						
	Richard Howse	200	0	0			
	Joseph Wright	100	0	0			
	Jno. Jackson	91	0	0			
	Wm. Vout	67	12	0			
	Mrs. Atkinson	26	0	0			
					484	12	0
	,, Incidental Expenses:—						
	Coal	5	7	6			
	Coke	17	1	3			
	Gas	6	7	0			
	Water	6	17	4			
	Advertisements	9	17	10			
	Taxes	4	16	0			
	Insurances	31	2	0			
	Electric Lighting	44	17	11			
					126	6	10
	,, Tradesmen's Accounts, etc.:—						
	Robson & Sons	40	0	0			
	Dinning & Cooke	5	19	6			
	Gurney & Jackson	1	12	6			
	Sopwith & Co.	28	0	0			
	G. G. Laidler	2	0	3			
	Walker & Son	1	12	6			
	F. H. Michael	20	0	0			
	P. Hall	0	19	8			
	Carnegie & Co.	1	7	6			
	Faraday Spence £8 4 6						
	,, ,, ... 4 5 6						
		12	10	0			
	Museums Association	2	2	0			
	Bustard, per Richard Howse	7	10	0			
	Patterson (Wire)	1	15	6			
	Currie & Co.	19	15	0			
					145	4	5
	,, Sundries, per Joseph Wright				22	15	1
	,, Cheque Books				0	10	0
	,, Balance as per Bank Book				57	3	1
					£836	11	5

THOS. THOMPSON,
HON. TREASURER.

Examined and found correct, 1st Dec., 1893.

JNO. D. SCOTT, } AUDITORS.
E. O. REID, }

THE HONORARY TREASURER IN ACCOUNT

ELECTRIC LIGHTING FUND,

		£	s.	d.
1893.				
June 30.	To Balance from last Account	7	7	9
	,, Subscription, as per Bank Book	28	6	0
		£35	13	9

HANCOCK MEMORIAL FUND,

		£	s.	d.
1893.				
June 30.	To Balance from last Account, as per Bank Book	128	11	10
	,, Subscriptions, per Joseph Wright	34	6	0
	,, Cash from General Account	0	17	2
		£163	15	0

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1898.

		£	s.	d.
1893.				
June 30.	By Cash transferred to General Account, as per Bank Book	35	13	9
		£35	13	9

THOS. THOMPSON,
HON. TREASURER.

Examined and found correct, 1st Dec., 1893.

E. O. REID,
JNO. D. SCOTT, } AUDIORS.

30TH JUNE, 1893.

		£	s.	d.
1892.				
Oct. 13.	By Craggs, for Tablet, as per estimate	100	0	0
1893.				
Jan. 17.	,, F. H. Michael, Portrait of J. Hancock	35	0	0
April 13.	,, Mawson & Co., Picture Frames	6	15	0
June 30.	,, J. Angove, Cutting Letters in front of Museum..	22	0	0
		£163	15	0

THOS. THOMPSON,
HON. TREASURER.

Examined and found correct, 1st Dec., 1893.

JNO. D. SCOTT,
E. O. REID, } AUDITORS.

THE HONORARY TREASURER IN ACCOUNT

CAPITAL ACCOUNT,

1892.		£	s.	d.
June 30.	To Invested in Newcastle Corporation Irredeemable Stock at $3\frac{1}{2}$ per cent., as per last Capital Account	2000	0	0
	,, Invested in River Wear Commission Funded Debt at $4\frac{1}{2}$ per cent., as per last Capital Account	500	0	0
Dec. 30.	,, Invested in Tyne Commissioners Consolidated Fund at 4 per cent., as per Mortgage No. 5948, 30th Dec., 1892	2000	0	0
	,, Balance of Maintenance Fund, as per Bank Book, 30th June, 1893	45	19	2
		£4545	19	2

MAINTENANCE FUND,

1893.		£	s.	d.
June 30.	To Balance from June, 1892	45	19	2

WITH THE NATURAL HISTORY SOCIETY.

30TH JUNE, 1893.

1893.		£	s.	d.
June 30.	By Newcastle Corporation Irredeemable Stock at $3\frac{1}{2}$ per cent, as per Certificate No. 260.	2000	0	0
	,, River Wear Commission Funded Debt, No. 967, at $4\frac{1}{2}$ per cent.	500	0	0
	,, Tyne Improvement Commissioners Consolidated Fund at 4 per cent., Mortgage No. 5918, 30th Dec., 1892..................	2000	0	0
	,, Cash in Messrs. Lambton & Co.'s Bank, as per Maintenance Fund Account	45	19	2
		£4545	19	2

THOS. THOMPSON,
HON. TREASURER.

Examined and found correct, 1st Dec., 1893.

JNO. D. SCOTT,
E. O. REID, } AUDITORS.

30TH JUNE, 1893.

1893.		£	s.	d.
June 30.	By Cash in Messrs. Lambton & Co.'s Bank	45	19	2

THOS. THOMPSON,
HON. TREASURER.

Examined and found correct, 1st Dec., 1893.

JNO. D. SCOTT,
E. O. REID, } AUDITORS.

OFFICERS OF THE NATURAL HISTORY SOCIETY, 1893–94.

The following Gentlemen were elected as Officers of the Natural History Society for 1893-94.

PATRONS.

His Grace the Duke of Northumberland.
The Right Rev. the Lord Bishop of Durham.
The Right Rev. the Lord Bishop of Newcastle.

PRESIDENT.

The Right Honourable Lord Armstrong, C.B., F.R.S.

VICE-PRESIDENTS.

The Right Honourable the Earl of Ravensworth.
Sir M. White Ridley, Bart., M.P.
Sir Lowthian Bell, Bart., F.R.S.
Sir Andrew Noble, K.C.B., F.R.S.
The Worshipful the Mayor of Newcastle.

Lieut.-Col. Potter, C.B.
T. W. Embleton, Esq.
D. Embleton, Esq., M.D.
R. R. Dees, Esq.
J. A. Woods, Esq.
G. H. Philipson, Esq., M.D., etc.
Thomas Bell, Esq.
John Daglish, Esq.
John Rogerson, Esq.
J. W. Swan, Esq.
Joseph Blacklock, Esq.
D. O. Drewett, Esq.
Wm. Maling, Esq.
H. N. Middleton, Esq.
Rev. Canon Lloyd, D.D.
Alex. S. Stevenson, Esq.
C. M. Adamson, Esq.
I. G. Dickinson, Esq.

HON. TREASURER.

Thomas Thompson, Esq.

HON. SECRETARIES.

Wm. Dinning.
A. H. Dickinson.

COMMITTEE.

Mr. H. T. Archer.
Mr. E. J. J. Browell.
Mr. Robt. C. Clephan.
Mr. Samuel Graham.
Mr. R. Y. Green.
Mr. N. H. Martin.
Prof. G. S. Brady, F.R.S.
Rev. Canon Norman, F.R.S., etc.
Mr. Frederick Page.
Mr. John Pattinson.
Mr. John Philipson.
Mr. J. F. Spence.

HON. AUDITORS.

John D. Scott.
E. O. Reid.

HONORARY CURATORS,

1893–94.

ZOOLOGY.

VERTEBRATA.

D. Embleton, M.D.
Samuel Graham.
C. M. Adamson.
Thos. Thompson.

INVERTEBRATA.

Rev. Canon Norman.
C. M. Adamson.
Wm. Maling.
N. H. Martin.
Wm. Dinning.

BOTANY.

Rev. Henry Fox, Durham.
Rev. Wm. Johnson.
C. E. Stuart.
M. G. Potter.

GEOLOGY.

E. J. J. Browell.
J. Daglish.
W. Dinning.
E. J. Garwood.
J. W. Kirkby.
Prof. G. A. Lebour.
Jno. Pattinson.

CURATOR.

Richard Howse.

KEEPER OF THE MUSEUM.

Joseph Wright.

LIST OF EXCHANGES AND DONATIONS TO THE MUSEUM AND LIBRARY

OF

THE NATURAL HISTORY SOCIETY,

From JULY 1st, 1892, to JUNE 30th, 1893.

AMERICAN SOCIETIES.

Albany ;—New York State Museum.
44th Annual Report. 1890.

Boston :—Society of Natural History.
Proceedings, Vol. 25, Parts 3, 4. Nov. 1891—May, 1892.
Memoirs, Vol. 4, No. 10. *The Society.*

Boston :—American Academy of Arts and Sciences.
Proceedings, New Ser., 18 ; Whole Ser., 26. May, 1890—May, 1891. *The Academy.*

Cambridge :—Museum of Comparative Zoology, Harvard College.
Bulletin, Geol. Ser., Vol. 2 ; Whole Ser., Vol. 16, No. 11, 12.
,, Vol. 23, Nos. 3, 4, 5, 6.
,, ,, 24, Nos. 1, 2, 3.
Annual Report of the Curator. 1891-92. *Prof. Alex. Agassiz.*

New York :—Academy of Science and Lyceum of Nat. History.
Annals, Vol. 6, Nos. 1-6. Dec. 1891—May, 1892. *The Academy.*

Philadelphia :—Academy of Natural Sciences.
Proceedings, Parts 2, 3, 1892 ; Part 1, 1893. *The Academy.*

Philadelphia :—American Philosophical Society.
Proceedings, Vol. 30, No. 138. April, 1892.
,, ,, 30. ,, 139. Dec., 1892.
,, ,, 31, ,, 140. Jan.—March, 1893.
Transactions, Vol. 17, New Ser., Parts 1, 2. 1892. *The Society.*

Philadelphia :— Wagner Free Institute of Science.
Transactions, Vol. 3, Part 2. Oct.—Dec., 1892.

Rochester :—Academy of Science.
Vol. 2. Brochure 1. 1892. *The Academy.*

Salem:—American Association for the Advancement of Science.
Proceedings, 40th Meeting, Washington. 1891.
,, 41st Meeting, Rochester. 1892. *The Association.*

Wisconsin:—Wisconsin Academy.
Transactions, Vol. 8. 1888–91.

St. Louis:—Academy of Science.
Transactions, Vol. 5, Nos. 3, 4. 1888–91.
Appendix to Cat. of Flora of Nebraska. March, 1892. *The Academy.*

Washington:—National Academy of Science.
Memoirs, Vol. 2. 1883–4. *The Academy.*

Washington:—Smithsonian Institution: Bureau of Ethnology.
7th Annual Report, Bureau of Ethnology. 1885–6.
Contributions to American Ethnology, Vol. 7. 1890.
Athabascan Bibliography. 1892.

Washington:—Smithsonian Institution: Contributions to Knowledge.
Vol. 28. Life History of N. American Birds, by Capt. C. Bendire. 1892.
On the Application of Interference Methods of Spectroscopic Measurement. *The Institution.*

Washington:—Smithsonian Institution, U.S. National Museum.
Report of U.S. National Museum. 1890. *The Institution.*

Washington:—United States Geological Survey.
Mineral Resources of the U.S.A. for 1889–90. D. Day.
The Director of U.S. Geol. Survey.

Washington:—Department of Agriculture.
Bulletin 3 (Hawks and Owls of U.S.A.).
The U.S. Department of Agriculture.

BRITISH SOCIETIES.

Berwick-upon-Tweed:—Berwickshire Naturalists' Club.
Vol, 13, No. 2. 1890–91. *The Club.*

Cardiff:—Naturalists' Society.
Report and Transactions, Vol. 24, Parts 1, 2. 1892–3. *The Society.*

Dublin:—Royal Society.
Scientific Proceedings, Vol. 7, New Ser., Parts 3, 4.
Transactions, Vol. 4 (Ser. 2), Parts 9–13. *The Society.*

Edinburgh:—Meteorological Society.
Journal, 3rd Ser., No. 9. 1891.

Essex, Buckhurst Hill :—Essex Field Club.
Essex Naturalist, Vol. 6, Nos. 6, 7, 8, 9, 10, 11, 12.
,, ,, ,, 7, ,, 1, 2, 3, 4, 5. *The Club.*

Glasgow :—Natural History Society.
Proceedings and Transactions, Vol. 3, New Ser., Part 3. 1892. *The Society.*

Glasgow :—Geological Society.
Transactions, Vol. 9, Part 2. 1890–92. *The Society.*

Greenwich :—Royal Observatory.
Magnetic and Meteorological Observations. *The Astronomer Royal.*

Liverpool :—Naturalists' Field Club.
Reports. 1892. *The Club.*

Leeds :—Naturalists' Union.
Transactions, Parts 17, 18. 1891-2. *The Union.*

Leeds :—Philosophical and Literary Society.
Annual Report for 1891–2 and 1892–3 *The Society.*

London :—British Museum, Cromwell Road, Kensington.
Catalogue of Birds, Vols. 16, 17.
Catalogue of British Echinoderms in the British Museum, by Prof. F. Jeffrey Bell.
Guide to Sowerby's Models of British Fungi.
The Trustees of British Museum.

London :—Ealing Microscopical and Nat. Hist. Society.
Report for 1892. *The Society, per A. T. Belt.*

London :—Geologists' Association.
Proceedings, Vol. 12, Nos. 8, 9, 10. *The Association.*

London :—Nature.
From June 30th, 1892—June 30th, 1893. *The Publisher.*

London :—Quekett Microscopical Club.
Journal, Vol. 5, 2nd Ser., Nos. 31, 32. *The Club.*

London.
Rhopalocera Exotica, Parts 21, 22, 23, 24. 1892-3. *Purchased.*

London :—Zoological Society.
Proceedings, Parts 2, 3, 4. 1892.
,, Part 1. 1893.
Transactions, Vol. 13, Parts 5, 6. *The Society.*

Manchester:—Literary and Philosophical Society.

Memoir and Proceedings, 4th Ser., Vol. 5, No. 2. 1891–2.

" " " " 6.

" " " " 7, No. 1. 1892-3.

The Society.

Manchester:—Owen's College.

Three Museum Handbooks, viz.:

Classification of Animal Kingdom.

" " Vegetable Kingdom.

Catalogue of Type Fossils. *The Keeper of Museum.*

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

Transactions, Vol. 39, Part 3; Vol. 40, Part 5; Vol. 41, Parts 3, 4, 5, 6; Vol. 42, Parts 1, 2, 3. *The Institute.*

Plymouth:—Plymouth Institute.

Report and Transactions, Vol. 11, Part 2. 1891–92. *The Institute.*

Northampton:—Northamptonshire Nat. Hist. Soc. and Field Club.

Nos. 49–52. Jan.—Dec., 1892. *The Society.*

York:—Yorkshire Philosophical Society.

Annual Report for 1891. *The Society.*

COLONIAL SOCIETIES.

AUSTRALIA.

Sydney, N.S.W.:—Australian Museum.

Report of Trustees for 1891.

Records, Vol. 2, Nos. 2, 3, 4.

No. 16. Catalogue of Australian Mammals.

Catalogue of Marine Shells of Australia and Tasmania, Part 2.

The Trustees.

Sydney, N.S.W.:—Royal Society.

Journal of Proceedings, Vol. 26. 1892. *The Society.*

CANADA.

Halifax, Nova Scotia:—The N. S. Institute of Natural Science.

Proceedings and Transactions, Vol. 1, Part 1, 2nd Ser. 1890-91.

The Society.

Montreal:—Natural History Society.

Canadian Record of Science, Vol. 4, No. 8; Vol. 5, Nos. 1, 2, 3, 4, 5.

Cover for Catalogue of Canadian Plants, Part 6.

The Natural History Society, Montreal.

Ottawa:—Geological and Nat. Hist. Survey of Canada.

Contributions to Canadian Palæontology, Vol. 1.

Catalogue of Canadian Plants, Part 6, Musci.

Maps for Annual Report, 1888–89, Vol. 4, Parts D. and N.

Contributions to Canadian Micro-Palæontology, Part 4.

Per Dr. Alfred R. C. Selwyn, Director.

EUROPEAN SOCIETIES.

AUSTRIA.

Prague:—Archiv. der Naturwissenschaft Landesdurchforschung von Böhmen.

Band 6, Nos. 1, 5. 1888, 1891.
,, 7, ,, 2, 3, 4, 6. 1889, 90, 91.
,, 8, ,, 1, 3. 1891. *The Society.*

Vienna.

Verhandlungen der K. K. Zool-Botan. Gesellschaft in Wein:
Jahrgang, 1892, Band XLII., Quartals 1, 2, 3, 4. *The Society.*

BELGIUM.

Brussels:—Société Royale Malacologique de Belgique.

Annals, Tome 26, 4th Ser.; Tome 15, Année, 1880.
Proces-verbaux. July, 1891, to Sept., 1892. *The Society.*

DENMARK.

Copenhagen.

Videnskabelige Meddelelser fra Naturhistoriske Forening i Kjobenhavn for Aaret 1892. *The Society.*

GERMANY.

Dresden:—Isis.

Jahrgang, 1889. Jan,—June.
,, 1890. July—Dec.
,, 1891. Jan.—June.
,, 1891. July—Dec.
,, 1892. Jan.—Dec. *The Society.*

NORWAY.

Bergen.

Bergens Museums Aarsberetning, 1891. *The Director of the Museum.*

Christiania:—Royal Norske University.

Viridiarum Norvegicum, Vol. 32. 1891. *The University.*

RUSSIA.

Kieff:—Memoirs of the Society of Naturalists.

Tome XII., Parts 1 and 2. 1892.

MISCELLANEOUS BOOKS, ETC.

Selections from the Correspondence of Dr. George Johnston, of Berwick-upon-Tweed.

Westgarth Forster's Section of the Strata from Newcastle-upon-Tyne to Cross Fell, 3rd ed., 1883. *Mr. Joseph Wright.*

Royal Horticultural Society; Report on the Conifer Conference, Oct., 1891. *Drewett O. Drewett, Esq.*

Fossil Fish-remains of the Coal-measures of the British Islands, Part 1. *Pleuracanthidæ.* Plates 65-73. *Presented by the Author, the late J. W. Davis, Chevinedge, Halifax.*

Flora Londinensis, by Curtis. *Presented by R. Y. Green, Esq.*

The Library of the late Thomas J. Bold, of Long Benton, consisting of about 277 volumes of works of Natural History, and a number of Pamphlets, etc. See Catalogue. *Presented by Miss Smith, Long Benton.*

MAMMALS.

1891.

July 20. About 36 pairs of Antelope Horns, from Swazieland, South Africa, viz., *Eleotragus arundinaceus; Connochetes taurina; Strepsiceros kudu; Tragelaphus sylvatica; Æpyceros melampus*, Waller's Gazelle. *Mr. George Allan, Swazieland.*

Aug. 11. Common Bat, young, from Ross, Hereford. *Frederick V. Wallis, Esq.*

Sept. 22. Three species of Antelope, from the Somali district, viz., Kudu Skull ♀, *Gazella Sœmmeringü* ♂, *Neotragus Saltiana.* *Chas. Liddell, Esq., Sandhoe.*

Dec. 10. A Coypu, *Myapotamus coypus* (Mol.), from South America, died in Bostock's Menagerie at Newcastle. *Presented by the Proprietor.*

1893.

Jan. 6. A specimen of the Stoat from Dumfries-shire. *Mr. G. R. Rome.*

,, 9. Portion of Vertebral Column of Dolphin brought up in trawl net. *Mr. F. H. Phillips.*

Feb. 2. Stuffed specimen of the Marten, *Mustela Martes*, Linn. *Mr. H. T. Archer.*

,, . Maccarthy's Mongoose, *Herpestes* (*Onychogale*) *Maccarthiæ*, Gray, ?, Ceylon. *Mr. Ernest Scott, Riding Mill.*

Mar. 30. Bactrian Camel, young, stuffed by the late William Yellowley, South Shields. *Mrs. Yellowley.*

Apr. 26. A young Seal. *Mr. David Richardson.*

June 22. A specimen of the Common Shrew, *Sorex vulgaris.* *Rev. W. Featherstonhaugh.*

BIRDS.

1892.

July 14. Four specimens of the Jay. Young of the Cuckoo, from Ross, Herefordshire. *Fred. V. Wallis, Esq.*

Sept. 8. Eighteen Skins of Australian Birds. *Miss Brown, Bloomfield, Woodlands Road, Darlington.*

,, 22. A specimen of the Golden Crested Wren, from Spilsby. *Mrs. Clarke, per Mr. J. F. Spence.*

,, 24. Specimen of Grouse ♀ with many white feathers on the breast and wings. *Mr. George E. Crawhall.*

,, 26. Specimen of the Kestrel from Shotley Bridge. *Mr. J. Logan.*

Oct. 4. Two specimens of Black Tern (young), *Hydrochelidon fissipes,* (Linn.), shot at Holy Island. *Mr. John Robinson, North Shields.*

,, . Group of Birds, Cock of the Rock:

Four *Rupicola crocea* ♂, N.E. of S. America.

Two ——— *Peruviana* ♂ ♀, N.W. America.

Group of Birds of Paradise:

Paradisea major=P. apoda, Linn.

Cicinurus regia.

Two specimens of *Ampelis Japonicus=A. phenicoptera,* from North Eastern Asia.

Sent from Oatlands by Executors of the late John Hancock.

Nov. 12. Specimen of the Glaucus Gull ♂, immature.

Greater Black-backed Gull ♀ and Pink-footed Goose, shot near Newton-by-the-Sea. *Mr. John Jackson.*

,, 14. Specimen of the Giant Petrel, *Ossifraga gigantea*, caught in the South Pacific. *Mr. James Thompson, Rose Cottage, Newport-on-Tay.*

,, 17. Specimen of *Falco peregrinus*, var. *anatum*, caught in the rigging of a vessel 200 miles from the American coast. *Mr. H. T. Archer.*

,, 23. Specimen of *Apteryx Owenii*, New Zealand. *Mr. E. T. Wythes, Birkley Park, Kent, per Mr. R. Y. Green.*

Dec. 5. Specimens of the Nuthatch, *Sitta Europaea*, Linn., var. *cæsia*, found dead at Riding Mill; and one of the Red-necked Phalarope, *Phalaropus hyperboreus*, shot at St. Mary's Island. *Mr. John Duncan.*

,, 15. A fine specimen of Macqueen's Bustard, *Otis Macqueeni*, J. E. Gray, shot near Marske, Yorkshire, Oct. 5th, 1892. *Purchased, per Mr. R. Howse.*

Nov. . Bones of the body, neck, femurs, and humeri of the above specimen of *O. Macqueeni.*
Presented by Mr. Pearce Coupe, Marske.

1893.

Jan. 7. Two Lapland Buntings, *Plectrophanes Lapponicus* (Linn.), winter plumage, shot near Berwick.
Mr. George Bolam, Berwick-on-Tweed.

,, 9. Banded Parrakeet, *Palæornis fasciata*, Müll., Ceylon, died Jan. 8, 1893. *Mrs. Ward, Osborne Avenue.*

Feb. 2. Specimen of the Wigeon, *Mareca penelope* ♂, shot at Dardon Lough, Elsdon, Redewater, Feb. 1st, 1893.
Mr. George E. Crawhall.

,, 17. Head of Mallard, with malformed bill.
Mr. George E. Crawhall.

,, . Specimen of Iceland Gull, immature, shot Dec., 1892, at Howick Burn-mouth, Northumberland.
Purchased, per Mr. J. Duncan.

,, 18. Young of Greater Black-backed Gull, from Brora, Sutherland.
Mr. Alex. Yellowley, South Shields.

Apr. 8. Specimen of the Whimbrel ♂, St. Mary's Island. *Purchased.*

May 16. A fine specimen of the Wild Turkey ♂. This bird had been kept in a domestic state for several years, was a prize taker, and weighed 32 lbs.
Mr. Arthur Blayney Perceval.

,, 20. A specimen of the Herring Gull, var., shot near Whitley, May, 1893, and Lesser Black-backed Gull ♂, mature.
Bought of Mr. J. Duncan.

,, 22. Ring Dotterel ♂, mature, breeding plumage, Whitley sands, May, 1893. *Purchased.*

June 13. Three specimens of the Jay, 2 mature, 1 immature, from Ross, Herefordshire. *F. V. Wallis, Esq.*

FISHES.

1892.

Aug. 11. Specimen of the Sea Lamprey, 31 inches long, from the Tyne, found in a pool at Bell's Close, near Scotswood, at low water. *Mr. James Henderson, Bell's Close.*

,, . Specimen of the Viper in spirits. *Mr. G. E. Crawhall.*

Dec. 13. Specimen of the Greenland Bullhead, *Cottus Groenlandicus*, from Norway. *Mr. Walter S. Corder, North Shields.*

,, 13. Specimen of the Three-bearded Rockling, *Motella vulgaris*, Will., from Cullercoats. *Mr. F. H. Philips.*

1893.

Feb. 9. Lower Jaws of Dog-Salmon, from Cowichan River, British Columbia, sent by Mr. G. R. G. O. Driscoll, B.C.
Mr. Wm. Colville Gibson.

May 10. Two specimens of *Lacerta vivipara*, from Teesdale, and two of *Molge cristata* ♀, and several of *Molge vulgaris* ♂ ♀, from Winlaton. *Mr. John Duncan.*

,, . A specimen of the Tree Frog, *Hyla arborea*, L., from Greece.
Mr. Rome, Eldon Street.

,, 30. Two specimens of the Palmated Newt, *Molge palmata* ♂ ♀, and several other Newts from Shincliffe, Durham.
Mr. John Duncan.

June 1. Three Snakes, three Lizards, and several Insects from India.
Mr. Thomas Laidler, Gateshead.

May 18. Specimens of the Natterjack, *Bufo calamita*, from Surrey.
Mr. I. G. Dickinson, per Mr. A. H. Dickinson.

June 10. Tadpoles of the Toad, from a pool by the side of the Rede near Woodburn. *Mr. R. Howse.*

,, . Newts from Shincliffe. *Mr. John Duncan.*

MOLLUSCA.

1892.

Dec. 28. Two Valves of Giant Clam, *Tridacna gigas*. *Mr. J. Garland.*

CRUSTACEA, INSECTS, ETC.

Sept. 5. Specimens of Butterflies, Coleoptera, and other insects caught in the Royal Botanic Garden, Calcutta.
Mr. R. L. Proudlock.

Oct. 10. A specimen of *Urozeuctes Owenii*, Milne Edwards, taken out of a fish caught near Melbourne, Victoria, Australia, by Dr. Sheaf. *Mrs. Sheaf, Eldon Street.*

1893.

Jan. 2. King Crab, *Limulus*. *Mr. R. Maxwell.*

Specimen of Sawfly, *Sirex gigas* ♀, caught in Newcastle, also one caught at Christon Bank. *Mr. John Duncan.*

May 22. Specimens of *Scarabeus* ———, Aigle, Helvetia.
Miss Craig, per Mr. R. Y. Green.

June . Two Stag Beetles from Surrey. *Mr. I. G. Dickinson.*

,, 17. Specimen of Sawfly, *Sirex gigas*, from America?
Mr. F. H. Wilcox.

,, 15. Tick, parasite from Tortoise, ♀ ? (very large).
Mr. C. W. Anderson.

Do. do. do. ♂ ? *Master Norman Cooke.*

MINERALS AND FOSSILS.

1892.

Aug. 13. Specimens of Hæmatite and Quartz Spar from Cleator Moor. *Messrs. James Hughes and John Nugent.*

,, 24. Three pieces of Charnwood Forest Syenite from Mount Sorrel, and Markfield, Leicestershire. *Mr. T. F. Howe, Leicester.*

Sept. 14. Glaciated portion of Calamite Stem from Wideopen Quarry. *Mr. W. C. Robson.*

1893.

Feb. 4. Piece of *Stigmaria* from roof of Brockwell Seam, Dunston Colliery. *Mr. Nathan Thompson, Watson Street, Teams.*

Mar. 4. Deposit in Spouting from Dudley Colliery. *Mr. George Forster, Corbridge.*

,, 14. Three boxes of fragments of Marl-Slate Fishes collected at Midderidge by the late Mr. Joseph Duff, Bishop Auckland. *Mr. William Booth.*

,, 29. Specimen of Cannel Coal from Australia. *Prof. G. A. Lebour.*

May 10. Cast of supposed Meteorite (slag from iron works?), which was said to have fallen near Middlesbro', 1881. The original is now in York Museum. See Prof. Herschell's Report.
Another piece of slag supposed to be part of a Meteorite!! *Mr. Charles Barkas.*

,, 31. Crustacean Tracks on Sandstone (Millstone Grit series), near Edmondbyers. *Rev. Walter Featherstonhaugh.*

June . Basaltic Rock from Arthur's Seat, Edinburgh. *Mr. M. J. Pelegrin.*

,, . Small collection of Chalk Fossils from Southerham Chalk Pits, near Lewes, and Glynde Chalk Pits, Sussex Downs. *Mr. R. B. Brentnall.*

BOTANY.

1892.

Aug. . Sample of Granary Wheat from Upper Egypt, circa 18th, Dynasty. *Mr. Robt. C. Clephan.*

Oct. 13. Rhizome of large Fern. *Miss M. Hancock.*

Apl. 8. Specimens of *Rubus chamæmorus* from the Cheviot. *Mr. George Bolam, Berwick.*

June 15. Nut of a Palm from San Francisco. *Miss Shanks.*

ETHNOLOGY.

1892.

July 20. Four Shields made of hide; one Axe; two Sticks with carved, human heads; four Sleeping Stools or Pillows; two Metal

Vessels ornamented by natives; one Wooden Dish on legs several Wooden and one Horn Spoon; small round Vessels of Wood, carved, and one of Leaves; four Pipe Heads cut out of soft stone; seven Plaited Bags with lids; seven Bead Ornaments; strips of Hide; Porcupine Quills: and two kinds of Fruit.

Mr. George Allan, Swazieland, S. Africa.

Lady's Muff made of feathers, India, 100 years old.

Miss Brown, Darlington.

American-Indian Pocket, Canada? *Mr. R. Y. Green.*

Nov. 12. Piece of Cloth made by South Sea Islanders, 4 yards long.

Miss Roberts, 8, *New Cavendish Street, London, per Dr. Embleton.*

1893.

May 25. An old Quern, found in a ploughed field on East Link Hall Farm, near Charlton Hall, Christon Bank.

Mr. John Avery.

XVIII.—*On the occurrence on the North-East Coast of Yorkshire of a Ruffed-Bustard, Otis houbara,* Gmelin, *commonly known as Macqueen's Bustard, Otis Macqueenii,* J. E. Gray. By Richard Howse, Museum, Newcastle-on-Tyne.

Otis Macqueenii, J. E. Gray, Illustr. of Indian Zoology II., pl. 47 (1833-34).
Otis Houbara, Gmelin, Syst. Nat., p. 725.
Eupodotis undulata, G. R. Gray, Cat. Brit. Birds (1863), p. 134.
Macqueen's Bustard, Morris, Hist. Brit. Birds (1861), p. 11.
Macqueen's Bustard, Yarrell, Brit. Birds, edt. 4, vol. III., p. 221.
Houbara undulata, Degland & Gerbe, Ornith. Europ. II., p. 104.
Houbara Macqueenii, Degland & Gerbe, Ornith. Europ. II., p. 105.
Houbara macqueeni, List of Brit. Birds, B.O.U., p. 154 (1883).

During the last weeks of October, 1892, I spent a short autumnal holiday at Saltburn-by-the-Sea, or rather hybernated there in the very severe, stormy weather that prevailed through all the latter part of the month on the North-East Coast. The weather was so severe that nearly all my plans for collecting were set aside, and most of the time was spent indoors; in fact, only one or two things out of many were accomplished. One was the purchase of some stuffed birds that had been shot near Marske. It was this last transaction that led eventually to my negotiating in November the purchase for the Newcastle Museum of a fine adult specimen of Macqueen's Bustard, which, according to authorities, is the second specimen only of this Asiatic bird which has been recorded as killed in England. The first specimen was shot in Lincolnshire, near Kirton-in-Lindsey, on the 7th October, 1847, and is now preserved in the Museum of the Yorkshire Philosophical Society. A characteristic drawing of it by Mr. John Hancock is among his Sketches of Birds in the Newcastle Museum, and shews it to have been either a female or young bird in immature plumage.

"On the 5th of October last a fine Ruffed-Bustard was shot by Mr. J. Richardson in a bare pasture field near the edge of the sea-banks, a little south of Marske-by-the-Sea, Yorkshire. When it was first seen it was apparently feeding, as it had a few green seeds in its crop and a few were found in the throat and beak when it was examined. The day was very misty, and on being approached, about noon, it squatted close to the ground at first, and then rose straight up, when it was easily shot, indeed, it was severely shot on the left side of the head and shoulder. It was sent to Mr. Pearce Coupe for preservation, and he not only identified it immediately as a specimen of Macqueen's Bustard but has also carefully set it up, taking as his guide the figure given in Morris' British Birds. The body of the bird was cooked and eaten; those who partook of it pronounce that the flesh was savoury but rather tough. The bones of the body and neck were saved and carefully cleaned and have been presented to the Newcastle Museum by Mr. Coupe.*"

I am indebted to Mr. Pearce Coupe, of Marske-by-the-Sea, the taxidermist who preserved and correctly identified the bird for the early information of the occurrence of this individual at Marske, for all the local details respecting it, and also for negotiating the purchase of it for the Museum of the Natural History Society, Newcastle-upon-Tyne.

The height of the bird when standing erect would be about 22 inches; in the position it is now stuffed, 20 inches. Total length of the body from the beak to the end of the central tail feather about 26 inches. Length of wing from shoulder to tip of the longest primary, 16 inches. Neck about 6 inches. Tail about 7½ inches. Bill, dark-greenish or horn colour, 1⅝ inches; to end of gape, 2¼ inches in length. Culmen, 1⅜ inches. Tarsus, 4 inches, pale yellowish olive-green.

The crest is rather small, with the undermost, long, slightly

* The substance of the above paragraph was published in the Yorkshire Naturalist for Dec., 1892, and the "Zoologist" for Jan., 1893, but it seems advisable to add to this the fact that this bird was seen when just killed by more than a dozen people, two or three of whom on the next day eat part of its body. The bones of the body, neck, humeri and femora were then carefully cleaned and were presented, as stated above, to the Newcastle Museum. Several feathers of the bird were sent to me, which were not fully grown, and contained fresh coagulated blood still in the imperfect quills, on the evidence of which and the fresh bones of the body the bird was negotiated for. Mr. Coupe justly remarked that the only question which could arise in his mind was, Had the bird escaped from an aviary? The fresh and uninjured state of the plumage was entirely against this supposition, and the only conclusion we can arrive at from the above evidence is, that it was a freshly-arrived, wild bird from the Continent of Europe.

curved feathers quite white. The upper ones white at the base and black for the rest of their length. The feathers in front of the crest and sides of the head light fawn colour, finely vermiculated with brownish bars with a few hair-like feathers at the base of the culmen or upper mandible. The auriculars form a tuft of fine, rather long feathers directed backwards. They are slightly tinged with delicate fawn colour at the distal ends and whiter at the base.

Chin and upper throat white, becoming a delicate fawn or cream colour vermiculated with brownish bars, the whole washed over with a tinge of bright silvery grey, below which the long grey plumes of the crop spring out, hang down, and cover the breast feathers. On each side of the neck below the auricular tufts, springs a large, long tuft of deep black, ribbon-shaped feathers, some of which are white at the base; gradually becoming longer lower down, and hanging with a slight sigmoidal curve downwards and backwards over the shoulders and back. The longest of these are about 4½ inches. The whole of the back and all the wing and tail-coverts and the tail feathers are of a rich cream or reddish fawn colour, darker here and there; the greater coverts extending nearly to the ends of the primaries. All the feathers of the upper surfaces are marked with fine delicate zig-zag, dark vermiculations; the vermiculations becoming larger and darker about the centre of each feather, where there is a large arrow-head-shaped or cuspidate patch of black, the finer vermiculations being continued below to the edge of each feather, excepting along and close to the side of each shaft below the black cuspidate markings.

Under parts of the body pure white, except the lower portion of under-tail coverts and the sides of the tail-coverts, which are strongly vermiculated and banded with black.

The back of neck or nape of a light colour and vermiculated or barred as on the throat, but more silvery white.

The primaries are white at the base, graduating by a slight wash of fawn colour into a rich brownish black from about half their length to the distal ends. A few of the primaries are edged with white at the tips.

The tail-coverts extend down the central parts of the tail nearly to the end of the rectrices. They are finely vermiculated and banded on the upper parts with brownish black, the delicate ornamentation extending to the margin of each feather. The tail feathers are of a rich fawn colour, plain at their base (where they are over-lapped by the tail-coverts), the exposed feathers finely vermiculated and ornamented with three irregular bands of bluish-grey. The outer tail feathers are quite white at the tips. The tail feathers are, underneath, of a pale fawn colour, becoming white at their ends, with zig-zag markings and two broadish irregular bands of reddish brown.

In none of the figures which I have been able to examine is the peculiar and delicate ornamentation of the plumage of this Bustard correctly represented. The delicate vermiculations and the black, cuspidate markings of the feathers of the back and greater coverts becoming gradually fainter till they almost disappear on the shoulders and margin of the wings, and the peculiar irregular colour-bands of the tail have not yet been accurately delineated, and would require the talent and graver of a Bewick to depict them faithfully.

There appears to be two races or geographically-distributed forms of the Ruffed-Bustard known—the one first described has a white crest and is peculiar to Northern Africa, Arabia, and occasionally straggling into Spain and Southern Enrope, and the other with a crest partly black and partly white found in India and other parts of South-western Asia, which occasionally straggles westward into North-western Europe and as far as England.

"In the African race or form of the Ruffed-Bustard (*Otis houbara*) the top of the head is furnished or adorned with a thick tuft of long, curved white plumes not very regularly arranged; on each side of the neck there is an irregular series of hanging feathers, which for the greater part of their length are black, with the basal parts white, and the longest of which reach the middle of the breast; the elongated plumes of the crop are white. This Bustard is found in the North of Africa and is not rare in the neighbourhood of Tripoli and Constantine. It is found as a migrant in Spain and Portugal, also in Turkey and the Archipelago."

"The Asiatic and Arabian form or race of the Ruffed-Bustard (*Otis Macqueeni*, J. E. Gray and recent authors) has the top of the head ornamented with a small tuft of long curved feathers, white, or white at their base and black for the rest of their length to their ends; on each side below the parotic region there extends an irregular tuft of feathers, of which the upper ones are black and many of the lower ones white, the longest of which extend hardly to the lower part of the neck; the long feathers of the crop are greyish or grey. This form of the Ruffed Bustard is found in Asia, chiefly in Persia, Afghanistan, Beluchistan, and other parts of India, also in Arabia, and more rarely in Turkey and the West of Europe. It is said to have been found in Belgium, Austria, and Germany, and once before in England in October, 1847, as mentioned above."

Until Mr. J. E. Gray separated the Asiatic form as a new species both forms were included under one species by all the older naturalists, but since then, recent writers excepting G. R. Gray (Cat. Brit. Birds, 1863) have referred to Macqueen's Bustard as if it were a well-defined and essentially-distinct species. Prince Bonaparte has gone a step further, and apparently because these two forms are recognized as species by some authors he has separated the Ruffed-Bustard from the genus *Otis*, under the generic term *Houbara*. There are not many known species of Bustard, but unfortunately most of the species have been taken as types of new genera, so that the number ef genera and species is about equal. In such an interesting group as the Bustards, where every species seems to be more strongly marked than usual, this practice of breaking up a genus into numerous genera can serve no good purpose, but tends to destroy and limit the geographical distribution of the members of the group.

The Ruffed-Bustard is one of the rarer casual or accidental visitors to the North-west of Europe and the British Islands, driven here no doubt by stress of weather or other untoward physical circumstances. By many ornithologists, causal or accidental visitors, as they are often called, are considered of very little importance and as almost unworthy of notice in the Fauna of any country. But on reflection is not this the way in which all or nearly all of our now resident species have at first arrived here, having been driven, or, induced by a law of immigration to the westward, and have thus been brought or introduced into these Islands in very remote times, but at any rate since the Glacial period, and there seems to be no apparent reason why other casual visitants should not become permanently, or for a time, residents, provided that suitable locality and food be found. Unfortunately our over civilization, drainage of marsh-lands, destruction of forests, and wanton destruction of all the larger wild animals which are supposed, often erroneously, to be of no use or service to man, will prevent any chance-visitor from becoming a resident and an addition to the Fauna of these Islands, so long as our present civilization lasts.

XIX.—*Additions to the Catalogue of the Fishes of the Rivers and Coast of Northumberland and Durham and the adjacent Sea.** By Richard Howse, July, 1894.

Sub-Class. TELEOSTEI.

Order. ACANTHOPTERYGII.

Fam. PERCIDÆ.

Labrax lupus, Cuv. Basse.

On the 12th February, 1894, a small specimen nine inches in length was presented to the Museum by Mr. W. Clift, South Shields. It had been captured in a shrimp net a short distance above the High-level Bridge, Newcastle-on-Tyne. The last recorded specimen taken in the Tyne was in 1838. Doubtless

* Nat. Hist. Trans., Vol. X.

many specimens have been taken since that time of which no record has been made. This fish may be considered a resident in "Coaly Tyne."

FAM. SPARIDÆ.

Pagellus centrodontus, Cuv. COMMON SEA-BREAM.

This is the only species of the *Sparidæ* that I have been able to satisfactorily and from personal inspection of a specimen to authenticate as a visitor to the North Sea. The Gilthead has often been said to occur on our coast, but most probable the specimens were only the Common Sea-Bream. In the Catalogue this fish and the Black Sea-Bream were introduced on the authority of others, but at any rate they have not been recognised recently, and I have not seen a specimen preserved or otherwise. Until other specimens are taken their occurrence in the North Sea must remain very doubtful.

FAM. SCORPÆNIDÆ.

Scorpæna dactyloptera, Delaroche.

A fine example of this rare fish was captured by the steam trawler "Black Watch," Capt. Henry Whitfield, and sent by him through J. F. Spence, Esq., to the Museum. It was captured about 12 miles off the mouth of the Wansbeck, Northumberland Coast, 8th of May, 1894, and sent alive to Mr. Spence, who kept it for several hours in salt-water swimming about freely. It is about 6¾ inches (172 m.m.) in length, was of a brilliant carmine colour on the back, gradually softening into nearly pure white on the abdomen.

The first specimen recorded from the North Sea was washed ashore near Redcar in January, 1893, and sent by Mr. F. H. Nelson, of Redcar, to Mr. Eagle Clarke, by whom its occurrence is mentioned in the "Yorkshire Naturalist," 1893, and more recently it has been figured and an exhaustive description given of it by Mr. Clark in the Transactions of the Physical Society of Edinburgh. A third specimen is said to have been taken in the mouth of the Humber. Until these captures this fish was only known as as rare, deep-water fish found in the Mediterranean, on the Coast of Norway, and the West of Ireland. Until more information is obtained it must be considered a straggler to the North Sea and our coasts.

? Sebastus viviparus.

A specimen or what appears to be this species was presented to the Museum by Mr. Phillips in April, 1892. It was sent as a specimen of the Norwegian Haddock, but a dark black spot on the upper edge of the operculum and the finer contour of the body indicated at once that it was not that species. As it was taken in a trawler about 150 miles from the Tyne it cannot be considered as a local fish, but its occurrence in the North Sea seems worth recording. On referring to Dr. Day's British Fishes I find he considers it only a variety of *Sebastes Norvegicus.*

Fam. CYTTIDÆ.

Zeus faber (Willughby). John Dory.

Four or five small local specimens have been sent to the Museum by Mr. McArthur.

Fam. CORYPHÆNIDÆ.

Brama Raii. Ray's Bream.

A large specimen was landed at Redcar in 1891, shewing that this fish still visits the mouth of the Tees.—*T. H. Nelson.*

Lampris luna (Gmelin). Opah.

A very fine specimen was brought in by a North Shields trawler and exhibited as a "Sun-fish" in Mr. Read's shop at North Shields. It had been caught some distance from the Tyne.

Fam. SCOMBRIDÆ.

Scomber scomber (Linn.). Mackerel.

When staying near North Sunderland in July, 1892, I saw a great many Mackerel of the usual size which had been caught in the herring nets a short distance off the North Northumberland Coast. By our east-coast fishermen this fish seems to be accounted of no commercial value.

FAM. LOPHIIDÆ.

Lophius piscatorius, Linn. FISHING-FROG.

Specimens of this fish are often captured by the fishermen of Beadnell and Newton-by-the-Sea, in the turbot nets when they are fishing on rocky ground not many miles from the shore.

FAM. COTTIDÆ.

Cottus scorpius, Linn. SEA SCORPION, "GUNDIE."

Very frequently caught in the lobster-pots and also on lines baited with Lobworm in the outer Laminarian Zone.

Cottus Grœlandicus, Cuv. et Val. GREENLAND BULLHEAD.

According to Yarrell and Couch the Greenland Bullhead is rare in the British Islands, having been recorded only twice in Ireland prior to 1850, and not recorded at that date on any of the coasts of Great Britain. Dr. Day (Fishes of Great Britain and Ireland, Vol. 1, p. 49, 1894) unites this form, which has been considered by Gunther and others a good species, with *Cottus scorpius.* On comparing the specimen, about nine inches long, caught in the lobster-pots near Cullercoats, with a much larger one from the Norweigan Coast, I find them identical and also very distinct from *C. scorpius* found in the same locality in colour and general appearance.

They live no great distance from the shore, in the outer margin of the Laminarian Zone, just beyond the lowest tide marks, and are frequently caught in the lobster-pots, which they enter with the other species to feed on the bait. They are very showy in colour and are well known among the fisher-folk by the Northern name of *Gundie*, applied to all the members of this genus. Cullercoats, *R. Howse;* St. Mary's I., *J. Duncan.*

FAM. CATAPHRACTIDÆ.

Cataphractus Schoneveldii, Willughby. POGGE.

One small specimen obtained at St. Mary's Island has been sent to the Museum by Mr. J. Duncan. It only occurs occasionally.

Fam. GOBIIDÆ.

Callionymus dracunculus, Linn. Sordid Dragonet.

Numbers of these were caught on the fishermen's lines in October last, a short distance from the shore, and not one of the Gemmeous Dragonet. The opinion seems to be well-grounded that this is only the female of the Gemmeous Dragonet.

Fam. BLENNIDÆ.

Blennius galerita, Linn. Montague's Blenny.

In June, 1893, I saw a small specimen of this fish in spirits in the late Dr. R. Embleton's collection, which was said to have been taken near Beadnell.

Order. ANACANTHINI.

Fam. GADIDÆ.

Motella vulgaris (Willughby). Three-bearded Rockling.

This fish is probably not rare on our coast, living on the outer margin of the Laminarian Zone. Fine specimens have been sent to the Museum from the Northumberland Coast by Mr. Phillips and by Mr. T. H. Nelson from the Redcar fishermen. A very finely marked example was caught a short distance from the coast near St. Mary's Island, October, 1893.

Raniceps trifurcatus (Turton). Lesser Forkbeard.

Often caught on the inshore fishing lines. It lives in the outer Laminarian Zone in a few fathoms water and is sometimes washed ashore after storms. Specimens presented by Mr. Birchall and Mr. F. H. Phillips.

Fam. PLEURONECTIDÆ.

Phrynorhombus punctatus (Bloch). Bloch's Top-knot.

A fine specimen 9½ inches in length, caught on line by the Cullercoats fishermen, when fishing not far out, was sent to the Museum by Mr. Phillips. This fish probably lives much nearer the shore than was expected, as it is generally caught on the inshore lines and has been found washed ashore. Dr. Day considers this and Muller's Top-knot to be identically the same species.

Order. PHYSOSTOMI.

Fam. CLUPEIDÆ.

Clupea finta, Cuv. Twaite Shad.

A fine specimen sent to the Museum in Feb., 1891, by Mr. Phillips. The exact locality on our coast was not obtained.

Order. LOPHOBRANCHII.

Fam. SYNGNATHIDÆ.

Nerophis æquoreus (Linn.). Ocean Pipe-Fish.

A small specimen taken at St. Mary's Island, April, 1894, and presented to the Museum by Mr. John Duncan.

Sub-Class. PALÆICHTHYES.

Order. CHONDROPTERYGII.

Fam. CARCHARIIDÆ.

Galeus canis, Willughby. Tope.

Appears to be plentiful in the North Sea, as numerous specimens are sometimes caught in the trawlers. About twenty, all females, were sent to Newcastle in Feb., 1892. Several specimens of Fish-lice were found on these.

Fam. LAMNIDÆ.

Alopecias vulpes, Cuv. Fox Shark.

One brought into Cullercoats, Aug., 1893, and another caught in salmon nets off Sunderland 9 feet in length, Sept., 1892.—*J. Duncan.*

Fam. SCYLLIDÆ.

Scyllium canicula. Larger Spotted Dog-fish.

A specimen of this Dog-fish, which is rare on our coast, was brought in by a North Shields trawler and presented to the Museum by Mr. James Read, North Shields. It was about 3 feet 3 inches in length, and is the first authenticated specimen from our coast.

SUB-CLASS. HOLOCEPHALI.

ORDER. CHIMÆROIDEI.

FAM. CHIMÆRIDÆ.

Chimæra monstrosa. RABBIT FISH.

Two specimens, male and female, were taken out of the stomach of a large Ling by a fisherwoman, in March, 1892. One of these was presented to the Medical College, and part of the skeleton of the other is preserved in the Museum. On July 15th, 1893, two specimens, both females, about 3 feet in length, were brought in by a trawler. One of these, now preserved in the Museum, was presented by Mr. Wm. Clift of South Shields.

ORDER. GANOIDEI-CHONDROSTEI.

FAM. ACIPENSERIDÆ.

Acipenser sturio, Linn. COMMON STURGEON.

A specimen of this fish, weighing about 141 lbs., was caught in the salmon nets near Scotswood on the Tyne, July 13th or 14th, 1894. This is the first recorded instance that I know, of the occurrence of this fish in our river. Doubtless others have entered the Tyne in former years and been captured, but it is remarkable that no authentic record is known.

SUB-CLASS. CYCLOSTOMATA.

FAM. PETROMYZONTIDÆ.

Petromyzon marinus, Linn. SEA LAMPREY.

A specimen, 31 inches in length, was caught in the Tyne at Bell's Close, Lemington, on Aug. 11th, 1892, and presented to the Museum by Mr. James Henderson. It was found in a pool at low-water.

XX.—*Miscellanea—Bird Notices.*

*Bird Life on the Farne Islands.**—On the 10th July, 1890, I joined an excursion to North Sunderland and the Farne Islands with about ten other members of the Club. We met for breakfast at the Castle Inn, Sea-Houses, intending afterwards to visit the Farne Islands. The outlook towards the sea was most unfavourable, as it had begun to rain in earnest, but as we had come specially to visit the Islands none of us appeared daunted by the steady rain that had set in ;—so, clad in oilskin jackets, waterproof coats, and under cover of sundry umbrellas, we set sail merrily and were soon carried over the five miles that separated us from the Outer Farnes.

Our first object was to see the place where that ill-fated vessel the Forfarshire was wrecked and part of the crew and passengers rescued by the heroic Grace Darling and her father. We then landed on the Island known as the Harcars. As we struggled up their smoothly-polished and steep surface there was little worthy of notice, but when upon the top a sight presented itself ever by me to be remembered. The very first object of interest was the birth of a Lesser Black-backed Gull.† The little creature had cracked the shell all round, and just as I cast my eyes upon it, struggled out and rolled upon the cold, bare stone, wet and forlorn. To one of the boatmen who stood near I said this little bird will have but a poor chance for life, but he replied they are hardy little fellows, the parent bird will soon come and warm it and it will be all right in a very short time. I next observed eggs in all stages of incubation and young birds of all ages, from the one just hatched up to those strong enough to fly.

As I was just recovering from an attack of gout, and not being able to walk over the rough, slippery, rocky ground alone, I obtained the help of one of the boatmen to assist me and act as my guide, and I found him a most intelligent observer of the

* Abstract of a Paper read at the Field Meeting held at Chester-le-Street and Lambton Castle, May 27th, 1891.

† As the Gulls make a large rough nest for their eggs and young it is probable that this was the young of one of the Terns which make no nest.—Ed.

birds of the Islands. Seeing a hole in the ground, I enquired if there were rabbits on the Island. Yes, he replied, but I expect there is a Puffin in that hole—then kneeling down and thrusting his arm into the hole he pulled out an old Puffin and her little, black, young one. After examining the old bird she was thrown into the air, but instead of flying away the bird alighted upon a stone about ten yards in front of us, and there remained looking very sullenly at us as if afraid that her chick would come to grief. However, the young bird was replaced in the hole again and left unhurt.

Up to this time I had been intent upon observing the eggs and young birds only. I now raised my eyes and what a sight presented itself. Hundreds of Gulls were sailing about and screaming above my head, coming so close at times that I could have reached them with a stick.

We now returned to our boat and soon landed on another Island, upon which were eggs and young birds in all stages of development. My guide now led me over the top of this Island, and suddenly we saw the top of the Pinnacles, which were covered thickly with old and young birds, chiefly Guillemots. There were eggs also lying on these rocks so close together that it is difficult to imagine how any bird can find its own egg again among the hundreds that lie strewn about.

The Pinnacles are a group of rocks rising sheer out of the sea to a height of forty or more feet, the tops of which are almost flat, and they are united at the base but divide as they rise upwards like the fingers of a man's hand. The Guillemots lay but one egg each, which egg, when compared with the size of the bird, is large indeed. They vary very much in colour, and it is almost impossible to find two marked exactly alike. They vary in colour from nearly pure white to sea-green or a brownish-red. Although we were so near the birds sitting with their young or upon their eggs on the top of the Pinnacles, they did not seem in the least afraid. It was a glorious sight, and the confidence shewn by these little creatures was charming.

Next we returned by the other side of the Island, and on the way observed the nest of the Eider Duck with its three eggs, which were covered over with down. My guide told me that it was the constant habit of these birds when leaving the nest to cover the eggs to prevent their being seen and destroyed by other birds. A little further on we found the nest of another Eider in which seven eggs had been deposited. I mentioned this observation to Mr. T. Thompson, and he expressed an opinion that these eggs must have been laid by two or more ducks in the same nest, as the Eider only lays three eggs at a sitting. I have ascertained since that this applies to the King Eider and not to the Common Eider which nests on the Farnes.

Not far away we came upon three nests of the Common Cormorant placed close to each other—one contained the young just hatched, the next young ones about a week old, and the third young Cormorants about a fortnight old. These young birds presented a very strange appearance, for, unlike the young of the Duck family which can swim as soon as hatched, these young Cormorants were quite helpless and compelled to remain in the nest and be fed by the parent birds much in the same way as young pigeons are fed. The young birds in the third nest, which were most advanced, were quite helpless and very unlike birds in appearance,—queer, wry-necked, little creatures with smooth, black skins, more like young serpents than birds, for they had neither down nor feathers on them. The nests were large and made chiefly of sea-weeds. Two other nests of the Cormorant were placed on a ledge of rock a little below the others.

Upon returning to the boat the young birds were so numerous that it required great care to avoid treading upon them. Close by we observed Razor-Bills and Kittiwakes sitting upon the ledges of the cliffs. The latter use dry grass and sea-weeds in the constructisn of their nests for the safety of the eggs and the security of their young. Many of them were sitting on the ledges preening their feathers, their white plumage presenting a fine contrast to the dark background. On leaving this Island I was charmed by the graceful flight of numbers of the Arctic, Common and Sandwich Terns. My guide informed me that the Island we were to visit next, known as the Knoxes, abounded with the eggs and young of these elegant birds placed without any nest upon the bare rock. On landing we were soon in the midst of them, and, as upon the other Islands, they were in all stages of development, from those which had just burst the egg-shell to those that were able to fly—the youngest, which somewhat resemble young Partridges, are covered with a fine, mottled down and are able to move about soon after they are hatched.

We now paid a short visit to the Inner Farnes, upon which stands the Chapel known as St. Cuthbert's, built probably near the site of St. Cuthbert's Cell. Returning to our boat the homeward passage was soon made in finer weather, and after an excellent dinner at the Castle Inn our party partially dispersed. Thus ended one of the many instructive and enjoyable days passed with the members of the Tyneside Field Club.—*W. E. Branford, Newcastle-on Tyne.*

The Hedge-Sparrow's Song.—Sir, I take the liberty of writing to ask you if you will kindly give me your opinion* (or any of your correspondents) respecting the singing of our common Hedge-Sparrow (*Accentor modularis*), *i.e.*, singing by moonlight. I heard it in full song in the early mornings of 20th and 21st of March, also on the 24th March at 8 p.m., and again at 11 p.m. on the 1st of April, both nights being bright and clear starlight.

I and none of my friends to whom I have spoken ever heard of it under these circumstances, that is, here in the North of England.—*Winlaton House, Winlaton-on-Tyne, 10th April, 1894.*

Singular Nesting of Chaffinches (Fringilla cœlebs).—In a very old and large hazel pear tree, here in my garden, two pairs of the above built and had eggs in the first week of May. Both nests were destroyed and carried off.—*Ibid.*

Visit to a breeding place of the Black-headed Gull.—Through the kindness of Mr. Alex. Watt, agent to Lord Muncaster, I had, with a friend, the gratification of visiting a very large colony of

* It is not unusual in the South of England.—*Ed. of Land and Water.*

the Black-headed Gull (*Larus ridibundus*) near Drigg, in Cumberland, on the 16th May.

There were many hundreds of nests with three eggs, and dozens of young birds were visible; four nests only, contained four eggs, but one nest had five eggs, all of which I think were laid by the same parent, at least judging by colour and all being in the *same stage of incubation.* A few dead old birds were also found; one seemed to have had a painful death, not having had strength to get its egg clear through the oviduct. A fine specimen of the Greater-Black-backed Gull (*Larus marinus*) was also lying dead, probably caught red-handed. I have frequently seen four eggs on previous occasions in one nest, both at Walney Island, Lancashire, and other breeding places in Northumberland —never but on this occasion five eggs.—*Thomas Thompson, Winlaton, 26th May, 1894.*

Black-headed Gulls hawking for Moths.—Several weeks ago, at the end of June, I spent some time every day watching the movements of numerous Black-headed Gulls which came every fine evening to the meadows and moorlands on the banks of the Rede hawking for Moths and other insects. They generally made their appearance about six o'clock, sometimes alone but generally a few together, about the time that the Moths commence their nocturnal flights. Every low-lying pasture, meadow, and steep hill side was carefully searched and scanned, sometimes by one Gull but often by several working together over the same field. All the ditches, hollows, and sides of the stone walls were thoroughly searched, then a sweep was taken round, under and over the oak or other trees standing isolated, not a single likely nook was left unexplored, in fact a more complete examination of the country side was made than could be thought of or done by the nimblest member of the London or any other Entomological Society. Some nights the labour expended and the miles travelled over must have been very unprofitable, for after watching long and far I did not see a single stoop or capture. Other evenings labour was better paid, and I saw frequent captures, and in one instance I saw six large moths captured in as many minutes. The movement of the birds, whether sweeping over the ground generally or swooping down suddenly on a poor devoted insect, was most graceful and dexterous, the insect having very little chance of escape. Before darkness set in a departure towards home was made. As most of the birds were adult it is possible that this late forage was made for the benefit of their young. It would be interesting to know how many miles are traversed by these unwearied birds in a long summer's day. As there appears to be no limitation of working time among them, and as they appear on the wing from early dawn to dewy eve, the number of miles they travel daily must be enormous. And how beneficent must be the services of these insectivorous birds to the agriculturist! Indeed it is pleasing to find that their unpaid services are rocognized in some parts of our Island and their usefulness fully acknowledged, and that they receive careful protection during the breeding season.—*Richard Howse, July, 1894.*

Do Gulls dive under Water to reach their Food?—Recently I have been more than once asked this question. In 1891, when staying near Sea Houses, North Sunderland, during the herring season, I had several opportunities of seeing and watching some Lesser Black-backed Gulls plunge and dive under water of no great depth for herrings lying at the bottom of the harbour basin. When the boats were discharging their cargoes many damaged herrings were thrown overboard, some of which floated on the surface and many others sank to the bottom where, as the water became shallow by the ebb tide, they could be distinctly seen shining like pieces of brilliant silver. The floating pieces were soon picked up by birds on the wing, but those resting at the bottom remained till the tide was nearly out. Then the Gulls assembled on the sides of the pier, and first one then another took a "header" from the pier or some projecting timber into the clear water, at the bottom of which the herrings were lying, with sufficient force to enable them to reach the fish at the bottom. On rising to the surface the fish was immediately swallowed before flight was resumed, a not unnecessary precaution. I saw this repeatedly done when the surface of the water was fully twenty feet from the pier edge. None of the birds plunged from the wing, always from a standing position. When any herrings were scattered on the pier or road the Gulls always alighted on the ground before seizing the herrings; they stooped at fish floating on the surface only.—*Richard Howse, July, 1894.*

*Note on the Nesting of the Peewit.**—At Eastertide, 1880, I made an observation on the nesting habit of the Peewit (*Vanellus vulgaris*), which seemed entirely new, and which, so far as I am aware, has not been mentioned or recorded by any writer on the habits of birds in any work on ornithology.

It is, I believe, the generally accepted opinion, that all birds after commencing to lay, deposit one egg per day of twenty-four hours. This appears to be the acknowledged rule with regard to domestic poultry, and also with regard to those small well-known birds whose habits are of easy observation, but there are some rare deviations from this rule among domestic fowls, for it is well known that some hens lay two eggs per day occasionally, but not so regularly as to invalidate the rule of one egg per day of twenty-four hours. Till within a few years I certainly thought this was the general rule for all birds, but an observation made at Easter, 1880, led me to doubt the universality of this habit of one egg per day among the Plovers, and to conclude that at least some of them laid their clutch of four eggs in a much shorter space of time than four days.

On the Saturday morning preceding Easter, 1880, I searched for Pewitts' eggs with a friend in a small field, on the edge of an extensive moor in Redesdale. The field was very small, and sloped rapidly towards the south, and was enclosed with high stone walls, and was well sheltered from the cold east winds which were then prevailing. A dozen or more Peewits were hovering about over the field, and on our entering it, the birds did not disperse, but kept hovering round us, but did not cry vociferously as when they have nests or young. We, were,

* Read at the Joint Evening Meeting of the Nat. Hist. Society, and Tyneside Nat. Field Club, April 5th, 1892, and appeared in the Yorkshire Naturalist, May, 1892.

however, induced to think by their behaviour and their not dispersing, that their nesting operations were begun. The field, the lower part of which was in rigs, was regularly quartered, and carefully searched over, rig by rig, for a long time, with the result that only numerous false nests, or slight depressions trodden down into the ground by the birds, were seen. With some reluctance, after our long and unsuccessful search, we quitted the field about twelve o'clock, and afterwards as carefully searched the nearest part of an adjoining field, but without success, for we did not find a single egg all day. Out of the sunshine, the air was bitterly cold, and though there were birds in great numbers, no eggs were to be found on the Saturday.

On the Monday following (Easter Monday), after a long moorland walk, we were returning homewards by the same small field, but approaching it in a different direction, and along a road by which we were concealed from view, and could not be seen till we were close to it. On looking cautiously over the stone wall to see if the birds were still there, we saw several Peewits rise from the ground in the peculiar manner they assume when rising from their nest. Proceeding over the wall directly to the spot where the bird nearest had risen from the ground, we came upon a nest with four eggs, and at short distances off we found two others, each with two eggs. In the adjoining field, which we had searched also on the previous Saturday, we found another nest with four eggs, and not far off, on an adjoining rig, another nest with two eggs. That is, in about twenty minutes on the Monday at noon we found altogether fourteen eggs on the same ground which, on the previous Saturday, we had searched for about an hour and a half without finding a single egg. As we had on the Saturday examined the ground with much care, and were certain that we had not overlooked any eggs on that day, the conclusion was forced on us that the nest with four eggs, as well as the others, must have been laid within the forty-eight hours, that is, between twelve o'clock on Saturday and the same hour on Easter Monday, if not in even a shorter time.

As further evidence that Peewits lay their eggs quickly and in a short time, and confirmatory of the above observation, it may be mentioned that in Easter week, 1866, I found some Peewits' eggs under the following circumstances in the same district, but not in the same fields. There had been a severe snowstorm and a heavy fall of snow for the season on Easter Monday, and all the moors were covered with snow until the Wednesday morning following, when it all disappeared from the higher grounds exposed to the sun's rays. About five o'clock on Thursday evening I started a Peewit from a piece of uncovered moorland, though snow was still lying in all the hollows and sheltered spots around. On going to the place from which the bird rose there was a nest with two eggs, which the bird had been sitting on, as they were quite warm. Now both these eggs must have been laid since the morning of the previous day, if not in a shorter time, for all the moors were covered with snow till the middle of that day. That is, two eggs had been laid in or within the twenty-four hours.

Peewits, as is well known, often rise from a nest containing only one or two eggs. This seems to indicate that these birds begin to sit continuously from the time the first egg is laid. This habit would be of the greatest advantage to the Peewit, for, the nest being always on exposed, open ground, the eggs, if voluntarily left uncovered by the parent bird for a short time even, would inevitably fall a prey to the numerous gulls, rooks, and crows which are constantly hawking for eggs over the moors in spring.

To the more migratory species of this family, which have to travel such immense distances for the purpose of nesting and rearing their young, this rapid habit of laying their eggs and incubating them would be of special service, for many of these birds leave our shores late in spring for their breeding-grounds, often within the Arctic circle, the young of some of them returning as early as August, and the others in the early part of September, on their journey back to the north of Africa, or further southwards; the whole process of nesting and rearing their young, and the passage of many thousand miles to and from their winter quarters having to be accomplished in three or four months. It must be evident from these facts that the shorter the period required for the purposes of incubation and rearing their young, the greater would be the advantage to the Plover family.

Since the above observations were made, I have not had an opportunity of confirming their correctness, or otherwise rectifying any error in the observation. I have, therefore, given this rather long account of what may seem a very trifling matter in bird-life, but which, if substantiated, would be of considerable interest, in the hope that someone with ample opportunity may further investigate this question, and establish the exact time in which the Peewit and other Plovers lay their clutch of eggs.—*Richard Howse, Museum, Newcastle-on-Tyne.*

A List of the Places fixed for the Field Meetings of the Tyneside Naturalists' Field Club, from the first meeting, May 20th, 1846, to October, 1893, including those places (in small capitals) visited by the Club on its Annual Excursions. By RICHARD HOWSE.

An asterisk * after a date denotes that a Meeting was not held.

A.	May.	June.	July.	Aug.	Sept.	Oct.
Acklington	1866	1862	...	...	...	...
Allenheads	...	...	1848	1889	...	...
,, ...	...	...	1851	...	...	...
Allendale	...	...	...	1889	...	...
Alnmouth	...	1858	...	1863	...	...
Alnwick	...	...	...	1854	1847	...
,, ...	...	...	...	1861	...	...
Alston (C.)...............	...	1853	...	...	...	...
,, ...	...	1880	...	...	...	...
,, ...	...	1884	...	...	...	...
Amble	...	...	...	1863	...	...
Askrigg (Yks.)..........	...	1885	...	...	...	...
Axwell Park	1878	...	...	...	...	...
AYDON CASTLE	1881	...	...	...	...	...
Ayton (Yks.)............	...	...	...	...	1875	...
B.						
BALDER DALE (Yks.) ...	...	...	...	1883	...	...
Bamburgh	...	...	1879	1852	...	...
,, ...	...	...	1890	1868	...	...
Bardon Mill	...	...	...	1846	...	...
,, ,, ...	...	...	...	1853	...	...
BANKS OF THE WEAR ...	...	...	...	1860	...	...
Barnard Castle......	...	...	...	1857	1863*	...
,, ,, ...	...	...	...	1873	...	...
,, ,, ...	...	...	...	1883	...	...
,, ,, ...	...	...	...	1892	...	...
Barrasford	...	...	...	...	1880	...
Bass Rock (N.B.) ...	...	...	1880	...	...	...

	May.	June.	July.	Aug.	Sept.	Oct.
Beadnell	...	...	...	...	1891	...
Beamish (D.)	1869	...	...	...	...	...
Beanley Camp	...	...	...	1862	...	...
Bebside	1889	...	...	...	...	...
Bedburn	...	...	...	1879	...	...
Bedlington	1889	...	...	...	...	...
Belford	...	...	1890	1885	...	...
Bellingham	...	1893	1861	1870	...	...
,,	...	...	1881	...	...	...
Bellister Castle	...	...	1872	...	...	...
Belsay	...	...	...	...	1859*	...
Berwick, North	...	...	1880	...	...	...
Birtley (N. Tyne)	...	...	...	...	1867	...
Bishop Auckland	...	...	1857	1877	...	...
Blackaburn (N. Tyne)	...	...	1865	...	...	...
Blackburn (S. Tyne)	...	...	...	1874	1860	...
Black Halls	...	1877	...	...	1881	1893
Blagdon	1865	...	...	...	...	...
Blanchland	1882	...	...	...	1879	...
Blaydon Burn	1885	...	...	...	...	...
Blenkinsopp Castle	...	...	1872	...	...	...
Blyth	...	...	...	...	1856	1859
,,	...	...	...	...	...	1884
Bolam	...	...	...	1872	...	...
Boro'bridge (Yks.)	...	...	...	1886	...	...
Bothal	1868	1885	...	...	...	...
,,	1872	1855	...	...	...	...
Boulmer	...	...	...	1863	...	...
Bowes and Roman Road	...	...	...	1892	...	...
Brancepeth	...	...	...	1860	...	...
Brainshaugh	...	1862	...	...	...	...
Brampton	1883	...	1877	...	...	...
Branxton	...	...	...	1890	...	...
Breamish (River)	...	...	...	1859	...	...
,, ,,	...	...	...	1862	...	...
Bridge of Alne	...	...	...	1859	...	...

	May.	June.	July.	Aug.	Sept.	Oct.
Brinkburn	...	1854	...	...	...	...
,, ...	...	1888	...	...	...	...
Broom Park...............	...	...	...	1859	...	...
Brough Law (N.)	...	...	...	1862	...	...
Bywell	1851	1871	...	...	...	...

C.

	May.	June.	July.	Aug.	Sept.	Oct.
Callerhues Crag.........	...	...	1881	...	...	...
Carter Fell	...	...	...	...	1866	...
Castle Eden Dene ..	...	1847	1852	...	...	1893
,, ,, ..	...	1860	1854	...	...	...
,, ,, ..	...	1870	...	...	...	...
,, ,, ..	...	1877	...	...	...	...
,, ,, ..	...	1889	...	...	...	...
Cauldron Snout	...	...	1881	...	...	...
Cawsey Dene	1867	...	...	...	...	...
Chartners Lough	...	...	...	1872*	...	...
Chattlehope	...	...	...	...	1866	...
Cherry-burn	...	...	...	...	1857	...
Chesters	1884	1859	1862	1850	1880	...
,, ...	...	...	...	1857	...	...
,, ...	...	...	...	1858	...	...
Chester-le-Street..	1891	...	...	...	...	1874
Chevington Wood	...	...	...	1848	...	...
Cheviot (Great), etc....	...	...	1877	1859	...	...
,, ,, ,, ...	...	...	...	1890	...	...
Chibburn..................	...	...	...	...	1853	...
,, ...	...	...	...	...	1859	...
Chillingham	...	...	1855	...	...	...
Chipchase Castle ...	...	1859	...	...	1867	...
Chollerford	1884	1859	1862	1857	...	...
,, ...	...	...	...	1858	1880	...
Chollerton	...	...	...	...	1880	...
Chopwell Woods.........	...	1875	...	...	...	...
Cleadon	...	...	...	...	1846	1860
,, ...	...	...	...	...	...	1866

	May	June.	July.	Aug.	Sept.	Oct.
Coaly Hill	1861	...	...	...	...	...
Cockfield	...	...	1867	...	...	...
Coldingham (N.B.)	...	...	1880	...	...	...
College Burn	...	...	1877	...	...	...
Coomb Crag	...	...	1884	...	1886	...
Coquetdale	...	1862	...	...	...	...
,,	...	1888	...	...	...	...
Corbridge	1881	...	...	...	...	1851
,,	1888	...	...	...	...	...
Cornhill	...	...	1879	...	...	...
Cotherston	...	...	...	1871	...	...
Crag Lough	...	...	...	...	1869	...
,,	...	...	...	...	1873	...
Craster-by-the-Sea	1892	...	...	...	...	...
Creswell	...	...	...	...	...	1886
Craven (Yks.)	...	1883	1882	...	...	...
Crawley Tower	...	...	...	1862	...	...
Croft (Yks.)	1890	...	...	...	...	...
Cronkley Scar	...	...	1860	...	...	...
Crook Burn	...	...	1853	...	...	...
Cross Fell	...	1880	...	...	...	...
,,	...	1884	...	...	...	...
Croxdale Woods	1874	...	...	...	...	...
Cullercoats	...	...	...	...	...	1882

D.

	May	June.	July.	Aug.	Sept.	Oct.
Dead-Water Well	...	...	1863	...	...	...
Deepdale (Yks.)	...	...	...	1865	...	...
Deneholm	...	...	...	...	1881	1893
Derwent Valley	1864	1868	...	...	...	...
Devils Water	1854	...	...	...	...	...
,,	1880	...	...	...	...	...
Dilston	1854	1867	...	...	...	...
Dipton	1880	1849	...	...	...	...
,,	...	1867	...	...	...	...
,,	...	1873	...	...	...	...

	May.	June.	July.	Aug.	Sept.	Oct.
DRURIDGE BAY	...	...	...	...	1877	...
Dumfries (Scotland)..	...	...	1893	...	...	...
DUNSTANBOROUGH CASTLE.	1892	1858	...	1867	1848	...
,, ,, .	...	1872	...	...	1888	...
Durham	1862	1851	...	...	1858	...

E.

	May.	June.	July.	Aug.	Sept.	Oct.
EASINGTON	...	1866	...	...	...	...
Ebchester..............	1886	1875	...	...	...	...
EGGLESTON ABBEY.........	...	...	...	1883	...	...
EGLINGHAM................	...	...	...	...	...	...
ELSDON	...	...	...	...	1883	...
Embleton	1892	1858	...	1867	1848	...
,, ...	...	1872	...	...	1891*	...
ETAL	...	...	1879	1890	...	...

F.

	May.	June.	July.	Aug.	Sept.	Oct.
FALCON CLINTS	...	1881	...	...	...	...
FALLOWFIELD	...	...	1862	...	...	...
FALLOWLEES LOUGH	...	...	...	1872*	...	...
Farne Islands.........	...	1876	1864	...	...	...
,, ...	...	...	1890	...	...	...
FEATHERSTONE CASTLE ...	...	1852	1872	...	...	...
Felton (Coquetdale)...	...	1862	...	...	...	...
FERRY HILL	...	...	...	...	1862	...
FINCHALE ABBEY	1862	...	1870	...	...	...
FLODDEN EDGE	...	...	...	1890	...	...
FORD CASTLE...............	...	...	1879	1890	...	...
FOUNTAINS ABBEY (Yks.)	...	1891	...	...	...	...
FOURSTONES	...	...	1860	1850	...	...
FOX-HOLE DENE	...	1866	...	...	...	...

G.

	May.	June.	July.	Aug.	Sept.	Oct.
GELT RIVER (C.)	1883	...	...	...	...	...
GIBSIDE WOODS............	1848	...	...	...	...	...
,, ...	1858	...	...	...	...	...
,, ...	1864	...	...	...	...	...

	May.	June.	July.	Aug.	Sept.	Oct.
Gilling (Yks.)	...	...	...	...	1872	...
Gilsland	...	...	1859	1849	1886	...
,,	...	...	1884	...	...	...
,,	...	...	1889	...	...	...
Glanton	...	...	...	1862	...	...
Glendue Burn	...	...	...	...	1860	...
Gosforth Lake	1876	...	...	...	...	...
Grains o' the Beck (Yks.)	...	1881	...	...	...	...
Greaves Ash	...	...	...	1862	...	...
Greenhead	...	...	1872	1881	...	...
Gunnerton Crags	...	1859	...	...	1880	...

H.

	May.	June.	July.	Aug.	Sept.	Oct.
Hallington Reservoir	1888	...	...	...	...	...
Hambleton Hills (Yks.)	...	...	...	...	1872	...
Halton Chesters	1881	...	...	...	...	...
Haltwhistle	...	1852	1847	1846	...	...
,,	...	...	1859	1849	...	...
,,	...	...	...	1872	...	...
Harbottle	...	1879	...	...	...	...
Hardwick Hall	...	...	...	...	1862	...
Hareshaw Linn	...	1893	1881	1870	...	...
Hartlepool	...	...	...	...	1850	...
,,	...	...	...	...	1874	...
Hartford Bridge	1865	...	...	...	...	...
,, ,,	1870	...	...	...	...	...
,, ,,	1889	...	...	...	...	...
Hartley Burn (S. Tyne)	...	...	...	...	1860	1855
Hartley	...	...	...	...	...	1885
Harwood Beck	...	1881	...	...	...	...
Hawes (Yks.)	...	1885	...	...	...	...
Hawthorn Dene	...	1849	...	...	...	...
,, ,,	...	1861	...	...	...	...
Haydon Bridge	...	...	1847	...	...	...
Hazelden Dene	...	1848	...	...	1881	...

	May.	June.	July.	Aug.	Sept.	Oct.
Hesleden Dene	...	1857	...	...	...	...
Hedgehope	...	...	...	1862	...	...
Hedgeley	...	...	1892	...	...	...
Helmsley (Yks.)......	...	...	...	...	1872	...
Hen Hole (Cheviot) ...	...	...	1877	...	...	...
Hesleyside	...	...	1861	...	...	...
Hexham	1880	1867	1862	...	...	...
,, ...	...	1873	...	...	...	...
Highcup Nick (W.)......	...	1882	1860	...	...	...
High Force (Teesdale)	...	1878	1853	1865	...	...
,, ,,	...	1882	1860	...	...	...
,, ,,	...	1887	1869	...	...	...
Holy Island............	...	1854	1879	1850	...	...
,, ...	...	...	1890	1856	...	...
,, ...	...	...	...	1875	...	...
Holywell Dene	1873	...	...	...	...	1885
Horden Dene	...	1849	...	...	...	...
,, ...	...	1866	...	...	...	...
Housesteads	...	1886	...	1878	1863	...
Hulne Abbey	...	...	...	1859	...	...
Hurworth-on-Tees	1877	...	...	...	...	...
Hylton Castle.........	1853	...	...	...	...	...
I.						
Ingram	...	...	...	1862	...	...
Irthing (River)	1864	...	1889	1849	1886	...
K.						
Knaresboro' (Yks.)..	...	1892	...	...	...	...
Knarsdale	...	...	...	...	1860	...
,, ...	...	...	...	...	1865	...
Kieldar	...	...	1863	...	...	...
Kirkby Stephen (C.) ...	...	1890	...	...	...	...
Kyloe Crags..............	...	...	1858	...	...	...
L.						
Lambton Park	1852	...	...	...	1858	...
,, ...	1891	...	...	...	...	...

	May.	June	July.	Aug.	Sept.	Oct.
Lamesley	1879	...	...	...	...	...
Lanchester	...	1863	...	...	1892	...
Lanercost Priory (C.)...	...	1865	1877	...	...	...
Langdon Beck	...	1881	...	...	...	...
Lartington (Yks.)	...	...	...	1865	...	...
Leamside	1862	...	...	...	...	...
Leyburn (Yks.)	...	...	...	1884	1876	...
Lintz Green..............	1871	...	...	...	...	...
Loftus (Yks.)	...	...	...	...	1884	...
Longhoughton	...	...	...	1867	1888	...
Low Row (C.).........	...	...	1884	...	...	...
Lumley Castle	1852	...	...	...	1858	...
Lunedale (Yks.).........	...	1881	...	...	...	...

M.

	May.	June	July.	Aug.	Sept.	Oct.
Mainsforth	...	...	...	...	1862	...
Maize Beck (Yks.)	...	1882	1860	...	...	...
Marsden	...	...	...	...	1870	1858
,, ...	...	...	...	...	...	1860
,, ...	...	...	...	...	...	1861
,, ...	...	...	...	...	...	1862
,, ...	...	...	...	...	...	1863
,, ...	...	...	...	...	...	1864
,, ...	...	...	...	...	...	1865
,, ...	...	...	...	...	...	1866
,, ...	...	...	...	...	...	1867
,, ...	...	...	...	...	...	1872
,, ...	...	...	...	...	...	1873
,, ...	...	...	...	...	...	1876
,, ...	...	...	...	...	...	1877
,, ...	...	...	...	...	...	1879
,, ...	...	...	...	...	...	1880
,, ...	...	...	...	...	...	1881
,, ...	...	...	...	...	...	1887
,, ...	...	...	...	...	...	1888
,, ...	...	...	...	...	...	1889
,, ...	...	...	...	...	...	1891

	May.	June.	July.	Aug.	Sept.	Oct.
Meldon	...	1864	...	...	...	...
Melrose (N.B.)	...	...	...	1891	...	...
Middleton-one-Row	1877	...	...	...	...	...
Middleton-in-Teesdale	...	1881	...	...	...	...
Mickle Fell (Yks.)	...	1881	...	...	...	...
Mitford	...	1864	...	1859*	...	...
Morden Cars	...	...	...	...	1862	...
Morpeth	1847	...	...	1859*	...	1883
,,	1849	...	...	...	...	...
Muckle Moss	...	...	1860	...	...	...
,,	...	...	1883	...	...	...
N.						
Naworth Castle (C.)	...	1865	1877	...	...	...
Nent Head (C.)	...	1880	...	...	...	...
Netherwitton	...	...	...	1859*	...	...
New Abbey (Dumfries)	...	...	1893	...	...	...
Newbiggin-by-the-Sea	...	...	...	1869	...	1859
,,	...	...	...	...	1877	1886
Newbrough	...	...	1860	...	...	...
Newburn	1861	...	...	...	...	...
Nidderdale (Yks.)	...	...	1887	...	...	...
North Shields	...	...	...	...	...	1882
,,	...	...	...	...	...	1892
North Sunderland	...	...	1864	...	...	...
Northumberland Lakes	...	1886	1849	1853	...	...
,,	...	...	1850	1854	...	...
,,	...	...	1859	1858	...	...
,,	...	...	...	1878	...	...
O.						
Old Bewick	...	...	...	1862	...	...
Otterburn	...	...	...	...	1852	...

	May.	June.	July.	Aug.	Sept.	Oct.
Otterburn	...	...	...	...	1883	...
Ovingham	1846	...	...	...	1857	...
,,	1859	...	...	...	...	...
P.						
Pallinsburn	...	...	1879	1890	...	...
Pateley Bridge (Yks.)	...	...	1887	...	...	...
Pearl Fell	...	...	1863	...	...	...
Percy's Leap	...	...	...	1862	...	...
Plashetts (N. Tyne)	...	...	1863	...	...	...
Powburn	...	...	...	1862	...	...
Prestwick Car	1857	...	...	1847	1855	...
Prudham	...	...	1860	...	...	...
Prudhoe Castle	1846	...	...	1878	...	...
R.						
Raby Castle	...	...	1867	...	...	...
,,	...	...	1886	...	...	...
Ravensworth Castle	1879	...	...	...	...	...
Redesdale	...	...	...	...	1890	...
Reeth (Yks.)	...	...	1891	...	...	...
Richmond (Yks.)	...	...	1868	...	...	...
,, ,,	...	...	1891	...	...	...
Riding Mill	1851	1856	...	...	...	...
,,	...	1860	...	...	...	...
Rievaulx Abbey	...	...	...	...	1872	...
Ripon (Yks.)	...	1891	1878	...	...	...
Rochester	...	...	...	...	1866	...
Roddam Dene	...	...	...	1862	...	...
Rokeby (Yks.)	...	...	...	...	1893	...
Roker	...	...	...	...	1851	1860
,,	...	...	...	...	...	1887
Roman Wall	...	...	1859	...	...	...
,,	...	...	1883	...	...	...
Roseberry Topping (Yks)	...	...	...	...	1875	...
Rosehill	...	...	...	...	1864	...

	May.	June.	July.	Aug.	Sept.	Oct.
Rothley Lake	...	1874	...	...	...	...
Rothbury	...	1879	...	...	1870	...
Routing Linn	...	...	1879	...	...	...
Rowland's Gill	1858	1855	...	...	...	...
,,	1885	...	...	...	...	...
Ryhope	1863	...	...	...	1849	1890

S.

	May.	June.	July.	Aug.	Sept.	Oct.
Saltburn (Yks.)	...	...	...	1866	1885	...
Saughtree	...	...	1863	...	...	...
Seaham	1863	1861	...	...	...	1890
,,	...	1866	...	...	...	...
Sea Houses	...	...	1890	...	...	...
Seaton Carew	...	...	...	...	1874	1885
Seaton Delaval	...	...	...	...	...	1884
Sedgefield	...	...	...	...	1862	...
Settle (Yks.)	...	1883	1882	...	...	...
Sewing Shields Crag	...	...	1883	...	...	...
Shaftoe Crags	...	...	...	1872	...	...
Sheepwash	1868	...	...	...	...	...
Shotley Bridge	1886	1868	1846	...	...	...
Simonburn (N. Tyne)	...	...	...	1858	1868	...
Slaggyford	...	...	...	...	1860	...
,,	...	...	...	...	1865	...
Snowhope	...	...	...	...	1865	...
Spen	1885	...	...	...	...	...
St. Abb's Head (N.B.)	...	...	1874	...	...	...
,,	...	...	1880	...	...	...
St. John's Chapel	...	...	...	1880	...	...
St. Mary's Island	...	...	...	...	...	1868
,, ,,	...	...	...	...	...	1869
,, ,,	...	...	...	...	...	1871
St. Mary's Loch (Special)	...	...	...	1882	...	...
St. Oswald	...	...	1862	...	...	...
South Shields	1875	...	...	...	...	1888
Southwick	1853	...	...	...	...	...

	May.	June.	July.	Aug.	Sept.	Oct.
Stagshaw Bank	1881	...	...	...	...	...
Stainmoor Fell (Yks.)..	...	1881	...	1892	...	...
Staithes (Yks.)	...	...	...	...	1884	...
Staindrop	...	...	1886	...	...	...
Stanhope	...	...	...	1864	...	...
,, ...	...	...	...	1876	...	...
Stanley Burn	1850	...	...	...	...	...
Staward Peel	...	1850	1856	1851	1861	...
,, ...	...	1869	1876	1893	...	...
Sunderland	...	1849	...	...	...	...
Sunderland Bridge......	...	...	...	1860	...	...
Sunderland, North	...	...	1890	1864	...	...
Swaledale (Yks.) ...	...	1890	1891	...	...	...
Sweethope	...	...	1866	...	...	...
Swinburne Castle	...	...	...	...	1880	...

T.

	May.	June.	July.	Aug.	Sept.	Oct.
Talkin Tarn	1883	1865	...	...	...	...
Teesdale	...	1878	1853	1873	...	...
,, ...	...	1881	1856	...	...	...
,, ...	...	1887	1860	...	...	...
Thirlwall (Nine Nicks)	...	...	1859	1881	...	...
,, ,,	...	...	1872	...	...	...
Tindale Fell	...	1865	...	...	...	...
Tindale Tarn	...	...	...	1874	...	...
Twizell House............	...	...	...	1885	...	...
Tynemouth	...	...	...	...	1854	1846
,,	...	...	...	...	...	1892
Tyne, North	...	...	1875	...	1880	...
Tyne, South	...	...	...	...	1865	...

U.

	May.	June.	July.	Aug.	Sept.	Oct.
Ushaw College	...	1863	...	...	...	...

W.

	May.	June.	July.	Aug.	Sept.	Oct.
Walbottle	1861	...	...	...	...	...
Wallington	...	...	...	1855*	...	...

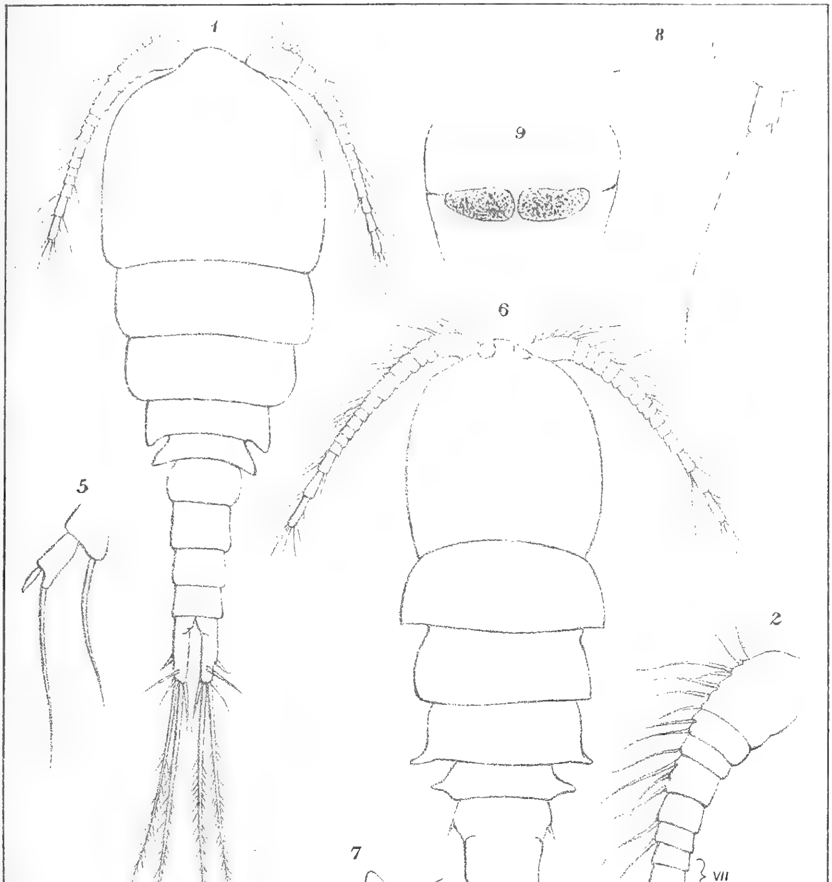
	May.	June.	July.	Aug.	Sept.	Oct.
Wall-town Crags	...	...	1847	1849	...	...
,, ,,	...	...	...	1881	...	...
Wark (North Tyne) ...	...	...	1865	...	...	...
,, ,,	...	...	1875	...	...	...
Warden	...	...	1860	...	...	...
Warkworth	1866	...	1885	1863	1878	...
Washington	1853	...	...	...	...	...
Weardale..............	...	...	...	1880	...	...
Wemmergill (Yks.)......	...	1881	...	...	...	...
Wensleydale (Yks.).	...	1885	...	1884	...	...
Whitburn	...	...	...	...	1846	1860
,, ...	...	...	...	...	1851	1880
,, ...	...	...	...	...	...	1887
Whitfield (W. Allen)	1887	...	...	...	...	...
Whitby (Yks.)...........	...	...	1873	...	1875	...
Whittingham	...	...	1878*	1888	...	...
Whittle Dene...........	1846	...	...	1878	...	...
,,	1859	...	...	...	...	...
Widdrington	...	...	...	...	1853	...
,, ...	...	...	...	...	1859	...
Winch Bridge	...	...	1860	...	...	...
Winston Bridge	...	...	1886	...	1893	...
Wolsingham	...	...	...	1879	...	...
Woodburn	...	...	1866	...	1890	...
,,	...	...	1871	...	...	...
Wooler	...	...	1877	1890	1857	...
,,	...	...	...	...	1871	...
,,	...	...	...	...	1887	...
Wycliffe-on-Tees (Yks)	...	...	...	...	1893	...

Y.

	May.	June.	July.	Aug.	Sept.	Oct.
Yad Moss (C.)	...	...	1860	...	...	...
Yetholm (Scotland)......	...	...	1879	...	1871	...

N.B.—To several of the above localities more visits have been paid than are recorded in this List.

INDEX.



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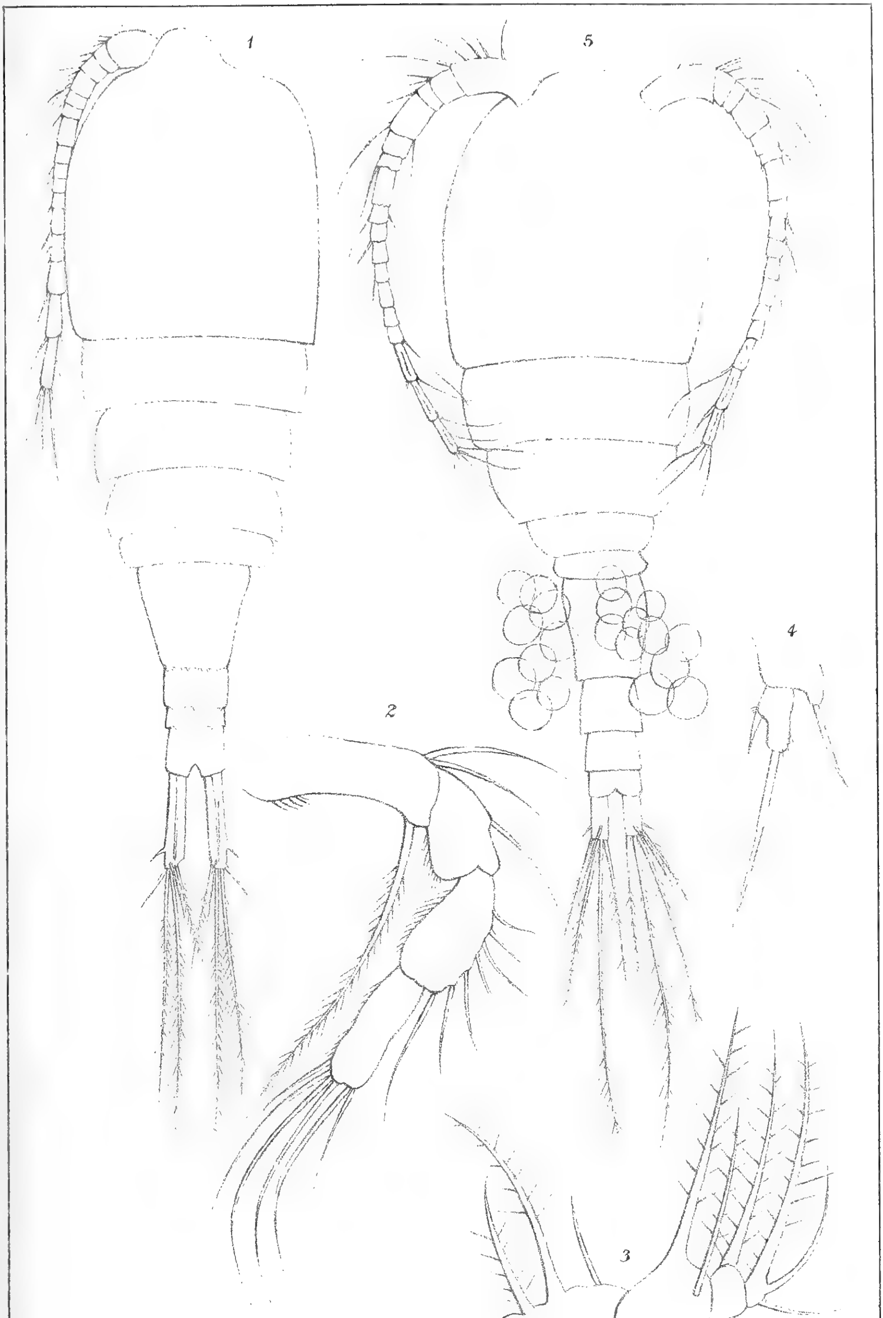
Figs 1–5. CYCLOPS ELONGATUS
6–9. " VICINUS.



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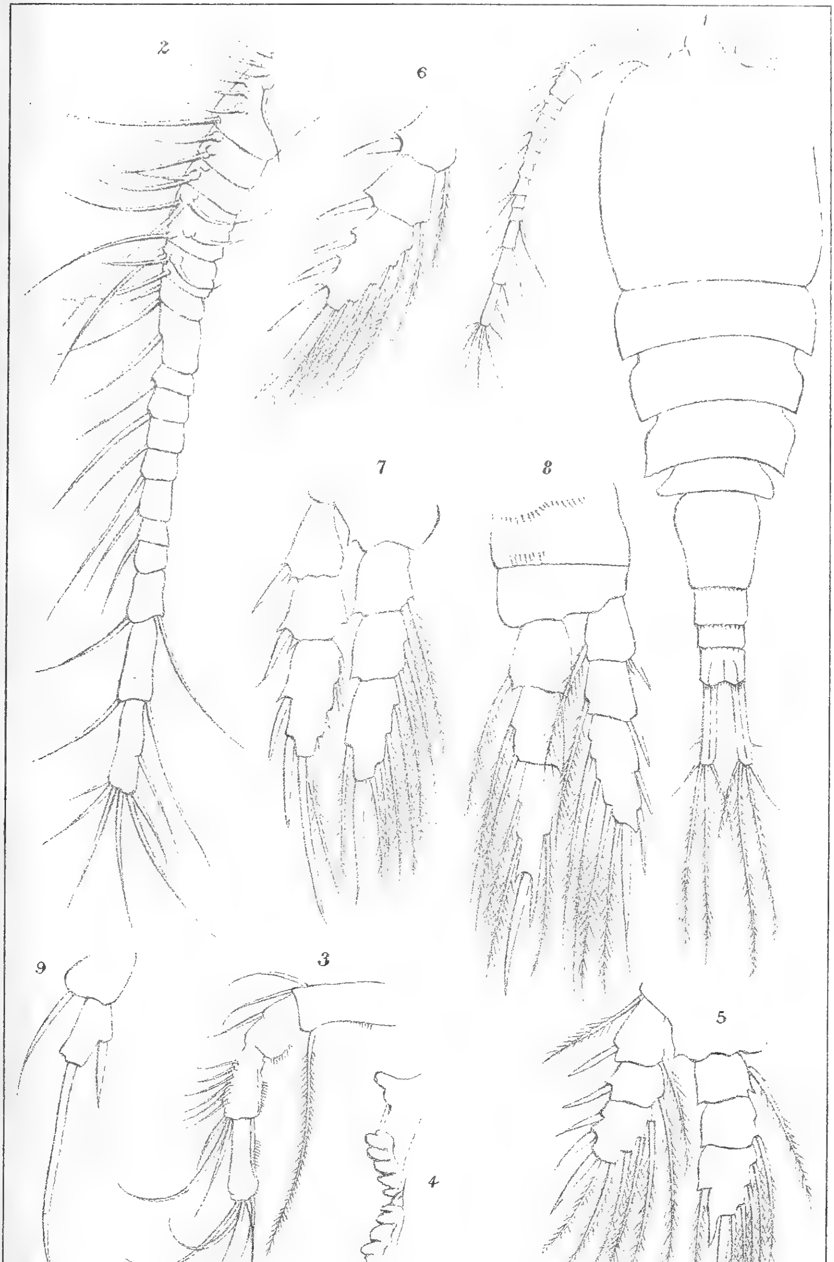
Figs. 1–4. CYCLOPS STRENUUS
5. " SIGNATUS.



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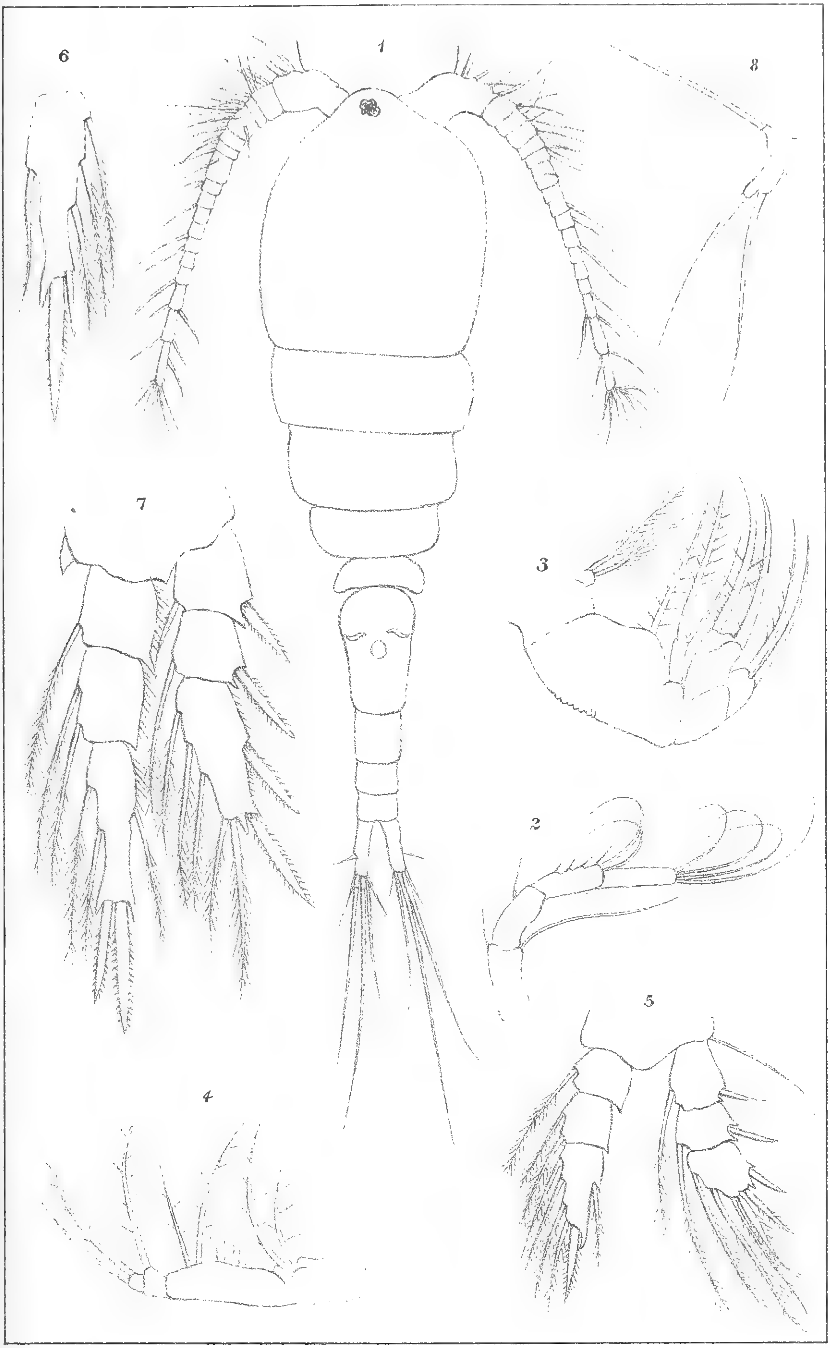
CYCLOPS ABYSSORUM.



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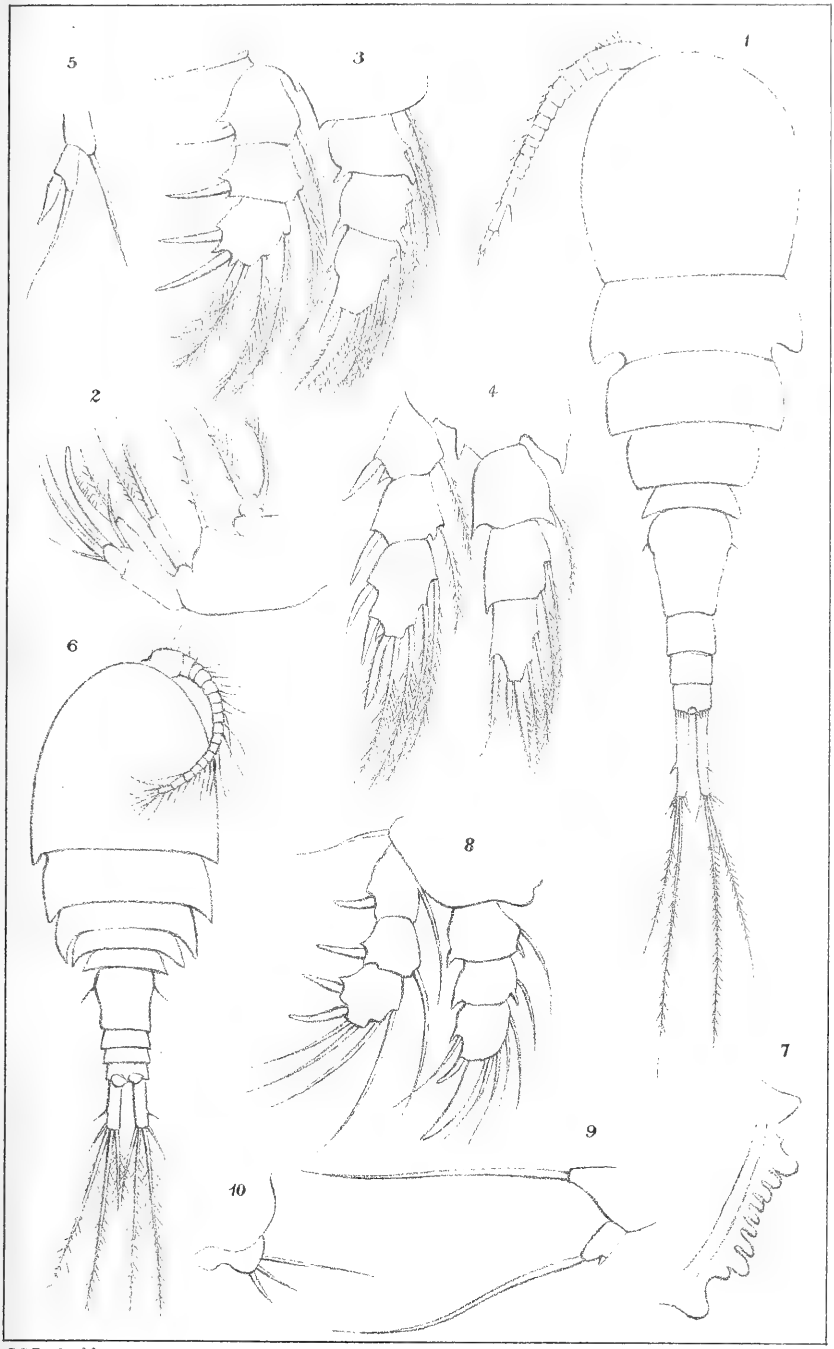
CYCLOPS SCOURFIELDI.



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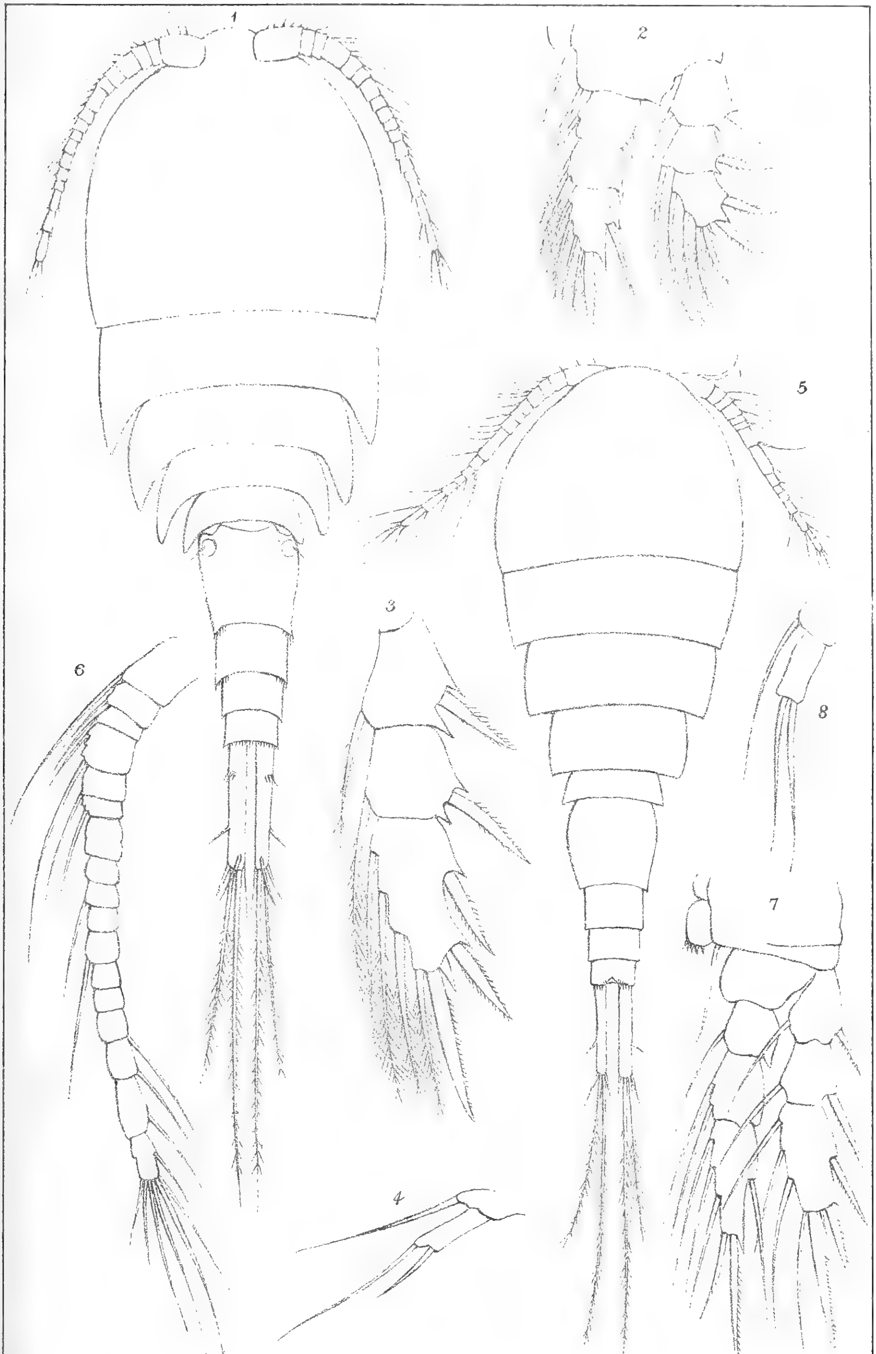
Figs 1–5. CYCLOPS BICUSPIDATUS
6–10. " VIRIDIS.



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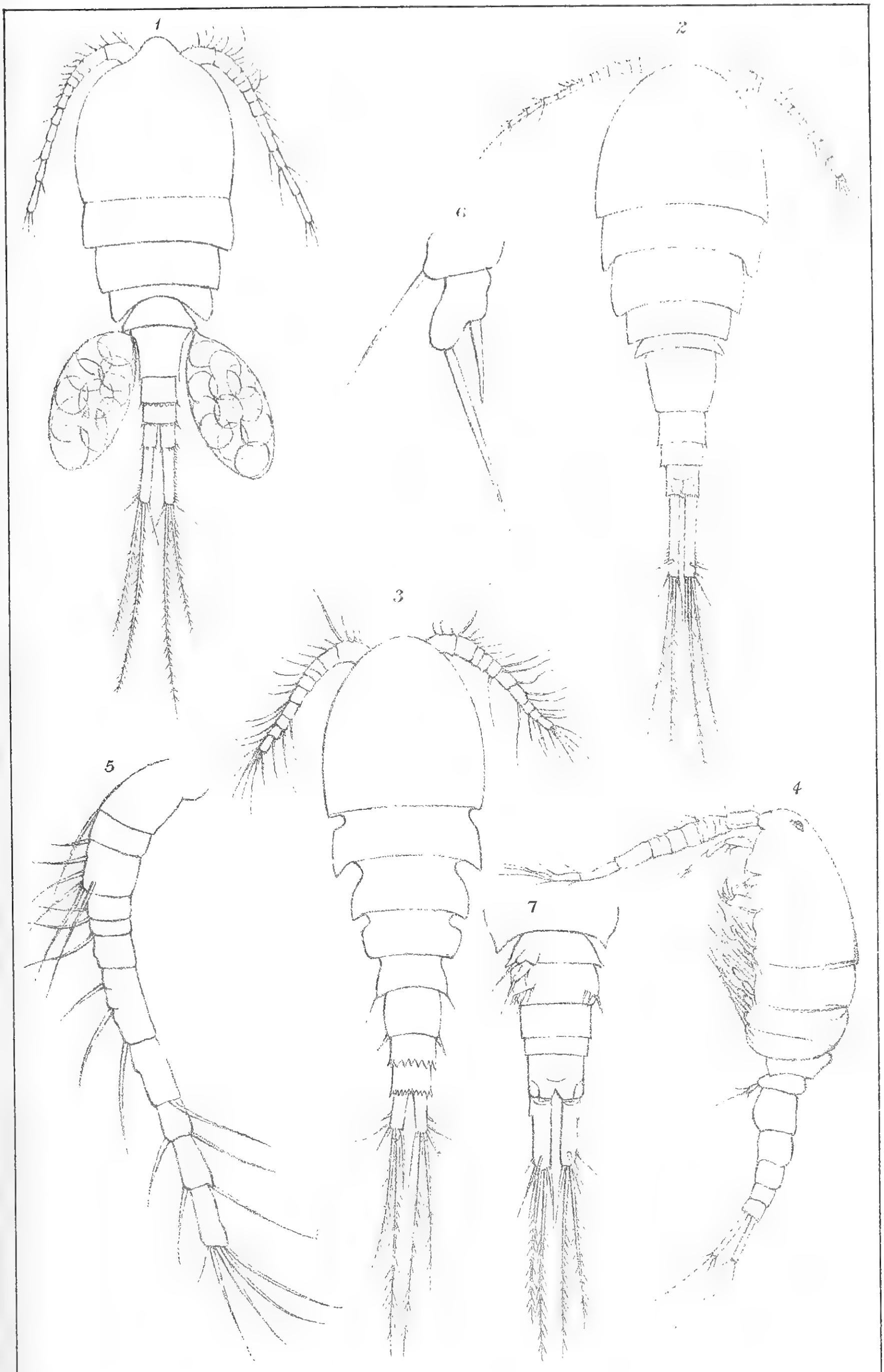
Figs. 1–4. CYCLOPS THOMASI
5. " INSIGNIS
6–8. " SCOURFIELDI. Var.



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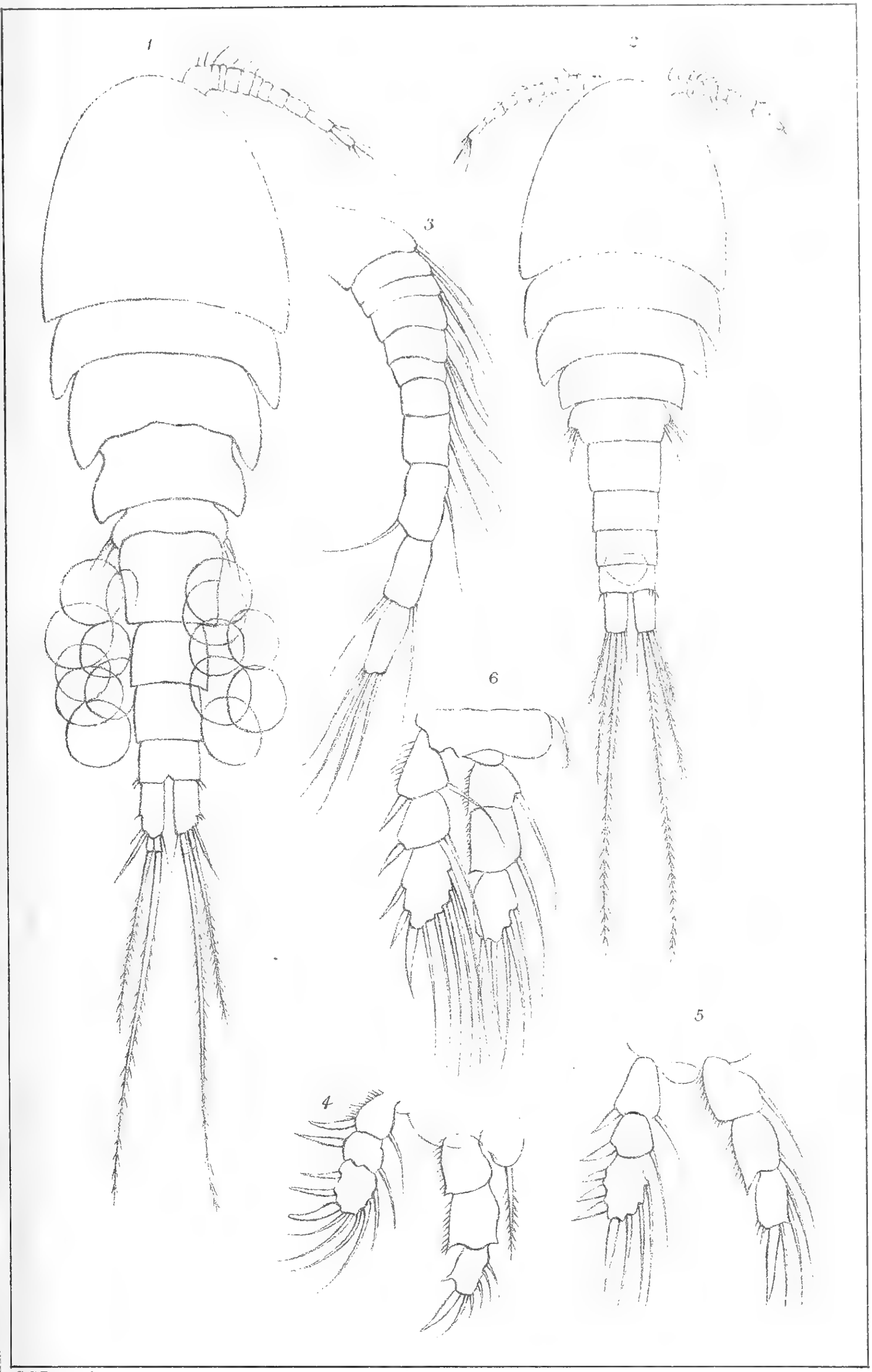
Figs. 1. CYCLOPS SERRULATUS
2. " MACRURUS
3. " KAUFMANNI
4 – 7. " EWARTI.



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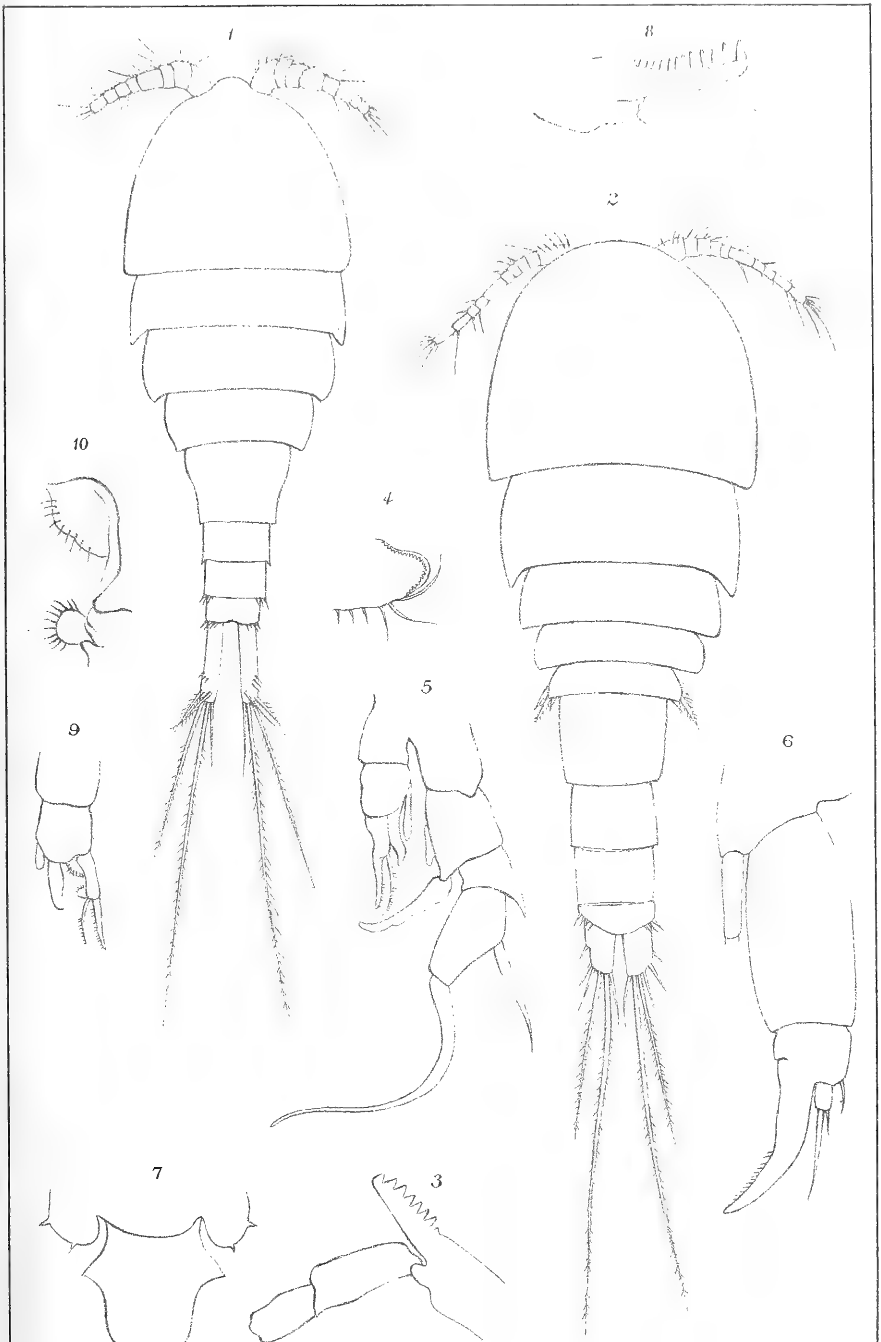
CYCLOPS AFFINIS.



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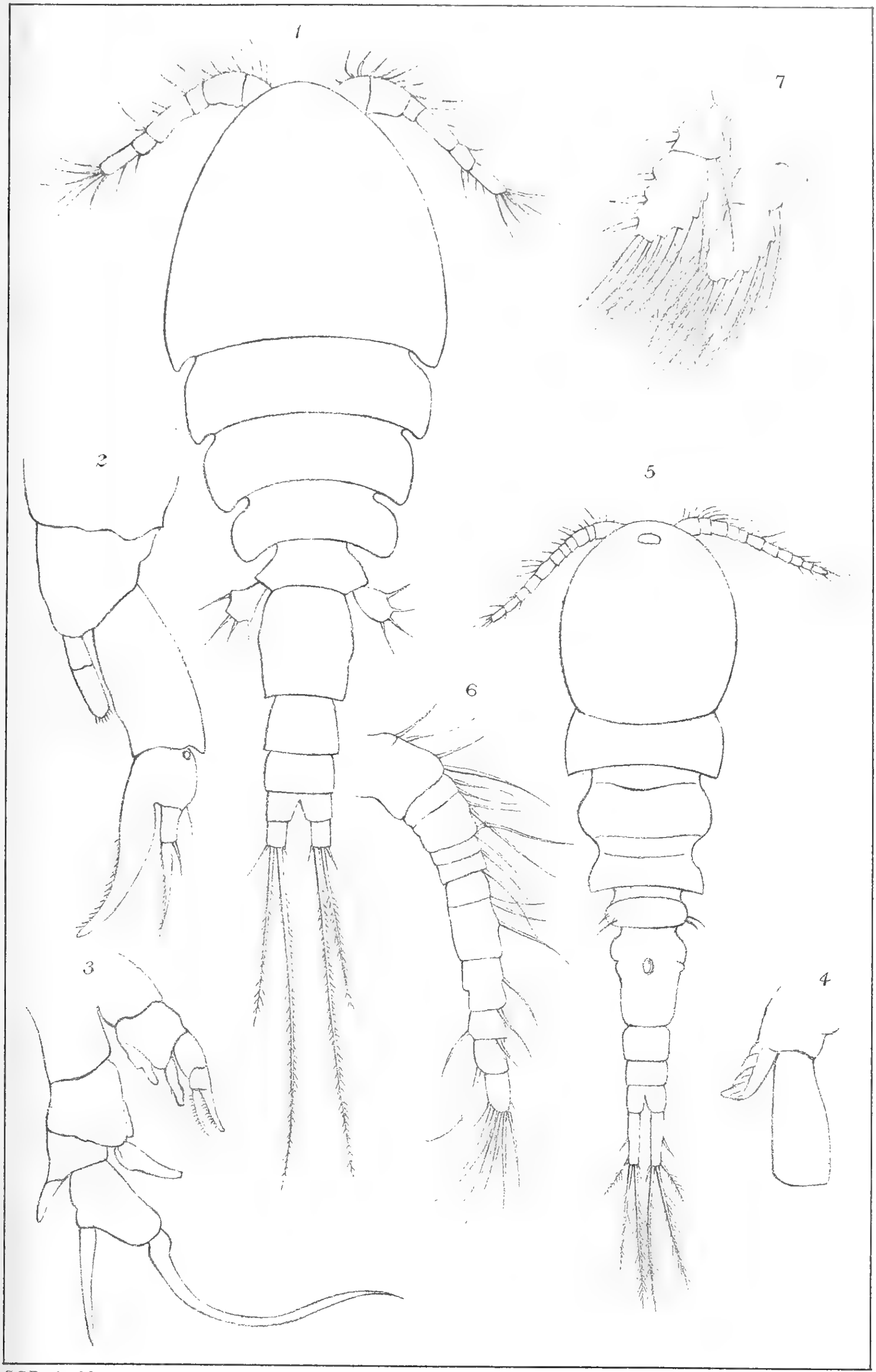
Figs 1. CYCLOPS CRASSICORNIS

2. " PHALERATUS

3-10. DIAPTOMUS SERRICORNIS.



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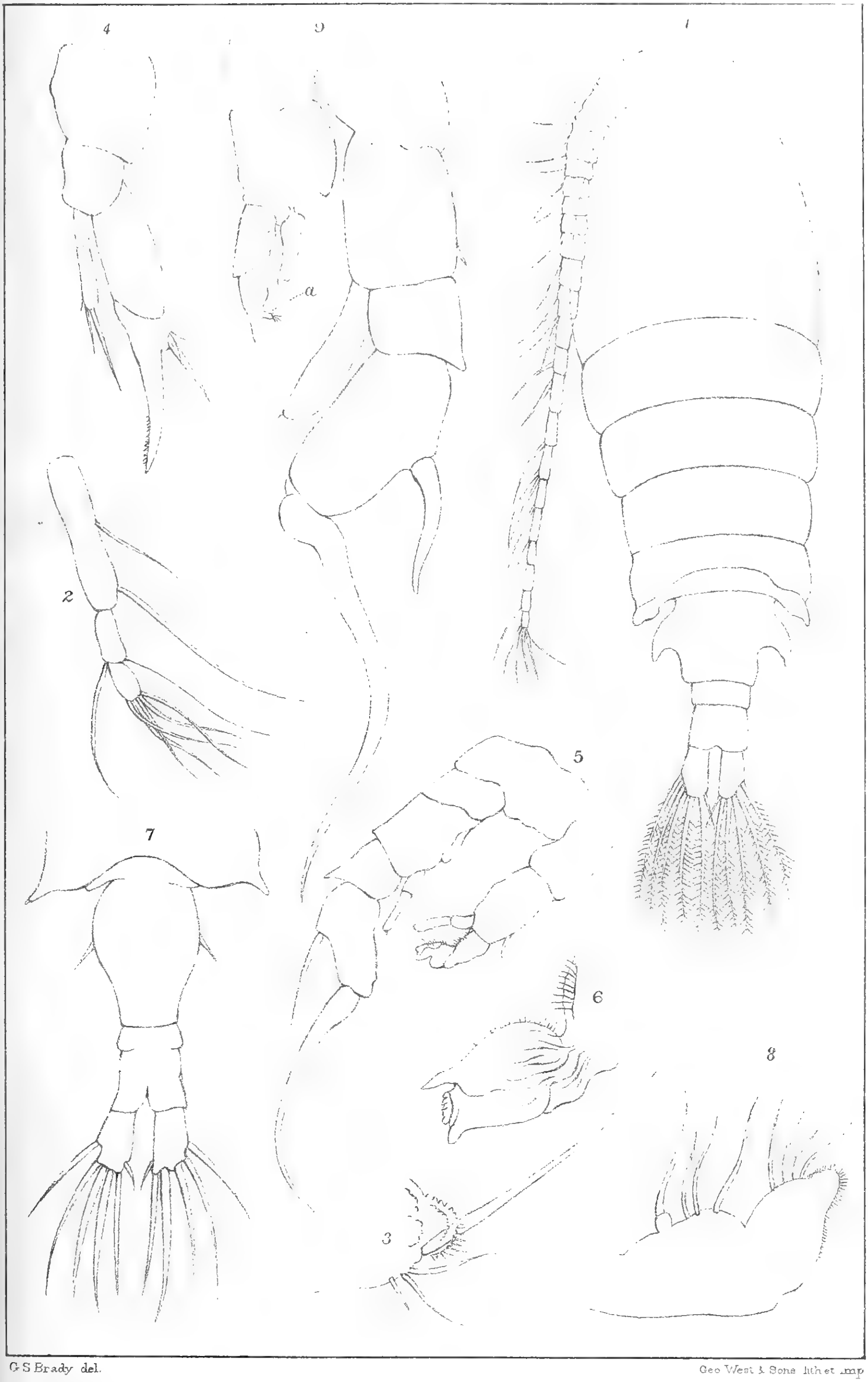
Figs 1. CYCLOPS ÆQUOREUS
2–4. DIAPTOMUS HIRCUS
5–7. CYCLOPS LONGICAUDATUS.



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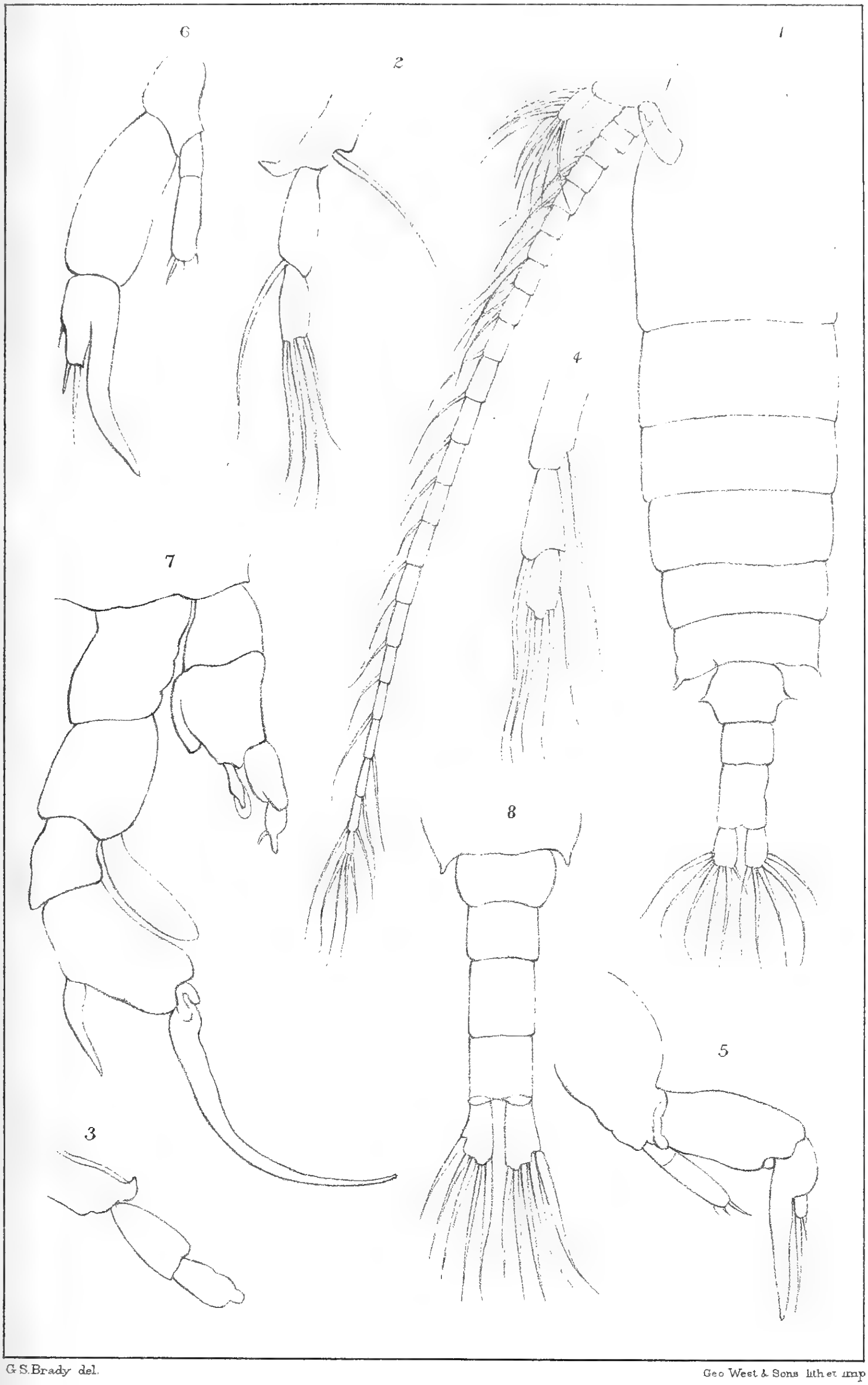
Figs 1–6. DIAPTOMUS CASTOR
7–9. " GRACILIS.



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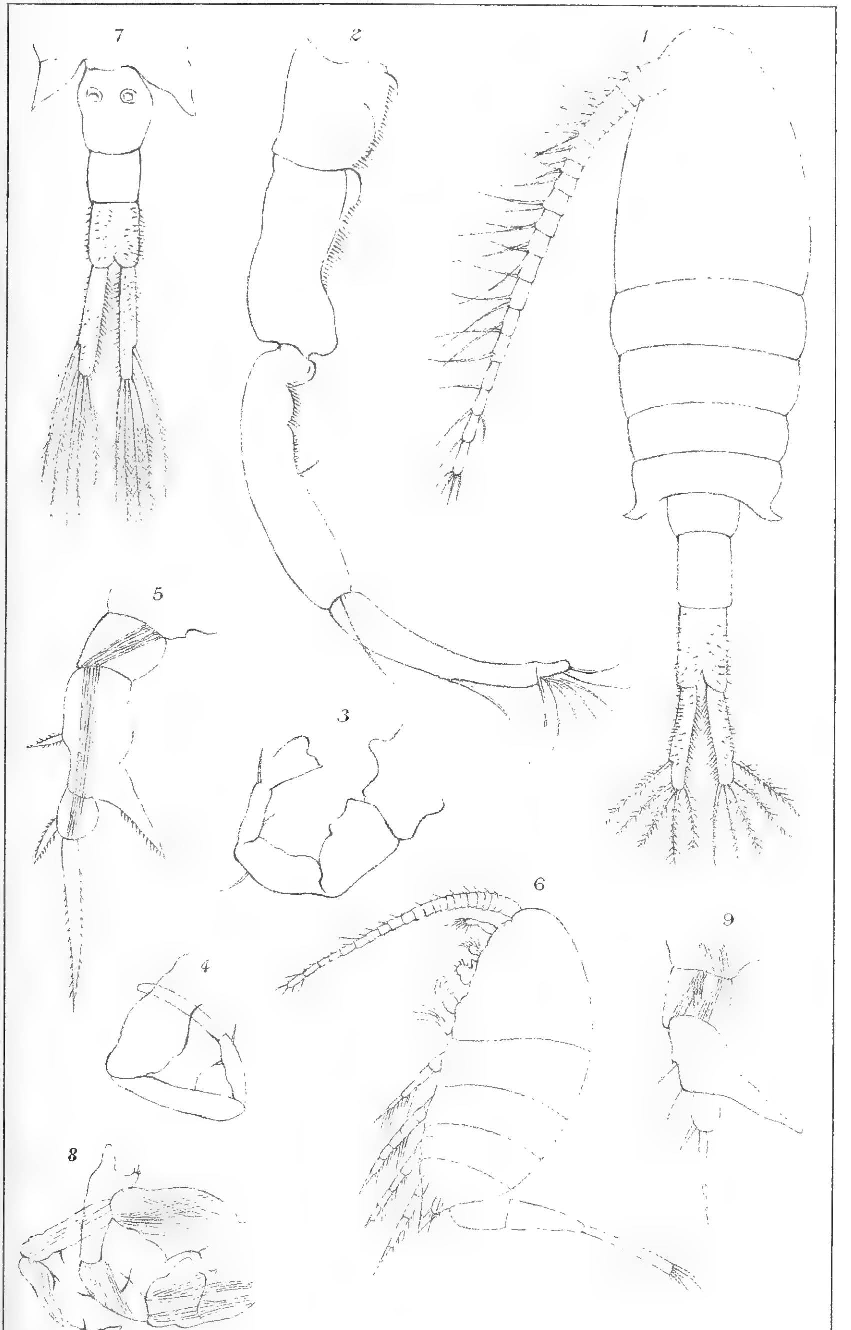
DIAPTOMUS GRACILIS.



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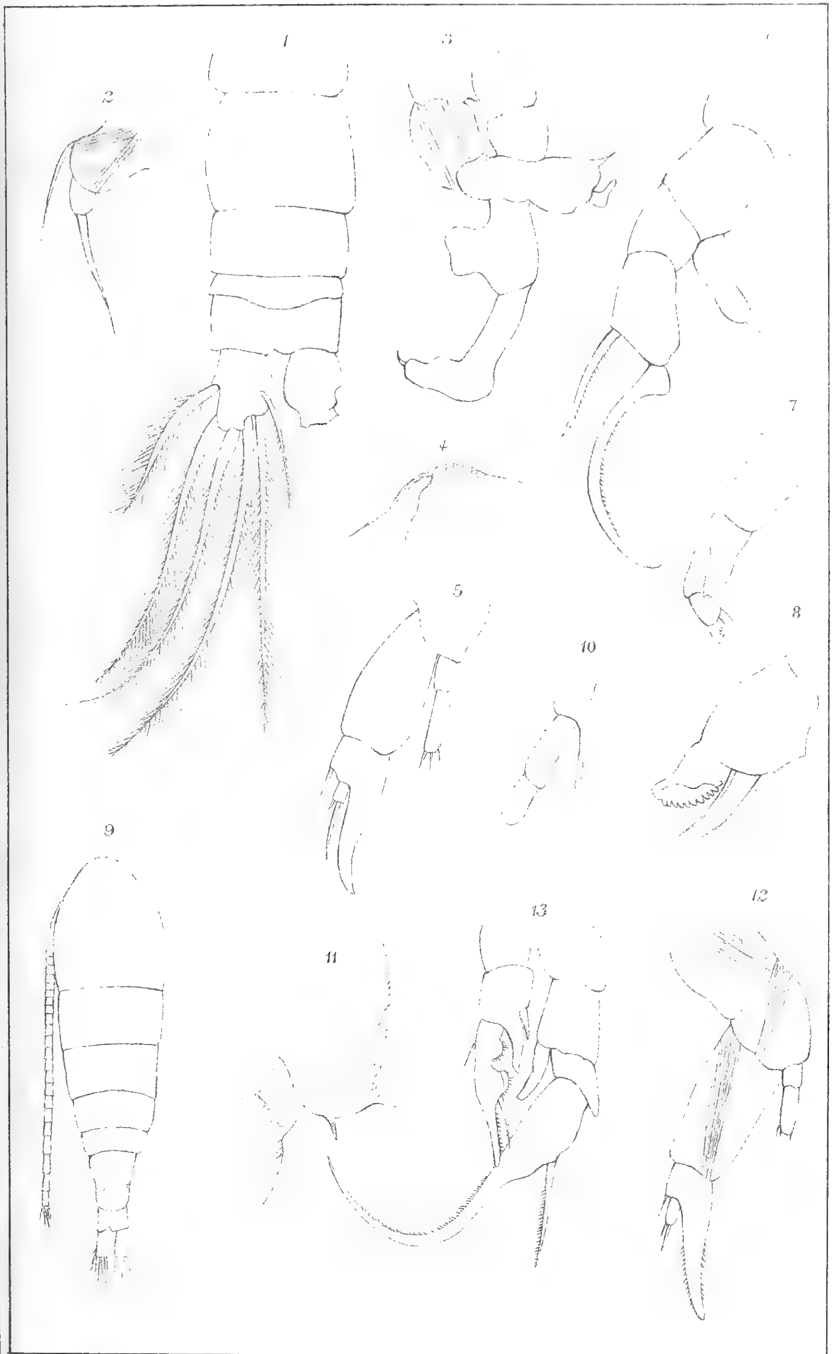
Figs 1–5. EURYTEMORA CLAUSII
6–9. " AFFINIS



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Figs 1–4. ACARTIA LONGIREMIS
5–8 DIAPTOMUS SANCTI-PATRICII
9–13. " BACILLIFER.

June 19, 1892

5363

NATURAL HISTORY

TRANSACTIONS

OF

NORTHUMBERLAND, DURHAM,

AND

NEWCASTLE-UPON-TYNE.

VOL. XI.—PART I.

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