IMPORTANT ANNOUNCEMENT TO THE MEMBERS OF THE CLUB.

"JOURNAL OF PROCEEDINGS OF THE ESSEX FIELD CLUB." Vol. iv., Part 2.

Edited by WILLIAM COLE, *Hon. Secretary.*

The Editor is very glad to announce that this long delayed part is now in the press, and will be issued in March. It will contain extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of "Proceedings"), after which date reports appeared in the "Essex Naturalist."

The volume is, of course, *absolutely indispensable* to COMPLETE THE SET OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE CLUB, which will then consist of five volumes.

The printing of the limited edition of the part will cost about £50, and the Council has fixed the price at 5s. to Members, and 6s. 6d. to Non-members, post free.

It is hoped that every Member possessing the "Transactions" will take this part to complete their sets, and to save the Club from serious loss by reason of its publication.

X

FORM OF ORDER.

[.....ENCLOSED.]

Dear Sir,

Please send me.....cop of the "Journal of Proceedings," E. F. C., vol. iv., part 2, as above. for which I enclose.....for.....

Yours faithfully,

.....

To Mr. A. P. WIRE,
1, Seaton Villas,
Birkbeck Road,
Leytonstone, E.

1892.

THE

ESSEX NATURALIST:

BEING THE

Journal of the Essex Field Club.

EDITED BY

WILLIAM COLE,

Honorary Secretary.

VOLUME VI.

JANUARY—DECEMBER, 1892.

"*Men that undertake only one district are much more likely to advance natural knowledge than those that grasp at more than they can possibly be acquainted with. Every kingdom, every province, should have its own Monographer.*"—GILBERT WHITE of Selborne.

[*The authors alone are responsible for the statements and opinions contained in their respective papers.*]

PUBLISHED BY THE CLUB, BUCKHURST HILL, ESSEX.

E. DURRANT & CO., 90, HIGH STREET, CHELMSFORD.

1892.

"Every good man has his hobby, and every hard-working man should have one."

ATHENÆUM.

"Surely, my friends, plenty of bacon is good and indispensable; but, I doubt, you will never get even bacon by aiming only at that."

CARLYLE.

"Thou passest in review before me the whole series of animated things; and teachest me to know my brothers in the still wood, in the air, and in the water."

HAYWARD'S "FAUST."

"Once more am I admitted peer
In the Upper House of Nature here,
And feel through all my pulses run
The royal blood of breeze and sun."

J. RUSSELL LOWELL.

"When a man has learnt to take an interest in the varied operations of Nature which are everywhere being carried on about him, and has acquired the habit of directing his attention to such matters, and keeping his senses always alive to any new information thereby afforded him, he has made himself almost independent of outward circumstances. He has opened to himself a source of occupation and mental enjoyment but little affected by the ordinary vicissitudes of life."

REV. LEONARD JENYNS.

"What could be the vision of the Saturday stroller? Perhaps it might be the old Common, where, amongst furze bushes and mud puddles, and tall bracken and swamp, he could find, year in and year out, always something new; when the time passed so swiftly away that he could chide the dusky evening for coming on so speedily, and when enough had been found, or seen, to send him home with something to think about all the week; when the only feeling that could find a place in his breast was that of increased love for all created things, and when the only exclamation that could escape his lips was—'How manifold are Thy works, in wisdom hast Thou made them all.'"

DR. M. C. COOKE.

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ILLUSTRATIONS.

ANNUAL SUBSCRIPTION—Members, 4s. 6d.; Non-Members, 9s. Post Free.

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Ent. Stationers' Hall.] [*Issued March, 1892.*]

Attention is called to List of Publications of the Club on pages 2 and 3 of Wrapper.

Communications *and* Advertisements *should be addressed :—*
The Editor of "THE ESSEX NATURALIST,"
-, Knighton Villas, Buckhurst Hill, Essex.

Publications of the Essex Field Club.

All the Publications of the Club are still in print, *but Volumes I. and II. of the "Transactions" can only be supplied with complete sets*, of which about 15 copies are in hand, and the price of which will soon be raised.

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Report on Exploration of the Essex Deneholes. (With Coloured Plates)	0	2	0
Fac-simile reproductions of "Norden's Map of Essex" (1594)	0	1	0

A few copies of other maps and plans can also be supplied.

A pamphlet giving full details of the Museum and Technical Education Schemes of the Club, and papers on Local Museums by Professor J. W. Trail and Mr. F. W. Rudler (Curator of the Museum of Practical Geology) has been printed, price 6d.

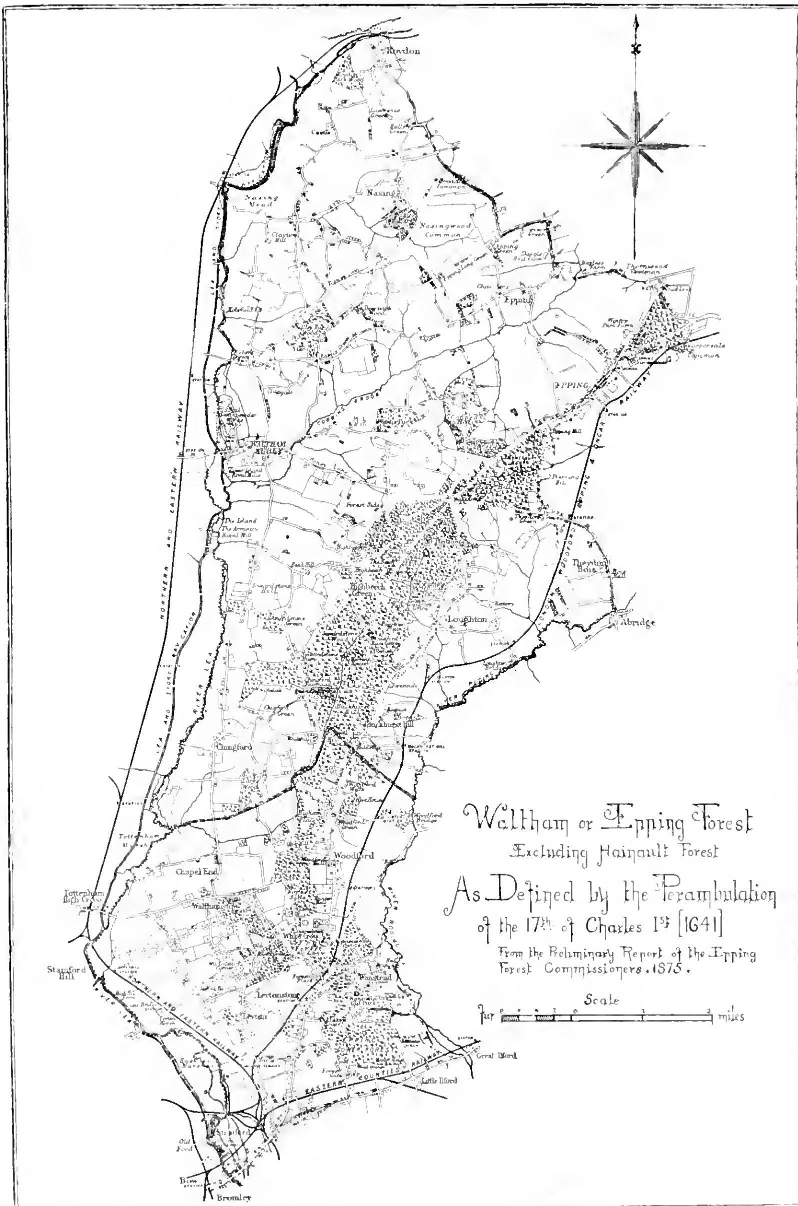
"THE ESSEX NATURALIST."

Edited by WILLIAM COLE.

This is the organ of the Club, and is published monthly. It contains reports of all Meetings of the Club, papers and memoirs on scientific and antiquarian subjects especially relating to Essex, and numerous short notes on the Natural History, Geology, Prehistoric Archæology, &c., of the County.

Subscription: Members, 4s. 6d.; Non-members, 9s. per annum, post free. All communications should be addressed to the Editor, Mr. W. Cole, Hon. Secretary, 7, Knighton Villas, Buckhurst Hill.

[*Continued on page 3 of wrapper.*


Waltham or Epping Forest
Excluding Hainault Forest
As Defined by the Perambulation
of the 17th. of Charles 1st [1641]
From the Preliminary Report of the Epping
Forest Commissioners. 1875.
Scale
fur
miles
Roydon
Nasing
Epping
Waltham Abbey
Theydon Bois
Loughton
Abridge
Chingford
Chapel End
Tottenham High Cross
Woodford
Walthamstow
Whipps Cross
Wanstead
Stamford Hill
Leytonstone
Great Ilford
Little Ilford
Stratford
Old Ford
Bromley

THE

ESSEX NATURALIST:

BEING THE

Journal of the Essex Field Club

FOR 1892.

THE EXISTING FLOWERING PLANTS OF EPPING FOREST.

By J. T. POWELL.

With Map, Plate I.

[*Read September 28th, 1889; Revised 1891.*]

BY this title I wish to imply that the plants existing to-day in the Forest are but a remnant, though a considerable remnant, of the former flora; that, of the species recorded by Warner in his "Plantæ Woodfordienses" of 1771, and even of those noted by Edward Foster and other botanists in the early part of the present century, a good number are probably extinct.

How large is this surviving remnant? This is not an easy question to answer. One pair of eyes, occupied only on odd half holidays, may, over this large area, miss many things. This is perhaps why, although I have botanised over the district for the last eighteen years, I have not found some fifty or more of the species included in the tolerably full list given in Mr. Buxton's capital book on the Forest. Still, something fresh turns up almost every season. For example, not until 1889 did I find *Rhamnus frangula*, which I had long sought, in E. Foster's station (Snaresbrook), where it may still be correctly reported "not common."

Until recently I was in some doubt as to what might fairly be considered the boundaries of the Forest for natural history purposes, and confined my researches strictly within the limits of the portions preserved to the public. Latterly, however, I have gone somewhat over these limits, working down the slopes, wherever

accessible, towards the Lea and the Roding, especially towards the latter river, which runs so near to the Forest in more than one place. I was confirmed in thus extending the area by the opinion of Mr. W. Cole, honorary secretary of the Essex Field Club, who, when consulted on this point, suggested that the boundaries laid down on a map published by the Forest Commissioners should be adopted This map (see plate I.) represents the perambulation made in 17th year of Charles I., when the area of the Forest was 60,000 acres. As there delineated its boundaries are:—On the west, the River Lea from Bow Bridge to Roydon on the Stort; on the south, the Romford Road; on the east, the Roding from Ilford to Abridge; thence the north-east boundary takes a somewhat irregular course to beyond Epping, including the portion known as the Lower Forest; thence by Epping Green past Nazeing (including the common and village) on to Roydon. Of the northern part of this extended area I know but little.[1]

[The reader is referred to an article in the present number on the ancient boundaries of the Forest, and their retention for faunistic purposes; also to the map of Epping Forest as defined by the perambulation of Charles I. (plate I.).]

The Forest generally strikes a botanist accustomed to districts less frequented by the holiday-maker as being rather bare of flowering plants. Everything showy is, of course, carried off by the multitude of visitors. The Primrose and Foxglove, once common, are now seldom seen in bloom, and will soon, it is to be feared, become things of the past. The less conspicuous Phanerogams are, however, still numerous both in species and individuals.[2]

Notwithstanding the extent to which it is stripped of its floral treasures by the thoughtless excursionists, there are times of the year when, in certain parts, the Forest is gay with flowers. In spring the Wood Anemone and Blue Bell are still tolerably abundant. In some of the ponds the Water Violet (*Hottonia palustris*) makes a considerable show, and, being for the most part out of reach, is increasing. In some years the Hawthorn and Crab blossom furnish a lovely sight, and the Gorse and Broom add a lavish tinge of gold.

1 It is in the northern and north-western parts of the district that additions to the list of Epping Forest plants are most likely to be made. The Chalky Boulder Clay is a congenial soil for many chalk-loving plants, which are, of course, very rare or absent on the gravels and clay of the southern district. A good deal of useful work might be done on the slopes of the valleys of the Lea and the Stort north-west of Epping.—W. Cole.

2 I am glad to say that the Primrose is again asserting itself in the quieter parts of the Forest, probably owing to the operations of the beneficent rule of the Conservators forbidding the rooting up of the plants. There can be little doubt but that the rarity of the Primrose in the neighbourhood of London is mainly the work of the "plant grubbers-up," gathering roots for sale. W. Cole.

There is a time, however, after the wild roses have bloomed, when the Forest lacks colour and looks somewhat bare of flowers. Later on it is brightened again with Heather, Dwarf Furze, Blue Scabious, Wood Betony and Yellow Composites.

During the last eighteen years I have collected or noted over this area nearly 520 of the species enumerated in the "London Catalogue of British Plants." If we could add to these the fifty odd species of Mr. Buxton's list (in his "Epping Forest") which I have not yet found, we should have a respectable list of Forest plants. But this it will not be safe to do. Some are doubtless old records needing recent verification. *Alyssum maritimum*, *Atropa belladonna*, *Polygonatum multiflorum*, and others, have very slender claims to be included with the "existing" plants of Epping Forest. Information concerning some others, which certainly existed thirty to fifty years ago, is desirable.

In the following list only the names of the less frequent of the plants found are given. It would occupy undue space to insert all the common species. The nomenclature is that of the "London Catalogue," eighth edition :—

Clematis vitalba, Linn. Rare. Found only in one spot near Chingford. It may still exist in Mr. Doubleday's Epping station.[3]

Thalictrum flavum, Linn. River Roding, and by the backwater near Buckhurst Hill.

Ranunculus circinatus, Sibth. In the Roding.

R. fluitans, Lam. River Lea, in several places.

R. drouetii, Godr. Ponds near Chingford.

R. peltatus, Schrank. Rather common.

R. hederaceus, Linn. Walthamstow, and near Fairmead.

For the determination of these Aquatic Ranunculi and other difficult plants I am indebted to the kindness of Mr. Arthur Bennett, F.L.S., of Croydon.

Berberis vulgaris, Linn. Near the Ching ; rare.

Cardamine flexuosa, With. Near Fairmead.

3. It is pleasant to note that the "Traveller's Joy" (with many other chalk-loving species) is still fairly common in the lanes in northern districts of the Forest, where the Chalky Boulder Clay forms the surface soil. W. Coll.

Erysimum cheiranthoides, Linn. Cultivated fields about Walthamstow.

Senebiera didyma, Pers. Seen in 1887 and 1888 near Hale End, but not since. This plant appears and disappears in a very capricious fashion. The other Wart Cress (**S. coronopus**) is quite common.

The **Cruciferæ** are poorly represented in the Forest area. Judging from former records, we have lost considerably in this Order.

Saponaria officinalis, Linn. Lark's Wood, Chingford, but probably the remains of former cultivation. I have ascertained that more than half a century ago a cottage stood there, with its garden. Traces of the brick-work are still visible.

Stellaria palustris, Ehrh. (*S. glauca*, With.) Occurs also in Lark's Wood.

S. uliginosa, Murr. Not very uncommon.

Montia fontana, Linn. V. *minor* tolerably common; v. *rivularis* comparatively rare.

Hypericum elodes, Huds. In one or two of the northern bogs.

Linum catharticum, Linn. So common elsewhere, seen only in one spot near Monk's Wood.

Euonymus europæus, Linn. About Walthamstow, Buckhurst Hill, Chigwell Lane, &c.

Rhamnus catharticus, Linn. In several places. On "Ludgate Plain" it grows almost to the size of a tree.

R. frangula, Linn. Seen only in one station.

Genista tinctoria, Linn. Occurred in 1878 near the highest part of the Forest; not seen there recently, but heard of in another locality from a botanical friend.

Melilotus altissima, Thuill. (*M. officinalis*, Willd), **M. alba**, Desr., and **M. officinalis**, Desr. (*M. arvensis*, Wallr). These have been collected about Walthamstow: the last by my friend Mr. R. Paulson.

Ornithopus perpusillus, Linn. Found in several places on high sandy ground.

Prunus insititia, Linn. Near Fairmead.

The **Rubi** have been already recorded (Essex Naturalist, vol. iii., p. 20, and vol. v., p. 189), so that nothing need be repeated

here. Up to the present time I have collected twenty-eight distinct forms of Bramble.

I have not studied the **Roses** sufficiently to report upon with any completeness at present.

Pyrus torminalis, Ehrh. In hedgerows about Chingford and Hale End. There is a fine tree in Lark's Wood.

Pyrus malus, Linn. It is gratifying to see how the old Crab trees have been spared in various parts of the Forest. Both varieties, *acerba* and *mitis*, occur at High Beach.

Drosera rotundifolia, Linn. Much less common than it was fifteen years ago.

Callitriche stagnalis, Scop. Very common.

C. hamulata, Kuetz. Fairly common.

C. obtusangula, Le Gall. Less frequent.

Epilobium angustifolium, Linn. In two stations near the Epping Road.

E. tetragonum, Linn. Much less common than the next species.

E. obscurum, Schreb. Fairly abundant.

Circea lutetiana, Linn. Near High Beach and elsewhere.[4]

Sanicula europæa, Linn. Chingford, Fairmead.

Conium maculatum, Linn. Sewardstone.

Apium nodiflorum, Reichb. Fairly abundant in ditches.

A. inundatum, Reichb. Nearly fills some of the southern ponds.

Sium erectum, Huds. Walthamstow.

Pimpinella saxifraga, Linn. Chingford Plain, &c.

Œnanthe fistulosa, Linn. Common on Walthamstow marshes.

Œ. crocata, Linn. By the Lea.

Œ. phellandrium, Lamk. In the Roding, near Chigwell.

Viburnum opulus, Linn. Near Buckhurst Hill.

Galium mollugo, Linn. About Chingford.

Dipsacus pilosus, Linn. Near Theydon.

Solidago virgaurea, Linn. In the northern part of the Forest, and *increasing*.

Anthemis nobilis, Linn. Grassy spots near Walthamstow and other places ; rather abundant.

4 Very common, and apparently wild in old gardens and in Wanstead Park.—W. Cole.

Artemisia vulgaris, Linn. Grew some years ago by the railway near Leyton. I have not seen it lately.

Senecio sylvaticus, Linn. This species is not in Mr. Buxton's list, but is quite abundant at Buckhurst Hill and Walthamstow.

S. erucifolius, Linn. Near Theydon.

S. jacobæa and *S. aquaticus* are very common.

Lactuca virosa, Linn. About Hale End.

L. muralis, Fresen. Near High Beach, but getting scarcer.

Wahlenbergia hederacea, Reichb. Still to be found in its old stations, but decreasing in quantity.

Vaccinium myrtillus, Linn. Yet exists in its one locality, sometimes flowering.

Lysimachia vulgaris, Linn. Near Buckhurst Hill.

L. nummularia, Linn. Near Leyton.

L. nemorum, Linn. Near Loughton and elsewhere.

Anagallis tenella, Linn. Still to be found in two or three bogs.

Vinca minor, Linn. Near Theydon.

Erythræa centaurium, Pers. Buckhurst Hill, Chingford.

Cuscuta epithymum, Murr. On Furse, near Loughton.

Pedicularis sylvatica, Linn. Fairly common. The taller species, *P. palustris*, I have sought for in vain.

Orobanche major, Linn. On Broom near Hale End.

Verbena officinalis, Linn. Near High Beach.

Mentha rubra, Sm. Sewardstone.

M. arvensis, Linn. Near Epping. Several species of Mints recorded by E. Foster about Walthamstow are probably extinct.

Lamium galeobdolon, Crantz. Hawkwood, and Leppitt's Hill.

Galeopsis tetrahit, Linn. About Chingford ; rare.

Chenopodium polyspermum, Linn. Chapel End, and near Fairmead.

C. bonus-henricus, Linn. About Walthamstow, probably an Alien.

Polygonum minus, Huds. High Beach.

Rumex hydrolaphathum, Huds. Plentiful in Roding near Buckhurst Hill.

Daphne laureola, Linn. Near Chingford.

Alnus glutinosa, Linn. Fairmead, and near the Roding, not common.

Corylus avellana, Linn. Hawkwood, and Honey Lane quarters, not abundant.

Quercus robur, Linn. V. *pedunculata*. Near Chingford and Buckhurst Hill. While it is true, as stated by Mr. Buxton, that v. *sessiliflora* abounds in the Forest, v. *pedunculata* is not uncommon.

Populus tremula, Linn. Epping Road, beyond the "Robin Hood."

Hydrocharis morsus-ranæ, Linn. About Walthamstow.

Stratiotes aloides, Linn. Near Chingford, probably introduced.

Epipactis media, Fr. Probably not distinct from *E. latifolia*. One of the rarities of the Forest. Seen in 1885, but seems to be nearing extinction.

Orchis morio, Linn. Near Leppitt's Hill and near Theydon.

O. maculata, Linn. Tolerably abundant.

Habenaria bifolia, R. Br. Though much less plentiful than twelve years ago, over a restricted area still exists in fair quantity.

Ruscus aculeatus, Linn. This interesting shrub is found sparingly in many places.

Convallaria majalis, Linn. Recently seen in three different localities other than its old station. In two of these instances it was in small quantity and looked as though it had been transplanted by some friendly hand. The third was clearly an old habitat.

Allium ursinum, Linn. Fairly abundant in two localities on the Lea slope of the Forest, one within and one without the preserved area.

Fritillaria meleagris, Linn. In 1875 this was found near Theydon by my friend Mr. E. Liddell. On searching with him a season or two afterwards I could not find a single specimen. He subsequently learned that it had been dug up. This may illustrate the destruction of rare plants which goes on.

Luzula pilosa, Willd. Occurs in Lark's Wood.

The common **Rushes** are all given in the list so frequently alluded to. One, however, in Buxton I have not found, *viz: Juncus diffusus*.

Lemna trisulca, Linn. Pond at Fairmead.

L. polyrrhiza, Linn. Fairly common.

I record these because they are not in Mr. Buxton's list.

Damasonium stellatum, Pers. Hardly entitled to a place among "existing" plants. Found in Wanstead Park soon after it was

thrown open to the public. In 1890 I received a specimen taken by Mr. P. Thompson from a well-known pond in the northern part of the Forest area. As I had dipped in this pond for years without seeing any trace of so remarkable a plant, I suspect it to be a recent introduction.

Butomus umbellatus, Linn. Once plentiful in ditches towards the Lea: now scarce there, but fairly plentiful in the Roding.

Triglochin palustre, Linn. Walthamstow marshes, sparingly.

Potamogeton natans, Linn. Abundant.

P. polygonifolius, Pour. Not uncommon.

P. lucens, Linn. In the Roding.

P. perfoliatus, Linn. In the Lea.

P. crispus, Linn. In several Forest ponds.

P. densus, Linn. Ditches near the Lea.

P. pectinatus, Linn. Wanstead Park.

Scirpus fluitans, Linn. Common in the southern part of the district.

S. sylvaticus, Linn. Near Buckhurst Hill.

S. setaceus, Linn. Near Loughton; rare.

Eriophorum (angustifolium ?), Roth. The *species* is rather uncertain, as the spot is inaccessible where this "Cotton-grass" has maintained its hold for the whole period I have known the Forest.

The commoner **Carices** are abundant in damp places. In some spots **Carex echinata, C. ovalis, C. goodenowii, C. panicea, C. flava**, and **C. hirta** form the bulk of the herbage. As Mr. Paulson has recently given a full list of the Forest Carices in the ESSEX NATURALIST (vol. iv., p. 137), the names need not be repeated here. I have repeatedly looked in vain with him for *C. pulicaris* at High Beach, where E. Foster knew of its existence from 1795 to 1861.

The student of the **Grasses** will find our area anything but bare. Since 1875 I have collected 49 species and two or three varieties. Among the rarest are:—

Alopecurus fulvus, Sm. Near Walthamstow.

Milium effusum, Linn. Near Epping, and (1891) Buckhurst Hill.

Calamagrostis epigios, Roth. Sewardstone.

Apera spica-venti, Beauv. About Walthamstow.

Aira caryophyllea Linn. High Beach.
A. præcox, Linn. Rather common.
Melica uniflora, Retz. Lark's Wood, &c.
Festuca loliacea, Curtis (non Huds). Walthamstow.
Lolium temulentum, Linn. Chingford.
Agropyron repens, v. *barbata*, Douval-Jouve. Near Epping, and just outside our area near Chigwell.

A few evident **Aliens** have been met with during my botanical explorations in the Forest.

Claytonia perfoliata, Don., has been established in one spot near Walthamstow for quite fifteen years. It should perhaps be promoted to the ranks of "denizen."

Geranium striatum, Linn., has flowered regularly for twelve years under the cover of brambles. As it is not far from a house, it is probably a garden outcast.

Amelanchier canadensis has to my knowledge been established as long as the preceding, near Woodford. As its blossoms are much pulled by children, it does not increase in size.

The two plants before mentioned, *Stratiotes* and *Damasonium*, should also in my opinion be classed with these Aliens.

All true lovers of nature will strive to preserve from extermination the floral and other treasures of our grand hunting ground. The Essex Field Club has done good service in this way by again and again raising its voice against destruction and spoliation. But the Forest has not only suffered from the ignorant and selfish plunderer, who plucks its blossoms only to throw them down as they wither, or digs up its plants by the roots to languish for a short time in London gardens; it has been damaged, from our point of view, by those who profess to conserve it. In a district whose flora and fauna depend to a considerable extent upon the existence of bogs and ponds, over drainage may do irreparable mischief. The pond-hunter is painfully conscious of the loss of good things from this cause in the southern part of the Forest, and most of the bogs have been intersected by straight drains. In one of the best bogs in the centre of the district there was, a few years since, an abundance of fine *Drosera* and a little of *Lycopodium inundatum*. On visiting it a year or two after, it had been drained, and I could find no trace of the latter; the spot on which it grew was dry and hard. The "Sundews" too,

were fewer in number and much reduced in size; most of them could be covered by a sixpence, and anyone could have plucked them without soiling his boots. The last time I saw the Ivy-leaved Campanula a straight cutting had been made through the middle of the spot on which it grew. During wet seasons no apparent harm is done, but two or three dry seasons would bring home to us the extent of the damage.

[The Club as a body (as well as many individual members) has repeatedly protested in the strongest manner against the practice of deep drainage in the Forest, but without impressing the powers that be. Our only hope apparently lies in the great expense of attempting this work, which must be constantly renewed to be effectual. We say "attempting" advisedly, for most fortunately the treading of the cattle, the natural disintegration of the soft banks, the growth of plants, and the drifting of leaves, soon fill up the ugly straight ditches and completely close them unless they are cleared every few seasons. The arguments against the attempts at deep drainage on the Forest were well stated by Dr. M. C. Cooke in a paper published in the Appendix to volume iii. of the "Proceedings of the Essex Field Club," and which has since been published in a separate pamphlet entitled "Papers and Memorials issued by the Essex Field Club on the Protection of Wild Animals and Plants and the Present Condition and Future Management of Epping Forest" 1883).—Ed.]

THE AREA OF EPPING FOREST FOR FAUNISTIC PURPOSES.

By WILLIAM COLE, F.E.S.

[With Map, Plate I.]

IN compiling lists of the Flora and Fauna of Epping Forest a difficulty at once arises concerning the area which should be included in our purview so as to afford some defined district for natural history purposes. To regard only those parts now actually covered with wood and under the control of the Conservators as Epping Forest would be so clearly an artificial limitation as to be at once rejected. There are many parcels of land contiguous to the forest as now legally defined by the Arbitrator, which are still covered with trees, or which have been replanted as private woods and pleasure grounds. Plants, or insects and other animals may still live there in a perfectly wild state, and are therefore deserving of recognition as members of the flora or fauna of the forest. It is also a well-known fact that woodland species may linger for many years

in parts which have been partially or wholly cleared of trees, or may even re-appear when the tracts are replanted. This may be seen in parts of the cleared tracts of land formerly constituting Hainault Forest. What area, then, should we consider as being Epping Forest for our purposes? There is no very natural district which can be so defined. A very large portion of Essex was formerly actually covered with trees, and even in historical times the limits of the legal "Forest of the Lord the King" were very wide indeed; in 1292, its metes and bounds in Essex extended "from the bridge at Stratford unto the bridge of Cattywad [over the Stour] in length, and in breadth from the Thames unto the King's highway which is called Stanstrete" [the road from Bishops' Stortford to Colchester]. But such extensive claims represented the views of a race of Norman kings who "loved the deer as though they were brothers," and killed them off almost as jovially. We naturalists must be satisfied with more modest domains. Several successive ordinances have restricted the area of the legal "Forest of Essex," and have brought its bounds more nearly conterminous with the remains of the ancient woodlands which we know as Epping or Waltham Forest. We therefore propose, in the absence of a better basis of delimitation, to define Epping Forest for faunistic purposes as the area embraced in the last perambulation, that of 17th Charles I. (1641). The tract of land so defined is fairly natural, being the district between the Lea and the Stort on the west, and the Roding on the east, and bounded by the road from Stratford to Romford on the south. The northern margin is less easily traced. It should always be remembered that it by no means follows that the included district was all woodland, only that the district was "forest" in a legal sense, and therefore subject to forest laws and customs. Within these boundaries were, of course, many villages, farm lands, and private grounds and woods. The lines of the Perambulation of 1641 embraced about 60,000 acres, of which about 10,000 acres were open waste, and of this 4,000 acres belonged to Hainault Forest (with which we have nothing to do at present), leaving about 6,000 acres as the waste of Epping Forest. And remembering, as we have before pointed out (see "Journal of Proceedings, Essex Field Club," vol. iv., p. ciii.), that Epping Forest at present consists of about 5,575 acres, its area since Charles the First's time has manifestly not greatly diminished. With these facts in view it is time that the disagreeable word "remnant" should cease to be applied to our forest.

The perambulation was made in pursuance of the Statute 16 Car. I. cap. 16, intituled "An Act for the certainty of Forrests and of the Meetes, Meeres, Limits and Bounds of Forrests," by which it was declared that the meets, meers, limits and bounds of all the Forests should be those used or taken in the 20th year of the reign of James I. The perambulation was fully set out in the Appendix to the "Preliminary Report of the Epping Forest Commissioners," 1875, and was accompanied with a map showing the lines of the perambulation. This map is reproduced on Plate I. to this volume, and we append a transcript of the main portion of the perambulation, excluding the mere formal words, &c. This will not only be useful as precisely defining the limits of the area we propose to adopt as the "Epping Forest District" in faunistic publications, but it is very interesting in itself as giving the ancient names of many places in the district. It should be observed that the perambulation includes Hainault Forest, and we have indicated the "meets and bounds" of this now desecrated region by enclosing the words descriptive thereof within [ ]. The map on Plate I. does not include Hainault, the southern boundary line running only as far as Ilford, then turning north along the course of the Roding to Abridge.

The northern and north-western portion of the area has been but little explored by naturalists, and steady work in those districts will possibly bring to light many interesting additions to our forest flora and fauna :—

PERAMBULATION OF THE FOREST OF WALTHAM, IN THE COUNTY OF ESSEX, IN THE SEVENTEENTH YEAR OF KING CHARLES THE FIRST (1641).

Essex, to Wit. } INQUISITION taken at Stratford Langthorne, in the county of Essex, on Wednesday, being the 8th day of September, in the 17th year of the Reign of our Lord Charles, by the Grace of God, King of England, Scotland, France, and Ireland, Defender of the Faith, &c.

Before &c. . . . . [Commissioners] and forty and eight good and lawful men, &c. . . . . [Jurors].

"Which same jurors, as well by view upon their perambulation as by the oaths of divers witnesses worthy of credit produced and sworn upon the inquisition aforesaid, in the presence of the same Commissioners, jurors, and officers of the Forest aforesaid, say, upon their oath, that all and singular the mears, metes, bounds, and limits of the said Forest of Waltham, otherwise the Forest of Essex, in the county aforesaid, which were commonly known to have been the meares, metes, bounds, and limits of the same Forest, in the aforesaid 20th year of the reign of the said Lord James, late King of England, &c., were in the same

20th year, commonly known to have been as followeth (that is to say): The said meares, metes, bounds, and limits of the said Forest began on the same 20th year, at the Bridge of Stratford, called the Bow, under which runs the River Lee, and so going into the hundred of Becontree, by the King's highway unto Great Ilford[1], [and from Great Ilford direct by the same King's highway leading towards Rumford, unto a certain four ways, called the 'four Wonts,' where there was lately placed, and as yet remains, a certain rib of a whale called the whale-bone, at which said four ways one way thereof leads on the south side towards Dagenham, and the other way thereof on the north part towards Collier Row, and so going straight from the four ways aforesaid, in and by the aforesaid King's highway, leading towards Rumford aforesaid unto a certain lane called Beames Land-lane, at the head of which lane is now placed and erected a certain stone or mear stone, sculptured and named Havering Stone, and so going in the lane aforesaid, between certain lands called Beanes Land on the left unto certain other lands called Twenty Acres, parcel of the demesne lands of the Manor of Markes, and so returning in the lane aforesaid, between the aforesaid land called Beanes Land on the south part, and the aforesaid other lands called Twenty Acres on the north part, unto and in the aforesaid way leading from the four wayes aforesaid towards Collier Row aforesaid, and so going in the aforesaid way leading from the aforesaid four ways towards Collier Row aforesaid, by and near the site of mansion house of the said Manor of Markes, to a certain elm tree marked with a cross growing on the right of the same way, where there is now a certain gate leading from the aforesaid way into a certain warren called Marks Warren, at which gate there is now put and erected a certain other stone or mear stone sculptured and named Marks Stone, and from thence going to the warren aforesaid, directly towards the east by the bounds dividing the said parish of Dagenham from the liberty of Havering-att-Bower, unto a certain corner in the same warren where there is now put and erected a certain other stone or meer stone, sculptured and named Warren Stone, and from thence by the aforesaid bounds dividing the same parish of Dagenham from the liberty of Havering aforesaid unto Collier Row aforesaid, at a certain place there near the messuage called Captions, where is now put and erected a certain other stone or mear stone sculptured and named Collier Row Stone, and from thence downwards by the said metes and bounds dividing the parish of Dagenham aforesaid from the liberty of Havering-att-Bower aforesaid unto the west corner of the park of the said Lord the King called Havering Parke, at which west corner commonly called Havering Park Corner, a certain other stone or mear stone is now put and erected, sculptured and named Park Corner Stone, and from the aforesaid stone or mear stone called Park Corner Stone, the meares, metes, bounds, and limits of the Forest aforesaid further extend themselves, and in the same 20th year of the said late King James of England, &c., did extend themselves and were known to extend themselves by the pales and sides of the park aforesaid called Havering Park unto a certain brooke called and commonly known by the name of Bourne Brooke, and from thence going by the banks of the same brooke unto the house of a certain Robert Makin, in the parish of Naverstock, near which house another stone or mear stone is now put and erected, sculptured and named Naverstock Stone, and from thence turning to the right (leaving behind the aforesaid house), by the hedge and sides of a certain common, called Naverstock Common, direct to the gate,

1 The words within square brackets [ ] from this point to the words "from thence to the river of Roden" on page 14, define the area of the beautiful Hainault Forest, grubbed up in the dark ages of the '50's.

called Richard's Gate, near which gate in like manner another stone, or mear stone is now put and erected, sculptered and named Richard's Stone, and from thence by the hedge of the land of the said Robert Makin, leading direct to the gate called Overmead Gate, and from thence to the river of Roden],[2] and from thence by the river aforesaid unto the bridge of Aybridge, otherwise Assbridge, and passing over the bridge aforesaid by the King's highway, directly leading to the parish church of Theydon Boys, and so on forward by the King's highway aforesaid to the dwelling-house of the Rector of Theydon Boys, unto a gate called Thoydon Green Gate, and thence by the hedge called Purliew Hedge, to the corner of a certain hedge called Piershorne Corner, and so by the hedge aforesaid called Purliew Hedge unto the end of a certain lane called Hawcock Lane, and so to the banck near the end of the town of Epping, called 'Purliew Banck,' and so going by the banck aforesaid unto a place called Bennett's Corner, according to the bounds, limits, and divisions of the parishes of Epping and Thoydon Garnon, they include within the Forest aforesaid the whole parish of Eppinge lying within the banck aforesaid, and exclude out of the Forest the whole parish of Thoydon Garnon, and so going by the banck aforesaid to the end of the lane called Duck Lane, and so to the corner of the Great Waste, called Thornewood Common, and then going by the banck aforesaid, called 'Purliew Banck,' lying near the hedge on the south side of the common aforesaid unto a certain brook which runs down from a ditch lying below the hedge aforesaid, and the aforesaid banck, called 'Purliew Banck,' near a certain elm tree, which is the sole boundary and terminal mete between the parish of Eppinge aforesaid and Northwealde Bassett, and also between the two half-hundreds of Harlow and Waltham. And further, going by the brook aforesaid to the ditch before and near the mansion house of a certain William Sprangers, situate upon the side of the waste and common of Thornwood Common aforesaid, and from thence returning by the ditch aforesaid unto the mansion house of a certain Daniel Hudson, also situate on the side of the common aforesaid, and so by the metes and divisions dividing the aforesaid half hundreds of Harlow and Waltham to a certain free hedge called Lincely Gate, including within the Forest the said parcel of waste or common called Thornewood Common, as it lies within the brook aforesaid, and also includes within the said Forest the aforesaid tenement of the said Daniel Hudson, and a certain grove called Halyes Grove, and all and singular the lands and tenements there lying within the said half hundred of Waltham, and so going to the gate aforesaid, called Lincely Gate, upwards to a certain piece of land called Lincely Merles, and from thence direct passing over bank of the stream called 'Millmeade Brooke,' by a hedge called Eastfield Hedge, to a place called Lyme Holes Corner, and so passing over the King's highway, leading to the church of Eppinge, unto Pincroft, leading to the bridge called Pymbridge, and so going from the bridge aforesaid, called Pymbridge, by the hedge called 'Purliew Hedge,' to the gate called Cloggett's Gate, entering into the King's highway leading to a place called Siviar's Greene, and so descending in the highway called Kennett's Lane direct unto the waste or common called Bradley Common, and so by the side of the same waste or common called Bradley Common, going the round the hamlet of Roydon unto the river of Lee aforesaid, and thence to a corner of the marsh called Ody Marsh, and so passing over the river aforesaid of Lee, including within the Forest the whole of that marsh called Hollyfield Marsh, unto a meadow called the Frythie,

2 Epping Forest boundaries here recommence.

and so passing over the Frythie, at a place called the Shire Lake to the marsh called Hookes Marsh, including within the Forest aforesaid all those marshes called Hookes Marsh and Normarsh, and so going by the river of Lee, likewise including all that great marsh called Waltham Great Marsh, and so passing over the ditch there to the bridge called Smalley Bridge, extending to the side of the same bridge downwards by the ditch or brook flowing to the right of the King's highway, leading to Waltham Abbey unto Coldhall, and immediately beyond Coldhall, turning by the ditch or brook which divides the counties of Essex and Hertford to the river there, including within the Forest aforesaid all that meadow or marsh called Canwardes, and from thence to a certain place called Cobbing Mouth, and from thence by the river aforesaid of Lee to a meadow called Spencer's Meade, and so going along by the river aforesaid to Syward Stoneford, and from thence going over the marsh called Ware Marsh to a ditch called Marditch, and so going along by Marditch unto the river of Lee aforesaid, and from thence by the river aforesaid unto Broadmeade, in the parish of Walthamstow, and from thence by the river aforesaid to the bridge called Lockbridge, now broken up, where now for passage is used as a ferry, and from thence by the same river of Lee to the first-named bridge of Stratford Bow, commonly known by the name of Bow Bridge.

"And the jurors aforesaid, further say upon their oath aforesaid, that the Forest of the said Lord the King of Waltham, otherwise called the Forest of the Lord the King of Essex, in the aforesaid county of Essex, did extend itself in the said 20th year of the reign of the late King James of England, &c., as above by the aforesaid meares, metes, bounds, and limits, it is divided and expressed, and not beyond, and that the aforesaid meares, metes, bounds, and limits of the Forest aforesaid, above mentioned, and expressed in the said 20th year of the late King James of England, &c., were, and were commonly known and reputed, the true and certain terminations, metes, bounds, and limits within which the Forest aforesaid was terminated, bounded, and limited, and other more ample or larger meares, metes, bounds, and limits of the Forest aforesaid, in the said 20th year of the late King James of England, &c. The Forest aforesaid had not as to the jurors aforesaid, in anywise could appear.

"And the jurors aforesaid, further say upon their oath, that in the hundred of Becontree aforesaid, in the aforesaid 20th year of the late King James of England, &c., there remained wholly within the Forest aforesaid, the towns of Wanstead, Leighton, Walthamstow, and Woodford, and that the towns of Stratford, Westham, Eastham, Ilford Parva, Ilford Magna, Barking and Dagenham, in the hundred of Becontree aforesaid, at that time partly remained out of the Forest aforesaid (that is to say), all the lands, woods, and hereditaments of the same towns as lie to the right of the King's highway aforesaid, leading from the bridge of Stratford-le-Bow aforesaid, towards Rumford aforesaid, and partly at that time remained within the Forest aforesaid (viz.), all and singular the lands, woods, and hereditaments of the towns aforesaid, to the left of the King's highway aforesaid, as above by the metes and bounds they are divided, and that in the aforesaid 20th year of the said Lord King James of England, &c., the liberties of Havering-att-Bower, in the county aforesaid, and the park there, commonly called Havering Park, together with all other lands, tenements, woods, and hereditaments, in Hornchurch, Rumford, and Haveringe, in the said county of Essex, and in other parishes, and members appendant to the said liberty of Havering remained wholly out of the Forest aforesaid; and that in the same

20th year of the said Lord, late King James of England, &c., in the hundred of Onger, remained wholly within the Forest aforesaid, the towns of Lucton, otherwise Loughton, Chigwell, Lamborne, and Stapleford Abbots, and that the towns of Naverstock and Throydon Boys, in the aforesaid hundred of Onger, were partly within the Forest aforesaid, and partly without the Forest aforesaid, as above by the metes and bounds aforesaid fully are divided, and that all the residue of the towns within the hundred of Onger aforesaid, in the same 20th year aforesaid, were and wholly remain without the Forest aforesaid, and that the whole half hundred of Waltham aforesaid, in the said 20th year of the said late King James of England, &c., with all the lands, woods, and hereditaments in the several towns within the said half hundred remained wholly within the Forest aforesaid, except the lands of any person or persons lying within the half hundred aforesaid, by any charters have been disafforested, which to the jurors aforesaid was not made to appear. And that in the same 20th year of the late King James of England, the whole half hundred of Harlow aforesaid, and the hundreds of Uttlesford, Hinchford, Lexden, Tenderinge, Dengie, Wiltham, Chelmsford, Dunmowe, Claverenge, Freshwell, Chafford, Barstable, Thurstable, Rochford, and Winstree, in the aforesaid county of Essex, and all the towns and parishes with all their members and appendancies and singular, and every of them, with all lands, meadows, pastures, woods, tenements, and hereditaments whatsoever, in the towns and parishes of the hundreds last mentioned, wholly remain out of the Forest aforesaid. And the jurors aforesaid, further upon their oath aforesaid, say that in the said 20th year of the reign of King James abovesaid, and before as is aforesaid, within the memory of man, they have not found, nor been able to find, any other or more Forests, or Forest, to have been in the said county of Essex except the Forest aforesaid, so as above limited and bounded. In witness whereof, as well the Commissioners aforesaid, as the jurors aforesaid have subscribed and put their hands and seals to these presents.

[Then follow signatures of the Commissioners and Jurors.]

THE ESSEX FIELD CLUB.

ORDINARY MEETING, Saturday, January 30th, 1892.

THE 130th Ordinary Meeting was held (by the kind permission of the Rev. W. Linton Wilson) in the hall of St. John's College, Loughton, at 6.30 p.m., Mr. Walter Crouch, Vice-President, in the chair.

Mr. J. W. Knight, F.G.S, was elected a member.

Nomination of five new members of Council, and of the officers proposed for 1892 by the Council, were made and duly seconded.

Mr. Walter Crouch and Mr. C. Ridley were chosen as auditors of the Treasurer's accounts.

Owing to unavoidable circumstances, it was found necessary to postpone the date of the Annual Meeting. A proposal to this effect was made by the Secretary and carried unanimously.

Among the donations to the Library were announced the gifts of an important set of papers relating to the preservation of Epping Forest, from the executors of the late Mr. H. Ford Barclay, and an almost complete set of Mackay's "Geological Magazine" from Mr. T. V. Holmes.

Mr. F. C. Gould exhibited a specimen of a goose recently shot by Mr. Plater at the mouth of the Blackwater, which appeared to be the North American race of the Brent Goose, called the "White-bellied Brent" (*Bernicla brenta*, var. *glaucogaster*). The bird is sometimes met with among the ordinary Brent Geese on the Essex coast, but is much rarer.

The late Col. Russell gave a very interesting account of the Brent goose in Essex in some letters addressed to Mr. Cordeaux, and which were published in the "Zoologist" for 1890, pp. 59-69. [See also Seebohm's "Birds" vol. iii., p. 508.]

Mr. Walter Crouch exhibited a small case, containing some sprays of skeleton leaves from specimens collected in Loughton and Epping Forest—the Wild Service Tree, Poplar, &c., and the flowers of Canterbury Bells. All were prepared by Edward C. Day, of Poplar, who has long been noted for such preparations, and for which, many years ago, he took two Bronze Medals—one in 1865 at St. Mary's, Whitechapel, and again in 1866 at the Agricultural Hall.

Mr. Crouch also exhibited a print of an exceedingly rare shell, *Pleurotomaria adansoniana*, which was recently exhibited at the Zoological Society. The genus is an exceedingly interesting one, abounding in fossil species, some 1,156 having been described, of which 226 have been found in British deposits, but was not known in a recent condition till 1855. Since that date four species have been taken, and the specimen figured is only the fourteenth of the genus yet found, and came from deep water off the Island of Tobago. It is much to be regretted that no recent shell has yet been placed in the Collection of the British Museum. The few specimens known fetch exceedingly high prices, being not only rare but beautiful. The interior is of beautiful pearly texture, and the exterior rich in pattern and colour. The most curious feature is the long opening or slit, which in the present specimen extends half way round the outer whorl of the shell; but the animal not having yet been preserved or known to naturalists, the use of this slit is conjectural. Probably, however, a siphon, or a portion of the mantle of the animal protrudes from the opening, or some special arrangement of the breathing process. Strangely enough, the nearest ally, morphologically, is the tiny form of *Scissurella*, a specimen of which, *S. crispata*, from deep water off the Devon coast, was exhibited under the microscope, showing the small slit, and the delicate sculpture of the shell. Mr. Crouch also showed an enlarged drawing of the living animal and shell.

Mr. F. H. Varley exhibited specimens of *Agaricus ostreatus*, a species of edible fungus, which had grown during the late severe weather on a mountain ash tree in Mrs. Yeates' garden in Buckhurst Hill. It was interesting to find that an apparently delicate fungus could survive in the open during severe frost.

Mr. C. B. Sworder sent for exhibition a fine Neolithic stone-hammer or axe-head found near Epping, in 1888, in a heap of stones picked off the fields by the farm-labourers.

A "Note on some Ancient Remains at Epping, Essex," by Mr. C. B. Sworder, was read in his absence by Mr. Lockyer. The paper treated of the discovery of a supposed Romano-British potter's kiln at Epping. Specimens were exhibited in illustration of the paper.

The Secretary read for the author, Mr. W. Whitaker, F.R.S., extracts from a paper on "Some Essex Well-sections," being the third of a series, and bringing up the number of well-sections published in the ESSEX NATURALIST to 276.

Mr. George Massee had been announced to give an address on "The Study of

Plant Life," but the prevailing epidemic prevented, and Dr. M. C. Cooke kindly undertook to supply his place. Dr. Cooke delivered a most interesting and eloquent lecture on "Injuries to Plants caused by Fungi," and in the course of his address alluded to the immense importance of the study of the lower forms of fungi in connection with modern theories of the causes of diseases. Dr. Cooke gave some startling evidence from America and some of the British Colonies of the injuries caused to crops by fungi. The Doctor urged strongly the importance of the practical study of the subject, and expressed a hope that now technical instruction was in the air, County Councils and other bodies dealing with this matter would see that some real instruction should be given to farmers, gardeners, and others on the important subject on which he had spoken that evening.

[A full report of Dr. Cooke's address is printed below.]

A short discussion took place, and Dr. Cooke was warmly thanked for his lecture.

Mr. W. Cole called attention to the threatened spoliation of that magnificent recreation ground, the New Forest, by the Government for the purpose of forming a military range and permanent camp. The proposed enclosure was in direct contravention of the New Forest Act of 1877, which everyone thought would for ever protect this grand national woodland from the spoiler. The Club would have copies of a petition of strong protest ready for signature at a future meeting.

A cordial vote of thanks was passed to Mr. and Mrs. Wilson for the use of the room on this and the previous meeting, and for the trouble they had taken to accommodate the Club. Tea and coffee were served, and at the conversazione specimens were exhibited by Mr. Crouch, Mr. Oldham, Mr. Sauze, Mr. Sworder, and others.

PLANT DISEASES AND FUNGI.

By M. C. COOKE, M.A., LL.D.

[*Being the substance of a Lecture delivered before the Essex Field Club, January 30th*, 1892.]

DISEASE, especially epidemic, whether in man, animals, or plants, is the topic of the day. On all these phases the progress of science is gradually reflecting more light, and exhibiting close analogies; but especially has a strong and growing interest been manifested in plant diseases of fungoid origin. This increased interest and anxiety has been stimulated into activity by the investigations which have taken place, under the superintendence of Departments of Agriculture and other public bodies, into the heavy losses sustained by these causes. The powerful stimulus of self-interest has led to the establishment of experimental stations throughout the States of the American Union, and the organisation of agricultural departments of the Governments in our own colonies. In the course of time it will possibly arouse some spirit of inquiry

amongst the cultivators of the soil in our islands, where the ravages of fungoid disease are yet scarcely estimated at their true value.

Mildew, rust, smut, and bunt, have long been known to our farmers; and although, perhaps, less destructive than abroad, yet but little systematic effort has been made to combat these diseases. In Australia the pest of corn rust has been regarded with so much dismay that, in 1890, a conference of delegates was called to consider the subject; and on this occasion the chairman said[1] the first fact which presents itself is the terrible loss that we are every year subjected to. Sometimes two or three colonies have the rust together; at other times one has the rust, and the others escape; but we are seldom free of it in one or other of the colonies. This last season has been a particularly disastrous year, especially in South Australia. The Minister says that he considers "the loss by rust alone to be equal to £1,500,000 in that colony. Taking a loss of five bushels less than what the crop would have been had there not been rust, I estimate our loss in Victoria has been equal to that." And again, further on, it is declared that "the total loss suffered by the five colonies during the past season must have been not far short of £2,500,000 sterling."

But corn crops are not by any means the only sufferers. It is well known that apple cultivation is an important industry in the United States, to an extent wholly unknown in this country, and yet a terrible pest devastates the orchards, and inflicts grievous injury upon the proprietors. The Commissioner of Agriculture reports that "the distribution of the disease is co-extensive with the cultivation of the fruit which it attacks, although there may be a few favoured localities in which it has not yet appeared. Throughout the Eastern and Central States one is almost certain to find it in every orchard, and on the Pacific slope, in California, it is also frequent." We learn that in several States the extent of loss is said to amount to fully one-half of the crop, while reports from other States place the annual loss at from one-fourth to one-sixth of the crop. The Secretary of the Illinois Horticultural Society estimates the loss from this cause in his State at 20,000 bushels, which gives a loss of 4,000 dollars per county, or about 400,000 dollars for the whole State. In Missouri the loss is estimated at one-half the crop. In Kansas the annual loss is placed, one year with another, at one-fourth of the crop; and in Indiana it has been

[1] "Report of the Conference," 1890, p. 6.

estimated at about one-sixth of the crop. In Maine the reporter says: "I call to mind one season when we lost more than half our crop, about mid-winter, by rotting. The apples began rotting under the 'scab' spots, and eventually the fruit entirely decayed." This same "apple scab" is destructive in our own orchards, but to what extent no one has taken the trouble to inquire; and in the Australian colonies it is another of the foes with which the cultivator has to contend.

In countries where the cultivation of the grape-vine is of commercial importance, vine diseases, apart from the Phylloxera, cause immense injury. The Commissioner of Agriculture in the United States reports: "In my opinion, which is based upon special reports, and on other available and trustworthy information, the annual loss from 'grape rot' during the last ten years, in the principal vine-growing regions of the United States, has not been less than one-fourth of the entire crop."[2] Again, a reporter from Ohio states that: "In years past grape rot has destroyed hundreds of tons of grapes here, so that nearly every vineyard has been dug up. I have seen the produce of whole vineyards destroyed in three or four days." And yet this is but one of the many diseases of the vine, and is not the same with the white American mould which is finding its way into Europe.

Details are unnecessary of the damage done to other important crops, which are now matters of history, such, for instance, as the widely-spread potato disease, of which we have had a plentiful experience here and in Ireland; of the coffee disease which ruined the plantations in Ceylon, and brought the planters to despair; of the disease which fell upon the opium poppy in India, and at once reduced the area of cultivation; of the damage sustained by the cocoa-nut palm in tropical South America and the West Indies; and even of the larch disease, which has long been a terror in Northern Europe and in Scotland. In all these cases the pecuniary loss must have been enormous, and more than enough to justify the demand for a closer and more systematic investigation into the history and mystery of plant diseases, with a view to their remedy.

At the outset of this inquiry we are met by the general question of the causes of disease in cultivated plants, and are compelled to the confession that there are several primary causes, of which parasitic fungi is but one, although one of the most important. Another is due

2 "Report to Commissioner of Agriculture," Washington, 1886.

to the attacks of insects, of various kinds, which it is the province of the entomologist to investigate. Undoubtedly, the attention of farmers, and others interested in agriculture, was directed to insect pests for years before the slightest effort was made to check the ravages of fungoid parasites, and even before fungi were reckoned as a factor at all in the production of disease in crops.

In addition to these two causes, the most common and most injurious, there are other subsidiary elements which tend to disease, such as bad cultivation, insufficient drainage, overcrowding, uncongenial soil, impure air, external injuries, and, as we believe, hereditary transmission. Of all these, our remarks are intended to apply to diseases having a fungoid origin.

It has been objected by some writers that fungus diseases are in no sense hereditary, but are communicated externally to each generation of young plants, and therefore when infection is provided against, all that is necessary has been done. This we hold to be a dangerous deception in the face of the following facts: "A well-known nurseryman, in a large way of business, had imported seeds of *Dianthus* direct from Japan. These seeds were carefully grown under glass, and, immediately they were up in the seed pans, they were all attacked and destroyed by *Puccinia lychnidearum*. On making a microscopical examination of a series of the seeds, mycelium was detected inside the integument which surrounded the embryo, or infant plant, and within the coat of the seed."[3] It may be explained that the mycelium is the first stage in the development of fungus disease, and consists, for the most part, of the slender delicate filaments which result from the germination of fungus spores, or from the rejuvenation of portions of a hybernating or perennial mycelium.

Many years ago we were consulted on the condition of certain celery plants in a garden at Hampstead. Two or three rows of plants were in a perfectly clean and healthy condition; but one or two rows of plants growing beside them were covered with pustules of the celery brand, *Puccinia apii*, and thoroughly useless. Upon inquiry we found that the healthy plants had been raised from an old stock of "saved" seed; whereas the diseased plants had been raised from other seed which the gardener had begged from a friend, because his own seed was insufficient for planting all the ground he wished to cover. All the diseased plants were at once rooted up

3 "Gardener's Chronicle," 26th January, 1884.

and destroyed. Upon inquiry it was found that all the plants raised by the gardener's friend were also diseased in the same manner. The only inference to be derived from these facts is that the disease was latent in the seeds of the diseased plants, and that it was a clear case of hereditary transmission. His own plants, raised from clean seed, showed no trace of disease, although growing in close proximity to diseased plants.

Another instance may be cited in support of this view. "Some remarkable phenomena occurred in a garden near London, where all the plants of Pyracantha, arising from particular seed, were more or less completely destroyed by the same species of *Fusicladium* which injures the pear trees. [The cause of the American "apple scab."] The plants were raised from Russian seeds, about four or five years previously. They first appeared to be blighted in the year preceding this report, but inconsiderably. In the following year they were nearly all killed. The old shoots were black with the spores, the leaves crumpled and withered, and the late shoots and leaves were about to break out as their predecessors. The seedling bushes were growing in heavy land, well drained, but the disease was confined to them. Old bushes of *Pyracantha* in the same places were perfectly clean."[4]

Not only are plant diseases hereditary, as are some diseases in the human subject, but they appear to be analogous also in their epidemical character. Many years since the Rev. M. J. Berkeley alluded to this subject in the following terms:—"There is something extremely capricious in the attacks of these diseases amongst plants, exactly as is the case with infectious maladies amongst ourselves. One is taken and another left without our being able to account for it; nor is it probable that we shall ever penetrate these mysteries, which baffle all our efforts, and remind us of our true position in the scale of intelligent beings. A perennial plant, or tree, once attacked by parasites, seldom gets perfectly free from the disease, and there may be a greater analogy in the peculiar liability of certain constitutions to the recurrence of such maladies as influenza, than, in fact, in the present state of our knowledge as to the cause of disease we should be willing to allow."

The manner in which some of the most notable of fungus diseases have appeared affords remarkable coincidences with the spread of such human epidemics as cholera and influenza. The

4 "Gardener's Chronicle." October 28th, 1848.

potato disease, for instance, was first observed in Belgium in 1842, and about the same time it was stated to have been observed in Ireland, but the great outbreak was in 1844 and succeeding years. It was known in Canada and some of the United States in 1844, in St. Helena in the same year, and then first appeared in the Isle of Thanet. In 1845, on the 16th of August, it was seen in the Isle of Wight; on the 23rd of August in the south of England generally, but up to the 30th was still unknown in the Midland Counties. By the 7th September it had shown itself in Ireland, and later in the year in Scotland.

The hollyhock disease was first made known from Chili, and there it remained for many years, until the next place it visited was the Australian Colonies, and there it seemed to rest for some years. At length it was recognised in Europe, apparently beginning in the south, and spreading rapidly. Finally the mallows on the coasts of our island were attacked, almost simultaneously in the south and in Norfolk, moving rapidly inland, until at length, and as suddenly as a plague, covering the country and extending into Scotland. It was hardly possible at one time to find any species of mallow, or any individual of any species, which was not blotched and disfigured with the pustules of *Puccinia malvacearum*, not a little resembling a vegetable small-pox. The climax having been reached, and maintained for some time, a period of decadence commenced, and from thence to the present its ravages have steadily diminished.

At one time it was quite common to speak of plant life and animal life as different forms of life; but in these latter days the constant use of the term "Biology" indicates broader views, which experience and investigation have supported, at least in the establishment of a close analogy between the phenomena of life as manifested in animals and in plants.

Sir James Paget, in his address[5] at the British Medical Association in 1880, adduced some remarkable instances of the analogy between the diseases of plants and animals: "I have long and often felt," he says, "that we might gain help from studying the consequences of injury and disease in the structures of plants"; and again, "I have seen enough to make me more than ever sure that human pathologists may find, in watching the consequences of injuries and diseases of plants, facts of the highest interest in their more proper study." It will only be necessary to quote one

5 "British Medical Journal," October 16th and 23rd, 1880.

instance, which is adduced, of the analogy above alluded to: "The likenesses between the inflammations in plants and in animals are best shown in their visible structural changes, and these have been admirably traced by Waldenburg. He has applied various irritants to leaves, fruits, and stems, such as foreign bodies, setons, crushings, cauteries, and others. The results, speaking very generally, are that, as in ordinary wounds, the cell structures actually involved in the injury perish and dry up; that those most nearly adjacent suffer degeneration, indicated by their protoplasmic contents becoming turbid, and their chlorophyll becoming yellowish or brownish, while in those next to them, and within distances varying according to the injury and the texture of the part injured, enlargement of cells ensues, and increase by division and thickening of the cell walls. In these changes you may study, with comparatively easy experiments, imitations (as near as differences of texture will allow) of the most constant constituents of inflammation in animals, especially those of the least acute of the productive interstitial inflammations, leading to thickening, opacity, induration, and other such changes."

Pursuing this subject of analogy still further, we come face to face with the results of some of the most recent investigations in which microbes play an important part. It is only very recently that a long entertained suspicion has been verified of the presence of bacteria in plant disease, as well as in that of animals. The disease known in the United States as "Peach yellows" has constantly evaded all search for mycelium, or trace of fungoid development, and yet it is a destructive and insidious foe. Professor Burrill made investigations in 1888 and 1889, but without any decided results. Nevertheless he reports that "he had found in the tissues of the root, and of the old and young stems of diseased trees, an organism, classed with the bacteria, which is not known to occur elsewhere. This organism has been frequently obtained by method of cultures under circumstances which preclude the possibility of its coming from anything except the inner cells of the tree. He had it growing in artificial media, and it exhibited all the peculiarities of a pathogenic rather than a saprophytic microbe. It had peculiarities which served to distinguish it from all others of its kind, and he was convinced it had never before been described by any one. He found it in every set of specimens examined, known to be affected with this disease, and had thoroughly tried in the same manner to find it in healthy stock and failed." Still further he says: "If the

disease is really due to the microbe mentioned the malady differs widely from that of any heretofore described bacterial injury to living vegetation. The microbe must be sparsely but widely distributed through the still living tissues of the tree, in which it must very slowly develop without causing evident local disturbance. This latter especially is entirely at variance with known effects of parasitic organisms. But we know that the peach tree affected with this disease very gradually succumbs, lingering along several years without local injury of pronounced type." [6]

On the subject of the California vine disease, Mr. Pierce, a special agent sent to investigate the disease, states that yellow spots occur on the leaves, which showed no trace of insects or fungi. That "the peculiar appearance and location of these spots led to a careful study of the same, which resulted in finding bacteria-like bodies in large numbers, within the chlorophyllose cells of the spongy parenchyma immediately surrounding the spiral vessels supplying that region. After a long series of observations, made on material from various portions of the diseased district, which in no case failed to disclose the diseased vines as swarming with these bodies in all portions where sap had a ready flow, he believed it proper to undertake a series of experiments to determine if these bodies, always present, bore any relation to the disease as a whole. He had little doubt that they were micro-organisms, and gave to the local spotting of the leaves their characteristically sharp outline. Cultures from various parts of the vine were made in agar-agar, and other media. Three sorts of bacteria were found with enough constancy to warrant further study, but he had not, so far, been able to determine whether any of these were the cause of the disease. In view of the fact that several Italian students have for years claimed that an Italian disease of similar characteristics is caused by bacteria, it is proper the matter should be decided, if possible." [7]

It is established, then, beyond doubt, that bacteria inhabit the tissues of plants in great numbers, that they appear to be of kinds peculiar to those plants, and may, or may not, be the cause of some of the plant diseases. To carry on the subject still further, we must refer to a series of investigations on a disease of melons, and, by the results of these investigations, exhibit a very strong presumption that microbes are the cause of some diseases of plants.

6 "Report of the Secretary of Agriculture," U.S. Section of Vegetable Pathology for 1889, p. 423.

7 Report for 1889, p. 427.

"The attacked vines varied somewhat in their appearance, but generally there is a decay of the stem in proximity to the root, and then the whole plant wilts and fails to grow. Sometimes one or more leaves will fall to the ground, and rot away, before the balance of the plant is seemingly affected."

Dr. Byron Halsted reports[8] that "a microscopical examination of the decaying stems, leaves, and fruit showed that the decomposing tissues were teeming with bacteria. Inoculations of healthy fruits were made in the usual way, taking the germs from the centre of freshly-decaying cucumbers. It was found that, with no other fungus present, these germs were abundantly able to introduce a rapid decay into cucumbers, melons, and squashes. Cucumbers seem to be the favourite, and in them the decay is the most rapid. It will run from one end to the other, through the succulent centre of a four-inch fruit, in a single day.

"The next step in the study was the application of these germs to healthy plants in the field. When the inoculation was made near the end of a vine, the latter rotted away in from three to four days, and when nearer the base a longer time was required; but in all cases an ulcer was formed, which spread more or less rapidly, depending upon the tissue infected. In old stems the decay was almost entirely internal, and did not show much until the disease had spread through the pith to some distant soft parts. A medicine dropper was employed to place a charge in the middle of several petioles of large squash leaves. Upon the next visit, twenty-four hours after, all such leaves had fallen to the ground, and the portion of the petioles below the point of inoculation, six or more inches, in some cases, were thoroughly decayed. In short, the bacterial disease first found in the cucumber, and afterwards propagated from fruit to fruit in the laboratory, as also upon cut stems and petioles, is readily transmitted to vigorous living vines of the cucumber and squash in the field."

Sixteen seeds of squash were divided, and eight planted in a pot covered with a bell glass, watered with pure water, whilst eight in another pot were watered from the first with the juice of a cucumber which had decayed with bacteria. The first eight seeds germinated quickly, producing large, deep green plants, while in the other pot only two plants appeared above ground, and they were of a dwarfed, sickly-yellow colour, and did not continue to grow.

8 "Botanical Gazette," Nov., 1891.

The remaining six seeds, when removed from the soil, were decayed and noisome.

In another experiment, eight seeds were placed on blotting paper, moistened with distilled water, and covered. A duplicate set were similarly watered with a solution containing bacteria from a decaying cucumber. The first series all germinated with their usual vigour, while those which came in contact with the bacterial germs failed to germinate, and soon decayed.

"The pure virus was next introduced into the growing stems and green fruits of the tomato, and in both cases quickly produced a decay that caused the stems to fall, and the fruit to become a watery mass enclosed by the skin, similar to the cucumber from which the bacteria were taken for inoculation. At the time of the experiments some boxes of young tomato plants were close at hand, and into the centre of one of these a decaying cucumber was placed. In six hours some of the stems of the tomato plant, six inches in height, had rotted off close to the ground, where the liquid from the decaying fruit had come in contact with the young plants. In ten hours all the plants in the vicinity of the decaying cucumber were destroyed."

This account seems to be rather conclusive, especially when independently and collaterally supported by evidence given by other observers in respect to other plants, having similar results. From the report of the New York Agricultural Station for 1887, we gather that bacteria are found in great abundance in actively blighting tissues of "pear blight," so as to be easily demonstrable to the naked eye, and occur in less abundance in proportion as the disease is less active. This disease may be introduced into healthy tissue by inoculation with germs from diseased tissue. It is communicated with equal certainty when the germs are separated from all accompanying juices of the diseased tissue, by a series of fractional cultures. It is *not* communicated by the juices of the disease after the germs are removed by filtration.

Without following this part of our subject further, it is essential that we indicate some mode of escape or amelioration of this class of plant diseases. It should be unnecessary to insist upon some similar line of action to that pursued in similar diseases in man or animals. In the first place there must be a scientifically accurate diagnosis of the disease, and this must be followed by the special remedy which has been proved effectual in that class of disease. There is no specific for plant disease, as there is none for animal disease. We can point

to no remedy for everything which shall be "worth a guinea per box." Morison's pills are not yet invented which shall cure apple scab, potato rot, or vine mildew. Empirics may arise, but empiricism will effect no cure, except by accident. As there is no royal road to knowledge in general, so there is no royal road to knowledge in this particular instance, and no universal cure. It must be borne in mind that there are at least two classes of fungoid diseases, viz., those which are epiphytal, growing upon the plant from the outside, and those which are endophytal, or developed from within the tissues of the affected plant. Necessarily the means adopted for the cure must have regard, first of all, to the one of the two classes to which the fungus belongs. The epiphytal kinds are represented by our ordinary vine mildew, by the hop mildew, by the mildew of peas, by all those in which a web-like mycelium of delicate threads spreads over the surface of the leaves, chokes up the pores, prevents the ingress or egress of air, and suffocates the plant. In such diseases the destruction of the fungus must be attempted in such a manner as not to injure the host plant. This may be done by the application of fungicides, and especially by the application of sulphur. It was the discovery of this remedy which greatly mitigated the disease in the hop and vine mildew, and is known to be the most beneficial in any case of similar infection, but it is useless when applied to fungi of the other class, which are endophytal, and must be treated in a different manner. Another remarkable analogy here is presented in the treatmeut of plants and animals. A short treatise by Dr. Valentine Knaggs on "The Cure of Diphtheria by the Frequent Administration of Small Doses of Sulphur," affords this analogy. He says: "More than five years ago my father employed sulphur with magical effect in a case which was at that time regarded as desperate. The severity of the symptoms were hourly increasing under carbolic and other applications; but by the sulphur treatment, employed in the manner I here advocate, the patient made a rapid recovery. Since that time both my father and I have treated similarly seventy-two cases, in all of which diphtheritic deposit was unmistakably and markedly present. Though many of them were of a severe character, some even with laryngeal complication, and accompanied by lividity of skin, yet in not a single instance has a fatal termination occurred, and in remarkably few of them have any of the ill effects which are so apt to follow this complaint, even in the mildest and most transient forms, resulted." Further on, and incidentally, he says: "Sulphur

has the power, in greater or less degree, of destroying all the vegetable parasites which infest the skin, such as the different forms of ringworm. When applied to the 'thrush' of early infancy sulphur rapidly effects a cure, as I have found in a number of cases, etc." Now all these diseases of the human subject are attributed to the action of external fungus parasites, and, in all, the same remedy as that found beneficial for epiphytal fungi has been employed with success.

The other class, or endophytal, are more numerous, insidious, and less subject to external treatment. The disease is present in the tissues long before it makes its appearance on the surface, or even before it produces a sickly habit, and when at length the presence of the foe is unmistakable, all the mischief has been done, and the infested plant is more or less permeated with the disease. To this class belong the corn rust and mildew, the potato disease, the apple scab, and a host of other destructive agents.

The modes by which these internal parasites perpetuate their species are rather elaborate, and must be taken into account in all attempts to combat them. The rotting moulds of the genus *Peronospora* generally produce a speedy decay of the tissues, as, it may be believed, by a kind of fermentation. The initial conidium, or spore, is elliptical and uncoloured; the contents are at first granular, then they become divided into four parts, each of which is gradually surrounded by a thin membrane. When matured, the membrane of the mother cell is ruptured, and the four daughter cells are set free, each furnished with a pair of movable cilia at one extremity, by means of which they are capable of active motion in a thin film of moisture, such as would lie upon the surface of a leaf after a shower. After a short period of activity these little zoöspores come to rest, the cilia are absorbed, and they commence germination by the protrusion of a delicate thread, which enters one of the stomata of the leaf, and becomes the first thread of mycelium, in the interior of the tissues of the plant, which is thereby infected. Ultimately this mycelium, being largely increased, sends up erect threads through the openings of the leaf, such threads being usually much branched towards the apex, and bearing at the top of every branchlet an elliptical conidium or spore, just like the original conidium with which the series commenced. Each of these spores falls away when mature, either upon the supporting leaf or upon the ground, and then the differentiation into zoöspores, and all the suc-

ceeding changes follow each other in regular order. But this is not all, since another system of reproduction is going on within the plant tissues. Certain of the threads of the mycelium produce internally larger globose bodies, sometimes called "resting spores," which acquire a thick outer coat, and then remain dormant in the plant stems throughout the winter, only germinating after a period of rest. It is these "resting spores" which carry over the parasite to the following spring, and awake to life and vigour just at the time when young host-plants are ready to receive them. During the winter these resting spores are concealed within the old herb-stems which lie and rot upon the surface of the ground. In the spring, it is assumed, that by the decay of the stems of the original host-plant the resting spores are freed, and under the influence of spring rains undergo their final change, like that of a chrysalis to an imago. The contents of the globose body become divided into a number of segments, each of which is at length enveloped in a thin membrane, and furnished at one extremity with a pair of vibratile cilia. When the thick coating of the resting spore is ruptured, all the contained zoöspores escape, and are washed on to the ground, or wherever the moisture will carry them, fully competent to carry on the process of reproduction, by germinating upon the leaves of such young foster plants as may be growing in their vicinity. By the means of these two processes of reproduction, the conidia in the summer and autumn and the resting spores in the spring, the perpetuation of the species is assured.

After a consideration of this life history, it will become manifest that such a pest must be met and encountered, in no haphazard manner, but with skill and perseverance. Burning all the *débris* of old plants in the autumn will include the destruction of all the resting spores, and thus prevention will obviate the necessity of seeking for a cure.

By this time it will have become evident that there is only one way in which the fungoid diseases of plants can be successfully encountered, and that is by the patient acquisition of knowledge, and a course of action based upon that knowledge. It can no longer be maintained that the study of fungi is a waste of time; it is no longer possible to laugh at those who pursue the study as fanatics and enthusiasts. The old cry of *cui bono* has no longer any potency, for it is only by patient study, by the acquisition of knowledge, and by the spread of knowledge of the life history and characteristics of

these minute pests, that thousands and thousands of pounds per annum are to be saved to the cultivator, and important branches of industry can be conducted with profit. It is impossible for those who would grow plants on a large scale, and for profit, to remain indifferent to the diseases of plants. It is as necessary for the cultivator to be able to deal with the diseases to which his crops are liable as for the grazier to be able to treat his cattle for the diseases to which they are subject. The losses consequent upon ignorance or indifference are liable to be as great in one case as in the other, and it is as much to the interest of one as of the other to take advantage of the assistance which science can render him, and practically demonstrate that herein also KNOWLEDGE IS POWER.

BRITISH ANNELIDS.

WITH ESPECIAL REFERENCE TO THE EARTHWORMS OF ESSEX.

By REV. HILDERIC FRIEND, F.L.S.

(Continued from Vol. V., p. 241.)

I HAVE been induced by a dual consideration to give the first place in our systematic study of the indigenous earthworms of Essex to the Square-tailed Worm (*Allurus tetraëdrus*, Eisen). This species, in the first instance, is the sole representative of the genus in Britain, unless we raise the recently discovered varieties to specific rank ; so that when we have mastered it there remains a clear field for the study of the two important genera which constitute the bulk of our terrestrial annelids—*Lumbricus* and *Allolobophora*. In the second place, the Square-tail ranks first in order of time among the Essex worms of which I have any knowledge. In 1888 this species was discovered by the Rev. O. Pickard-Cambridge, B.A., in Dorset, and submitted to Dr. Benham, who identified it, and declared it to be new to Britain. I might dispute the latter statement, but must admit that this is the first reliable record. On December 5th, 1888, Mr. Cambridge being in Essex, again sought for this worm, and succeeded in finding it without difficulty. I have in my possession these original worms, and have had from Mr. Cambridge a detailed account of the discovery. I have also seen the correspondence relating thereto, and on this account feel it to be only just and right to place this species in the premier position.

Until last year the story of the Square-tail had never been fully told by any English author. I had the honour, however, of giving a lengthy sketch of its history in "Science Gossip," 1891, p. 80, and must refer the reader to that periodical for illustrations and details. When I speak of *Allurus* as the Square-tail, I wish it to be understood that the term is to be used in a modified sense, as we have one or two other worms which sometimes present this peculiarity, only in a less marked degree. I am anxious, however, as far as possible to attach to each species of worm a popular name which will pretty accurately set forth its characteristic feature, so that it may be possible to speak of each worm without being compelled always to adopt the technical name of the species. Now it was on account of the shape of the posterior half of this worm that it was named Allurus (Greek *allos*, another, different, and *oura*, tail or hinderpart), when it was separated from the old genus Lumbricus, and made the type of a new species.

Savigny is the first author who gives us any information respecting *Allurus*, which he named *Enterion tetraëdrum*. This was in 1828, in which year Dugés also wrote about it, and named it Amphisbæna, because, like the serpent of which Lucanus sang, it could go backwards as readily as forwards. In 1837, Dugés regarded the two worms as distinct, and called Savigny's species *Lumbricus tetraëdrus*, and his own *Lumbricus amphisbæna*. The distinctions which he points out have been overlooked by later writers until Eisen took up the subject, and now we find two or three well-marked varieties whose further study is likely to yield some interesting results.

In 1843 Hoffmeister gave our worm a new name, calling it the Agile-worm (*Lumbricus agilis*); but though the distinction is a good one when the square tail and the green worm, for example, are contrasted, it does not hold good when the purple worm (*Lumbricus purpureus*) and some others are placed in competition with it. Eisen was the first to recognise its generic distinctness from Lumbricus, and in 1870 gave it the name which it still continues to bear. Now that it has come of age, and had its biography written, I hope no one will venture to alter its name, and so add to the confusing list of synonyms by which it is already obscured.

Allurus ranges from one to two inches in length, but I have taken it frequently in its adult stage under an inch long. It is the smallest species we possess, and may easily be overlooked, not only by reason of its diminutive size, but also on account of its protective coloura-

tion. It lives among the roots of grass on the margins of stagnant or running water, and is often with difficulty distinguished from the mud-covered rootlets. To what extent its colour is strictly protective, or due to its food and other factors, is not yet ascertained ; but it is known to vary greatly. I have found a rich golden variety in Cumberland and Yorkshire, while elsewhere I have obtained specimens ranging from a dull brown to a bluish, iridescent colour through a dull yellow and red. Large series from every possible locality, with exact data respecting habitat, must be studied before we can venture on an opinion in the matter of cause and purpose. The varieties are widely distributed, for, in addition to my own records, I have notes of their appearance in Hungary, Scandinavia, and elsewhere.

The girdle of *Allurus*, which commences on segment 22 and ends on the 27th, is rather nearer the head than the tail. The latter portion of the body is angular, and usually consists of about forty segments, so that an entire, full grown worm should contain about seventy or eighty rings. I have found as many as ninety segments on a large specimen. The male pore may be easily detected on either side of segment 13, running parallel with the rings. The lip does not perfectly bisect the first ring. As I do not intend to refer to internal anatomy in these papers as a means of identification, I shall be content to direct the reader's attention to the details and references supplied in my article, already quoted, where its distribution so far as known last year is also detailed.

I may properly close this paper with a brief systematic description of the external characters of the " Square-tail " worm.

Name, *Allurus tetraëdrus* (Eisen, 1870). Length one to two inches. Colour usually a dirty brown, but variable. Normal number of segments 70 to 80, the girdle occupying 20 to 27. Male pores on papillæ, laterally on segment 13. Lip (prostomium) rounded in front, delicate, ramified with blood vessels, only partially cutting the first segment (peristomium). Hinder extremity angular with a pair of setæ at each angle, about 40 segments behind the girdle. Setæ of three kinds, *viz.* : the ordinary bristles, penial setæ on segment 8, and small claws or spinets. First record for Essex, December 5th, 1888, Rev. O. P. Cambridge, B.A., confirmed by Dr. Benham and H. Friend.

ON SOME ANCIENT LAKE REMAINS AT FELSTEAD, WITH NOTICES OF OTHER SIMILAR REMAINS IN THE NEIGHBOURHOOD.

By J. FRENCH.

[*Read November 28th, 1891.*]

ABOUT a mile north of Felstead village there is a brook running in an east and west direction. The brook has worn a considerable valley in geological time and consequently presented advantages for the formation of a lake by means of a dam stretched across the valley. At one place where the sides are somewhat steeper there exists such a dam, and the meadow in which the dam is found has been called from time immemorial the "Mill Lands." The dam is certainly suggestive of a mill and hence probably its name. There is, however, no evidence that a mill ever stood there, and a brief examination with a short process of reasoning will prove almost conclusively that the site has never been thus occupied. But the arguments for or against may be omitted, as we have only now to consider the antiquity of the dam and the original purpose for which it was raised.

The suggestion that the dam must be referred to times of tribal occupation and consequently of great antiquity, is entire due to the Rev. J. W. Kenworthy, the vicar of Braintree, who on a previous occasion was instrumental in discovering a Neolithic lake in Cumberland. Working on his suggestion some difficulties and observations which had long been made have been found to receive a solution; and there can be no doubt that we have in these ancient dams, which may be numerous, relics of a time equivalent to or preceding the Roman occupation.

The evidences of age for the "Mill Lands" dam are purely geological, and must be stated in detail and then collated in order to give a sufficient demonstration.

When the Great Eastern Railway Company constructed their branch line from Braintree to Bishop's Stortford, they had occasion to make an embankment along part of the bed of the brook and through the dam in its middle (which had been previously breached at that place). The effect of making this embankment was to divert the course of the stream, and a new channel was cut for it partly on the south side of the railway embankment and partly on the north, the stream crossing the embankment by means of a culvert. The

cutting of the new channels exposed some sections of soil varying from two to ten feet in depth, and as these occur on both sides of the dam, we are enabled to study the deposits of the lake and the contemporaneous deposits which formed on the other or outer side of the dam. I may here mention that at the time the workmen widened the old breach of the dam they found some curious implements which they took to be "Mill-bills," but which equally well might have been "Celts." These relics are lost.

The dam is about 150 yards long, about 35 feet broad at its base, and 10 feet at its top, and is about 20 feet high at its deepest part. It is made most probably of Gravel and Boulder-clay in equal layers, and would hold back perhaps 10 acres of water or more.

Of the first deposit inside the dam we cannot speak with certainty, as the channel does not cut through it. At one place the brook flows over very compact dark lake mud, destitute of stones, and nearly so of organic remains. Traces of oyster-shells may be noticed sparingly, and there are the nacreous remains of some fresh-water molluscs. The corresponding level at a point higher up stream is of gravel which as yet has furnished no relics.

On the *outside* of the dam the original bottom is exposed in the section cut by the stream. It is of Chalky Boulder Clay. Parenthetically it may be observed that Boulder Clay occupying the bottom of a valley is rare. The sheet of Boulder Clay also extends up the northern side of the valley slope to a considerable elevation. It is necessary to bear this in mind.

Soon after the dam was made, perhaps immediately after, a fire was lit on this newly scooped out Boulder Clay, and the fragments of charcoal and calcined stones resulting remain to this day. It would seem that the place of this fire, occupying a depression, soon became saturated with water, because in immediate contiguity to these ashes is a thin layer of shell-marl. The species occurring are Land-shells of various species; among them occur *Helix arbustorum* and *Cyclostoma elegans*, both of which are now considered to be locally extinct.

The first overflow of the dam has left unmistakable evidence of its work. This is a bed of rather coarse gravel of about two feet in thickness. It would seem that the first overflow came from the northern end of the dam, and eroded some Glacial gravel at that point. It then passed down the slope of the valley in a line parallel and near to the side of the dam and laid down the gravel in its

course. This gravel furnishes oyster-shells, and a fragment of pottery has been found in it. Beyond the transverse section made by the present channel, we are in complete ignorance of the further course of this bed, as it is buried under some feet of later deposits. This gravel, from the compactness and narrowness of its bed, seems to be a product of slow erosion, and must have been obtained from the deepening rather than the widening of the channel of overflow. It may have been that the wear of the stream took off the coating of Clay and choked-gravel and exposed porous sands and gravel, which are known to exist near by, and so drained the lake to an inconvenient extent. Whatever may have been the cause, the dam was afterwards made good at that end and the overflow was transferred to the other end of the dam. After this alteration the gravel and shelly-marl that we have mentioned, received no other addition but that due to the wear and tear of the seasons. A coating of rainwash derived from the Boulder Clay and Glacial gravel of the valley side was slowly deposited, and entombed the ashes of the fire, the shell-marl, and the gravel with oyster-shells. This rainwash ultimately attained a thickness of eight feet; but it has received no addition for a great number of years, as we shall show further on.

Turning now to the inside of the lake, we note that at some time in its history, which does not appear to be at the beginning, a considerable quantity of Chalky Boulder Clay was thrown into its bed. This clay now exists with the lumps of chalk intact, and rests at one place on lake mud with oyster-shells, and is itself overlaid by two feet of lake mud, also with oyster-shells and a fragment of Roman pottery, showing clearly that after its deposition the lake still existed and was used by the inhabitants as in days gone by. The confusion of deposits at different parts of the lake's bed is very great. The bed seems to have consisted of gravel overlaid by peat at the time the dam was made. In one place we now have:—

	Feet.
Rainwash	$\frac{1}{2}$
Lake Mud—very compact—(one piece of Roman pottery found here)	2
Chalky Boulder Clay	$\frac{1}{2}$
Peat	1
Gravel (not bottomed)	3
	7

In another :—

	Feet.
Lake Mud	1
Chalky Boulder Clay	½
Alluvial Gravel and Peat	1
Gravel	3
	5½

More satisfactory evidence is found by returning to the outside of the dam and taking its southern end. When the overflow was transferred to this end, a broad and deep channel seems to have been excavated for it. This channel can still be traced. Taking a circuitous course, it enters the original bed of the stream about 70 yards below the dam. This channel was an effectual conductor of the overflow for a very long time, and probably represents the period of active occupation or use of the lake. The work of keeping this channel clear and repairing the dam must have involved a continual shifting of material and addition of new gravel to replace the waste. There are various hollows in the vicinity which were perhaps made for this purpose.

A time, however, came when these labours ceased, and this period of decadence has also left its mark. The channel was first choked at about 30 yards from the dam, and the water then took a new course across the enclosure made by the artificial channel and the brook's original course. This new channel also succumbed in course of time, and various other minor ones were made from time to time, which have left faint traces. During this time, or in the later years of the lake's existence, the dam was also neglected. The process seems to have been that the overflow channel became stopped at the dam, and lateral erosion commenced which gradually extended along the dam for about 20 yards, and has reduced it 4 feet in height. The waste now lies behind the dam and forms an inclined plane at that place to its summit.

Finally there came a time when a breach was made in the dam at its deepest part and the brook resumed something like its original course. There are some considerations which lead us to believe that this final drainage of the lake was effected a very long time ago, and is, perhaps, only measurable by centuries. One consideration is the road skirting the northern end of the dam. This has been worn down about 4 feet since the breach was made—were the lake now

refilled its natural outlet would be by that road. The road has also cut through 4 feet of the rainwash mentioned as occurring on the northern slope of the valley, burying relics, etc., and has therefore precluded the further formation of rainwash since this erosion commenced.

Another reason for supposing the final drainage of the lake to have taken place long ago, is the accumulation of rainwash or brick-earth inside the lake basin. This accumulation has completely covered the lake mud, and obscures, except for the artificial section, all the other deposits.

This is all the evidence known at present for the antiquity of the lake. We have therefore, primarily, an accumulation of 8 feet of rainwash at one place; an accumulation of compact lake mud (the product of still water) exceeding 8 feet; and the accumulation amounting to many feet and to hundreds of superficial yards resulting from the normal overflow of the lake. Secondarily, there is the after accumulation of rainwash in the lake basin and the amount of road which has been lost by denudation.

Before passing on to notice the other lake remains of the neighbourhood, it might be mentioned that the "Millands" seems to have had the largest feeder and so has produced the greatest accumulations in the rear of the dam; and, thanks to the Railway Company, the section here now shown is the finest. So compact is the lake mud within the basin that the railway embankment has been allowed to rest on it as a sufficient foundation.

We will now pass on to notice the other remains of a similar kind in the neighbourhood. Half a mile west of Felstead village a strong spring issues from the side of the hill. Like the "Millands" brook it has cut a depression in the course of geological time. Across this depression two dams have been thrown; the first is near the point of issue of the stream, and the second is somewhat lower down the hill. These dams, although long breached, once held back two considerable ponds (lakes, as we shall continue to call them in the technical sense). The overflow channel which can still be traced, was carried off at a right angle towards another depression about 70 yards to the right of the pond, and has left there unmistakable alluvial traces. The bed of the lower pond has an accumulation of shell-marl of over 5 feet, in part, at least, due to the lake. But as other kindred accumulations occur in the locality, it is not safe to attribute the whole of this to the lake's agency. It is, however,

worthy of note that a piece of decayed "squared" timber is shown still in place in the shell-marl, with which it is completely surrounded. Just outside the lower dam a land-drain made a few years ago gave a very large accumulation of bones at a depth of 6 to 7 feet.

In the alluvial deposit left by the artificial overflow, oyster-shells may be frequently obtained; and in a land-drain made in this deposit two human skeletons were found a few years ago.

About one mile south-east of Pleshey, at the confluence of two small streams a dam is thrown across the valley. It is about 200 yards long and of proportionate height and thickness. It is called "Dead Man's Bank," and is now clothed with oak and other trees. No notice appears to have been made of this earth-work. A recent additional breach has been made, and shows its structure to consist of clay and gravel in equal layers. I found three oyster-shells here after a hasty search. This dam would hardly have been made *subsequent* to the military earthworks in Pleshey village, as an important part of its water supply was appropriated for artificial moats there.

About $1\frac{1}{2}$ miles south-west of Shalford village there exists another dam of considerable dimensions, which once held back a lake of some four or five acres. The place is still called "Pond Green," and it does not appear to have been very long ago drained. The dam is here made of gravel and clay in equal layers. The water-line all round the lake's basin is still visible, and all below it is dark alluvial soil. One piece of Roman pottery was yielded by a molehill in that basin. With this single exception all the lakes appear to have been finally drained a very long time ago, as there is a deposit of rainwash in them which obscures all traces of earlier deposits.

Less than half a mile east of Black Notley village there is a dam very similar to that at Pleshey, and of about the same dimensions. It is also clothed with timber trees. The evidence of age is here very apparent, the fields at each end of the dam being planed down by natural denudation to a depth of at least 4 feet from the top of the dam. It is worthy of remark that in all these cases the dams seem to have suffered but little from natural weathering. I find, however, from various authorities that artificial earthworks inclined at a high angle, generally retain their sharpness and contour through long periods of time. This is particularly characteristic of the earthworks at Pleshey, some of which date at least from the Roman occupation.

What were the uses to which these lakes were applied? Undoubtedly chiefly as fish reservoirs, and perhaps for the protection and decoy of wild fowl. There seems to be no evidence at present of lake habitations; but in the "Millands" basin at Felstead there has been an artificial deposit of Boulder Clay which has been already described as overlying peat and being itself overlaid with lake mud. This clay was evidently deposited for some purpose, and may have sustained an erection on piles.

One other question arising is as to who the people were who made and used these lakes? There seems to be but little doubt that an antiquity equal or anterior to the Roman occupation may be claimed for them. Yet, as Mr. Kenworth points out, it is not consonant with the Roman genius as we know it, to build earthworks in retired situations and there spend their days in the peaceful pursuits of fowling and fishing. Such a course better agrees with earlier settlers, and is quite consistent with all we know of their habits.

Further excavations, which, however, are not probable in this neighbourhood, might shed more light upon the subject. It would be interesting to know where other similar dams are to be found in Essex, or indeed in a wider field.

NOTES—ORIGINAL AND SELECTED.

The Marten (Martes sylvatica) in Essex.—Mr. J. E. Harting thus sums up the records of the Marten in Essex in the December number of the "Zoologist" (3rd ser., vol. xv., p. 456):—"Daniel, in his 'Rural Sports' (vol. i., p. 503), states that a farmer in the parish of Terling, in Essex, was famous for taming this animal, and seldom had less than two. He adds that some years since (1801) one used to run tame about the kitchen of the 'Baldfaced Stag' on Epping Forest. About 1822 one was shot out of a crow's nest in the Waltham Woods, near Chelmsford, by Mr. Thomas Gopsill, of Broomfield, near Chelmsford (H. M. Wallis, 'Zoologist,' 1879, p. 264). On February 11th, 1881, being at Colchester, Ambrose, the bird-stuffer there, informed me that the last Marten he had seen in Essex was killed in the autumn of 1845 at Walton, near Colchester, by a keeper, who sold it to him for half-a-crown. He skinned and preserved it, and disposed of it to Mr. Maberley, of Colchester, for ten shillings. On November 27th, 1880, being in Epping Forest, near Loughton, I learnt from T. Luffman, one of the keepers, that in March or April, 1853, while he was acting as keeper to Mr. Maitland, he trapped a Marten in a covert near Loughton. After keeping the carcase for some days, till it was nearly spoilt, he took it to Epping, where it was purchased by the late Mr. Doubleday. At a sale of Natural History specimens

at Steven's Auction Rooms, on the 10th December, 1889, a case of British Weasels (lot 52) contained a fine Marten, stated to have been killed at Chingford, Essex—date not mentioned. It belonged to a Mr. West, of High Street, Gravesend, for whom the case was bought in at a reserved price (ESSEX NATURALIST, vol. iii, p. 271). Mr. E. A. Fitch, of Maldon, heard that the reason the capture was not published was that the woodman who set the trap was afraid of getting into trouble, and that they knew all about it at the 'Bald-faced Stag'" (ESSEX NATURALIST, vol. iv., p. 126; see also vol. iv., p. 185).

Singular Adventure of a Fox.—"The other morning a lad employed at the Lion Inn, St. Osyth, observed a fine dog fox in the inn yard, playing with two cats. The lad, with others, pursued the animal, which bolted into the garden, and in attempting to escape underneath the gate was captured, one boy seizing it by the head and another by the brush. Reynard was securely muzzled and tied up, presumably for future sport."—"Essex Standard," December 12th, 1891.

Destruction of Otters in Essex.—It is very distressing to read in the county newspapers paragraphs announcing, time after time, the shooting or trapping of otters. Why are these poor beasts so persecuted? One would think that any one with a spark of feeling for nature would cherish rather than seek to destroy such an interesting inhabitant of our streams and rivers. Naturalists have protested again and again against the destruction of otters, even in the supposed interests of anglers, but in vain. The man with the gun is omnipresent and insatiable; in him the savage delight of mere destruction overpowers all sense of pity or regard for nature's pensioners; that they live, move, and feel is a sufficient incentive to the noble, or ignoble, "sportsman" to hunt, maim, and kill them all—eagle, fox, hawk, jay, or otter—in defiance of enlightened public feeling, and disregard of remonstrance or argument. And we can only sigh and bear the wrong, until the community takes courage, and, in defence of our fast disappearing fauna, stays by law the ruthless destructiveness of a few of its members. The following are records of otter-killing in Essex which we have noted during the last two months:

Bishop's Stortford.—"A large otter, weighing about 24lbs., was shot the other day by Mr. Towler, at Hay Mead Springs."—"Essex County Chronicle," December 18th, 1891.

Great Bentley.—"Mr. Luigi Corti, of the Cottage, last week shot two otters, which were turned out of a fleet near his house."—"Essex County Chronicle," December 25th.

Chappel.—"On January 11th, Mr. J. S. Goodey, of Broom House, shot a fine dog otter, in the river near his residence, which measured four feet one inch from the tip of the nose to the end of the pole, and weighed 22½lbs. This gentleman also shot one about a year ago, and has shot as many as six in the same river at various times."—"Essex Standard," January 16th, 1892.

Stoke-by-Nayland.—"Mr. Harry Church, of Rams Farm, Stoke-by-Nayland, shot, on Monday evening, January 11th, a very fine female otter on the river Bot, measuring four feet in length, and weighing 16lbs."—"Essex Standard," January 16th.

Heybridge.—"On Wednesday morning Mr. F. Cocks, of Heybridge Mill, was walking, with his gun and dog, along the banks of the Navigation water, between the old station bridge and his mill. Suddenly the dog stopped, and began barking and sniffing round the stump of a decayed tree. Mr. Cocks went back to

ascertain the cause, and in the hollow of the tree he saw a fine, full-grown otter. He fired at the creature, but only succeeded in slightly wounding it, and it bolted down its run into the river. After an exciting chase, the otter was lost sight of for nearly two hours, when Mr. Cocks again found it, crouched up among the roots of the tree. With the aid of two men, the hole down into the river was wired over, and Mr. Cocks once more took aim at the otter, and this time killed it. It was found to be a male, and weighs 13lbs. Mr. Cocks has decided to have it stuffed. P.C. Brown, of Heybridge, states that he has seen two otters about the same spot."—"Essex Herald," February 16th.

Chelmsford.—"On Wednesday morning, Albert Wheeler, groom to Mr. Garrad Baker, observed a young otter in the river Chelmer, which runs at the foot of his master's garden. After one or two fruitless efforts, he succeeded in pinning the animal down between the tines of a stable fork, and he then killed it by a blow on the head. The otter weighed 8lbs. On the same day Mr. A. T. Aldham, of Tower House, Springfield, shot two otters, weighing about 15lbs, near the spot where Wheeler killed the first otter."—"Essex Weekly News," February 19th.

"Eagles" in Essex.—Mr. French, of Felstead, writes (December 5th):—"An eagle has been seen (surrounded with a quantity of rooks) at Lindsell within the last fortnight;" and, later (December 22nd), he reported that "the bird still haunts the locality, and evades all efforts, backed with a £5 reward, for its capture, dead or alive. It roosted several nights in Great Hall Wood, at Bardfield, and folks were quite unable to conjecture what it was, as its wings appeared to droop whilst perching. The conclusion come to was that it was an 'old sack,' by some means transferred to the top of the tree. One person, name forgotten, is said to have seen it swoop down and take one of his hens. It was seen on Saturday last at Little Bardfield. Should not the county papers be asked to make an appeal for the preservation of this noble bird? At present the only care is to 'bring it down.'"

[It is probable that this is the bird referred to in the following paragraph in the "Essex County Chronicle" of December 11th:—"A large eagle has been seen hovering over poultry-yards at Stebbing and other places in the neighbourhood during the last few days. Several fowls are said to have fallen a prey to this unusual visitor. The eagle is described as of a rusty-black colour. Attempts have been made to shoot it, but we have not heard that any one has succeeded." The species has not been determined, but it is quite possible that the bird was a spotted eagle, two specimens of which have occurred in Essex—at Elmstead and Leigh (ESSEX NATURALIST, vol. v., p. 218). An unusual number of raptorial migrants have been seen in East Anglia during the winter. A spotted eagle was shot at Wickham Market, Suffolk, in November (see "Field," November 28th), and the Rev. J. G. Tuck records (Zool., January and March, 1891) many rough-legged Buzzards from Cambridgeshire and Suffolk, a Hen Harrier from Cambridgeshire, Peregrines, a young Merlin at Bury, and a White-tailed Eagle at Rushbrook, &c. Short-eared Owls have been abundant, and such an immigration of Rough-legged Buzzards has not occurred since 1876.—ED.]

Raven at Felstead.—A raven has been observed here, at Felstead, within the last month. The bird is so rare in the neighbourhood that many folks were unable to tell what it was.—J. FRENCH, Felstead, December 5th, 1891.

A Night Heron (Nycticorax grisens) at Brightlingsea.—We take the following from the "Essex Standard" of December 17th, 1891 :—"On Sunday, November 29th, an unknown bird was seen stalking about the marshes near Brightlingsea station. On Friday, December 4th, while Mr. Bateman and Mr. Doyle were shooting over the Brightlingsea Woods, for the second time (when the totals reached 391 head, including 270 pheasants and 46 hares), this bird was again flushed, just after the last shot had been fired, nearly at dusk, and consequently not bagged. On December 5th, Mr. Doyle, with the keeper, again had a look for the stranger, and this time brought him to book. It resembled a small heron, coloured like a curlew, measuring 23 inches from tail to beak, weight about 21 ozs. The bird was almost certainly an immaturely plumaged 'Night Heron,' *Nycticorax grisens*, which Bewick describes as very rare in Great Britain; while Gould, in 'British Birds,' says it has many times occurred in England, but hardly ever in Ireland or Scotland. Bewick says that the brown and white plumage is that of the female; while Gould, with much better information at his disposal, affirms that the full plumaged bird, both male and female, has a black crown and two long white droopers, something like quill pens, attached to the back of the head, with a white breast and vivid green back. According to the same authority the bird does not acquire its beautiful colouring till fully two years old. The unearthly, unmusical croak it gives at night when hunting for eels or frogs gave cause for its being thought a bird of ill omen in Italy, for one of the old classic poets (the writer forgets whether Horace or some other) speaks of it as '*Improbe nycticorax*,' the 'wicked night-croaker.' The bird has been sent to Mr. Ward, of Piccadilly, for preservation."

According to Christy's "Birds of Essex," the Night Heron has occurred but once in Essex, at Dovercourt, on November 29th, 1880. We shall be glad to have further particulars of the Brightlingsea bird.

The Clarke Collection of Humming Birds.—We understand that the very fine collection of Humming Birds and allied forms, formed by the late Alderman Joshua Clarke, at Saffron Walden, has been removed from his house to the Saffron Walden Museum. The members of the Club had an opportunity of seeing this collection on the occasions of two former visits to Saffron Walden.

The New British Butterfly, Hesperia lineola.—It is quite evident that Essex will not retain the honour of having its own peculiar species of butterfly. *Hesperia lineola* turned up last season in many localities, particularly in the fens, and entomologists are beginning to think that it will ultimately prove to be as generally distributed as its congener, *H. thaumas*. Many specimens were taken last season in the neighbourhood of Leigh, where it was first discovered, and in the "Entomologist" for January (vol. xxv., p. 17), Mr. Gervase F. Mathew gives an interesting account of his finding the butterfly at Harwich, in July, 1886. He also took several last July, and bred one from a pupa which he found spun up between some blades of coarse grass. Mr. Mathew's notes on the distinctions between the two very closely allied species, *lineola* and *thaumas*, will be found useful.

The Essex Emerald Moth (Phorodesma Smaragdaria) in Essex.—This almost exclusively Essex moth seems to become commoner the more it is looked for, over 200 larvæ having been taken, it is reported, during last autumn in the salt marshes. In the case of such a local insect it is to be feared that the rapacity of some collectors will seriously diminish its numbers, if indeed they do

not altogether exterminate it in some of the more restricted localities. Mr. R. E. James, in the "Entomologist" for December (p. 298), wrote that two hours' work on September 12th furnished him with over fifty larvæ. He adds (in "Entom. Record," November, p. 256) that forty-five larvæ were taken on two small patches of wormwood, not more than a few yards square, both patches being quite close together. Mr. Quail ("Entom. Record," vol. ii., p. 207) records the taking of sixteen larvæ in the same locality. For the information of those having larvæ of *P. smaragdaria* and finding difficulty in obtaining fresh supplies of *Artemesia maritima*, Mr. G. T. Porritt mentions ("E. M. M.," vol. iii., 2nd ser., p. 47) that the larvæ will feed up just as well upon the garden species of *Artemesia* known as "Southernwood" or "Old Man" (*A. abrotanum*). He believes that all *A. maritima*-feeding species will take to it. This should prove a useful hint for our Essex collectors.

Abundance of Larvæ during the Autumn.—Many species of moths have been extraordinarily common in the caterpillar stage. Mr. J. A. Cooper, of Leytonstone, called attention in the "Entomologists' Record" to the numbers of larvæ of *Spilosoma menthastri* and *S. lubricipeda*, which in many cases had completely stripped the plants in the gardens. "At the back of the factory here, there is about half an acre of waste ground, where, for many past years, I have encouraged a fine growth of dock and other plants useful for feeding. There was a perfect army of the larvæ here, and as they grew in size they stripped everything to the ground, leaving the tall stems of dock and willow herb quite bare."

Larva-beating in Epping Forest.—During the past season of 1891 many kinds of larvæ were abundant throughout the forest. Several species which are generally very scarce were fairly plentiful. On 4th of July I beat out a larva of *Thecla betulæ* near High Beach, from which I bred a fine female on 11th August. This species has been taken freely in various parts of the forest on sloe. The great feature of the year was the occurrence of *Stauropus fagi* in Monk Wood. On September 5th I beat one from oak, and on the 12th of the same month I obtained two more, one from oak and the other from beech; at least a dozen other larvæ of this species were found in the same locality, and the fine beech trees in Monk Wood also yielded an unusually large number of *Halias prasinana*, *Demers coryli*, *D. pudibunda*, *Ephyra linearia*, &c. Other kinds, such as *Notodonta ziczac*, *N. camelina*, *Dicranura furcula*, &c., were also freely distributed. Thus it is evident that the severe weather has in no way diminished the number of larvæ, but has probably destroyed many of the deadly parasites that prey upon them. Also it would appear that the entomological resources of Epping Forest are far from exhausted.—C. B. SMITH, 24, Rectory Road, Stoke Newington, N., in "Entomologist" for February, 1892.

Rare Dragon-fly (Agrion Mercuriale) in Epping Forest.—In an article on "Some Famous Collecting Grounds for Dragon-flies," by the author of "An Illustrated Handbook of British Dragon-flies" [W. Harcourt Bath], in "Science Gossip" for January, 1892, occurs the following:—"*Agrion mercuriale*, common, but very local [New Forest]; it is only known to occur in one other locality in this country, namely, at Epping Forest, in Essex." In the continuation of his papers in the March number of "S. G.," Mr. Bath says:—"The delightful domain of Epping Forest certainly ranks second to none in England for the richness of its Dragon-fly fauna. . . . Every enthusiastic London entomologist ought certainly to be thankful that he has at his doors such a treasure-house of

insect life. . . . The following are the names of some of the Dragon-flies which have been recorded as having occurred in Epping Forest :—*Leptetrum quadrimaculata* and var. *pronubila* (plentiful), *Sympetrum vulgatum* (very abundant), *Gomphus vulgatissimus*, *Anax formosus*, *Bachytron pratense*, *Æschna mixta*, *Æ. cyanea*, *Calopteryx virgo*, *C. splendens*, *Lestes nympha*, *L. sponsa*," and *Agrion mercuriale*, above alluded to, taken by Mr. W. H. Nunney. He also notices *Lestes sponsa* as occurring at Plaistow.

New Rotifers from Epping Forest.—Several new Rotifers are described from Epping Forest in the January part of the "Journal of the Quekett Microscopical Club" (ser. ii., vol. iv., No. 30). Mr. Charles Rousselet, F.R.M.S., met with a very small, free-swimming Rotifer, on several occasions in the forest and particularly at Snaresbrook, in company with *Notops brachionus* and *N. hyptopus* and much resembling the latter, but which is distinct, and which he proposes to call *Notops minor*. Full description and figures are given (pp. 359-360, and plate xxiv.). Mr. F. A. Parsons describes a species of *Callidina*, allied to *socialis*, Kellicott, which he names *C. magno-calcaratu*. It was found attached to the undersides of *Asellus* and *Gammarus* in Epping Forest (Wood Street, etc.), also *Pterodina cæca* discovered at Loughton in September last, which, like the *Callidina*, lives commensally on *Asellus*. Mr. Parsons also obtained it near Wood Street, and it and the *Callidina* were found in company on the same host (pp. 378-379, plate xxv.). Lastly, Mr. G. Western, F.R.M.S., describes the *male* of *Triphylus stustris* found swimming among females in a rich gathering of the species from Chingford (pp. 374-375, plate xxv.).

In "Science Gossip," for March, 1892, Mr. Percy G. Thompson, in a paper on "Moss-Haunting Rotifers" describes and figures a new species of *Macrotrachela* (*M. multispinosa*) found amongst some *Jungermannia* gathered from damp ground in a swampy, wooded hollow, at Wanstead Park, in October, 1891. Mr. Thompson's paper is exceedingly interesting, and he points out a comparatively untrodden field for the employment of the microscope.

New Rotifers from River Lea and Epping Forest.—In "Science Gossip" for September, 1891, Mr. David Bryce has some interesting remarks upon the genus *Distyla*, and he describes two species which appear to be distinct from any of those yet described, and a *Monostyla* closely related to, but not identical with, the common and well-known *M. cornuta*. The species are—

Distyla depressa, Bryce. A gathering made in March, 1890, from the River Lea, below the Lea Bridge Water-works, which was placed on one side, was found to contain some moths, later a flourishing colony of Rotifera. "The species were few but very select, the most conspicuous being *Adineta oculata*, only hitherto found, I believe, near Aberdeen. Along with it were many examples of this *Distyla*, some *Callidina elegans*, and some others."

Distyla muscicola, Bryce. Numerous dead examples occurred amongst the sediment of water drained from *Sphagnum* gathered in Epping Forest, but Mr. Bryce has hitherto only found one living specimen.

Monostyla arcuata, Bryce. Dead specimens found very abundantly among the drainings from *Sphagnum* from Epping Forest, and Mr. Bryce has had recently for a short time a colony in a jar, the bottom of which was covered with some threads of moss, gathered last year, and springing into fresh growth.

Full descriptions are given, with woodcuts of the species.

New Species of Dasydytes in Epping Forest.—In "Science Gossip," for July, 1891, Mr. Percy G. Thompson, of Bow, E., has an interesting paper on a new species of *Dasydytes* (belonging to the Order Gastrotricha) from the forest district. He met with it in November, 1890, in a pond near Leytonstone, and could not identify it with any of the species described in Dr. Carl Zelinka's exhaustive monograph of the group ("Die Gastrotrichen," in Zeitschr. f. wiss. Zool., xlix., plate 2). Mr. Thompson proposes to name the new species *Dasydytes bisetosum*. He gives a full description, with figures, with many details of its habits. The same pond at Leytonstone furnished him with specimens of *Dasydytes fusiformis*, Spencer, and *Lepidoderma rhomboides*, Stokes (the latter only known before from Trenton, New Jersey). At Chingford he met with *D. goniathrix*, Gosse, and *D. fusiformis*. Mr. Thompson is convinced that many of the species recorded by Stokes in America ("Journal de Micrographie"), and by Zelinka, would be found in England if microscopists would but search systematically for them, and place on record observations on such forms as they may chance to meet with.

Males of Cladocera (Entomostraca) in Epping Forest.—During the months of September, October, and November last, the comparatively rare males of the Entomostracan order Cladocera seemed to be fairly abundant in the south Epping Forest district. Males of fourteen species in all were seen by me during the period mentioned, belonging to the different genera as follows:—*Ceriodaphnia* (4), *Scapholeberis* (1), *Simocephalus* (1), *Daphnia* (4), *Bosmina* (1), *Acropems* (1), *Camptocerens* (1), *Pteuroxus* (1). I do not know whether to consider this as an exceptionally good list for one season or not; but it is certainly far better than my records for the two preceding years, and it would be interesting if collectors of pond-life in other localities would give their experience in this matter.—D. J. SCOURFIELD, in "Science Gossip," January, 1892.

Microscopic Fossils from the Colchester Chalk.—In the year 1853, the ever-memorable John Brown, of Stanway, then in his seventy-third year, published an interesting notice of the foraminiferæ, &c., found in the chalk of the artesian well then recently made at Colchester. The depth was then 294 feet, and John Brown's notes, which were printed in the "Annals and Magazine of Natural History," October, 1853, gave a description and illustration of the microscopic fossils in the chalk brought up by the borer. It has recently been found necessary to make a further boring in the chalk at the bottom of the well to a depth of 400 feet from the surface, and I have examined the chalk from the borer at this depth. The specimens obtained are for the most part similar to those described by Brown in 1853—*Cristellaria*, *Globigerina*, *Truncatulina*, and the usual forms met with in chalk. In sketching some of these with the camera lucida, I had drawn a form exactly similar to one depicted by John Brown, and alleged by him to be a *Nodosaria*, when, to my surprise, the object rolled over in the still liquid balsam, and revealed itself as a *Gaudryina*, which had been lying edgeways. Is it possible that species sometimes acquire a name and a local habitation in text-books through a similar accident?—CHARLES E. BENHAM, Colchester, January 27th, 1892.

"Melampyrum Arvense in Essex."—In your last issue (E.N., v., p. 203) reference is made to the finding of *Melampyrum arvense* at Faulkbourne. In view of the rarity of the plant it may be worth while adding two localities from which I have recorded the species, *viz.*, Wickham Bishops and Hatfield Peverly, both in

1883. The plant occurred in some quantity in each locality.—H. N. DIXON, F.L.S., Wickham House, East Park Parade, Northampton, January 11th, 1892.

Development of Buds.—Now that buds are swelling on trees and shrubs, it will be interesting to notice the order of their development and the comparative vigour of shoots growing from terminal, axillary and accessory buds. I do not think such matters dependent on accident nor altogether on outward circumstances. The stem of a large elder tree is not produced by continuous growth from the plumule ; its upper part is formed by the growth of a lateral bud below the curve which is made by the original stem. Not only so, but I have observed that on a stem from which the top has been broken off the most vigorous bud will be an accessory bud growing from immediately below a small branch of last year. I think that this vigorous growth in the second year of accessory buds which had been latent during the premature development in the first year of the principal axillary bud is not confined to the elder, but occurs in the grape vine, and other plants with woody stems.—JOHN GIBBS, Chelmsford.

Mineral Spring at Wanstead.—In Thomson's "Life and Times of George Villiers, Duke of Buckingham," vol. i., p. 257 (Lond. 1860), quoting "Inedited Letters in the State Paper Office, Mr. Chamberlain to Sir Dudley Carlton, July, 1819," it is stated that "a mineral spring was about this time discovered at Wanstead, and there was such 'running there' by lords and ladies, that the spring was almost 'drawn dry,' and if it should hold on," writes Mr. Chamberlain, "it would put down the waters at Tunbridge, which, for these three or four years, have been much frequented, especially in summer." Is this spring known? and, if so, can any reader give some information about it?—B. G. COLE, Buckhurst Hill.

SOME ESSEX WELL-SECTIONS.

(PART III.)

By W. WHITAKER, B.A., F.R.S., F.G.S., Assoc. Inst. C.E.

[*Read January 30th, 1892.*]

THE number of Essex well-sections published, up to the end of the year 1889, was 239 (see ESSEX NATURALIST, vol. iii, p. 44). Four others, mostly shallow ones, have lately been added (*Ibid.* vol. v, pp. 204, 216, 217), situated at Felstead and Little Dunmow. This paper adds 33 more, and therefore brings up the total to 276.

The only section of general interest is that at Shoebury, which is one of the deepest in the county. Unfortunately, from a geologic point of view, it does not pass through the Cretaceous beds, stopping short in the Chalk, and so gives us no information as to what formation next underlies the Gault there. Its interest, therefore, is prospective, and suggestive of the advisability of deepening the boring as an experiment.

The Little Sampford section is of more local interest, as pointing to an error in the Geological Survey Map (Sheet 47); one of those errors that can only be found by such borings, in a tract where the Chalk and the Tertiary beds are covered by a thick mantle of Drift.

Unless otherwise stated the figures stand for feet.

[Words in square brackets have been added by the writer.]

Arkesdon.—*Public Well.* 1877.

Made and communicated by Mr. G. Ingold.

Water-level 69 feet down.

Gravel and clay [Boulder Clay]	35	72
Chalk	37	

Barking.—*Glenny's Brewery.* 1889.

Made and communicated by Messrs. Legrand and Sutcliff.

Water-level 17 feet down.

		Thickness. ft.	in.		Depth. ft.	in.
Dug well (the rest bored)		—	—	...	10	0
[River Drift] gravel		12	0	...	22	0
[London Clay]	Red clay	1	0	...	23	0
	Blue clay	42	0	...	65	0
	[? Basement bed] Conglomerate, clay, stone, and shells	1	6	...	66	6
	[? Basement bed] Hard rock	0	5	...	66	11
	[? Basement bed] Sand, clay, and pebbles	3	0	...	69	11
	[? Basement bed] Rock, flints, and shells	0	7	...	70	6
[Woolwich and Reading Beds.]	Loam and shells	1	6	...	72	0
	Sand and shells	6	0	...	78	0
	Blue clay and shells	11	0	...	89	0
	Rough pebbles	0	6	...	89	6
	Mottled clay and sand	16	6	...	106	0
	Dark clay and sand	2	0	...	108	0
	Black pebbles	0	6	...	108	6
	Dark sand, clay, and pebbles	17	6	...	126	0
[Thanet Sand, 40 feet.]	Thanet Sand	33	0	...	159	0
	Dead-sand	6	6	...	165	6
	Flints	0	6	...	166	0
Chalk and flints		154	0	...	320	0

There is a difficulty in fixing the base of the London Clay, and perhaps the lowest bed classed with the Woolwich Series, may belong in part to the Thanet Sand.

Berden.—[*Bearden on the old Ordnance Map, Sheet* 47.] *The Hall.* 1884.

Made and communicated by Mr. G. Ingold.

Water 122 feet down.

PUBLICATIONS OF ESSEX FIELD CLUB

(*Continued from page 2 of wrapper*).

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			Thickness.		Depth.
[Glacial Drift.]	[? Boulder Clay.]	Brown clay	5	...	5
		Sandy loam	1	...	6
		Blue clay	14	...	20
		Brown clay	1	...	21
	Chalky gravel		9	...	30
	Brown clay		12	...	42
	Hard chalky gravel		2	...	44
Chalk.	Bed of flints at 92 feet. Many shells at 100 feet		78	...	122

Canvey.—*Waterside Farm* (*northern side of the island*). 1890?

Made and communicated by Messrs. Wadsley.

Water rises to within 9 feet of the surface. Good supply.

		Thickness.		Depth.
Top ground		2	...	2
Quick sand [Alluvium]		28	...	30
[River Drift] gravel and flints		40	...	70
[London Clay.]	Clay and claystones	10	...	80
	London Clay	220	...	300
	Brown clay	20	...	320
[Lower London Tertiaries.]	Green sand	97	...	417
	Brown sand	30	...	447
	Chalk [? calcareous stone]	2	...	449
	Black sand	10	...	459

Clavering.—*The Hall.* 1889.

Made and communicated by Mr. G. Ingold.

Water-level 82 feet down.

Drift.	Brown clay 5	85
Chalk	 80	

Debden.—*Dean's Farm.* 1889.

Made and communicated by Mr. G. Ingold.

			Thickness.		Depth.
[Glacial Drift.]	[Boulder Clay.]	Brown clay	5	...	5
		Rubbly chalk	3	...	8
		Blue clay, with a thin layer of sand at 17 feet	38	...	46
		Blue sandy clay	6	...	52
		Blue clay	20½	...	72½
		Brown clay	1	...	73½
	Gravel		3½	...	77
	Sand		2	...	79
	Brown sandy loam		3	...	82
	Sharp red sand		15	...	97
Chalk			92	...	189

Dovercourt.—*Waterworks, Upper Dovercourt.* 1882.

Made and communicated by Messrs. Tilley.

		Thickness.		Depth.
Well, and brick-bottom (3 feet)		—	...	30
[London Clay.]	Sand and clay	7	...	37
	Hard stone	nearly 2½	...	39½
	Clay	5	...	44½
[Reading Beds, 43½ feet.]	Plastic clay	32	...	76½
	Sand and water	1	...	77½
	Mottled clay	over 9½	...	87
	Green sand and flints	1	...	88
[? Upper and Middle Chalk.]	Chalk, with flints at 183, 203½, 213¾, 222¼, 233, 249, 269¼, 284½, 315, 332½, 348¾, 358½, 364, 367⅔, over 419, 439⅔ and at the base	352¼	...	440¼
	Hard chalk	62	...	502¼

Eastwood.—*Southend Waterworks, N.W. of Coleman's Farm.* 1890.

Made and communicated by Messrs. Docwra.

45¾ feet above Ordnance Datum.

Cylinders and shaft 247 feet, the rest bored.

Water-level, 9th August, 1889, 100 feet down; 25th January, 1890, 66 feet 8 inches.

		Thickness. ft.	in.		Depth. ft.	in.
Soil		0	9	...	0	9
[River Drift.]	Mixed clay, with an inch of fine sand at the base	12	3	...	13	0
	Brick-earth, the bottom 3 inches mixed	12	9	...	25	9
	Gravel and sand	7	6	...	33	3
	Sharp sand	5	8	...	38	11
	White sand	3	7	...	42	6
[London Clay, 239½ feet.]	London Clay	233	6	...	276	0
	Sandy clay	6	0	...	282	0
[? Blackheath Beds, 18 feet.]	Pebbles and pyrites	1	0	...	283	0
	Dead sand	10	0	...	293	0
	Pebbles and rock	1	0	...	294	0
	Dark sand	4	9	...	298	9
	Pebbles and sand	1	3	...	300	0
[Woolwich and Thanet Beds, say 128 feet.]	Hard dark sand	33	1	...	333	1
	Green sand	25	2	...	358	3
	Blue clay	23	0	...	381	3
	Dark sand	18	0	...	399	3
	Dark clay	27	8	...	426	11
	Chalk flints [partly belong to Thanet Beds]	1	6	...	428	5

		Thickness.		Depth.	
		ft.	in.	ft.	in.
[Upper Chalk, 257 feet.]	Chalk, with a foot of flints at the base	9	2	437	7
	Chalk and flints	13	0	450	7
	Chalk, with layers of flints at the top and at the base, and eight others, from 6 inches (most) to a foot	54	8	505	3
	Chalk and flint	17	0	522	3
	Chalk, with flints at top, at middle and at base, 6 and 9 inches thick	20	3	542	6
	Chalk and flints	10	0	552	6
	Hard yellow chalk. On getting through this (? and to depth of 578¼ feet) the water-level rose nearly 30½ feet	4	0	556	6
	White sand, the bottom 4 feet "mixed"	6	0	562	6
	Sand	0	9	563	3
	Chalk	4	6	567	9
	Sand	0	6	568	3
	Hard chalk	4	0	572	3
	Sand and shells	0	9	573	0
	Hard chalk	4	3	577	3
	Sand and chalk	1	6	578	9
	Hard chalk	4	0	582	9
	Chalk, with flints at top, and with 30 other layers of flints, from 3 to 15 inches thick (mostly about 6 or 9)	78	6	661	3
	Hard sandy chalk	0	9	662	0
	Hard chalk	5	3	667	3
	Rock chalk, with seven layers of flints	17	9	685	0

This section seems to show the presence of the Oldhaven or Blackheath Beds.

The occurrence of sandy beds in the Chalk is peculiar, and it is a question whether these are owing to infiltration of Tertiary sand down joints, or whether they are merely loose gritty beds in the Chalk.

Foxearth.—*The Brewery* (*Messrs. Ward's*).

Made and communicated by Messrs. Isler and Co.

Supply 1,200 gallons an hour.

		Thickness.		Depth.
Pit [the rest bored]		—	...	6
[Glacial Drift]	Ballast [gravel]	12	...	18
[Glacial Drift or Eocene]	Blue clay	10	...	28
	Mottled clay	19	...	47
	Green sand	15	...	62
Chalk		64	...	126

If any of the beds should turn out to be Eocene, there must be an outlier here, quite hidden under Drift.

Grays.—*Lodge Farm, N.N.E. of the town, made to prove the strata.* 1891.

Communicated by Mr. W. H. Radford.

The water in the old well here (disused, 87 feet above Ordnance Datum) stands at 12·12 above O.D.

		Thickness.		Depth.
Soil		3	...	3
Gravel and sand		10	...	13
[Thanet Sand.]	Fine yellow sand	12	...	25
	Very fine white sand	22	...	47
Chalk		30	...	77

Great Chesterford.—*Park Road.* 1890.

Made and communicated by Mr. G. Ingold.

Shaft 162 feet, the rest bored.

Water-level 156 feet down at first; but lowered $5\frac{1}{4}$ feet from April 15 to July 23. The well having gone dry since, will have to be deepened.

Made ground	2	192
Boulder Clay	8	
Chalk	182	

Halstead.—1878.

Made and communicated by Messrs Tilley.

	Thickness.		Depth.
Brown clay and stones	15	...	15
Blue clay	13	...	28
Dark sand and water	$2\frac{1}{2}$	...	$30\frac{1}{2}$
Yellow loam and little water	6	...	$36\frac{1}{2}$
Light loamy dry sand	9	...	$45\frac{1}{2}$
Coarse gravel and sharp sand	$2\frac{1}{2}$	...	48
Yellow dry sand	10	...	58
Yellow sand and water	$10\frac{1}{2}$	...	$68\frac{1}{2}$

Harlow.—*Kingsmoor House (Mr. J. Todhunter).*

Made and communicated by Messrs. A. Williams and Co.

Water-level 50 feet down.

		Thickness.		Depth.
[Drift.]	Clay and stone	10	...	10
	Clay and sand	16	...	26
	White sand and clay	24	...	50
	Gravel	16	...	66

Hatfield Broad Oak.—*Half a mile S.E. of the church.* 1889.

Made and communicated by Mr. G. Ingold.

Shaft 66 feet, the rest bored.

		Thickness.		Depth.
[Boulder Clay.]	Brown clay	15	...	15
	Blue and brown clay	5	...	20
	Blue clay	61	...	81

Hornchurch.—*The Schools.*

Made and communicated by Mr. R. D. Batchelor.

Shaft 50 feet, the rest bored.

		Thickness.		Depth.
Soil		2	...	2
Gravel		10	...	12
[London Clay.]	London Clay	38	...	50
	Clay and stone	27	...	77
	Strong clay	41	...	118
[? Reading Beds.]	Clay, sand, and shells	$22\frac{2}{3}$	...	$140\frac{2}{3}$
	Hard sand	$8\frac{1}{3}$	...	149
[Reading and Thanet Beds]	Sand and clay	106	...	255
	Green clay and chalk, with flints	$3\frac{1}{2}$	...	$258\frac{1}{2}$
[Upper Chalk, $300\frac{1}{2}$ feet.]	Chalk with flints	$186\frac{1}{2}$	...	445
	Hard chalk with flints	50	...	495
	Chalk and flints	64	...	559

Latton.—1875.

Made and communicated by Mr. G. Ingold.

Shaft 138 feet, the rest bored.

Water-level 123 feet down.

		Thickness.		Depth.
Soil		2	...	2
Boulder Clay		10	...	12
[London Clay.]	London Clay	195	...	207
	[Basement bed.] Sand and shells	5	...	212
[Reading Beds, 58 feet.]	Mottled clay	10	...	222
	Green sand	8	...	230
	Green sandy loam	15	...	245
	Dark slate-coloured sandy loam, changing to very hard blue clay	24	...	269
	Brown clay, 3 inches, and then flints	1	...	270
Chalk		95	...	365

Little Sampford.—*The Hall.* 1889.

Made and communicated by Mr. G. Ingold (and from specimens sent by him from the boring).

Old well 21 feet, the rest bored. Water-level 56 feet down.

		Thickness.		Depth.
[Glacial Drift.]	Sand and gravel	18	...	18
	Blue Boulder Clay (light-grey, with fragments of chalk)	18	...	36
[Reading Beds, 25 feet.]	Hard slate-coloured clay (pale-grey and brownish)	16	...	52
	Reddish-brown clay (brownish-grey red-mottled sandy clay)	5	...	57
	Green clay (pale, sandy)	4	...	61
[Thanet Beds, 15 feet.]	Brown clay (fine clayey sand, with a slight pinkish tinge)	13	...	74
	Dark green clay (sandy)	2	...	76
Chalk		57	...	133

This section is of interest as showing two unexpected things:—the presence of a lower bed of Boulder Clay (beneath the Glacial gravel), which does not come to the surface hereabout; and an extension of Reading and Thanet Beds northward, along the valley of the Pant or Blackwater, beyond the limit to which they had been guessed to reach. The brownish sand with a pinkish tint reminds one of the pale pinkish bed above the green base-bed of the Thanet Sand at Sudbury, and proves therefore a westerly extension of that division of the Lower London Tertiaries.

Mistley.—*For Messrs. Rodwell, Free & Co.* 1891.

Boring, made and communicated by Mr. F. Bennett.

On a level with the quay, which is about 30 yards off.

Water-level sinks 20 inches at low tide.

The steam-pump was throwing considerably over 6,500 gallons an hour, and although we pumped for several hours, the supply seemed to be abundant. The water drops about 2 feet, and then remains at a fixed level of 14 feet 4 inches from the surface. (Letter from Messrs. Rodwell, November, 1891.)

		Thickness.		Depth.
Made soil		4	...	4
[London Clay, 17½ feet.]	Light [-coloured] mottled clay	10	...	14
	Brown mottled clay	5	...	19
	Running sand [? basement-bed]	2½	...	21½
[Reading Beds, 59 feet.]	Mottled clay	17	...	38½
	Running sand	1½	...	40
	Mottled loam	11½	...	51½
	Green mottled clay	4½	...	56
	Green sandy loam	1½	...	57½
	Rough sand	½	...	58
	Green sandy loam	1	...	59
	Running sand	1½	...	60½
	Stiff blue clay	15½	...	76
	Brown clay	1½	...	77½
	Green loam	2	...	79½
	Flint-bed	1	...	80½
Chalk. Large flint 82½ feet from surface		80	...	160½

Ovington.—*Public Well. By the roadside, near the Rectory.* 1891.

Made and communicated by Mr. G. Ingold.

Shaft 95 feet, the rest bored.

Water-level 102½ feet down.

		Thickness.		Depth.
[Glacial Drift.	Brown Boulder Clay	18	...	18
	Blue Boulder Clay	86	...	104
	Sharp brown sand	21	...	125
White chalk with flints		70	...	195

Pitsea.—*Railway Station. Between the old and the new lines.* 1889.

42 feet above Ordnance Datum.

Made and communicated by Messrs. Legrand and Sutcliff.

Water-level 28 feet down.

		Thickness.		Depth.
[London Clay.]	Brown clay	10	...	10
	Blue and brown streaky clay	25	...	35
	Blue clay	236	...	271
	Sandy clay	12	...	283
	Sand, shells and pebbles [? basement-bed]	2	...	285
Hard blue clay		3	...	288

Romford.—*South Essex Water Company. Havering Mead.* 1886.

Made and communicated by Messrs. Tilley.

Shaft 42 feet, the rest bored.

		Thickness.		Depth.
[London Clay.]	Yellow clay	9	...	9
	Blue clay	33	...	42
	[? Basement bed.] Dark dead sand	4	...	46
	[? Basement bed.] Live sand, with water	5	...	51
	[? Basement bed.] Hard stone	1	...	52
[Woolwich and Reading Beds, 38½ feet.]	Black clay	1	...	53
	Black sand and shells	1	...	54
	Black clay and shells	2	...	56
	Shells	2	...	58
	Black sand and shells	3	...	61
	Dark dead sand	2	...	63
	Light [-coloured] live sand	4	...	67
	Brown live sand	2	...	69
	Dark brown clay	1	...	70
	Green live sand	3	...	73
	Dead green sand	9	...	82
	Dead dark sand	8	...	90
	Pebbles	½	...	90½
[Thanet Sand, 73⅓ feet.]	Live light [-coloured] sand	64½	...	155
	Dead dark sand	8	...	163
	Flints	10 ins.	...	163¾
Chalk		224⅔	...	388½

Roydon.—*Mr. E. A. Barclay's.* 1889.

Made and communicated by Messrs. Legrand and Sutcliff.

Water-level 26 feet down.

		Thickness.		Depth.
Pit [the rest bored]		—	...	5
[London Clay.]	Sandy clay	7	...	12
	Blue sand	2	...	14
[Reading Beds, 50 feet.]	Hard mottled clay	18	...	32
	Sand and pebbles	18	...	50
	Blowing sand	14	...	64
Chalk and flints		56	...	120

Roydon.—*Temple Farm.* 1888.

Made and communicated by Mr. G. Ingold.

Shaft 20 feet, the rest bored.

Water from 18 to 20 feet down.

	Thickness.	Depth.
Gravel	5	5
London Clay, with veins of black sand at 18 to 20 feet	20	25
[Reading Beds.] Strong clay, with blue and red veins	16	41

Saffron Walden.—*Byrd's Farm, N.E. of the town.* 1875.

Made and communicated by Mr. G. Ingold, as also the next.

Water 164 feet down.

		Thickness.	Depth.
[Boulder Clay.]	Blue clay	36	36
	Brown clay	8	44
	Clay and chalk	2	46
Chalk		124	170

Saffron Walden.—*Westley Farm, N. of the town.* 1889.

Shaft throughout. Water 163 feet down.

		Thickness.	Depth.
[Glacial Drift.]	Blue Boulder Clay	35	35
	Clayey gravel	about 10	45
Chalk, with layers of hard rock, 2 to 5 feet thick		123	168

Sheering.—*Wells near Gladwyns,* 1. *a little S. of the house* (*shaft*), 2. *at the lodge, a little N.* (*shaft* 43 *feet, bored* 8). 1890.

Made and communicated by Mr. G. Ingold.

Water in 1 burst up suddenly from the bottom and rose to within 27½ feet of the surface; in 2 it came in very slowly from the bottom.

		(1)	(2)	Depth.
Soil		3	2	3 to 2
[Boulder Clay.]	White clay	6	6	8 to 9
	Brown clay	15	15	24 to 23
	Blue clay	17	28	41 to 51

[The water probably comes from gravel below the Boulder Clay.]

South Shoebury.—*For the supply of Shoeburyness Garrison. Less than half a mile north-eastward of St. Andrew's Church.* 1886-1889.

Communicated by Major E. Raban, R.E. (and from specimens).

About 23 feet above Ordnance Datum.

Cylinders to 80 feet: then shaft to 170 (enlarged from 115 downward): the rest bored. After piercing the clay (434 feet) it was

found that this was closing round the lining-tube, so that it could not be driven further; a timbered shaft, 4 feet square, was then made round the tube to the depth of 386 feet.

The Chalk was so soft, for a great depth, that the tube had to be carried down to the depth of 844 feet.

Water was met with at the base of the London Clay, at 434 feet (September, 1887), and still more at 456 feet, when it gave much trouble and was difficult to keep down, the water rising to 39 feet below the ground. While boring between 844 and 896 feet water began to rise rapidly, to 41 feet from the surface (October, 1888), but on testing the yield the well was pumped dry in $6\frac{1}{2}$ hours and took several days to fill again. After further boring the water continued to rise, and at 916 feet stood 23 feet from the surface (November 7, 1888), but a second pumping-test gave no better result than the first. After this the water-level fell somewhat, to 41 feet on July 2, 1889, at 1,048 feet.

At 473 feet sand blew 200 feet up the tube, and at 476 feet it filled 100 feet of the tube. Since leaving the bottom of the tube it has come in occasionally.

		Thickness.		Depth.
Soil		3	...	3
[River Drift, 51 feet.]	Brown sand and gravel	8	...	11
	Brick-earth	12	...	23
	Stiff clay (light brown at 32)	15	...	38
	Sand, with water (clayey sand at 42)	10	...	48
	Ballast (gravel, of flint pebbles and flints)	6	...	54
London Clay, with bed of large clay-stones at 162, and clay-stones at 205 (sandy at the base)		380	...	434
[Blackheath Beds, 26 feet ?]	Sand, shells and pebbles, with water (hard clay with green grains; pale greenish sand; pebbles)	14	...	448
	Clay (brownish-grey) and black pebbles	12	...	460
[Woolwich Beds, 21 feet ?]	Black peat (lignity clay)	2	...	462
	Clean (sharp grey) sand	10	...	472
	Peat (lignite and lignity clay)	5	...	477
	(Coarse grey) sand (or grit, with wee pebbles of quartz)	2	...	479
	Peat (hard lignite)	2	...	481
[Thanet Beds, 106 feet ?]	(Brownish-grey, fine, sharp) sand	27	...	508
	Clay (pale grey, and more or less sandy at 545, 547, 549, 550, 555, 560)	54	...	562
	Sandy clay, with water	13	...	575
	Clay	11	...	586
	Green sand, with water (green-coated flints in sandy clay with green grains)	1	...	587
[Upper Chalk, 309 feet.]	Soft chalk; clayey at 609	193	...	780
	Soft chalk, with layers of flints at about 4 feet intervals	70	...	850
	Hard chalk, with flints (specially marked at 869 and 875)	46	...	896

		Thickness.	Depth.
[? Middle Chalk, 144 feet.]	Very hard grey chalk	50	946
	Soft chalk	2	948
	Chalk	4	952
	Hard chalk	16½	968½
	Chalk and sand	1½	970
	Loamy sand	1	971
	Chalk and sand	4	975
	Chalk	14	989
	Hard grey chalk	2	991
	Chalk	11	1002
	Chalk, mixed with loose sand in the lower part	30	1032
	Hard chalk	1	1033
	Chalk	2	1035
	Hard chalk	5	1040
[? Lower Chalk]	Chalk	6	1046
	Chalk, with loose sand	2	1048

Major Raban writes that on reaching the water-bearing beds beneath the London Clay (which gave much trouble), from 434 to 460 feet down, the water-level in the War Department well at Sheerness fell 17 feet.

The divisions of the Lower London Tertiaries are not clearly marked. Perhaps the lower bed classed with the Blackheath Beds may belong in part to the Woolwich Beds; and the same may be the case with the top sand classed with the Thanet Beds.

The divisions of the Chalk are still more doubtful.

Stansted.—*New Dairy, near the Railway Station.* 1889.

Sunk and communicated by Mr. G. Ingold, as also the next. Water-level 15 feet down.

Clay and gravel	8½	120
Chalk	111½	

Stansted.—*Benfield End. Waggon and Horses Inn.* 1886.

		Thickness.	Depth.
Made ground		2	2
London Clay		28	30
[Reading Beds.]	Fine grey sand	4	34
	Brown clay	2½	36½
	Mottled clay	2	38½
	Green sandy loam, with a slow spring	4½	43

Stow Maries (or **Stow St. Mary**).—*Great Eastern Railway, Hogwell Siding, nearly a mile E. of Woodham Ferrers Station, on the northern side of the line.* 1889.

About 22 feet above Ordnance Datum.

Made and communicated by Messrs. Legrand and Sutcliff, and from Mr. W. T. Foxlee.

Shaft 35 feet; the rest bored and lined with tubes to the depth of 296½ feet, rising 2½ feet above the bottom of the shaft.

Water, found at 333 feet, rose to within 15 feet of the surface. Four days later it had risen 3¼ feet. A few days later it stood at 10 feet below the surface. Yield about 240 gallons an hour.

		Thickness.		Depth.
Brickearth		30	...	30
Blue clay, with clay-stones at 99½–100, 110½–111, 131–131½ and 321½–322½		303	...	333
Basement bed ?]	Sand and pebbles, with water	1	...	334
	Dead sand	3	...	337
	Shells and pebbles			

Tilbury.—*For Messrs. Fletcher and Fearnall.* 1887.

Made and communicated by Messrs. Legrand and Sutcliff.

		Thickness.		Depth.
[Alluvium and River Drift.]	Soil	10	...	10
	Clay, peat, sand and gravel	66	...	76
Chalk and flints		54	...	130

West Ham.—*Gasworks.* 1891.

A boring, made and communicated by Messrs. Docwra.

Water level 10¼ feet down, July, 1891. Yield so small as to lead to abandonment.

		Thickness, ft.	in.		Depth. ft.	in.
[Made Ground and Soil.]	Made ground	3	6	...	3	6
	Maiden ground	1	0	...	4	6
[River Drift, 13 feet.]	Ballast [gravel] and clay	2	6	...	7	0
	Clean ballast	10	6	...	17	6
[? London Clay.]	Blue clay and shells	5	0	...	22	6
	Shells	0	6	...	23	0
	Sand and pebbles	1	0	...	24	0
[? Woolwich Beds.]	Light[-coloured] clay	3	0	...	27	0
	Light[-coloured] sharp clay and sand	9	8	...	36	8
	Loamy clay	3	0	...	39	8
	Blue clay and shells	8	4	...	48	0
	Very hard loamy sand	4	0	...	52	0
	Hard rock	1	8	...	53	8
	Dark sand and clay	5	0	...	58	8
	Light-green sand	3	0	...	61	8
	Pebbles	2	10	...	64	6
	Green sand	8	0	...	72	6
	Dark sand and pebbles	8	6	...	81	0
	Pebbles	2	6	...	83	6
[Thanet Sand, 42½ feet.]	Very hard dark-green sand	3	0	...	86	6
	Light-green sand	39	0	...	125	6
	Flints	0	6	...	126	0
[Upper Chalk].	Chalk	2	0	...	128	0
	Chalk and straggling flints. Water at 214 feet. A bed of flints, 2½ feet thick, at 239 feet	127	2	...	255	2

Where the Woolwich Beds end off seems uncertain.

POSTSCRIPT.

The following section came to hand after the first two pages of this paper had been printed, in the March number of the ESSEX NATURALIST. The numbers on page 47 (*ante*) should, of course, be increased by one—the present paper adding thirty-four to the published well-sections, bringing up the total to 277.

Ashdon. *New House Farm.* 1891.

Made and communicated by Mr. G. INGOLD.

Water-level 54 feet down.

[Glacial Drift.]	[Boulder Clay]	Brown clay	12	...	12
		Blue clay	42	...	54
	Gravel		3	...	57

BRITISH ANNELIDS.

WITH ESPECIAL REFERENCE TO THE EARTHWORMS OF ESSEX.

By REV. HILDERIC FRIEND, F.L.S.

(Continued from page 33.)

TWENTY years ago every earthworm was known by the general name of "*Lumbricus*." Eisen carefully analysed the group in 1873, and referred our European species to three or four different genera. He was not altogether consistent with his own rules, and failed accurately to determine the relative position of some of his species; but we are, nevertheless, indebted to him for reducing the former chaos to something like order. It follows to-day that there are probably not more than half a dozen species of the genus *Lumbricus*, as now defined, throughout the whole of Europe. Four of these are British, and three are found in Essex. There is every reason to hope that the fourth may be found in that county this year, seeing that it has been discovered in Middlesex, Kent, and Sussex. The fourth species is new to science, having been added to the British list last year through my researches into the worm-fauna of Yorkshire.

It is my purpose in this paper to deal solely with the modified genus *Lumbricus*, and in so doing I shall describe the three species indigenous to Essex. I have to thank Mr. W. Allen, of Canning Town, for a constant succession of fresh consignments, with valuable data respecting habitat and other important factors; and I am in-

debted, moreover, to an unknown friend, through Mr. George Day, F.R.M.S, for some specimens taken at Epping Forest.

The species are as follows :—

1. *Lumbricus terrestris*, Linn. Hab., Epping Forest ; East Ham ; Canning Town : Plaistow Marshes.
2. *Lumbricus rubellus*, Hoffm. Same localities.
3. *Lumbricus purpureus*, Eisen. Same localities.

1. Let us first examine the common earthworm. It is generally thought that every one knows this species when he sees it ; but it is a curious fact that almost up till the present day this worm has been confused with half a dozen others, and scarcely any one has been able to give us an absolutely reliable diagnosis. Now, thanks to the labours of Rosa, Eisen, and others, we have arrived at a clear understanding respecting the true specific and generic characters of European worms, and can identify any species that may be alighted on with certainty.

The earthworm (*L. terrestris*) differs from the other two, both in size, and in the position of the girdle. Unlike them, it also has protuberances on the sides of the fifteenth segment. In other respects, the three species can scarcely be said to have any distinguishing feature either externally or internally. These, however, are ample, as we shall presently see.

In point of size *L. terrestris* is one of our largest worms. It is constantly associated with different species of *Allolobophora*, which it closely resembles when only casually examined, though the differences are very marked to a trained investigator. It is usually from four to six inches in length, with a thick round head (applying the term vaguely to the front portion of the body), a well-marked girdle when adult, and a flattened tail. In colour it is a warm or dark brown, with a beautiful play of iridescent colour along the anterior half of the body. The girdle and undersurface are a little lighter than the tail, but there is a fair margin in all species of worms with reference to the shade of colour they may assume. If the head is examined carefully with a pocket lens it will be found that the small rounded lip or prostomium in front is fitted into the first ring of the body by a perfect "mortise and tenon" arrangement. This is one of the distinguishing features of the genus, and applies to each of the species.

The girdle or clitellum covers six segments, *viz.*: the 32nd to the 37th. If the undersurface of the worm is examined carefully along the girdle, it will be found that a band stretches across segments 33, 34, 35, 36, thus covering the four innermost segments. This band forms what is known as the *tubercula pubertatis*. In every genuine *Lumbricus* we find the same arrangement, *viz.*: six girdle segments, on four of which, omitting the two outermost, the *tubercula pubertatis* are situated. One or two species of *Allolobophora* present a similar arrangement, but they differ in other respects from the true *Lumbricus*.

If the 15th segment be examined laterally or sideways, a pouch will be seen. Here we have the male pore, made conspicuous by being seated on papillæ. The other two species are without these cushions or papillæ; but the new species to which I have referred corresponds in this respect with the common earthworm. The setæ or bristles are found in four pairs, and on a few of the segments we find bristles of a different shape and size. These appear to be of service to the animal when it has reached the stage of sexual activity.

When we come to deal with the genus *Allolobophora*, we shall be able to indicate the means by which to distinguish the earthworm from those species which have hitherto been so fruitful a source of trouble. I shall present the distinguishing characteristics of the three species now under review in tabular form at the end of this paper, so that a fuller discussion of *L. terrestris* will not now be necessary. I retain the old Linnean term, because it is not only the oldest, but the best. Most of the modern synonyms have been applied to the worm through want of a perfect knowledge of the species, and it is found that all the species with which the true earthworm was formerly confused now fall into the new genus, thus leaving the true earthworm to enjoy its proper title without dispute.

2. The red worm (*L. rubellus*) is usually a good deal smaller than the former. True, it varies greatly in size, and I have found a large red worm which exceeded an average earthworm. This, however, is the exception, and the red worm averages three to four inches in length. It is frequently somewhat darker in colour than *L. terrestris*, and the girdle, which is usually a warm brick red, is prominent and closely fused in the adult. It is a very active worm, and may be found abundantly in damp pastures, or under stones by running water. If the turf of a meadow be shaken briskly with a garden fork or other tool, the worms will dash out of the ground with great alacrity, and it is pretty certain that among the specimens thus taken it will be pos-

sible to secure not only the red worm, but the new species as well, which it most nearly resembles.

The red worm has no swellings on the 15th segment where the male pores are situated. The girdle covers segments 27 to 32, and the band (*tubercula pubertatis*) extends over 28, 29, 30, 31. The tail often spreads out into a spoon shape (spathulate), a property of great value when it lies with the head exposed, as it can grasp its burrow very firmly thereby. The bristles are arranged as in the earthworm, while the head is exactly similar in shape. This worm is probably more common and widely distributed than the last, though it has generally been supposed that the common earthworm was ubiquitous.

3. The purple worm (*L. purpureus*) is the smallest of the set. It usually attains larger dimensions in Essex and the south of England than it does further north, and I have sometimes found it impossible to determine to which species a given specimen must be referred till I had counted the segments preceding the girdle. A good deal yet remains to be done before we can decide what influences affect the size, colour, shape and structure of the different species of worm ; and it is, therefore, of the highest importance that collectors should note carefully every detail likely to assist in the solution of these questions.

The purple worm is usually two to three inches long. It resembles the red worm in colour, shape, and general appearance. Sometimes it is of a pretty chestnut colour, which will account for one of its synonyms (*L. castaneus*, Hoffmeister). The tail is sometimes more square or angular than that of *L. rubellus*, and it frequently mimics the Square-tail in this respect, as well as by going rapidly backwards. The girdle covers six segments as usual, *viz.* : 28 to 33, and the band extends over 29, 30, 31, 32. The bristles are in four pairs, and on the under side of segment 10 there is usually a tumid growth. The male pore is not raised on papillæ. In this, as in the other species, a series of openings may be observed along the back ; and it is sometimes important to observe the number of the segments between which the first of these dorsal pores is found. The numbers are given below.

We may now summarise the characters of the genus in order that it may be possible to distinguish it from *Allolobophora*.

GENERIC CHARACTERS OF LUMBRICUS.

Prostomium forming with the peristomium a perfect "mortise and tenon."

Setæ always in couples, four couples on each segment, the individuals of which are close together [not ornamented, copulatory setæ longer, common setæ *f* shaped].

Clitellum always composed of six segments, usually closely fused, commencing somewhere between 27 and 34. [In *L. rubellus* the girdle sometimes occurs abnormally on segments 26 to 31.]

Male or spermiducal pores on segment 15, with or without papillæ.

Tubercula pubertatis occupying four contiguous segments of the clitellum, omitting the anterior and posterior rings, and forming a distinct band along or near to its ventral limit.

Colour, purplish brown with iridescence, lighter ventrally, and with the clitellum paler than the anterior portion.

First dorsal pore either between segments 5 and 6, or posteriorly to this. Anus terminal.

The internal characters are omitted with a view to preventing the student from being discouraged because he may be unable to dissect his specimens. In all the foregoing points, except those in brackets, the genus *Lumbricus* differs from *Allolobophora*, so that the two may be readily distinguished. The accompanying chart will enable the young naturalist readily to determine his species if he happens to have found a genuine *Lumbricus* : and I have added the characters of the new species in the hope that some one will be able to recognise it among the indigenous earthworms of Essex.

CHART OF THE GENUS LUMBRICUS.

LUMBRICUS	Segments occupied by the Girdle.	Band.	1st Dorsal Pore.	Papillæ.	Average length.	No. of Segments.
1. Terrestris, Linn.	32-37	33, 34, 35, 36	$\frac{8}{9}$	15, 26	5 inches	150-200
2. Rubescens, Friend	34-39	35, 36, 37, 38	$\frac{5}{6}$	15, 28	4 inches.	120-150
3. Rubellus, Hoffm.	27-32	28, 29, 30, 31	$\frac{7}{8}$		3 inches.	120-150
4. Purpureus, Eisen	28-33	29, 30, 31, 32	$\frac{6}{7}$	10	2 inches	100-120

I take this opportunity of thanking my correspondents for the assistance they have thus far rendered me, and would like to indicate the work which still needs to be done.

First, there is every reason to believe that *L. rubescens* may be found in the pastures and elsewhere. There are next the tree worms to be worked out. Hitherto, I have received none of these from Essex. They are about the size of the Square-tail (*Allurus* supra, page 30), and should be sought in woods; but especially under the bark of decaying trees in damp places, or in rotten stumps, and fallen timber. A large series is desired, as it is believed some new species are yet to be found here.

Next, there are the rich supplies of *Allolobophoras* to be found in gardens, manure heaps, fields, under stones, and in every conceivable locality. Finally, I am anxious to extend these studies to the species found in estuaries, ponds, streams; salt, brackish, and fresh water, and elsewhere. Consignments should be addressed, The Grove, Idle, Bradford.

(*To be continued.*)

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR ENDED DECEMBER 31st, 1891.

[*Read and adopted at the Annual Meeting, on March 19th, 1892.*]

ROLL OF MEMBERS.—The membership of the Club is maintained at the average level of 400, the election of thirty-four new members within the year about compensating for the losses. The most regrettable feature presented in the revision of the list of members is the large proportion of deaths. We have lost several original members, and some who have always been good friends of the Club, among whom may be mentioned Mr. T. C. Baring, M.P., Mr. Melles, Mr. Archer Houblon, Mr. T. B. Linley, Mr. John Rogers, Mrs. Meldola, and others. There are very many residents in the county who really ought, almost as a matter of duty, to join the Club, and every effort should be made by our well-wishers to attract desirable people into our ranks.

FINANCE.—The general expenditure during 1891 has been about the same as during the previous year, but the increased income from current subscriptions has unfortunately been neutralised by a diminished yield from "arrears," a reduced number of Entrance Fees, and a considerable falling off in the sales of publications. As a consequence of this unsatisfactory state of things it becomes necessary to at once reduce the expenditure, or increase the income, by about £30 per annum, and the Council is carefully considering how this can best be done. It is hoped that the members generally will co-operate by inducing their friends to join the Club, as this would clearly be the best method of meeting the difficulty. Meanwhile it may be pointed out that the liabilities at the beginning of 1892 were considerably less than usual, and that of the outstanding subscriptions about £40 may be regarded as good in time.

ESSEX NATURALIST.—Although somewhat irregular in the times of its appearance, the journal of the Club has been carried on with considerable success during the past year. Including the parts for October to December, 1890, which were published and paid for in 1891, 312 pages have been issued, evidently a

larger number than the present income of the Club will bear. The remaining part for 1891, as well as the parts for January to March, 1892, are now being printed off, and will soon be in the members' hands. The NATURALIST will then be quite up to date. The alteration of the rules with respect to the subscription to the journal has worked well, about 300 members having agreed to subscribe the extra 4*s.* 6*d.* per annum. This is a large proportion of the entire membership, a proportion that may be expected to increase, as almost every new member subscribes. It should be remembered that the Honorary and Life members receive the NATURALIST free, and also that our roll includes many married couples, and relatives living in the same house, who naturally take but one copy. It may be anticipated that ninety per cent. of the members will ultimately subscribe to our publication.

The papers printed in the ESSEX NATURALIST maintained the valuable feature of treating mainly of Essex subjects, and they were in many instances original contributions towards an accurate knowledge of the natural productions and phenomena of our county. The Council has to thank Mr. Walter Crouch for the block of the Fairlop Oak, published in the ESSEX NATURALIST, and Mr. H. A. Cole for several drawings and blocks which he has prepared free of cost to the Club.

"JOURNAL OF PROCEEDINGS, E.F.C."—It will be remembered that on the establishment of the ESSEX NATURALIST in January, 1887, the volume of the JOURNAL OF PROCEEDINGS was left unfinished, and the pressure of other matters has hitherto prevented the publication of the missing part. The Council is now very glad to announce that the whole of the matter has been prepared by Mr. Cole, and is in type, and that the part will be published in a few weeks' time. It will contain extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of the PROCEEDINGS), after which date reports appeared in the ESSEX NATURALIST,—as well as the sixth and seventh Annual Reports of the Council, and many small papers which remained unpublished during the years 1884 to 1887.

The part is, of course, *absolutely indispensable* to complete the set of the "Transactions" and "Proceedings" of the Club, which will then consist of five volumes containing about 1,490 pages.

The printing of the limited edition of the part will possibly cost about £50, and the Council has fixed the price at 5*s.* to Members, and 6*s.* 6*d.* to Non-members, post free.

It is hoped that every member possessing the TRANSACTIONS will take this part to complete their sets, and to save the Club from serious loss by reason of its publication.

MEETINGS AND PAPERS, ETC., CONTRIBUTED.—Thirteen Ordinary and Field Meetings have been held, and the remarks made in the last Annual Report as to the interest of most of the meetings fully apply to those held in the past year. At these meetings a considerable number of papers have been read, and most of them have been already printed in the ESSEX NATURALIST, together with others which have been communicated direct to the Editor. In addition to these, very many smaller "notes" have been printed, as well as extended reports of the meetings of the Club.

FIELD MEETINGS have been held in Epping Forest to view the recent addition of portion of Highams Park to the Forest; at Newport and Quendon Hall, where the Club was most hospitably received at luncheon by Lieut.-Col. A. M.

Cranmer-Byng and Mrs. Cranmer-Byng; in the Hainault Forest district, on which occasion the Club was entertained at tea at Little Gearies, Barking Side, by Mrs. Edenborough; a ramble from Chelmsford to Maldon; a geological ramble around Chelmsford, in conjunction with the Geologists' Association; at Ipswich and on the Orwell and Stour rivers, in conjunction with the Ipswich Scientific Society, for the purpose of dredging in the estuaries, on which occasion the Ipswich Society organised a very pleasant reception at the Museum, on the evening preceding the meeting; a journey by Barge from Maldon to Chelmsford, mainly organised by our President and Mr. Durrant; and, lastly, a very pleasant meeting at St. Osyth and Brightlingsea, organised by Mr. C. E. Benham and Mr. J. C. Shenstone. The Council most gratefully recognises the many acts of kindness shown by local residents and others at these meetings. They were all successful and largely attended.

Great assistance was received at the Field Meetings from the following ladies and gentlemen, who acted as "Conductors," or otherwise aided the Secretary in various ways:—Mr. Andrew Johnston, Mr. L. Cranmer-Byng, Rev. G. Tamplin, Mr. G. E. Pritchett, Mr. Walter Crouch, Mr. E. A. Fitch, Mr. E. Durrant, Rev. W. S. Lach-Szyrma, Mrs. Whitbourne, Mr. Douglas, Mrs. Ingleby, Miss Ingleby, and Mr. Holcombe Ingleby, Mr. F. Chancellor, J.P., Mr. C. Smoothy, Dr. Taylor, Mr. H. B. Monckton, Mr. Henry Miller, M.Inst.C.E., Mr. E. M. Holmes, Mr. T. V. Holmes, Mr. G. H. Hewetson, Mr. F. Woolnough, Mr. W. Jolly, Dr. Pearl, Mr. S. Garratt, Mr. Byford, Mr. J. C. Shenstone, Mr. C. E. Benham, Rev. J. E. Potts, Prof. Boulger, Sir J. H. Johnson, and many others.

It was with great regret that the Secretary found it necessary, in consequence of the sudden death of Mr. J. Archer Houblon, to cancel the Twelfth Annual Cryptogamic Meeting, which was to have been held on October 10th in Hatfield Forest. All arrangements had been made, and Dr. Cooke and Mr. G. Massee had kindly consented to act as Botanical Referees.

LIBRARY AND MUSEUM.—The library is slowly but steadily increasing by donations and purchases, but, as in former years, the Librarian has still to lament his inability to bind the numerous volumes received in parts. The Museum scheme (which was unanimously approved by the members at the last Annual Meeting) has received a very large amount of attention, and an influential public meeting was held at Chelmsford on March 18th last in its support. The Committee appointed to deal with the subject has held several meetings, and in June last an Appeal for Funds was widely circulated. In response to that appeal over £300 has already been promised or received, and other substantial aid promised. The Committee is desirous of obtaining promises to the value of £500 before issuing the list to the general public, and it is hoped that the total may be soon attained. Both the Committee and the Council are fully convinced of the importance of the project; all arrangements are completed, and the only requirements are funds to commence the work. The following noblemen and gentlemen have consented to serve as Trustees:—The Right Hon. Lord Rayleigh, D.L., D.C.L., LL.D., F.R.S.; Lord Brooke, M.P.; Sir T. Fowell Buxton, Bart., D.L., F.R.G.S.; The Ven. the Archdeacon of Essex; W. M. Tufnell, Esq., J.P., D.L.; Professor Meldola, F.R.S., F.R.A.S., F.C.S.; and G. P. Hope, Esq., M.A.

It cannot be too emphatically stated or too well known that the institution is for the benefit of the whole county, and not exclusively for that of Chelmsford or any particular district. It must, of course, have a home, and the proposed buildings are to be erected at Chelmsford simply because Chelmsford is a

convenient centre at and from which the important educational work that is contemplated can be best carried out. Express care has been taken in the amalgamation scheme to guard against the county town having a paramount or more than fair share in the management. The institution is to be essentially and really a county one, and it is designed for the assistance of every student, whether a member of the Club or not, desirous of improving himself in natural knowledge, and in contributing to the general well-being of Essex. The total amount of capital required for the Museum scheme is £4,000, and the estimated annual expenditure is £400. Active work can be commenced in the temporary premises when one-fourth of the required capital has been obtained.

The Council appeals strongly to the public spirit of the inhabitants of Essex, and generally to all those interested in science and in its practical applications, to give the financial support necessary to launch and to maintain the Museum, and to help forward the useful and interesting work which will grow up around it.

TECHNICAL INSTRUCTION.—The result of the Club's application for a grant to carry on scientific and technical instruction work in the county has already been set forth in the ESSEX NATURALIST (vol. v., pp. 173-4), and need not be further dealt with here. The Council understands that Mr. Fitch will explain the state of affairs in his annual address.

ADDITION TO EPPING FOREST.—The Council cannot refrain from congratulating the members on the successful issue of the project for obtaining a portion of Highams Park as a part of Epping Forest. Our secretary, Mr. Cole, acted as hon. secretary to the Committee, and very many members of the Club took an active part in the work. The land thus added to the Forest amounted to 30a. 2r. 39p, and it was formally dedicated to public uses by H.R.H. the Ranger on June 6th last. The warmest thanks of all interested in the forest are due to Mr. E. N. Buxton and Sir T. Fowell Buxton, to whose energy and munificence this grand addition to the Essex Woodlands is mainly due.

The present meeting sums up the work of the twelve years' life of the Club. During that period 188 meetings have been held, and a very large number of spots in our county visited. Several important investigations have been undertaken by the Club, and on two or three occasions the Society has been enabled to do good work in protecting Epping Forest from permanent injury. Including the two special memoir series, twelve volumes have been published, giving a total of 3,454 pages of matter, ninety per cent. of which, at least, has had a close relation to Essex. The Council ventures to claim that the Club has, during its tenure of existence, done much really good work, and that it is entitled to claim even a greater measure of support than it has yet received from residents in the county, and from those desirous of encouraging the study of nature, and of local antiquities.

Mr. Fitch retires from the Presidency to-night after four years' active service. The members of the Council beg leave to tender to him their most hearty thanks for his excellent efforts in forwarding the welfare of the Club. Mr. Fitch has ever been most ready to aid the operations of the Council in every way in his power, and his services as Conductor at Field Meetings, and his many admirable contributions to the publications of the Club, have been most valuable and useful, and entitle him to the gratitude of every member of the Club.

In recommending Dr. Laver to take the office vacated by Mr. Fitch, the Council feels that it is serving the interests of the Club. Dr Laver is an original member of the Society, and has always taken an active interest in its proceedings.

Dr. TREASURER'S ACCOUNT OF INCOME AND EXPENDITURE FOR THE YEAR ENDED 31ST DECEMBER, 1891. *Cr.*

	£	s.	d.		£	s.	d.
To Subscriptions, 1887	0	10	6	By Balance from 1890 (excess of Payments over Receipts)	76	4	4
,, 1888	0	10	6	,, Printing and Illustrating 'Essex Naturalist'	132	4	4
,, 1889	1	11	6	,, General Printing, Stationery, and Binding	30	1	9
,, 1890	6	6	0	,, Postage of 'Essex Naturalist' and Circulars, and Officers' Correspondence	33	7	6
,, 1891	211	16	0	,, Incidental Expenses	14	12	0
,, 1892	2	5	0	,, Secretary's Grant for Clerical Assistance	25	0	0
Entrance Fees	17	17	0	,, Rent of Headquarters	20	0	0
Donations	0	14	0	,, Hire of Meeting Rooms	4	8	6
Sale of Publications	3	14	6	,, Purchase of Books, &c.	11	17	8
Balance (excess of Payments over Receipts)	115	6	9	,, Fees and Expenses of Lecturers	4	16	0
				,, Subscriptions to Societies	4	4	0
				,, Loss on Field Meetings	4	15	8
	£361	11	9		£361	11	9

LIFE COMPOSITION ACCOUNT.

	£	s.	d.		£	s.	d.
To Balance from 1890	£125	10	6	By Balance to 1892	£125	10	6

SPECIAL MEMOIRS PUBLICATION ACCOUNT.

	£	s.	d.		£	s.	d.
To Seven Copies of 'Birds of Essex,' at 6s. 6d.	2	5	6	By Balance from 1890 (excess of Payments over Receipts)	8	2	11
,, Two ,, ,, 10s. 6d.	1	1	0				
,, Balance (excess of Payments over Receipts)	4	16	5				
	£8	2	11		£8	2	11

MUSEUM FUND *

	£	s.	d.		£	s.	d.
To Donations paid	29	8	6	By Advertisements	8	6	7
				,, Printing	3	3	8
				,, Postage	8	10	0
				,, Incidental Expenses	3	13	6
				,, Balance in hand	5	14	9
	£29	8	6		£29	8	6

LIABILITIES.

	£	s.	d.
Due for Printing 'Essex Naturalist'	16	2	3
,, ,, General and Museum Printing	11	1	6
Surplus of Assets over Liabilities	125	18	4
	£153	2	1

ASSETS.

	£	s.	d.
Cash in hand and in Bank	13	2	1
Unpaid Subscriptions, estimated at	40	0	0
Furniture, Books, Specimens, &c., estimated at	50	0	0
Stock of Publications, estimated at	50	0	0
	£153	2	1

January, 1892.

Examined with Vouchers and found correct, 16th March, 1892.

WALTER CROUCH, } *Auditors.*
CHARLES RIDLEY, }

* In the event of the Museum Scheme being for any reason abandoned the preliminary expenses will be defrayed jointly by the Essex Field Club and the Essex and Chelmsford Museum Society.

THE ESSEX FIELD CLUB.

ANNUAL GENERAL MEETING AND 131ST ORDINARY MEETING.

Saturday, March 19th, 1892.

THE Twelfth Annual General Meeting of the Club was held at the Loughton Public Hall, at seven o'clock, Mr. E. A. Fitch in the chair.

The minutes of the Eleventh Annual Meeting, held on Janaury 31st, 1891, were read and confirmed.

The Secretary read the Annual Report of the Council for the year 1891 (see p. 65).

Mr. Walter Crouch read the Treasurer's Statement of Accounts, which had been audited by Mr. C. Ridley and himself (see pp. 69). Mr. Crouch stated that the income for the year was £248 5s., and the expenditure £285, giving a loss of £47 5s. This, added to the previous deficit, made a total of £113 6s. 9d. If they had had the whole of the subscriptions in they would have made practically no loss last year. There was really a considerable surplus of assets over liabilities, but it was in kind instead of in money.

The report and statement were received and adopted, on the motion of Mr. C. B. Sworder, seconded by Mr. F. C. Gould.

Mr. Porter and Mr. Day were nominated as scrutineers of the ballot for the election of officers.

At the meeting on January 30th, the following members were announced as retiring from the Council:—Messrs. H. J. Barnes, W. H. Dalton, E. A. Fitch (becoming a Permanent Vice-President), Henry Laver (becoming President), and E. T. Stringer.

To fill the seats so rendered vacant, the following members were proposed for election into the Council, the proposals being duly seconded in accordance with Rule VI.:—Mr. L. Cranmer-Byng, Mr. F. Chancellor, J.P., Rev. W. S. Lach-Szyrma, M.A., Dr. J. C. Thresh, and Mr. T. Hay Wilson. No other candidates having been proposed, these five gentlemen were consequently declared to be elected.

Mr. H. Cohn, one of the members of the Council, having written resigning his seat in consequence of inability to attend the meetings regularly, the members present were requested by the Council to nominate some member to fill the vacancy. On the motion of Mr. Porter, seconded by Mr. George Day, Mr. John Avery was elected.

The scrutineers reported that the following members had been unanimously elected as officers for 1892:—*President*, Dr. Henry Laver, F.L.S., F.S.A.; *Treasurer*, Mr. Alfred Lockyer; *Hon. Sec. and Editor*, Mr. W. Cole; *Hon. Assistant Secretary*, Mr. B. G. Cole; *Hon. Librarian*, Mr. A. P. Wire.

It was also announced that on retirement from the Presidency, Mr. E. A. Fitch became one of the *Permanent Vice-Presidents* of the Club under Rule IV.

[The following therefore constitute the Officers and Council for 1892:—

PATRON.—H.R H. the Duke of Connaught and Strathearn, K.G.

PRESIDENT.—Henry Laver, M.R.C.S., F.L.S., F.S.A.

VICE-PRESIDENTS *(Appointed by the President)*.—E. N. Buxton, J.P., Aldm., C.C., D.L., &c.; Frederic Chancellor, J.P.; Walter Crouch, F.Z.S.; and the Right Hon. Lord Rayleigh, F.R.S., Lord Lieutenant of Essex.

PERMANENT VICE-PRESIDENTS *(Under Rule IV.)*.—Prof. R. Meldola, F.R.S., F.R.A.S., F.E.S., &c. (*President*, 1880-82); Prof. G. S. Boulger, F.L.S., F.G.S. (*President*, 1883-84); T. V. Holmes, F.G.S, M.A.I. (*President*, 1885-87); E. A. Fitch, C.C., F.L.S., F.E.S. (*President*, 1888-91).

OTHER MEMBERS OF COUNCIL.—John Avery; Gen. B. R. Branfill, J.P., C.C.; Miller Christy, F.L.S.; Bryan Corcoran; L. Cranmer-Byng; George Day, F.R.M.S.; Edmund Durrant; F. W. Elliott; A. J. Furbank; F. Carruthers Gould; Andrew Johnston, Chm. C.C., J.P., &c.; Rev. W. C. Howell, M.A.; Rev. W. S. Lach-Szyrma, M.A.; Thomas J. Mann; Charles Oldham; J. H. Porter; J. C. Shenstone, F.R.M.S.; J. C. Thresh, D.Sc., M.B.; F. H. Varley, F.R.A.S.; T. Hay Wilson; Rev. W. L. Wilson.

HON. TREASURER.—Alfred Lockyer.

HON. SECRETARY AND EDITOR.—William Cole, F.E.S.; ASSISTANT HON. SECRETARY.—B. G. Cole

HON. LIBRARIAN.—A. P. Wire.]

The Secretary read a letter from Dr. Laver, in which he apologized for his inability to attend that evening, in consequence of professional engagements. Dr. Laver added: "I esteem very highly the compliment the Club has paid me in choosing me as President, and I will try to keep up during my year of office the high character the society has obtained."

Mr. Sworder proposed a vote of thanks to the officers and auditors, which was carried unanimously.

The Secretary presented the accounts of the "Tea Fund" for 1891. The receipts had been £1 16s. 10d., and the expenditure £2 2s. 5d.

Mr. Fitch then delivered an Address, of which the following is an abstract:—

PRESIDENTIAL ADDRESS, DELIVERED AT THE 12TH ANNUAL MEETING.

By EDWARD A. FITCH, F.L.S., &c.

[*Abstract.*]

Mr. Fitch commenced by observing that, although it was usual in most Societies of a like nature with their own for the President to deliver an address on some matter of scientific interest, he was not at all sure that such a course was the best that could be followed. He rather inclined to the opinion that the retiring Presidents could most usefully employ the occasions of the Annual Meetings in reviewing the events of the past sessions, and in suggesting lines of work for the future.

One of the most important matters at present engaging the attention of the Club was the proposal to establish an Essex Local Museum. The question had been fully considered at the last Annual Meeting, and an admirable scheme had been agreed upon. As the result of the appeal for funds issued by the Joint Committee of the Essex Field Club and the Chelmsford Museum, between £300 and £400 had been promised; but the Committee were of opinion that actual work could not be commenced until £1,000 had been promised. But an opinion was entertained by many members of the Club that the best way of attracting pecuniary and other aid would be to commence active museum work at once, and, speaking for himself, the more he considered the matter, the more he was in favour of amalgamating with the Chelmsford Museum at once, and then making a vigorous effort to raise the funds for the new building. While commencing active museum work in the rooms at Chelmsford and showing the necessity for the new departure that the Club is desirous of making—even in a small way and with limited resources—he believed they could so demonstrate the nature of the collections proposed to be formed that their efforts would be appreciated.

The Chelmsford Museum had about 180 members, and the Club had about 400. At present one did not move and the other did not move, but if they were amalgamated there would probably be a greater incentive to go on. Pending the erection of a museum they could take over the present museum building at Chelmsford, and the good work might be at once begun. He thought they would then get outside support, and be in a position to build a museum building beyond the capabilities of the present premises. He read with very great regret the suggestion by the Chairman of the Essex County Council that the county records should

be taken from Chelmsford to London. It would be a very great pity if an attempt were made to do this; it would be the first step towards making Essex a mere appanage of the great metropolis. What could be better than to have a museum built in the county town by the Field Club, where a room or rooms could be provided for the county records? Now that County Councils were the order of the day he believed that a county record office would be a very suitable portion of the county museum. Into this all Essex historical and genealogical manuscripts should be gathered, and they should be under proper control and open for inspection under the conditions obtaining in the British Museum and the Rolls Office. Mr. Fitch read an extract from the 'Antiquary' for January last, stating that under the New District Councils Bill, County Councils would probably have to provide county museums and libraries. He suggested that this probability should spur them on to amalgamate with Chelmsford and form a county museum, and so secure the support of the County Council in the event of the duty being cast upon the county authority of providing a museum, so likely to happen as soon as we had a newly-elected parliament.

Mr. Fitch next dealt with the subject of Technical Instruction in Essex and the part that the Club had taken in it. He said he much regretted that the well-thought-out scheme which was so heartily approved at the last Annual Meeting was not adopted by the County Council Committee. In its place they appointed a Committee consisting of six members of the Technical Instruction Committee and six members nominated by the Club, who were known as the Organising Joint Committee. This authority had done much in arranging for and providing higher education in various parts of the county. Mr. Fitch gave the details of the classes and lectures that had been held in forty-seven centres under the auspices of this Joint Committee, with Mr. William Cole as Secretary. A considerable amount of scientific apparatus had been purchased (costing upwards of £400), for the selection of which technical knowledge was indispensable, and the county had profited much by the gratuitous advice rendered by members of this Club. The experience of this Committee had shown that there was a distinct desire in many localities for this teaching to be continued and further developed, and from the reports of the lecturers really valuable results that must contribute much to the intellectual and social improvement of the inhabitants of this great county had already been obtained. He then demonstrated how seldom it was that Joint Committees were satisfactory, and various causes had made it evident that such was the case here; in future, six members of the Club would be added to the Technical Instruction Committee, and there was every probability that the good work already begun would continue to grow, as was most desirable, and the Club would be recognised through its representatives.

Proceeding, Mr. Fitch said that if anything could be done to raise the status of Essex he believed it would be by the finding of coal in the county. He was not a geologist, but from what he had gathered he believed that there was every prospect of finding coal in their own county. If their Club had not been burdened by other schemes, he would have proposed that the Club continue the boring at Wickham Bishops, on land belonging to the county, another 200 feet, because if coal was there it would be found at a depth of about 1,000 feet below sea level. They had good reason to believe a seam extended across the county, and Wickham was well within the limits of the seam. He believed the work could be done for some £200 or £300—it would not exceed £500—and if, with the permission of the County Council, they undertook the work and were successful, the success of the Essex Field Club would be assured for all time. Ere long he might bring the matter again before the Club. Its importance to the future wealth and progress of the county, should coal be discovered in seams of workable thickness, could scarcely be over-estimated. Experimental or trial borings, under good scientific advice, should certainly be made in Essex, considering the results that have lately been arrived at near Dover. If coal existed under Essex, it was not at a depth prohibitive of its being successfully worked. In conclusion, Mr. Fitch thanked the members for their support during the four years he had been President, and bore testimony to the qualifications of Dr. Laver for the office. [Applause.]

AN EDITORIAL APPEAL.

THE Editor is very glad to say that with the issue of the present number of the ESSEX NATURALIST, the publications of the Club are quite up to date. In order that the *monthly publication* may be maintained with a reasonable expenditure of time and labour, the Editor most earnestly pleads for a greater meed of helpful co-operation on the part of the main body of the members, and naturalists generally, than has hitherto been afforded to him. Not only are longer and more important memoirs desired, but the greatest aid would be given by the communication of SHORT PAPERS, NOTES, and of books, periodicals, newspapers, &c. (*or extracts from the same*), containing matter (reports, captures, natural history, antiquarian or other "finds," topographical descriptions, news of the exposure of geological sections, &c.), likely to be useful for the NATURALIST or for the information of the council and officers.

The Editor will VERY GRATEFULLY receive promises from members and others of *systematic searching of periodicals, &c., for such information as above.* If extracts are sent they should be in a form as nearly as possible for publication. MSS. should be written on *one side of the paper only*, with *wide* spaces between the lines, and with *wide* margins.

DRAWINGS intended to illustrate papers should be in *very black ink* (Indian), with clearly drawn lines, on pure white card, and somewhat larger than required, so as to allow for photographic reduction. They should be sent through the post, *unfolded*.

It is *desired and expected* that the CONDUCTORS of FIELD MEETINGS and other Excursions *will themselves write a short report*, describing the country traversed, buildings visited, objects noted, &c., and giving the substance of any demonstrations given, either in the field or in a museum, and will forward the same to the Editor as soon as possible after the excursion. The Editor finds the task of describing the excursions far too heavy, and besides, reports written by Conductors specially acquainted with the districts visited, or objects seen, will have a freshness and value necessarily wanting in a mere compilation.

It would greatly assist if exhibitors of objects at meetings would themselves prepare short descriptions of them for publication, and hand the same to the Secretary *at the meetings*.

Address: Mr. W. COLE, Editor of ESSEX NATURALIST, 7, Knighton Villas, Buckhurst Hill, Essex.

A SELECTION FROM MESSRS.

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OF THE

ESSEX FIELD CLUB.

EDITED BY

WILLIAM COLE,

Honorary Secretary.

Contents.

The authors alone are responsible for the statements and opinions contained in their respective papers.

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For particulars of Publication of Part 2, Vol. IV., "Proceedings," see page 2 of Wrapper.

Attention is called to the APPEAL for aid for the NATURALIST on page 3 of Wrapper.

NOW PUBLISHED, AND READY FOR IMMEDIATE DELIVERY.

"JOURNAL OF PROCEEDINGS OF THE ESSEX FIELD CLUB."

VOL. IV., PART 2.

Edited by WILLIAM COLE, *Hon. Secretary.*

THIS Part is now published, and copies can be obtained at once by application to the Librarian. It contains extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of "Proceedings"), after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of "Transactions" and "Proceedings" combined, with single Title-page for each volume, and one volume each of "Transactions" and "Proceedings" with separate Title-pages, together with various Appendices.

The volume is, of course, *absolutely indispensable* to COMPLETE THE SET OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE CLUB, which will then consist of five volumes.

The printing of the limited edition of the part will cost about £50, and the Council has fixed the price at 5s. to Members, and 6s. 6d. to Non-members, post free (nett).

It is hoped that every Member will take a copy, and thus prevent serious loss to the Club by reason of the absolutely necessary expense of the publication of the work.

The sequence of the parts forming the old series of "Transactions" and "Proceedings" is set forth on the Wrapper of the above Part, and a full list of the Publications of the Club will be found on Wrapper of ESSEX NATURALIST for January-March, 1892.

FOR COPIES APPLY TO MR. A. P. WIRE, 1, SEATON VILLAS, BIRKBECK ROAD, LEYTONSTONE, E.

Prof. Meldola said that they could not allow Mr. Fitch to retire from the Presidential chair which he had so admirably filled for four years without expressing their hearty appreciation of his services. Mr. Fitch had done his best to make their Club a county club, and they had been more widely recognised during his presidency than at any other period during the twelve years' life of the Club. There were many points in Mr. Fitch's remarks about which he should like to speak, particularly the burning question of technical instruction, but remembering the peculiar position of the Club with regard to that most important matter he thought it would be best to imitate Mr. Fitch's reticence. Prof. Meldola concluded by proposing a very hearty vote of thanks to the retiring President for his constant and successful efforts to advance the interests of the Club during his four years of office.

The vote was carried amid hearty applause.

Mr. Fitch thanked the members, and said, although he hoped that the past four years had been years of progress, he looked upon the Club as being only in a transitional stage, and he anticipated that further advance would soon be made.

An Ordinary Meeting (the 131st) was then held, Prof. R. Meldola, F.R.S., *Vice-President*, in the chair.

Dr. Lewis Jones, Mr. D. A. Pelly, and Mr. C. F. Rea, B.A., B.Sc., were elected members of the Club.

Mr. Wire read the list of additions to the Library, and asked for help by means of donations of books and money. He stated that the library was already of considerable value, that many books were awaiting binding, and the rapidly accumulating pamphlets should be classified, and put into pamphlet cases.

Mr. Walter Crouch exhibited two shells of a handsome scallop from Mauritius, which has recently been described as a new species under the name of *Pecten crouchi*, by Mr. Edgar A. Smith, F.Z.S. (An. and Mag. Nat. Hist., March, 1892). The type which is in the British Museum Collection is somewhat smaller than one of the specimens in Mr. Crouch's cabinet. This brightly coloured bivalve is especially remarkable for the deep ribs and delicate tubular structure of the external surface of the shell.

Mr. Crouch also exhibited, on behalf of Mr. W. Allen, a series of shells of *Helix virgata* from Southend, and two shells of *Limnæa auricularia*, which were taken in a pond at High Beach last year by Mr. G. K. Guch.

He also exhibited a pair of claws, a portion of the vestigial hind limbs of the Indian *Python molurus*, taken by Mr. Allen from one of the eight specimens found on the 6th December in a ditch close by the Beckton Road Board School. These pythons measured in length from six to eight feet. How they came there is unknown, but Mr. Crouch opined that they had either escaped, or, being found dead, had been thrown overboard from some vessel on her way up to the docks, and had then been washed into the ditches.

Mr. Walter Crouch, F.Z.S., read a paper entitled "Notes on Two Days' Trawling and Dredging on the River Crouch." The paper was fully illustrated by preserved specimens of the species observed, and by numerous drawings and diagrams. [See p. 81.]

In proposing a vote of thanks for the paper, Prof. Meldola said that such work was very valuable as showing the extent of the riches of the marine fauna of our coast and estuaries. It was remarkable that very little had been done in this way by local societies. In this the Essex Field Club was setting an example

and he might instance also Prof. Herdman's work in connection with the Liverpool Marine Biological Committee. He hoped that the matter would be followed up by the Club in a systematic way.

The discussion was continued by Mr. F. C. Gould, Mr. Crouch, and others, and the meeting terminated with the usual conversazione, at which numerous specimens were exhibited.

Spring Ramble in Epping Forest.

Saturday, April 30th, 1892.

A pleasant ramble through parts of the forest little known to some of the members was taken on this afternoon, mainly for the purpose of calling the Club together for the opening of the summer meetings, and to receive a practical demonstration, under Prof. Boulger's guidance, of the effects of pollarding, as pursued until the last few years, on the recent growth of the hornbeams. The main body of members started from Chingford Station about three o'clock, traversing Chingford Plain, Fairmead, Hill Wood, etc., to High Beach, where a party coming from Loughton was met, and two of the verderers, Sir T. Fowell Buxton and Mr. P. Gellatly, joined the assembly. At Fairmead Bottom a herd of the forest deer was seen. The woods were very pleasant, the trees and bushes just bursting into leaf, and the air was warmed by the brilliant sunshine; but the backwardness of the season was very marked, and insects were few. The only butterfly seen was *Pieris rapæ*, although *Euchlöe cardamines* and *Gonopteryx rhamni* had been seen in the Nazing lanes a week previously. The cuckoo and the nightingale were heard.

From the "King's Oak" the way was led through Honey Lane quarters to Woodreden Hill, by the rustic spring, and so to the high spot just above it, whence a fine view was obtained over the Lea Valley into Hertfordshire, etc. Several interesting discussions were raised during the ramble in connection with the growth of the trees, the formation of "lawns," etc. It had been asserted by old inhabitants of the forest that if blackthorn bushes are cut down they do not reappear; but Sir Fowell Buxton pointed out an instance by the rifle butts where the blackthorns had been cut, but where they were again asserting themselves with rapidity and vigour.

Several botanists besides Prof. Boulger were with the party—Mr. J. T. Powell, author of the interesting paper on the flowering plants of the forest, in our January number, and Mr. C. Browne, Hon Counsel to the Club; but very few interesting plants were noticed. The Butcher's Broom (*Ruscus*) was abundant, and all were glad to note that the primroses had not been quite exterminated in the Honey Lane woods, but were springing up again in some numbers; beautiful patches of woodsorrel, with its delicate flowers, were to be seen all over the woods, and a specimen of the Spurge Laurel (*Daphne laureola*) had escaped the hand of the spoiler. Mr. Powell collected fertile spikes of *Equisetum maximum* and *E. pratense* in good condition.

A halt was called on the crest of the hill to listen to an address from Prof. Boulger, entitled, "Pollards and their Management, with special reference to the Hornbeam" (the text of this address will be given in the next number of the Essex Naturalist).

Sir T. Fowell Buxton, in thanking Prof. Boulger for his address, desired to point out that whatever was done in the forest, there was always a *per contra* to

be urged on the other side. "Lopping" and "topping" of pollards had been stopped; we had lost the beautiful effects of the brown leaves remaining on until the spring greenery appeared; while some of the best of the distant views were hidden (as, for instance, from the spot where they were then assembled) by the fifteen or twenty feet of growth that the pollards had now to bear. He feared that this increasing weight would prove too much for some of the old stems, and, as in several parks in Hertfordshire, they would be broken by wind or falls of snow.

Mr. Gellatly seconded the vote of thanks, which was carried by acclamation, and Prof. Boulger having briefly acknowledged the compliment, the members of the party made their way in quest of tea to Copt Hall Green Farm (the "Rose and Crown"), where, in a little hall in the garden (by the side of the Cobbin Brook) that refreshing meal awaited them.

After tea, an ORDINARY MEETING (the 132nd), was held, Prof. R. Meldola, Vice-President, in the chair. The meeting was intended for the proposal of new members, but a short discussion was initiated by the chairman on the growth of the hornbeam after lopping, in which Prof. Boulger took part, and Mr. W. Cole reminded the members the hornbeam formed a large part of the woodlands near Monken Hadly, near Barnett, on the other side of the Lea Valley.

The meeting shortly afterwards broke up, the members walking or driving through the forest to Theydon Bois, Loughton, Chingford, etc.

NOTES—ORIGINAL AND SELECTED.

Ancient Red Deer's Skull found at Colchester.—In excavating for the new cellar of the "Nelson's Head," West Stockwell Street, Colchester, the workmen came upon a quantity of pottery, building materials, and other rubbish of the Roman period. Amongst this rubbish was the portion of the skull and antlers of the Red Deer. This is, I think, worthy of a note, from its massiveness compared with the heads of deer of the present day. The measurements are: circumference of the permanent bony base, below the burr, 7 inches; just above the burr, 9 inches; above the brow antler, 9½ inches; around the bez antler, 5½ inches; between the bases of the antlers, close to the skull, 3 inches; across the occiput, just above the *foramen magnum*, 6½ inches. I could not get a satisfactory measurement across the eyes, in consequence of the damaged state of the skull, but it must have been considerable. The circumference of either the brow or bez tines, would be quite equal to the beam of the antler of a Scotch deer of the present time. The development of these ancient deer may, I suppose, in a great measure, be accounted for by the plentiful supply of good pasturage they could obtain in the extensive forests of that age.—HENRY LAVER, F.L.S., *Colchester*, May 7th, 1892.

Rooks Deserting Old Homes.—Some four or five years ago, when an estate near Great Bardfield changed hands, a group of oaks standing in a pasture were rather conspicuously marked and numbered for felling. These trees were the ancestral homes of a colony of Rooks, who, generation after generation had built their nests upon the upmost branches, and year after year had reared their families there. Can anyone tell me why, when the trees were marked, these

rooks, apparently aware of some impending change, deserted their old home for another wood near by; and, though the trees have not been taken down, they have never yet returned to them?—(Mrs.) J. SMITH, *Great Saling.*

An Albino Coot at St. Osyth.—Mr. A. B. Farn, of Mount Nod, Greenhithe, writes in the "Zoologist" for April:—"On June 1st, 1891, I received in the down and in the flesh an Albino Coot, *Fulica atra*, from the neighbourhood of St. Osyth. It was probably not more than four or five days old. The crimson and yellow hair-like processes on the head were as in an ordinary immature Coot of similar age. The legs were pale orange and the eyes red. With these exceptions the bird was white. Retaining the crimson and yellow on the head appears to me to be a curious circumstance."

Salmon and Salmon Trout at Heybridge.—We take the following from the "Essex Weekly News" of April 8th, 1892:—"On Sunday morning, George Clarke captured a salmon trout at the mouth of the locks at Heybridge Basin, where the Chelmer Navigation joins the river Blackwater. The tide was low at the time, and Clarke caught the fish with his hands, lying bodily on it in order to secure his prey. The fish scaled 10 lbs.

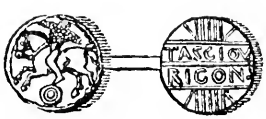
"On Monday afternoon, a well-known fisherman named Hayward, while working his nets above Fullbridge, caught a splendid salmon weighing 22 lbs. The fish made a bold stroke for his liberty, and soon broke through the net; but Hayward, aided by the ebbing tide, was enabled to get him into the net once more and to keep him there till transferred to his punt.

"The fish were sold to Mr. O. A. French, fishmonger, Maldon, and pronounced by him to be in excellent condition, meeting with a ready sale."

Paludestrina (Hydrobia) jenkinsi.—An interesting note, by Mr. B. B. Woodward, F.G.S., etc., on the radulæ of *P. jenkinsi*, Smith, and *P. ventrosa*, Mont., with illustrations of each, appears in "The Annals and Magazine of Natural History," for May, p. 376. The differences which obtain in the shape and number of the teeth give an additional confirmation to the validity of the new species. In *P. jenkinsi* the number varies from 420 to 490; whilst *P. ventrosa* shows from 280 to 315. Reference is also made in the note to my figure of *P. jenkinsi* in E. N., iv., p. 214.—WALTER CROUCH, May 3rd, 1892.

Stratiotes aloides at Great Saling.—I find that this plant still grows in the pond near Pattiswick Hall as described by Gibson in his "Flora of Essex." I have known it to grow there for nearly fifty years.—(Mrs.) J. SMITH, *Great Saling.*

Roman and British Coins found near Epping.—Mr. Benjamin Winstone has sent us the following extracts from the "Gentleman's Magazine," for 1821 (page 66), which he thinks likely to be of interest in connection with enquiries as to the character and age of the various pre-historic remains in the neighbourhood. Mr. Winstone has kindly presented the block of the coin here given:—



"Mr. John Barnard of Harlow, Essex, has favoured us with a British coin

which is not in Mr. Reeding's work, nor in Pegge's 'Essay on the Coins of Cunobeline.' It was lately found near Epping: the Metal is Electrum; its weight 5 dwts. 10 grs.; on one side is represented a man in Armour on horseback; on the reverse, Tasciovricon.[1]

"Near Harlow, Essex, are the remains of a Roman station, not yet noticed by antiquarians. The Castellum, or place of strength, appears to have been in the neighbouring Parish of Latton, on an Elevated field which was formerly almost surrounded by the waters of the River Stort. The works are not now Visible, but a few feet below the surface are the foundations of very strong walls.

"It is not improbable that this was one of the forts formed by the Romans to defend the Trinobantes from the Cateuchlani; as the Stort here, and, for some distance up its course, divides the Counties of Essex and Herts. This Conjecture is rendered more plausible by the appearance of four of these stations on the Essex side of the River, in the short space of nine miles—viz., this at Harlow or Latton; one at Hallingbury, called *Wallbury*, distant four miles; one at Bishop Stortford, three miles, and another at Stanstead Mount-Fitchet, two miles further.

"Perhaps some of our Antiquarian Readers can assist in discovering the Roman name of this Station at Harlow; it is distant from London 23 miles, from Cheshunt 12 miles, and from St. Albans, or Verulamium (24) twenty-four miles.

"Amongst the Antiquities found here (most of which are in Mr. Barnard's possession) are, a small bronze head of Silenus, of very good Workmanship; a large bronze brooch, and fragments of a Cup of highly polished red ware, and on the outside of which are figures of a Cock and Triton, found in a grave eight or ten feet deep.

"*British Coins.*—A helmeted head with Cunobilini; reverse, a hog[2] and Tasciovanit.—Another with a head on one side; on the other a man striking upon an anvil.—One with a star, between the rays of which are the letters Verlamio; reverse, an Ox.[3]—Another similar, except that the head of the Ox is turned the Contrary way—and two or three others not intelligible.

"*Roman Coins.*—Silver, of Sabina, Tautus the Elder, and Constantinus Junr.

"*Brass.*—Various sizes and Various Emperors, from the first Claudius to Valentinian—in all, upwards of 200."

Ancient Remains at Shoebury.—"The well-known camp at Shoeburyness on its first establishment, was placed within the entrenchments of the Danish fortress mentioned in the Saxon Chronicle [see Mr. F. C. J. Spurrell's paper on 'Hæsten's Camps at Shoebury and Benfleet, Essex,' ESSEX NATURALIST, vol. iv., pp. 150-153], and previous to the Danish occupation the district appears to have been a favourite dwelling place with the earlier inhabitants of this country, for at various times considerable numbers of Celtic weapons of the Bronze period have been unearthed, besides palæo- and neolithic implements. In fact, the whole district is rich in antiquities, Roman pottery and weapons and Saxon and Danish remains having frequently come to light. Lately the military authorities have been forming a new road near the artillery barracks, and in

1 "In consequence of the connection between the names of Cunobeline and Tascio, those coins which bear the latter name, without the former, are usually attributed to that monarch."—"Reeding on Coinage." Vol. i., p. 200.

2 Engraved in Reeding, Pl. 5, Fig. 23.

3 *Ibid*, Fig. 3.

doing so found the oven or kiln mentioned by Mr. W. H. King, in his paper at the recent meeting of the Essex Archæological Society at Colchester. In its immediate vicinity a vase was found containing some bronze celts and an armilla, and these have been secured for the British Museum. Possibly they may have been a portion of the stock-in-trade of a merchant or founder, as there was "a lump of metal with them."—From the "Antiquary" for April, 1892.

Early Pottery at Clacton-on-Sea.—"During last week, as some men were engaged in digging gravel on Mr. P. Smith's farm at Bull Hill, they found three vases in the red gravel three feet from the surface. They were found on different days. The first was unfortunately broken and the others injured. They appear to be early British or pre-Roman. One measured 5 inches in diameter, and was 6 inches in height. The shape is that of an ordinary water-bottle, only with a larger neck. The outside is of a beautiful red colour, and very smooth. The ornamentation is very regular, and the design is very primitive. The interiors are rough, and underneath the red outside is a layer of black clay. Fragments of unburnt pottery were also found; and from the nature of the upper strata, in which are many calcined stones, it is possible that a pottery may have existed on the spot."—From the "Essex Standard," May 7th, 1892.

Palæolithic Implement at Felstead.—On the 27th April, I found on the left bank of the Ter, near Peak's Hall, Felstead, a well worked Palæolithic Implement. It is 3 inches long, 2 inches wide, and 1 inch thick; shaped to a chisel point at one end, and has a butt adapted to the hand at the other end. It is of flint, and has a white lustrous coating. This is the second Palæolithic Implement I have found resting on a denuded surface of Boulder-Clay; but how it got there there is no evidence to show.—J. FRENCH, *Felstead.*

County Museums.—The following is the paragraph from the "Antiquary" for January, referred to by Mr. Fitch in his "Presidential Address," *ante* page 72. With regard to the suggestion for the circulation of objects among villages and other districts, attention may be called to the suggestive paper by Mr. F. W. Rudler in our last volume on "Cabinets of Natural History Specimens for Circulation among the Village Schools of Essex" (E. N., vol. v., pp. 186-189), where the idea is admirably set forth:—"We have good reason to believe that when the question of district and village councils comes before Parliament in the ensuing session, or, as is more probable, in the newly elected Parliament, a proviso of considerable interest to antiquaries will be inserted in the bill. It will be proposed that the County Council shall be instructed to provide a central museum and library for the area of the county, and that the museum objects and books shall circulate from time to time to village halls or smaller local centres. No doubt in the minds of the proposers of this scheme 'museum objects' would primarily mean such substances and raw and manufactured material as illustrated the particular industries and trades of the district; but archæological objects have not been forgotten. It would add immensely to the study of the past if a general notion of the nature and appearance of pre-historic implements, early pottery, coinage, and the like, could be spread throughout our country districts by the circulation of carefully chosen specimens."

ANCIENT REMAINS AT EPPING, ESSEX.

By C. B. SWORDER.

[*Read January 30th, 1892.*]

ON December 19th, 1891, hearing that some Roman tiles had been unearthed by workmen employed in moving clay for brickmaking in a field called Solomon's Hoppet, the property of S. Chisenhale Marsh, Esq., of Gaynes Park, I went to the spot at once. The land is now in the occupation of Mr. Styles, whose grandfather opened the ground for brickmaking about 100 years ago. Unfortunately, the men had already destroyed nearly the whole of two walls which were about twenty feet long, two feet high, and two feet apart. At one end the walls were returned, and the intermediate space was floored with concrete-like material so hard that the pick was broken by the workman when trying to get through it.

Part of the floor had a layer of flint stones, but these were all removed and thrown into a heap with broken tiles, so that no particulars of position could be taken.

The remainder of the space between the walls was filled up with ashes and wet clay, the whole being about three feet below the surface, and in a bed of clay which had not been moved. The walls consisted of layers of tiles of various thicknesses from one to two inches, the intervening substance seeming more like clay than mortar, that nearest the ashes being harder, but both tiles and mortar were very soft and brittle, so that not a single whole tile was saved; however, a few were carefully put together, from which the following dimensions were taken, but they varied slightly in size and thickness. Length fourteen inches, width at one end twelve and a-half inches, the other end ten and a-quarter inches, upon each side a flange two inches high extends nearly the whole length, but cut off one and a-half inches from the wide end, and two inches from the other, evidently for overlapping, but no sort of projection to hang the tile upon a lath could be found.

These are roofing tiles, the projecting flanges of adjoining tiles being covered by a semi-circular ridge-tile, which bound them together and excluded the wet; nearly all bear a hand-mark upon one side, but scarcely two are alike. Many bear the impression of the foot-prints of dogs, goats, etc. Besides these were fragments of flue pipes marked with lines in various designs; no whole pipes could be found, and these pieces were built into the walls.

A fragment of a lipped circular vessel in dark ware of Roman make was also found.

Mr. Styles gave me a small vessel of red ware which was found a few years ago, which having been played with by children is somewhat worn at one end, so that the shape cannot be very well determined; but it is cup shaped, five and a-half inches in diameter, one and three-quarter inches deep inside, the lip having knife marks radiating irregularly from a hand moulded ridge to the outer edge. Below the lip the sides are contracted in a cone shape, the surface showing that a knife was used in a perpendicular direction to form it. Just below the lip are three lines not equidistant, and below these some straight cross lines, evidently, like the others, cut with a knife; the bottom gives only slight signs of being somewhat enlarged for the foot or pediment.

Mr. Franks, of the British Museum, considers this unique example to be false Samian ware, of British or Roman local make.

About forty years since a large quantity of burnt earth was removed from this yard to an adjoining farm, having been discovered about fifty feet from the spot where the remains above described, which I look upon as a kiln, were unearthed.

EPPING FOREST RUBI.

By J. T. POWELL.

PART III.—FURTHER ADDITIONS.

[*See* ESSEX NATURALIST, *Vol. III., p.* 20; *and Vol. V., pp.* 189-190.]

THROUGH the kindness of the Rev. W. Moyle Rogers, F.L.S., I am able to record some additions to the list of Forest Brambles.

I mentioned in my last paper (ESSEX NATURALIST, vol. v., p. 189) that one elegant but puzzling little *Rubus* had received three different names. A specimen of this form was forwarded by Mr. Rogers to Dr. Focke, the greatest European authority on the genus, who named it *Rubus hystrix*, Weihe, var. This nearly agrees with Professor Babington's determination, and may be accepted as conclusive. Thus a difficulty is cleared up and another name added to the Forest list.

A very distinct-looking Bramble found on both sides of the Epping Road towards the Wake Valley turns out to be *R. fuscus*, W. and N. This name is not in the "London Catalogue of British Plants," and is, I believe, a new record for the district. Also near the Wake Valley Pond I found a bush or two of a very striking form which I had not seen before. This proved to be *R. corylifolius*, var. *conjungens*, Bab. The commoner variety of the same species, *sublustris*, Lees, is found about Leppitt's Hill and elsewhere; and was included in my first paper (ESSEX NATURALIST, vol. iii., p. 20) under the aggregate name. Two other forms, possibly hybrids, have not, up to the present time, been satisfactorily referred to any known species.

The nomenclature of the *Rubi* is in so transitional a state that one or two of the names given in my previous reports, on the authority of the "London Catalogue," eighth edition (already out of date so far as the Brambles are concerned), will have to be changed. This revision it will be well to defer.

The additions are :—

R. hystrix, Weihe, var.		High Beach to Wake Arms.
R. fuscus, W. and N.		Epping Road.
R. corylifolius, Sm.		
	var. a. *sublustris*, Lees.	Leppitt's Hill, etc.
	,, b. *conjungens*, Bab.	Wake Valley.

NOTES OF TWO DAYS' TRAWLING AND DREDGING IN THE RIVER CROUCH, OCT. 10th AND 15th, 1891.

By WALTER CROUCH, F.Z.S., *Vice-President.*

[*Read March 19th, 1892.*]

TRAWLING and dredging, whether in the deep and open sea, off the coast, or in an estuary, is, at all times, an exhilarating and fascinating occupation; and it is one of yet greater interest when pursued in any locality from which but few records have been made, such as the eastern coast-line of our own county.

There is abundance of labour, and often personal discomfort, in the work; but the marine naturalist who loves "the inexpressible sweetness of old ocean's breath," and the wondrous and beautiful world of life which exists therein, can brave all this for the pleasure of learning, and of beholding some of the secrets of the sea; for

> "Only those who brave its dangers
> Comprehend its mysteries."

But apart from the hard and often dirty work, must also be counted the cost of purchasing or hiring craft, and the necessary appliances, including the

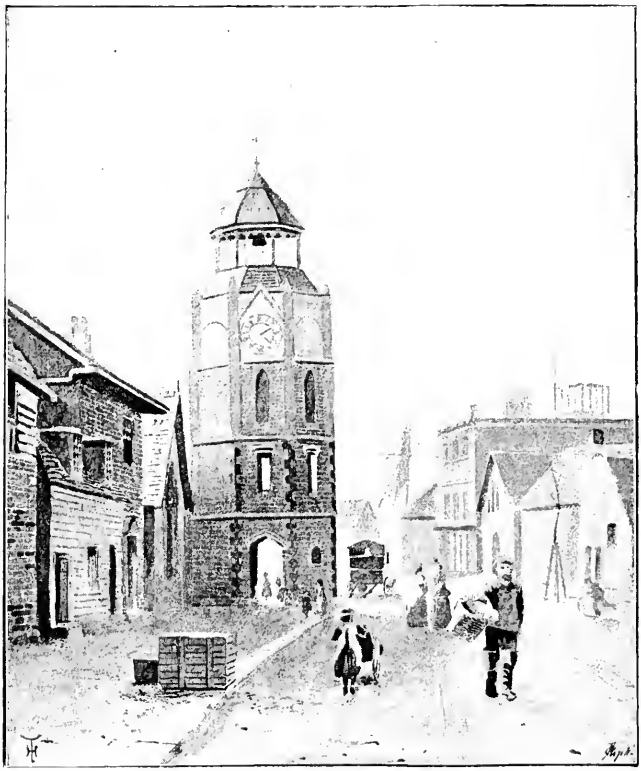
> "Naturalist's dredge, with its iron edge,
> And its mystical triangle,
> And its hided net, with meshes set,
> Odd fishes to entangle."

This same question of cost has, no doubt, prevented many students of biology from taking up the study, and working at marine forms.

Therefore, are our thanks especially due to our good friend, Mr. John Rogers, of "Mangapp," Burnham, for again placing his yacht "Fame," and its experienced crew, at our disposal, with the necessary apparatus, and also a well-stocked basket of creature comforts to help lighten the toil, and renew the strength. Thereby Mr. E. A. Fitch and I had again the opportunity of working in the Crouch and Roach Rivers; and he, having given us last year the results of our one-day trip (see "A Day on the Crouch," ESSEX NATURALIST, vol. v., pp. 145-152), has left to me the honour of preparing these notes of the two-days' cruise.

On the first day, we left Maldon early, and, as we passed near

Southminster, on the way, Mr. Fitch pointed out a fine growing crop of mangolds, which were thriving on the flesh of the whale which was taken earlier in the year at Burnham. (E. N., v., pp. 124-128.)

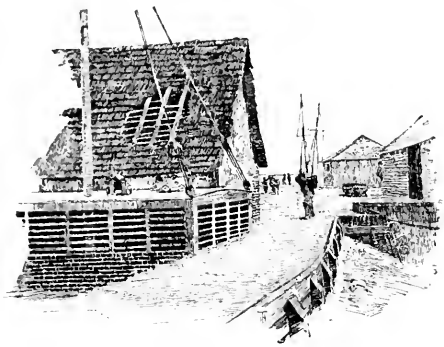


School House and Clock Tower, Burnham.

At "Mangapp" (which, by the way, is a fine old house, somewhat resembling Upminster Hall), we surrendered to our host, who drove us down to Burnham Quay; and we were soon safely on board his new centre-keel, well-deck yacht, "Ilka," scudding away under sail and spinnaker to Cricksea Ferry, where we brought up alongside the "Fame."

So far, all was well; but the threatening clouds soon fought against us, sending down their unwelcome hosts in the shape of heavy rain, which continued more or less all day, somewhat spoiling

our enjoyment; but the sea was calm—too calm, in fact—and the process of examining the contents of trawl and dredge was carried on under decidedly watery conditions. Most of the takings had been already recorded on the previous occasion, but a few fresh forms turned up; and we saw, during the afternoon, a promise of hope in a fine double rainbow.



Oyster Pit, with Flagstaff and Miniature Cannon, on the Quay, Burnham.

On returning, our host and his wife entertained us right well, and then, though our garments were still moist, our spirits were not aweary, and we trotted back the twelve miles to Maldon, with the *spolia opima* from the river bed.

But before starting homeward, we had arranged to have another and a brighter day; and had fixed the following Thursday for the venture. Meanwhile, the violent and destructive gale of the 13th had occurred, and throughout all the night of Wednesday there were heavy winds and rain: and on our arrival at the quay at Burnham the river was very high with full tide, the wind blew hard, and the water running with white-flecked waves. We soon boarded the "Fame," however, and, hoisting sail, began another day's work. Though the waters were rough, we kept the dredge and trawl down nearly all the time, sailing between Fambridge and Cricksea Ferries. On one occasion we nearly lost the trawl, and on another had a narrow shave of running our bowsprit into a large stack barge of hay and straw, which was moored off the shore.

Taking all together, I think that our chief captures on both days were of fish, of which we got a large quantity. It was not these, however, we went to collect: but, as they belong to the Vertebrata,

and being withal of gastronomic importance, they shall have first mention.

The most abundant catches were of the various kinds of flat fish. Plaice (*Pleuronectes platessa*) and Dab (*P. limanda*) were exceedingly common, one of the latter being of large size, about thirteen inches in length. We also took two Flounders (*P. flesus*), and several Brill (*Rhombus lævis*). Of the Sole (*Solea vulgaris*), only three slips came up.

Some young Dogfish, or "Topers" (*Galeus vulgaris*); with the empty capsules ("*pixy-purses*") of the young fry, and a goodly number of Skate (*Raia clavata*), but all small "maids." When large they are termed "thornies" or "thornbacks," from the spines on the back, which are very large and sharp.

We also took three Suckers, "sea snail" (*Liparis vulgaris*); a few Bull rout (*Cottus scorpius*); the Pipe-fish (*Syngnathus acus*); and one Butterfish or Gunnel (*Centronotus gunnellus*), $5\frac{1}{2}$ inches in length.

Of the Invertebrate forms, I will first mention the Mollusca.

On the last occasion (E. N., v., pp. 149-151), twenty-two species were recorded, and of these eleven again occurred, those which were new numbering eighteen. So that we now know forty species in these waters. This result seems very poor; but conditions were not favourable for obtaining the very small species which must occur, the mesh of the dredge being too large to retain many when caught, and I hope this year we may have an opportunity of trying the dredge with a bunting lining, and a finer cod[1] to the trawl; but for this we should require calmer weather.

We were scarcely under weigh, when I asked one of the men to fill some jars with sea water, and the first capture, strangely enough, was two specimens of a brackish-water form, *Hydrobia ventrosa*, which had probably been washed out of a ditch by the high tide. They are seldom, if ever, found in salt water, but always near it; though not in ponds or ditches usually overflowed by the tide. You will, perhaps, remember how they occurred in thousands in a pond near the Martello Tower, St. Osyth, on our visit there on 7th September last (E. N., v., 259).

Of the Bivalves not previously recorded, I may mention a dead valve of *Anomia ephippium*, the first I have ever met with on the Essex shore. The shell is generally white, with pearly nacre inside.

[1] This word was misprinted "cord" in E. N., v., p. 147, line three from bottom.

The other valve has an opening into which the "stopper" fits, and by which it is attached to stones or other shells. On the south coast it occurs abundantly of considerable size, on the shell of the large Scallop (*Pecten maximus*) with both the valves moulded to the conformation of the ribs of that toothsome mollusc. Some fragments of wood were brought up riddled through with the borings of a species of ship-worm, *Teredo navalis* (not really a *worm*, but a true mollusc allied to the rockborers, *Pholas*, &c.); but in most cases the brittle calcareous lining only was to be seen. On breaking the wood up carefully, I was able to obtain the boring valves and a few of the pallets, which enabled the species to be determined. The valves are exquisitely sculptured in series of lines, and the pallets are embedded nearly to the cusped tips, close by the long siphons.

The use of these pallets, which vary very greatly in the different species, has never been clearly ascertained; but they are probably used to close the tube and protect the mollusc when the siphons are retracted.

A few good-sized specimens of *Modiolaria marmorata*, and the larger form, *M. nigra*, were taken; and a large species which is called the "Horse mussel" (*Mytilus modiolus*), which has a more handsome shell, well distinguished from the common mussel, not only by the rich brown colour and thickish epidermis, but by the umboes of the shell not being on the apex.

One dead valve of *Cardium echinatum* (the Horse Cockle), showed that this exists in the Crouch, and we obtained many live specimens of the small *C. exiguum*.

Another species of *Tapes* was also found, *T. aureus*, so called from the yellow colour of the interior of the shell; but the shape also is very different from the other species, the contour being more wedge-like in form.

Some specimens of *Scrobicularia alba* came up; but, strangely enough, *S. piperita*, which is larger, and the shells so common around the coast at Walton-on-Naze, Harwich, Felixstowe, &c., did not seem to be present—perhaps it is more purely marine than its smaller ally; or its absence may be due to the clearing of the bottom of the river for the oyster culture. We also got two species of Sandgapers, *Mya arenaria* and *M. truncata*. One of the latter, which I kept alive some time, measured, when the siphons were fully extended, $5\frac{3}{4}$ inches.

Of the Gastropods (Univalves), we took two dead shells of

Velutina lævigata. On our Blackwater excursion in 1888 (E. N., ii., 248), we took two of these alive, the rich scarlet bodies being very conspicuous.

Lacuna crassior, with its pretty, wrinkled epidermis, crawling on masses of shells and zoophytes, came up in great abundance, but all small; not so big, even, as those we took on the Orwell. On the Devon and Dorset coast I have taken them, fully grown, about half an inch in length.

Whelks and "Tingles" occurred largely as before—but of the latter, the Dog Whelk (*Purpura lapillus*), we obtained a varied series, some of the shells being banded with black and white, others in various yellows and browns, and one purely white; but the noticeable feature being the series of delicate frills with which they were all more or less covered—these frills being the marks of growth, the up-turned edges of the former peristome. In water exposed to heavy seas and masses of shingle, these frills are not found on the shell, or are broken off and the shell worn smooth. I cannot help thinking that the frilled varieties are evidence of a quieter habitat. These beautiful fimbriations, when they occur, give this very common shell a pretty appearance.

Of the Nudibranchs we took three species, making seven now recorded in the Crouch—a good number of *Doris tuberculata*, but all small, and one specimen of *Eolis papillosa*. But the most beautiful and interesting was a specimen, about an inch in length, of the graceful *Eolis drummondi*, with carmine double tentacles and mouth. Unfortunately, on my returning to Wanstead, we placed a small Pea-Crab (*Pinnotheres*) in the same bottle; and the next morning I found that the voracious brute had eaten up all the branchiæ from its back, and it was only with difficulty I could persuade him to relinquish his hold. In doing this, the left pincer was torn off, so tenacious was its grip. The mutilated *Eolis* crawled about in a languid state for some time, but ultimately succumbed to its injuries.

In most of the Nudibranchs the dorsal tentacles are prettily laminated, and in this species they are very closely ringed.

Before quitting the Mollusca, I must mention that in January, 1892, a young living specimen of Whelk (*Buccinum undatum*) with a sinistral shell was taken by our old trawling colleague, John Bacon, whilst trawling. He sent it on to Mr. Fitch, who forwarded it to me. It lived about a week, but having no change of sea water, was

not very lively. Such reversed shells are not uncommon, but this, I believe, is the first record of a genuine Essex native The shell, operculum, and a portion of the body I have preserved; but I found it impossible to remove the remainder of the body from the shell.

A fine specimen of one of the *Cephalopods* was taken in the Crouch on the 21st November last, by the crew of the smack "Effort" whilst sprat fishing. After being on view at the Old Ship Hotel, it was bought by Mr. Rogers, who sent it on to Mr. Fitch, and he brought it on to me. It is a fine, well-grown specimen of the Common Squid (*Loligo forbesii*), and from the end of the body to the extreme tip of the long arms measures 2 feet $5\frac{1}{2}$ inches, the body itself being $14\frac{3}{4}$ inches in length. The greatest width of the body, including the lateral lobes or fins, is $6\frac{1}{2}$ inches. The suckers are all serrated, thus enabling the creature to grasp with a firm hold, the largest being $\frac{3}{16}$ of an inch in diameter on the long arms; and on measuring I found that one of these arms is half an inch longer than the other, one measuring $12\frac{3}{4}$, and the other $12\frac{1}{4}$; the head is about 2 inches long. This specimen is certainly a well-grown one, and I hoped that it had not been surpassed; but the internal "pen" (which I have not extracted) cannot be more than 15 inches in length. I have subsequently been informed by Mr. Edgar Smith that the Newcastle Museum has one of these "pens" 22 inches in length, from a Squid taken on the Northumberland coast. That must have been a veritable giant among his fellows.

Among the CRUSTACEANS—the new captures were three specimens of a Spider Crab (*Stenorhyncus tenuirostris*); a form I was rather surprised to see brought up here, though it is fairly common on the Dorset coast.

Several of the PYCNOGONS were also taken, both male and female of *P. littorale*, the latter possessing a pair of six-jointed false feet for carrying the eggs; and several specimens of *Nymphon gracile* of good size. On looking over the *débris* at home, I found *two* minute forms which form a new Essex record; but I had a great deal of trouble in their identification. They turn out to be *Anoplodactylus petiolatus* and *Ammothea laevis*; and, from the specimen I have mounted as a micro-slide, it may be seen how interesting these small and little-known species are.

I am indebted to Mr. A. O. Walker, of Colwyn Bay, for kindly identifying these.

Until recently, the identification of these curious creatures has

been a matter of some difficulty. The descriptions are scattered, and many of them are old, and the accompanying figures not correctly drawn. Dr. Hoek, of Leiden, in his "Report on the Pycnogonida of H.M.S. *Challenger*, 1873-76" ("Zoology," vol. iii., 1881), attempted a more careful classification of these spider-like forms, which, from the time of Linnæus, have been variously placed with the land spiders, *Arachnida*, on the one side, and by other naturalists with the *Crustacea*. In the latest Monograph, published last year (1891), by Prof. G. O. Sars, of Christiania ("Den Norske Nordhavs Expedition, 1876-78, vol. xx. Zoologi, Pycnogonidea"), detailed descriptions and drawings of all the northern species are given, and the volume is a most valuable contribution to our knowledge of the subject, and for the identification of species; none the less because it is published in Norwegian and English, in two columns. So far as the systematic position of the Pycnogonidæ is concerned, Prof. Sars agrees with Dr. Hoek and Prof. Dohrn in considering them as a distinct group (class) of the Arthropoda.

Of TUNICATA we found nothing fresh; *Cynthia* and *Ascidia* were plentiful as usual.

The same may be said of the ECHINODERMATA. *Ophioglypha ciliata* and the common Sun Star (*Solaster papposa*) came up in larger numbers; and some of the latter were much larger than we had taken before. We found them with eleven, twelve, and thirteen rays, and one specimen with six rays only. I have endeavoured to preserve some of these, and think I have succeeded better than last time. The rows of radial spines are in better order, and in the ambulacral groove many of the suckers may be seen extended. This species is exceedingly variable in the number of rays; at the tip of each is a little scarlet eye protected by spines, and the reticulated surface is armed with aggregations of spines. These features, and especially the madreporic plate, grooved like a miniature brain coral, make this common species a most interesting microscopical study.

ANNELIDS.—Of the *Marine worms* I am not competent to say much; although a great number of the smaller ones were taken and have been preserved, but they have not been worked out. A species of *Polynoe*, probably *cirrata*, was extremely abundant, and of *Nereis pelagica*, a few; the largest measuring $7\frac{1}{2}$ inches in length.

We also obtained one fine specimen of the sea-mouse, *Aphrodite aculeata*, which is always a beautiful object, with its fringes of silky iridescent hairs amongst the bristles.

AN EDITORIAL APPEAL.

THE Editor is very glad to say that with the issue of the present number of THE ESSEX NATURALIST, the publications of the Club are quite up to date. In order that the *monthly publication* may be maintained with a reasonable expenditure of time and labour, the Editor most earnestly pleads for a greater meed of helpful co-operation on the part of the main body of the members, and naturalists generally, than has hitherto been afforded to him. Not only are longer and more important memoirs desired, but the greatest aid would be given by the communication of SHORT PAPERS, NOTES, and of books, periodicals, newspapers, &c. (*or extracts from the same*), containing matter (reports, captures, natural history, antiquarian or other "finds," topographical descriptions, news of the exposure of geological sections, &c.), likely to be useful for the NATURALIST or for the information of the council and officers.

The Editor will VERY GRATEFULLY receive promises from members and others of *systematic searching of periodicals, &c., for such information as above.* If extracts are sent they should be in a form as nearly as possible for publication. MSS. should be written on *one side of the paper only*, with *wide* spaces between the lines, and with *wide* margins.

DRAWINGS intended to illustrate papers should be in *very black ink* (Indian), with clearly drawn lines, on pure white card, and somewhat larger than required, so as to allow for photographic reduction. They should be sent through the post, *unfolded.*

It is *desired and expected* that the CONDUCTORS of FIELD MEETINGS and other Excursions *will themselves write a short report*, describing the country traversed, buildings visited, objects noted, &c., and giving the substance of any demonstrations given, either in the field or in a museum, and will forward the same to the Editor as soon as possible after the excursion. The Editor finds the task of describing the excursions far too heavy, and besides, reports written by Conductors specially acquainted with the districts visited, or objects seen, will have a freshness and value necessarily wanting in a mere compilation.

It would greatly assist if exhibitors of objects at meetings would themselves prepare short descriptions of them for publication, and hand the same to the Secretary *at the meetings.*

Address: Mr. W. COLE, Editor of ESSEX NATURALIST, 7, Knighton Villas, Buckhurst Hill, Essex.

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OF THE

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EDITED BY

WILLIAM COLE,

Honorary Secretary.

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The authors alone are responsible for the statements and opinions contained in their respective papers.

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Attention is called to the APPEAL for aid for the NATURALIST on page 3 of Wrapper of last Number.

NOW PUBLISHED, AND READY FOR IMMEDIATE DELIVERY.

"JOURNAL OF PROCEEDINGS OF THE ESSEX FIELD CLUB."

VOL. IV., PART 2.

Edited by WILLIAM COLE, *Hon. Secretary.*

THIS Part is now published, and copies can be obtained at once by application to the Librarian. It contains extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of "Proceedings"), after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of "Transactions" and "Proceedings" combined, with single Title-page for each volume, and one volume each of "Transactions" and "Proceedings" with separate Title-pages, together with various Appendices.

The volume is, of course, *absolutely indispensable* to COMPLETE THE SET OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE CLUB, which will then consist of five volumes.

The printing of the limited edition of the part will cost about £50, and the Council has fixed the price at 5s. to Members, and 6s. 6d. to Non-members, post free (nett).

It is hoped that every Member will take a copy, and thus prevent serious loss to the Club by reason of the absolutely necessary expense of the publication of the work.

The sequence of the parts forming the old series of "Transactions" and "Proceedings" is set forth on page 3 of Wrapper of the present Part, and a full list of the Publications of the Club will be found on Wrapper of ESSEX NATURALIST for January-March, 1892.

FOR COPIES APPLY TO MR. A. P. WIRE, 1, SEATON VILLAS, BIRKBECK ROAD, LEYTONSTONE, E.

(See fac. 3 of Wrapper.

Several specimens of *Sabella penicillus* were brought up alive, looking very unattractive when withdrawn into the leathery tubes, but beautiful when the head, with its feathery mottled plumes, is displayed in full movement, gathering in the food by which it lives. These are very abundant, and are called locally "Hassocks." Years ago they were thus written of by Dr. Baird:—

"In some of our creeks and tidal rivers these animals abound in immense numbers, and on the coast of Essex they are known to the fishermen by the name of 'Hassocks.' When dredging in the River Roach, I have often come upon banks where they existed in hundreds of thousands, and appear in masses of large extent, growing erect like a standing field of corn."

Of the POLYZOA, we found only one fresh record, *Bicellaria ciliata*, local name "Moseyweed," which is, however, one of the most beautiful, each cell being armed with seven long and delicate processes or spines. This genus appears to be world-wide in its distribution, and delicately coloured species may be found on Australian coasts.

Membranipora, *Lepralia*, and *Eschara* were fairly abundant, as before.

The SEA ANEMONES I only mention as I have endeavoured to preserve one of these, *Actinia mesembryanthemum;* but I do not think I have been very successful, knowing how very beautiful they are when alive and extended. We found two or three species; one little sage-green fellow with chrome yellow furrows was not uncommon, but its identification is uncertain.

The JELLY-FISH taken were the same species as previously captured. The most notable was a very large *Rhizostoma cuvieri*=*pulmo*, the disc measuring over thirteen inches in diameter. The scalloped edge was of a bright violet colour; there are from nine to ten of these scallops in each of the eight radial parts into which the disc is divided: and at the termination of each radial vessel, there is an eye, protected on either side by a film or veil, which hangs over it like a transparent curtain. The peduncle, which is prettily foliated, and eight arms hang down from the centre of the disc, and the terminal points are triangular in form.

It was a lovely sight to see this jelly-like mass moving by the contraction and expansion of its disc in the tub in which we placed it; and I determined, if possible, to preserve it, so on landing, one of the men was sent off to bring a large iron bucket in which we

conveyed it to Maldon—but it died after a day there, of a surfeit of alcohol. As you will see, the beautiful violet colour has entirely gone. *Aurelia* and *Cydippe* also occurred, and I tried to preserve a specimen of the latter, *C. pomiformis*, alive. It is like a globular and translucent mass of crystal, and is called by Gosse "a gem of the sea," but it does not preserve well. The rapid and graceful movement of this small creature is produced not by contraction of the disc as in most jellyfish, but by a series of square plates down the radial lines which overlap and moving to and fro, as they catch the light cause an appearance of iridescence.

Amongst the ZOOPHYTES, we recognised most of those which we had seen here before ; species of *Sertularia*, *Hydrallmania*, &c., the fresh record being the very common *Halecium halecinum*, and a species of *Tubularia* (*? attenuata*), which I have not, as yet, been able to identify with any published figures. The polype bears two circles of pale crimson tentacles, and it looks like a miniature flower.

We also took one mass of *Alcyonium digitatum*, "Deadman's fingers," or "Cow paps." In these the translucent polypes containing eight ciliated tentacles are embedded in the mass ; and when fully extended they exhibit a very delicate appearance.

The parasitic *Hydractinia echinata* was of course in evidence on various shells. In one instance the shell of *Natica monilifera* was eaten up by the living *Hydractinia*, and it was also the abode of a young hermit crab.

This form of zoophyte is common all round the English coast, and I know extends to Norway. Other species occur in tropical waters. *H. arborescens* is a very branch-like form, and occurs not only in the fjords of Norway, but I have a shell of *Siphonalia* from Japan, which is entirely destroyed by it.

SPONGES. Species of *Halichondria*, *Grantia*, *Chalina*, and *Clione* occurred as before, but none that have not been previously recorded.

On examining the *débris* in one of my jars, I was glad to find that it contained three species of FORAMINIFERA, a class of which none had been observed on the previous occasion ; but they are mostly so small that, unless carefully searched for, they are likely to be overlooked and thrown away with the dirty washings. One of these is the test of *Peneroplis planatus*, a flat discoidal form ; another is *Miliolina* (*seminulum ?*), and the third is the *Lagena vulgaris*, var. *striata*. The form of the latter is like a Florence flask, the neck and lip

representing the septal orifice, and in this variety there are longitudinal ribs or striæ.

The record so far, therefore, is not a very large one ; but nearly all the great divisions of Invertebrate life are represented by one or more species. These are but a few in comparison with the forms of life in the sea, which appear to be quite inexhaustible ; and the collections made by various scientific expeditions give us perhaps but an idea of the abundance of it. All around our own coast (not to mention the great oceans beyond), there are vast tracts which have never yet been touched by trawl or dredge, reminding us of the lines in Spenser's "Faërie Queen" :

> "Oh what an endless work have I in hand,
> To count the seas' abundant progeny,
> Whose fruitfull seede farre passeth those in land,
> And also those which mouve in th' azure sky."

The results of deep-sea trawling have also entirely disproved the hypotheses of the older naturalists with regard to the limitation of life at great depths, where the pressure and density of the water is enormous. Dr. Wallich's report on "The North Atlantic Sea-bed" in the "Bulldog," 1860, and the later expeditions of the *Porcupine*, *Challenger*, and others, have proved the existence of marine life at tremendous depths, extending to about three miles, some of which are especially adapted to their environment ; and that any limit is not so much affected by the depth as by the temperature.

When once an attempt is made to illustrate our marine fauna in an Essex local museum, there is little doubt but that such expeditions as those recorded by Mr. Fitch and myself would for a long time contribute many new records ; and much more satisfactory results would be obtained when once the more general species in each order are sufficiently represented, which might then be passed over for the rarer and less-studied genera and species. The plethora of marine life is so great that, in the attempt to collect or preserve all that is caught, many of the more interesting, and especially the minuter, forms are lost opsor ilt. A commencement that would lead to better results might be made by a competent committee undertaking a week's systematic work in the spring, and again in the autumn, who would contribute full reports, to which additions might from time to time be made as opportunity offered. Some of our members would probably undertake to work out the more difficult groups, *e.g.*, Zoophytes, Polyzoa, &c.

We may also indulge the hope that, when more general interest is aroused, and the importance of such work is better understood, it may be possible to obtain funds for the establishment of a Biological Station, where many interesting problems of the life-history of marine forms, and original research, may be carried on.

I should not like to conclude without putting in a word for the men, especially John Bacon, who not only worked hard, but were much interested in the various captures; and on the second trip, when we had a roughish time, were literally, in spite of their oilskins, wet through to the skin.

There was a good deal of hard work in managing the trawl, and constant tacking, and we all had to eat and drink without ceremony; our bottles got upset, the live stock swam about the cabin, and even a fine pigeon pie poured out a generous libation of gravy on the floor. Nor must I forget to mention the poor little dog, who could not touch the dainty fare we laid before him, and kept in his kennel for long stretches—except when we turned him out by a rough act of ejectment.

POLLARDS AND HOW TO TREAT THEM; WITH SPECIAL REFERENCE TO THE HORN-BEAMS IN EPPING FOREST.

By G. S. BOULGER, F.L.S., F.G.S., A.S.I., *Vice-President.*

[*Read April 30th, 1892.*]

IF in the spring we examine the stump of a horse-chestnut, or of almost any broad-leaved tree which has been cut down, we find just within the bark a ring of young leafy shoots. These shoots spring from the "cambium" or growing layer, and, though they are of no value in the horse-chestnut, in other species which do produce useful coppice growth, as they are termed, it is customary to carefully avoid tearing down the bark of the stump so as not to prevent their formation. Beech and maple will produce such shoots, but not of very strong growth; whilst oak, ash, chestnut, willows, poplars, and hornbeam yield shoots of value. The Spanish chestnut is largely grown as coppice, both as cover for game and for hop-poles. Willows are felled level with the ground in our osier-beds, though also treated as "pollards," *i.e.*, having their main stem cut off higher

up, as in the "shock-head" forms familiar to us along our river banks. Though not commonly pollarded in this country, poplars are so occasionally on the Continent, and are so commonly, under the name of cottonwood, as fuel, in the United States. The hornbeam has been so uniformly pollarded in England, as hardly ever to be seen as a spear tree. It is a timber tree, and derives its name from its horny wood, which was used in the manufacture of yokes and cog-wheels; but it furnishes so excellent a fuel that it has been regarded almost exclusively as firewood.

If, on the other hand, we go into a plantation of pines, firs, spruces, or larches, we find no such coppice growth; for, with the exception of the Redwood of California (*Sequoia sempervirens*), the *Coniferæ* do not produce "adventitious" shoots or buds, as these shoots are termed by botanists.

It is rather remarkable that in most of our modern botanical text-books, which we borrow so generally from the Germans, there is hardly any mention of pollards or coppice as illustrative of adventitious budding. When the authors of these works dwell on the comparative rarity of adventitious buds they may perhaps only mean to imply their rarity on natural uninjured structures, since they are surely common enough on cut or injured surfaces, from the well-known case of the leaves of *Begonia* to the pollards we are now considering. In calling these shoots, or the buds in which they originate, "adventitious," we merely imply that they arise in no definite order.

Pollarding, and, to limit the subject of our consideration, the pollarding of the hornbeam, is no doubt a practice of considerable antiquity. Having traced this species through the wildest woodlands of Kent, Sussex, Surrey, Middlesex, and Essex, I have little hesitation in terming it one of the most characteristically indigenous trees of south-east England. At the same time it must, I fear, be admitted that, until our own time, our woodlands have been regarded, both by commoners and by lords of the manors, solely as sources of profit, on the one side as firewood, on the other as cover for game or as timber. No considerations of scientific treatment or of beauty have prevailed, though some people seem even now to prefer the grotesque distortions of disease to the symmetry of healthy development.

In normal growth the hornbeam somewhat resembles the beech, its lower boughs occasionally sweeping down to the ground, and it is

to be hoped that in a few years we may have in Epping Forest a good store of spear hornbeams illustrating the proper form of the species. Sir Fowell Buxton has given me his opinion, which seems highly probable, that pollarding was preceded by coppicing; and that the latter practice gave way to the former owing to the damage done by game to the young shoots when springing from the stump. The familiar fact that pollards of considerable age very commonly spring from the ground in groups would thus be explained by their having sprung originally as coppice-shoots from a single stump. Either deer and cattle, or ground game, or both, may have been the cause of the change of practice.

As with other things, there are two ways to pollard a tree, the right way and the wrong way. If a tree is to be pollarded, the proper method of procedure is to cut off the main stem and branches a little *above* the fork. It was not, however, I suppose, to be expected that the commoner desirous of firewood should think of anything beyond getting the maximum quantity with the minimum of trouble, so that our pollard hornbeams have mostly been cut *below*

the fork, at the point indicated by the line in the middle figure. The consequence is that, instead of repairing the injury by healthy growth, as in the right hand figure, we have diseased misshapen heads, like that in the left hand figure, with mop-like branches and too often a rotten heart to the trunk. Damp collects among the warty excrescences of the head; and those who have accompanied our autumn fungus forays know the abundance and variety of the Agarici, Boleti, Bulgarias, and Tremellas that hasten the decay of the rotten stems they frequent. Insect larvæ, moreover, are perhaps more likely to attack trees in such an unhealthy condition than when thoroughly sound.

Similar motives of "economy" led, no doubt, to the dense overcrowding of the pollards which characterised many parts of the Forest at the time when it was taken over by the Corporation. So

long as the shoots were cut under the commoners' rights of topping and lopping every fifteen years, this crowding had perhaps little evil effect; but when these rights were abolished one of two results was inevitable, either these pollards must be extensively thinned, or their over-crowded boughs would be drawn up into long, straight, bare poles, with nothing but some scanty foliage at their summits. This latter alternative has actually happened in that part of Great Monkwood, in which Mr. Maitland tried the experiment of *laissez faire*, and the result is disastrous enough.

How pollard hornbeams can recover great grace of outline, if given free space *soon after* pollarding, is well shown by some beautiful trees in Mr. E. N. Buxton's grounds at Knighton. These trees, in addition to ascending branches, have sent out others horizontally, or rather in a descending direction, with the spreading spray and nearly all the beauty of spear trees.

But little, if any, thinning was carried out by the Corporation for some years after the cessation of the lopping rights, so that even the best and soundest pollards afterwards selected for preservation had in those years taken too vertical a direction: and it may be doubted whether, if left to themselves, though freed from the crowding of their former neighbours, they will ever rival the beauty of the Knighton trees.

There can be no doubt that extensive thinning was not only desirable, but necessary in many parts of the Forest; but, admitting this, two questions remain, viz.: (i.) what should be the principle of selection and (ii.) what should be the treatment of the trees selected for preservation. One obvious principle, considering the comparative scarcity of oak in the Forest, has been the preservation of all examples of that species, even when pollarded. This has perhaps been carried to an injudicious extreme in places, between Oak Hill and the Ditches, for example, by the sacrifice of sound trees of other species for pollard oaks too hopelessly rotten ever to be worth anything. Then as regards hornbeams, though some of the most malformed may be worth preserving for their grotesque appearance, especially if decked with polypody, as a rule the soundest should certainly be preserved. In any case, no pollard is immortal, and we may well hope some day to see them replaced by normally grown trees. With this object, the undergrowth must be preserved as a protection to natural seedlings, and I would urge the desirability of planting hornbeam.

As to the remaining pollards, the great question is, Shall they be re-pollarded? The reasons in favour of so doing are their drawn-up character, owing to their having been left in an over-crowded state, and the possibility of making them spread, and, a secondary reason, pointed out by Sir Fowell Buxton, the variety of landscape colouring obtained by the admixture of some of the dead leaves that hang on a pollard with the young spring growth. The main argument against the suggestion seems to be the danger of unauthorised lopping, supplementing that undertaken by the Forest officials; but the extensive felling of the last few years does not seem to have produced such a result, and it might be possible to have, at least, provisionally, some temporary enclosures for such an experiment in management, similar to those already made for the purpose of planting.

RECENT EXCURSIONS OF THE GEOLOGISTS' ASSOCIATION IN ESSEX.

UPMINSTER AND HORNCHURCH.

ON March 5th there was an excursion for the purpose of visiting the cuttings on the railway now being constructed between Upminster and Romford, a northerly prolongation of that from Grays to Upminster. The first sections inspected were those in the cutting west of Upminster Station, and east of the Ingrebourne. They were seen to consist of London Clay, capped by a variable thickness of gravel or loam, the former predominating. Here and there the London Clay formed the surface for a few feet between two festoon-like beds of gravel, a feature of frequent occurrence where the Clay is covered by these old river deposits. The gravel of the high ground traversed by the railway between Upminster and Romford is of greater elevation and older date than that between Upminster and the Mardyke, the latter being only from 60 to 70 feet above Ordnance Datum, while between Upminster and Romford the plateau is from about 90 feet to a little over 100 feet. But, alike in each case, the surface gravel or loam is an old river deposit, formed when the Thames flowed with a more northerly course and at a higher level than it now does. Crossing the Ingrebourne the party entered another cutting N.E. of the church at Hornchurch. There, in addition to London Clay and old river-gravel, a hollow in the London Clay was seen to be filled with Chalky Boulder Clay for a horizontal distance of about 300 yards, the greatest thickness attained by the Boulder Clay being about 15 feet. It was to view this Boulder Clay, which lies about three miles south of any hitherto known in this district, that the excursion was planned so unusually early in the year; and the party was fortunate enough to see a clear section of it close to its north-westerly termination, the rest of the cutting having been sloped. Walking thence towards Romford, cuttings on each side of the road at Butts Green were inspected, that to the east showing only sand and gravel, while that between the

road and the stream west of Butts Green displayed more or less London Clay at the base over the greater part of its length. The cuttings between the stream just mentioned and Romford were too little advanced at the date of the excursion to be worth visiting, and they are but little more developed now (April 23rd).

A full account of the Upminster and Hornchurch cuttings, by the present writer, and more especially of that containing the Boulder Clay, will appear in the *Quart. Journ. Geol. Soc.* for August. T. V. HOLMES.

WALTHAMSTOW.

On May 7th Mr. J. Walter Gregory, F.G.S., conducted a party to some cuttings at Walthamstow, on the new railway now being constructed between Forest Gate and Tottenham. Alighting at St. James' Street station on the Chingford Branch, the visitors proceeded to a cutting about half a mile east of the reservoirs of the East London Waterworks, and a few yards S.E. of the Royal Standard public-house, which stands at the junction of Ferry Lane with Black Horse Lane. East of Black Horse Lane, and on the northern side of the houses known as Stonydown and Stonydown Cottage, an excellent section appeared, disclosing an irregularly channelled surface of London Clay covered by old river-gravel, which here and there attained a thickness of 10 to 12 feet. The continuity of this gravel was slightly interrupted in one or two places by the existence of narrow necks of London Clay, which presented a somewhat squeezed-up appearance between the gravel on each side. Some hollows in the gravels itself, which looked, a short distance away, as though they might be the result of contemporaneous erosion, turned out, on nearer inspection, to be the sites of shallow gravel-pits, which, after the removal of the gravel, had been filled up with earth and rubbish.

Leaving this excavation, and proceeding in a south-easterly direction, a walk of about a mile brought the party to another cutting on the same line. When the railway is completed these two cuttings will form but one, though at present there is about three-quarters of a mile of ground between them still to be excavated. The position of this second cutting was found to be a few yards south of Grosvenor House, a mansion on the southern side of Hoe Street, and it ranged in a north-westerly and south-easterly direction, its course being nearly parallel with that of the street just named. The sections seen consisted of old river gravel and loam, the subjacent London Clay not being visible. Between the grounds of Grosvenor House and the Lea Bridge Road the cutting disappears, and the line will cross that road on arches on the southern side of the Bakers' Almshouses. In fact, the only cutting will be the long one at Walthamstow, the line east of Grosvenor House ceasing to afford any geological information beyond what may be attainable from diggings for the foundation of bridges, etc.

The gravel seen at Walthamstow appears to belong rather to the Lea than to the Thames. The height of its surface above Ordnance Datum is from 40 feet to a little above 50 feet, the greatest altitude being at the Grosvenor House end. It is thus of lower level and more recent date than that on the course of the line between Upminster and Romford. T. V. HOLMES.

NOTES—ORIGINAL AND SELECTED.

Delphinus tursio in the Colne.—On Sunday morning, May 29th, 1892, as a man named John Crossley was searching for flounders in Mill Creek, Fingringhoe, he discovered, in a shallow part of the creek, three large Porpoises, unable to pass outwards, as the receding tide had left insufficient water over some banks below. He obtained the assistance of some of his friends, and between them they managed to pass a slip-knot of rope over the animals and drew them up the mud on to the marsh. The unfortunate animals' throats were then cut in the same manner as pigs are slaughtered. In the afternoon the men gave me notice of the catch, and I went and inspected the Porpoises. I found one to be a male, 10 feet 1 inch from the tip of the nose to the notch in the fluke, and 6 feet in girth; the other male was smaller, measuring 5 feet 10 inches and 5 feet; and the female was larger than either, being 10 feet 3 inches and 5 feet 10 inches. She had the appearance of being gravid, and had plenty of milk, which exuded in a stream on pressing the mammary gland. I caught a quantity in my hand and tasted it, and found it very rich and creamy, but it was strongly fishy, coupled with that peculiar rank flavour so characteristic of the odour of the breath and flesh of all the Cetaceans I have examined. This Dolphin is said to be rare, but in my experience it is the one most frequently taken in our estuaries. I have seen and recorded more examples of this species than any other during the last twenty years. I ought to have said before that the animals appeared to have been feeding on eels, as one of them turned out many pounds of the fish in a semi-digested condition, when first hauled up.

I was very glad to have an opportunity of tasting a Cetacean's milk, but I do not think I should crave a meal of it.—HENRY LAVER, F.L.S., Colchester, June 4th, 1892.

Otter and Trout.—Fishing to-day (May 20th) in the Chelmer at the place where the Stebbing Brook joins that stream, I saw a full grown otter quietly get out of the water immediately opposite to me and go up the bank, where I observed him resting on the grass for about half a minute. Making a slight noise to call my son's attention, the animal became alarmed and quickly and quietly returned to the water with a sinuous motion much resembling a large ferret; otherwise the animal, with his sleek coat, looked like a seal. So quiet were his motions that he did not disturb a trout of a pound weight which immediately began to bite, and which I caught. This incident, I think, shows that the otter in its ordinary course moves about in the water without being regarded by the fish. Both events, as it were, transpired at once, and we were not eighteen feet from each other. It is almost unnecessary to add that trout and otters are exceedingly shy and wary.—J. FRENCH, *Felstead*, May 20th, 1892.

Hoopoe at Roxwell.—On May 3rd, a Hoopoe (*Upupa epops*) flew up from a wet ditch at the bottom of my garden at Little Boyton Hall, and settled on some trees near. Although I have frequently been in pursuit of him with a binocular since, I have never seen him again, so he has probably passed on.—REGINALD W. CHRISTY, *Roxwell*, May 23rd, 1892.

Fieldfares in Spring of 1892.—Fieldfares were very late this spring in returning to their summer quarters. There were large flocks here from April 22nd to 30th, and one lot of about 500 stayed till May 10th, when the weather became

warmer, and on May 11th not one was to be seen, but on May 12th I saw a straggler feeding in a meadow with some starlings.—REGINALD W. CHRISTY, *Little Boyton Hall, Roxwell.*

Abundance of Cynthia cardui.—This spring there is an unusual abundance of the "Silver Y." moth (*Plusia gamma*). They swarm everywhere, especially in bean fields, where they fly like butterflies in the brightest sunshine.

The "Painted Lady" butterfly (*Cynthia cardui*) is also very common here now; in fact, with the exception of *Euchloe cardamines*, it is the commonest butterfly on my farm.

If the abundance of its plant food has anything to do with its numbers, this species is not likely to become extinct just yet.—REGINALD W. CHRISTY, Little Boyton Hall, Chelmsford, May 30th, 1892.

Abundance of Spring Insects.—I can confirm Mr. R. W. Christy's observations as to the abundance of some species of Lepidoptera in Essex this spring. During the last fortnight I have traversed a considerable portion of the county, and have observed very large numbers of *Cynthia cardui* and *Vanessa atalanta*, with *Plusia gamma* in countless thousands. My brothers and I have also seen with pleasure three specimens of *Colias edusa* (one at Buckhurst Hill, one at East Mersea, and one at West Mersea). The young larvæ of *Vanessa urticæ* are excessively common; in some places every patch of nettles has one or more colonies. The caterpillars of the "Magpie Moth," *Abraxas grossulariata*, and of the "Figure-of-8-Moth," *Diloba cærulecephala* are also present in astonishing numbers. We may reasonably hope that the abundance of the foregoing species will prove to be the harbinger of a glorious butterfly season, such as the memorable one of 1877, fondly looked back upon as the great "*edusa*-year."

Of the true spring butterflies the lovely "Orange-tip" *Euchloe cardamines* and *Satyrus megæra* have been exceedingly common in all parts of the county I have visited. The spring larvæ, such as "Drinkers" (*Odonestis potatoria*), *Arctia caja*, *Bombyx neustria*, have also been observed by hundreds, with *Bombyx quercus* not so commonly. At East Mersea the beautiful larvæ of the "Pale Oak-egger moth" (*Trichiura crataegi*) have been in very considerable numbers on the black-thorn and "May" bushes. In Epping Forest the ravages of *Tortrix viridana* are only too evident, very many of the oaks being absolutely defoliated. Ichneumon flies are very numerous, so that vast numbers of these "wasteful things," as a Mersea farmer called the caterpillars we showed him, may never come to the winged state, but nevertheless the entomologist may be pardoned in looking forward to the coming summer and autumn of 1892 as likely to rival some of the historic years of times past. [Since writing the above, my brother, B. G. C., has seen two more *C. edusa* near the "Red Hill," on Bower Hill Farm, West Mersea, and I am informed that several have been seen on the South Coast and elsewhere].—WILLIAM COLE, East Mersea, June 9th, 1892.

Funeral Garlands.—With reference to the interesting bygone folk-custom alluded to in the report of the Club's visit to Theydon Mount Church, on May 28th (see page 105), Mr. Chalkley Gould has kindly sent us the following illustrative extracts:—The "Antiquarian Repertory," 1784 (vol. iv., p. 239), says: ". . . these garlands at the funerals of the deceased was carried solemnly before the corpse by two maids, and afterwards hung up in some conspicuous place within the church, and was made in the following manner, *viz.*, the lower rim or circlet, was a broad hoop of wood, whereunto was fixed at the sides thereof

part of two other hoops crossing each other at the top, at right angles, which formed the upper part, being about one-third longer than the width. These hoops were wholly covered with artificial flowers of paper, dyed horn and silk, and more or less beautiful according to the skill or ingenuity of the performer. In the vacancy of the inside from the top hung white paper cut in form of gloves, whereon was wrote the deceased's name, age, &c., together with long slips of various coloured paper or ribbons ; these were many times intermixt with gilded or painted empty shells of blown eggs as farther ornaments, or it may be as emblems of bubbles or bitterness of this life : whilst other garlands had only a solitary hour-glass hanging therein, as a more significant symbol of mortality."

Washington Irving, in "The Sketch Book," tells us : "There is also a most delicate and beautiful rite observed in some of the remote villages of the south [of England], at the funeral of a female who has died young and unmarried. A chaplet of white flowers is borne before the corpse. . . . These chaplets are sometimes made of white paper, in imitation of flowers, and inside of them is generally a pair of white gloves."

Llewellynn Jewitt, writing in "The Reliquary," vol. i. (1860), gave an account of the former custom of hanging the garlands in the churches of Derbyshire, and Beck's "Gloves, their Annals and Associations" (1883), contains much interesting matter relating to the subject. Information will also be found in "Notes and Queries," October 12th, 1889.

A Romano-British Cemetery at Chigwell.—At a recent meeting of the Essex Archæological Society, our member, Mr. I. Chalkley Gould, read a paper upon this ancient burial ground and exhibited some pottery found there.

By the aid of a plan it was shown that a gravel bed extends for some distance northwards from near Woolston Hall in a line nearly parallel with the present high road to Abridge. Along this line pits have here and there been dug for many years, and these diggings have brought to light a vast number of fragments of pottery, together with a few perfect cinerary urns, some "Samian" ware, bronze articles, coins, etc., also a coffin of lead showing the practice of inhumation in addition to the abundant evidence of cremation upon the spot.

Fifty years ago much pottery, including some figured ware of decidedly "Roman" character, was found at the south of the line of gravel ; in after years as the digging proceeded northwards other chips and sherds were unearthed and recently at the north of the line the pits have yielded two little sepulchural vessels and many broken pieces. It *may* be that had occasion arisen for digging in the clay to the east other traces of the same kind would have been discovered ; but Mr. Gould gave reasons showing it to be improbable that the cemetery extended west or much farther north, and suggested that we must look southwards for the site of the habitations of those who required this large cemetery to accommodate their dead.

An illustrated paper will probably be included in the next issue of the Essex Archæological Society's "Transactions."

A Mound without a History.—At Bannister Green, Felstead, about a mile east of the village, there is a grass-grown mound, known as "The Quakers' Mount.' It is from 15 to 20 feet high, and somewhat oval. with a flat top, being about 22 paces long at the top, and 18 broad. Its sides incline an angle of 45°, and it was formerly surrounded by a moat about 8 or 10 feet broad. Not quite half of this moat still exists, the rest having been filled in, perhaps very long

ago, in great part by earth removed from one end of the mound. The original symmetry can be well made out in spite of this mutilation.

The name is probably derived from its being a trysting-place of the Quakers, under the old Five Mile Act, it being rather more than five miles from the nearest market town (Braintree). It has been suggested that it is an early British Barrow.—J. FRENCH. *Felstead.*

Supposed Earthquake Shock in Essex.—Our member, Dr. J. C. Thresh, Medical Officer of Health for the Maldon and Chelmsford Rural Sanitary Authorities, stated in the local papers that a slight shock of earthquake was felt by himself and household at the "Limes," Chelmsford at twenty-two minutes to twelve on Friday morning, May 27th.

Dr. Thresh has furnished the following particulars :—"Time 11.37. Sat at my desk, heard subterranean rumbling ; house shaken most distinctly. Went to some workmen who are enlarging my house, and one of them had been telling another that he was certain that it was an earthquake, as he was looking out of the window towards Writtle, and he distinctly saw some tremor of the earth (the shaking of the room would account for this. The man moved up and down, not the earth). My wife, also, without any suggestion from me, said: 'An earthquake!' I remember distinctly the shock felt in Manchester three years ago, and the house tremor and sound were exactly the same. I cannot tell what was the direction of the shock. The sound was muffled, and very peculiar—quite different to thunder."

A correspondent of the "Essex County Chronicle" writes that his wife and daughter were seated at home at needlework about the time named, and felt and heard a seismic vibration, so much so that the latter, fearing a thunderstorm was impending, put her knitting pins away. Several neighbours in Fairfield also felt the disturbance, and on May 30th, "Jessie Shortt," of Little Baddow, wrote as follows :—"I felt two distinct though slight shocks here. Feeling so convinced it was an earthquake, I at once looked at the time, which was exactly twenty minutes to twelve—two minutes later than the time felt in Chelmsford by Dr. Thresh. I have made inquiries, and am told it was also noticed at Danbury. I am quite sure it was a slight earthquake, as I have had many similar experiences abroad."

Another correspondent suggested that the vibration, which was undoubtedly felt, was caused by the discharge of big guns at Shoeburyness ; but in answer to our enquiries, Dr. Thresh writes as follows, under date June 7th :—"A number of people observed the peculiar noise, but few observed the shock ; probably I should not, had I not been sitting quietly at my desk. There had been thunder earlier in the morning, and many persons thought it was merely another distant peal. The biggest gun ever discharged at Shoeburyness could not cause at Chelmsford a vibration of the ground such as I felt. It was not an air wave, but a distinct movement of the earth."

The evidence appears to be conclusive that a noticeable seismic disturbance occurred in the centre of the county at the time stated. It is much to be regretted that no instrumental records of these vibrations is yet possible in Essex. Since the great earthquake of 1884, several shocks have been noticed ; but as they were all too slight to move objects, or to cause any structural damage, it was always open to the sceptic to suggest big guns or atmospheric disturbances as the cause. We think it desirable, however, to put on record all observations from skilled scientific observers such as Dr. Thresh.

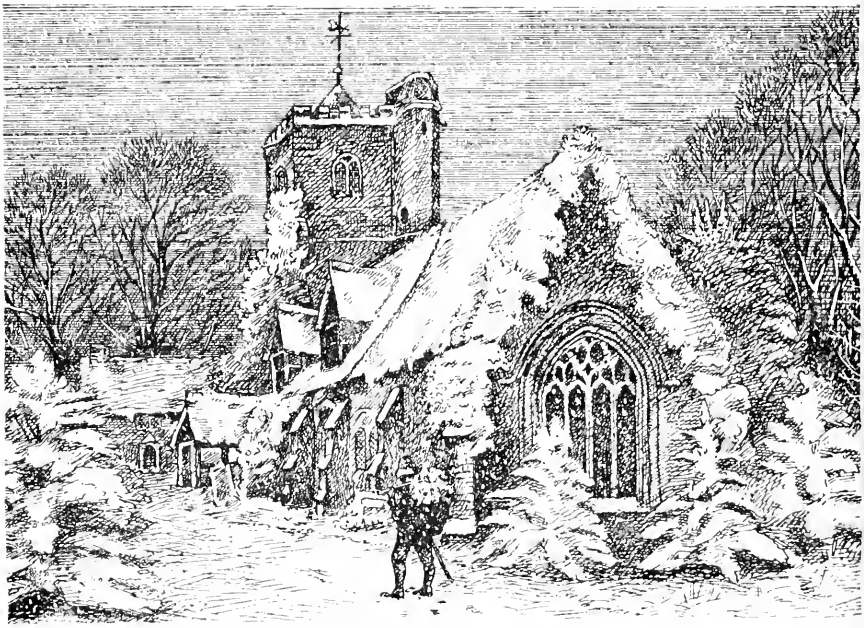
THE ESSEX FIELD CLUB.

MEETING IN THE THEYDONS, STAPLEFORD TAWNEY, ETC.

Saturday, May 28th, 1892.

DIRECTORS. — Rev. LEWIS N. PRANCE, M.A.; C. B. SWORDER; DAVID HOUSTON, F.L.S.; WALTER CROUCH, F.Z.S.; I. CHALKLEY GOULD, and G. E. PRITCHETT, F.S.A.

THE Hundred of Ongar consists of twenty-six parishes, nearly all extremely rural in character, and of these the route chosen for the afternoon's excursion led the visitors through eight. Starting from Loughton Station about three o'clock, the members were driven through perhaps the prettiest parts of that



THEYDON GARNON CHURCH (Winter).
From a Drawing by H. A. Cole.

parish, past Loughton Hall and the little memorial church of St. Nicholas, into England's Lane, by the charming hamlet of Debden Green (where a specimen of the little "Beech Hook-tip" moth, *Drepana unguicula*, was observed), and so through the avenue across Theydon Bois Green.

The weather was delightful, a somewhat strong breeze tempering the warmth of the brilliant sunshine. Very welcome were the sweet odours of profusion of "May" blossoms and opening tree buds, the almost magical luxuriance of the hedgerows, winding through miles upon miles of broad upland meadows which

were glistening with the bright golden buttercups and speckled with daisies and cuckoo-flowers. The bordering coppices were voiceful with birds and the mingled hum of insects, while overhead the clear blue sky, on either side glimpses of thatched and red-tiled cottages embowered in flowers, beyond white mansions in undulating timber-studded parks, and further yet (and later in the afternoon) the wooded heights of Brentwood and the forest, all blended into a succession of rural pictures, scents and sounds delicious, such as English (and Essex) lanes in spring can alone furnish forth. The early white butterflies were busy in the gardens and meadows, and flitting along the banks of *Sisymbrium* or "Jack-by-the-Hedge," were seen numerous "Orange-tipped" butterflies, which so well deserves the rustic name of "Wood-lady" as one of the prettiest of English insects.

Of Theydon Bois little need be said on the present occasion. Mr B. Winstone published in the first volume of the ESSEX NATURALIST (pp. 153-159) an enquiry

TIMBER PORCH OF THEYDON GARNON CHURCH (Winter).
From a Drawing by H. A. Cole.

into the origin and true pronunciation of the word "Böis," in which much local information was given. The church is comparatively new, having been built in 1844; but a few years later it required rebuilding, being found unsound, and the present building, close by the Green, dates only from 1851. The old churchyard may still be seen near Theydon Hall on the way to Abridge; but the church itself was pulled down, being far away from the village. It was very small, dedicated to St. Mary, and a small engraving of it was done by John Ogborne.

Theydon Hall, near the church, belonged to the Meggots and Elwes of Suffolk, and it was here that John Elwes, the well-known miser, lived. John Strype, the antiquary, was curate of Theydon Bois for a short time in 1669, and then went to Low Leyton, of which he remained vicar for sixty-eight years.

Crossing the railway, the lane was followed to Theydon Garnon Church, shortly before reaching which a halt was called at a spot where Mr. I. Chalkley

Gould pointed out the remains of an ancient road, probably a portion of the pre-coach road to Newmarket which after running along the eastern side of the Roding crossed that river at Abridge and passed by a course, still traceable nearly to Theydon Garnon Church, whereabouts it divided. The western branch led to Epping, while the main line of road led northwards past Garnish Hall, Stewards Green and Coopersale Street to Harlow.

The course of this ancient road is described in Mr. Winstone's book, "Extracts from the minutes of the Epping and Ongar Highway Trust," 1891.[1] The road is shown in the last Ordnance Survey Map (one inch scale), perhaps too plainly, as it indicates an existing road where it is now somewhat difficult to find (in places) more than a footpath. Near the rectory the party alighted and walked up to the church through the fine avenue of limes and chestnuts. It was visited by the Club in 1880, under the guidance of the then rector, Sir Cavendish Foster, and is notified in the PROCEEDINGS (vol. i. pp. xli.-ii). The name of the manor is derived from Sir Roger de Garnon who came over with the Conqueror and resided at the moated farm, Garnish Hall, a little north of the church.

The village is some distance from the church and is generally called Coopersale—tradition says from the fine ale which was served by a man named Cooper at the "Merry Fiddlers" there. Mr. Crouch gave this anecdote for what it was worth!

The churchyard is exceedingly pretty, and the timber south porch, and fine red-brick tower, at once attracted attention, as also did the picturesque priest's house at the west end of the church, which is said to have been built as a lodging for the priest serving the church from Waltham Abbey.

Mr. Crouch, Mr. Sworder, and Mr. G. E. Pritchett, gave many details of the construction of the church, and of the contained monuments and brasses, some of which are of considerable interest. From the north entrance of the churchyard a fine view was obtained, in the foreground being the *moated* Garnon (or Garnish) Hall, now a farm-house, while towards the west was pointed out the footpath, a remnant, Mr. Gould thought, of the road by Coopersale Hall to Epping, and to the right the track alluded to above to Coopersale Village and Common, and through the forest to the main Harlow Road, was indicated.

At Hobbs Cross Farm, Mr. James Smith showed in his garden a large mass of Conglomerate brought from a gravel-pit near Theydon Mount Church.

Amid the profusion of ordinary hedge row plants, *Veronicas*, *Stellaria*, Vetches, Ground-ivy, etc., near the church, was noticed the pretty *Adoxa moschatellina*, first found there twelve years ago.

Some members of the party then drove by the Brook-house and Skinner's Farms to Theydon Mount Church, others preferred to take the carriage drive across the fields. Here, and particularly near the vicarage house, now occupied as cottages, were seen a considerable number of the Painted-Lady Butterflies (*Cynthia cardui*), and one or two *Vanessa atalanta*. These were, of course, hybernated specimens, females; but their appearance was a good harbinger of plentiful broods of the handsome insect in the late summer, if only the weather is favourable. Under the elm trees bordering the road was found a larva of the White Hair-streak Butterfly, *Thecla w-album*, which the wind had blown down. A considerable number of more common insects were noticed, also a Green Woodpecker's nest, and in the park of Hill Hall some magnificent pollarded trees—hornbeams and beeches. At the north entrance are some boulders of considerable size.

1 Mr. Winstone kindly sent copies of the map from his book, for the information of the members

IMPORTANT NOTICE TO MEMBERS OF THE CLUB AND TO LIBRARIANS, &c.

'TRANSACTIONS' AND 'PROCEEDINGS'

OF THE

ESSEX FIELD CLUB.

The part of the 'Journal of Proceedings' the publication of which is announced on page 2 of the Wrapper of the present part of the E. N., completes the old series of 'Transactions' and 'Proceedings,' bringing up the reports to January 29th, 1887, after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of 'Transactions' and 'Proceedings' combined, with single title-page for each volume, and one volume each of 'Transactions' and 'Proceedings' with separate title-pages, together with various appendices. The parts were issued as follows, and the appendices indicated should be bound up with each volume :—

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	,, 5 (October, 1881)	5	6
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Volumes I. and II. can only be supplied with *Complete Sets, of which very few copies remain.* The complete set of 5 vols. (unbound) is £2 16s.

For other publications of the Club, see wrapper of ESSEX NATURALIST, January-March, 1892.

N.B.—A reduction of 25 per cent. from the above prices is allowed to Members.

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The Essex Naturalist:

BEING THE

JOURNAL

OF THE

ESSEX FIELD CLUB.

EDITED BY

WILLIAM COLE,

Honorary Secretary.

Contents.

The authors alone are responsible for the statements and opinions contained in their respective papers.

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The Editor of "THE ESSEX NATURALIST,"
7, Knighton Villas, Buckhurst Hill, Essex.

For particulars of Publication of Part 2, Vol. IV., "Proceedings," see pages 2 and 3 of Wrapper.

Attention is called to the APPEAL for aid for the NATURALIST on page 3 of Wrapper of the May Number.

NOW PUBLISHED, AND READY FOR IMMEDIATE DELIVERY.

"JOURNAL OF PROCEEDINGS OF THE ESSEX FIELD CLUB."

VOL. IV., PART 2.

Edited by WILLIAM COLE, *Hon. Secretary.*

THIS Part is now published, and copies can be obtained at once by application to the Librarian. It contains extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of "Proceedings"), after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of "Transactions" and "Proceedings" combined, with single Title-page for each volume, and one volume each of "Transactions" and "Proceedings" with separate Title-pages, together with various Appendices.

The volume is, of course, *absolutely indispensable* to COMPLETE THE SET OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE CLUB, which will then consist of five volumes.

The printing of the limited edition of the part will cost about £50, and the Council has fixed the price at 5s. to Members, and 6s. 6d. to Non-members, post free (nett).

It is hoped that every Member will take a copy, and thus prevent serious loss to the Club by reason of the absolutely necessary expense of the publication of the work.

The sequence of the parts forming the old series of "Transactions" and "Proceedings" is set forth on page 3 of Wrapper of the present Part, and a full list of the Publications of the Club will be found on Wrapper of ESSEX NATURALIST for January-March, 1892.

FOR COPIES APPLY TO MR. A. P. WIRE, 1, SEATON VILLAS, BIRKBECK ROAD, LEYTONSTONE, E.

(See page 3 of Wrapper)

At the church the party was received by the rector, the Rev. Lewis N. Prance, who gave an interesting account of the numerous fine monuments to the Smyth or Smijth family contained in it. The manor was one of the fifty-five lordships granted by the Conqueror to Suene, of Essex, who lived at Rayleigh Castle. It passed subsequently through many owners, before it came into the possession of Sir Thomas Smith, about 1548, and it still remains in that family, the present owner being Sir Wm. Bowyer Smijth, Bart., and it is much to be regretted that he does not live at the hall. The church is in the park, and is dedicated to St. Michael. It is comparatively modern, the old church having been struck with lightning and burnt down in 1611. The monuments are drawn and described in Mr. Chancellor's magnificent book, "Ancient Sepulchral Monuments of Essex," 1890.

One curious feature still remains in this church. From the roof of the nave hang some decayed garlands of flowers, with several pairs of gloves or mittens. These have been used at the burial of maidens (probably of the Smijth family), and remind us pleasantly of the old customs of the past, when on the death of a virgin, a chaplet or garland of white flowers and ribands was carried in and placed on the coffin; and this was afterwards hung up over the seat she had been used to occupy, and appended to it were gloves or paper cut in to that form Mr. Crouch had seen these some years ago in the north, in Cheshire and Derbyshire, and mention is made of them in parish registers, "a garland was hung up in the church," etc. Mr. Crouch also quoted the following from one of the Percy ballads:—

"A garlande fresh and faire,
Of lilies white was made,
In token of virginitie,
And on her coffin laid.

"Six maidens all in white,
They bore her to the ground;
The bells did ringe in solemn sorte,
It was a doleful sound."

It is right to mention, however, that some little difference of opinion obtained among the ecclesiologists present, Mr. Prance inclining to the opinion that the garlands appertained to brials and not to burials, inasmuch as he found on taking them down that the ribbons were of various colours, and he thought that the relics would be more correctly named coronals. In support of this opinion he quoted the sayings of an old man of the parish who was living when he first came into the rectory, and who described their use at village weddings, the bride hanging her gloves upon the garland.

Mr. Crouch was not inclined to accept this statement as conclusive in the absence of further evidence, for in an old poem called "Corydon's Doleful Knell," we read that:—

"A garland shall be framed
By art and nature's skill,
Of sundry-coloured flowers,
In token of good will.

"And sundry-coloured ribands
On it I will bestow;
But chiefly black and yellowe,
With her to grave shall goe."

Mr. Chalkley Gould also read some notes on the use of garlands at funerals, which will be found printed among the "Notes" on page 90 *ante*.

Leaving the church and crossing the road, Mr. Prance pointed out the site of the old hall, close to a good spring of water, and thence over a few fields the rectory at Stapleford Tawney was reached, where the members were entertained with tea by the rector and Mrs. Prance. Both parishes and churches are now under the same rector, the vicarage of Theydon *ad Montem* being probably dispensed with during the incumbency of one of the Smijth family.

A field was passed which showed the ravages of the Bean-beetle (*Sitona*), specimens of which were afterwards exhibited by Mr. Sworder under a magnifying glass.

A sketch map was also shown giving the positions of several borings for water surrounding the rectory, and also near the church and hall, at all of which the search was fruitless. One of the bores entered a mass of conglomerate to a depth of six feet without passing through it; this bed extends for about an acre. At the Hall Farm, within a few hundred yards of the other spot there are two good wells of water each about thirty feet deep obtaining their supply from a vein of gravel at about the same depth as that at which the conglomerate was reached.

The rectory garden is a charming spot, it being an elevated plateau, the ground sloping away in all directions affording fine views over the very pleasant country surrounding it.

After tea an ORDINARY MEETING (the 133rd) was held, Mr. Walter Crouch, Vice-President, in the chair.

Mr. A. W. Harrison was elected a member of the Club.

Various specimens obtained during the afternoon were exhibited. Mr. Sworder showed some geological specimens collected in the parish, including fossil wood bored by *Teredo* from the London Clay, *Inoceramus* in flint, *Echini*, *Belemnites*, oysters, sponges, etc.

Mr. Harry Sworder and Mr. Ernest Fitch, exhibited specimens of the Great and Lesser Grebe, which had been shot in the parish a few years since.

Time would permit only of a brief *resumé* of the intended address by Mr. David Houston, F.L.S., being given. It was entitled "Some Practical Suggestions concerning Botanical Field Work in the County." A paper on the subject by Mr. Houston will appear in a future number of the ESSEX NATURALIST. A short discussion took place in which hearty agreement with the proposals put forward by the lecturer was expressed by Prof. Meldola, Mr. Charles Browne, Rev. W. C. Howell, and Mr. A. P. Wire, and Mr. Houston was warmly thanked for his address.

On the proposal of the Chairman, seconded by Prof. Meldola, a vote of thanks was passed to the Rector and Mrs. Prance for their kindness in receiving the Club.

It was found also impossible to stay long enough to examine the ancient and picturesque Church of St. Mary's, Stapleford Tawney (about which Mr. Prance had gathered some notes), nor to visit Albyns, the seat of the Abdy family at Stapleford Abbotts, permission to view which had been courteously given to compensate for the disappointment of the refusal at Hill Hall, which the conductors had hoped to obtain. It was felt that the whole district was so interesting that another meeting should be held as soon as possible to complete the survey of the same by the Club.

The return journey was a very pleasant one, over Passingford Bridge to Stapleford Abbotts, and so to Lambourne End, skirting the remains of the old Forest of Hainault, through Chigwell, and along the new road over the Roding Valley to Buckhurst Hill Station.

BRITISH ANNELIDS.

WITH ESPECIAL REFERENCE TO THE EARTHWORMS OF ESSEX

By REV. HILDERIC FRIEND, F.L.S.

(*Continued from page 65.*)

THE genus of earthworms which now remains to be examined is represented in England by no fewer than fifteen species, so far as our present knowledge will allow us to judge. So large a group is certain to present a considerable variety of forms, and by a systematic study of each species it is possible to separate the genus into three or four well marked sections, thus enabling the student the more readily to identify the various forms. Before we proceed to this sub-division, however, it will be desirable to obtain a clear idea of the genus as a whole. As I have already indicated, Eisen split up the old genus *Lumbricus* in 1873, and made two new genera. His nomenclature was of the most intelligible character. Selecting the old *Lumbricus terrestris*, L. as his type, with its head perfectly mortised and tenoned into the first ring, he called all the worms which had a differently formed lobe *Allolobophora* or "Different-lobe-bearers." There was one worm, however, which, while it had a different lobe from that of the typical *Lumbricus*, and so was nearly allied to the new genus *Allolobophora*, yet had its male pore on segment 13 instead of segment 15. To distinguish this genus from the other, Eisen turned to its posterior extremity and found it to be sharply angular. He therefore called it *Allurus*, or "Different-tail worm"; and hence we have the true *Lumbricus* as the type, with two genera differing either in the shape of the head or of the tail.

Thus, while the genus *Allolobophora* agrees with *Allurus* in the shape of the lobe or prostomium, it differs from that genus in the position of the male pore. Again, while some of the species belonging to the genus *Allolobophora* closely resemble the true *Lumbrici*, they may always (with one exception, which is at present anomalous) be distinguished by the shape of the prostomium. Having, in my last paper, given a few of the principal characters of the genus *Lumbricus*, I may here supply a similar account of the genus *Allolobophora*.

GENERIC CHARACTERS OF THE ALLOLOBOPHORÆ.

Lip, or prostomium, only partially bisecting the first ring or peristomium.

Setæ eight in each segment, either in couples or forming separate rows.

Clitellum composed of five, six, eight, or more segments, in the British species, commencing on the 24th or some more posterior segment.

Male pores on segment 15 as in *Lumbricus*.

Tubercula pubertatis variable: absent, on alternate segments, or forming a band along part or whole of the ventral side of the clitellum.

Colour more variable than in *Lumbricus*: red-brown, rose-red, flesh, sienna-brown, yellow, green, or grey.

First dorsal pore either between segments 3 and 4, or posterior to this.

Spermathecæ absent or variable in number.

This popular exposition may be made clearer by a tabular presentation of the leading characteristics of the three genera.

TABULAR VIEW OF THE LUMBRICIDI.

GENUS.	*Lumbricus*.	*Allolobophora*.	*Allurus*.
PROSTOMIUM .	Entirely bisecting the first segment.	Not entirely bisecting the first segment.	Slightly cutting the first segment.
SETÆ . .	Always in four close couples.	Not always in four close couples.	On the angles of the tail.
GIRDLE . .	Always occupying six segments.	Not always occupying six segments.	Usually occupying six segments.
TUBERCULA .	Always a band on four girdle segments.	Variable both in number and position.	A band on three girdle segments.
COLOUR . .	Red-brown, irridescent.	Variable: brown, grey, green, flesh, and clayey.	Brown to yellow.
FORM . .	Cylindrical, tail flattened.	Cylindrical, tail cylindrical, flat, quadrangular, or octangular.	Cylindrical, tail quadrangular.
SPERMATHECÆ .	Two pairs in segments 9 and 10.	Number and position variable.	Two pairs in segments 9 and 10

With this systematic arrangement of the genus before us, it will now be necessary to inquire how the various species of *Allolobophora* may be differentiated. To render this point more easy I have arranged the genus in natural groups, depending upon a number of clearly defined characteristics. All the species at present known to science fall under some four natural heading; but as one of these groups is represented in Great Britain by only one solitary species at present, I shall limit the group to three.[1] These I will again arrange in a systematic way in order to show their principal characteristics at a glance.

TABULAR VIEW OF THE GENUS ALLOLOBOPHORA.

§ 1. Lumbricoidea.	§ 2. Mucida.	§ 3. Dendrobæna.
Large, closely resembling *Lumbricus;* usually dark in colour, with setæ in close couples: cylindrical in front, flattened behind. First dorsal pore usually about the 11th or 12th segment. Exude a slimy substance, but no coloured mucus. Found usually in rich soil, arable or pasture, or among manure. Usually addicted to burrowing and making large worm-casts on the surface of the soil.	Medium, not resembling *Lumbricus;* colour very variable, with setæ in close couples; usually more or less cylindrical throughout. First dorsal pore usually about the 4th or 5th segment. Exude a coloured and more or less abundant mucus, sometimes very fœtid. Found largely under stones and among vegetable débris. Not usually addicted to burrowing or making worm-casts on the surface of the soil.	Small, often not more than an inch long. Rose-red or dark brown in colour. Setæ usually wide apart; body more or less angular behind. First dorsal pore usually about the 5th or 6th segment. Exude a slimy substance, but sometimes a coloured mucus as well. Found under the bark of decaying trees, and among rotting timber, or decaying vegetable matter. Not addicted to making worm-casts except under fallen trees or in woods.

It is but right to state that each of these groups runs into the other, so that there is no hard and fast line to be drawn between them; just as we cannot absolutely differentiate the genus *Lumbricus* from *Allolobophora* so as to include every species known to science. Every system breaks down if pressed too hard, and even among the earthworms we find that Nature makes no freaksome leaps, but progresses on regular lines.

I purpose now taking the three groups of worms belonging to

1 Since this article was written I have not only added to the list of British Worms, but have also seen Rosa's excellent arrangement. On the strength of these, it will be necessary eventually to modify the proposed plan somewhat; but, for the present, I allow my arrangement to stand unaltered.

this genus in order, beginning with those which have the closest affinities with the old mother-genus. This is the more desirable, because up till the present time more than one of these lumbricoid species have been confused with the true earthworm, resulting in the greatest possible chaos in worm nomenclature. There are, in the European fauna, something like a dozen species of *Allolobophora*, which fall more or less naturally into our first section, which I term Lumbricoidea, on account of their resemblance to *Lumbricus*. In this country, however, the species have been so neglected that I doubt whether more than three or four have ever been identified; though I believe we shall discover two or three more when the work has been more thoroughly and systematically prosecuted.

Allolobophora: §1, Lumbricoidea.

The type of this section is the Long Worm (*Allolobophora longa*, Ude). Although the species is even more ubiquitous than the common earthworm, and has been known to the angler for ages past as the black-head, this worm was only recognised as a distinct species six years ago, when Ude described it in the "Zeitschrift für Wissenschaftliche Zoologie" (1886, vol. xliii., p. 136), from specimens found in rich garden soil at Göttingen. I believe it had not been recognised in England until two years ago, when I found it near Carlisle, although Mr. Beddard tells me he has generally employed it as the type for class work in his biological lectures! I now find it in every part of the country. A very fine consignment reached me some time ago from Mr. Allen, of Canning Town, who says that having heard that worms as long as young snakes were to be found on enclosed ground adjoining Canning Town Pumping Station, he made application to the resident engineer for permission to visit the spot. That gentleman generously placed a man at Mr. Allen's disposal with spade and other requisites, and thus enabled him to send me a very typical supply of materials. One portion of the ground, which is always damp, swarmed with this species, to the exclusion of all others—even the typical earthworm. I have received it from the borders of Epping Forest and elsewhere, and shall hope to give details of distribution in a special paper after the various species have been described.

The Long Worm is rightly so named. It is usually about six inches in length, but varies a great deal both in size and colour, and

I am making notes on these variations as opportunity permits, because of their important bearing on many points of interest in this connection. The body is cylindrical, tapering in front, and flattened behind. No one seems ever to have called attention to this fact in its relation to those worms which dwell in the soil but come forth to feed. The flattened tail is peculiar to these species, and is of immense importance as a means of securing attachment to the burrow, and resisting the efforts of enemies to drag the creature from its hole. An expert will be able almost instantly to tell the habits of any given specimen submitted to him simply by the shape of the tail. The disposition of the setæ is another matter with a similar bearing.

The colour of the Long Worm is somewhat similar to that of the earthworm when found in gardens or rich soil; but I have found it in some places almost white (var. *lactea*), while in pastures it is a dark sienna brown, almost amounting to black on the anterior portion. The segments number 150 to 200 in a full grown specimen. The setæ are disposed, as in *Lumbricus*, in four pairs, the individuals of which are nearly close together. The under side of segments 9, 10, 11, where the principal organs are situated, is tumid and pale, while on the 15th segment the male pore is easily seen situated on pale papillæ. The prostomium cuts the first ring only partially, but the grooves are very characteristic, as they closely resemble two arrow heads >< placed opposite each other. The first dorsal pore is found between segments 12 and 13. Ude was one of the first to draw attention to this point, and it will be seen by our diagnosis of the groups that there is almost always a direct relationship between the various members of each group in this respect.

The girdle of the Long Worm usually extends from the 28th to the 35th segment, three of which (32, 33, 34) bear the *tubercula pubertatis*. I have met with some puzzling exceptions, which may eventually be made the basis of a new system of classification, but at present they must be kept out of sight.

(*To be continued.*)

A NATURALIST IN ESSEX A CENTURY AND A-HALF AGO.[1]

KALM'S ACCOUNT OF HIS VISIT TO ENGLAND ON HIS WAY TO AMERICA IN 1748. TRANSLATED BY JOSEPH LUCAS. LONDON, 1892.

TO deal with this important work as a whole would involve more space than can be spared; but it must be mentioned that Pehr Kalm was a Swedish gentleman, scholar, and botanist, taking a special interest in horticulture and agriculture, whose stay in England at this time lasted from February to August of 1748. His diary contains a number of references to rural manners and customs, some of which are enriched by Mr. Lucas' notes, dealing, among many other matters, with the survival of words in use in rural districts, and comparisons thereof with the still current forms in other countries.

Unfortunately the work is in disjointed diary form, Essex matters cropping up in about eighty pages out of the 458 of which the book consists. Kalm was now at Woodford, then at Gaddesden in Hertfordshire, and elsewhere, back again to Woodford, in London, Chelsea, and various suburbs of the metropolis; then we find him at Gravesend, and again in Essex, rendering it impossible to trace a continuous narrative of his experiences in our county.

To give an idea of the variety of subjects with which our author filled his diary, it will suffice to quote a few lines from the carefully compiled index:—Acre-reins, Aftermath, Angria the Sea Rover, Asses, Barns, Bugs, Burial at Sea, Capstan, Churches, Cows, Duke of Argyle, Dust, Fairlop Oak, Geese, and so on! Premising that at Woodford he was much with Richard Warner (author of "Plantæ

1 This notice of a book of considerable interest to Essex Naturalists has been kindly written for our journal by Mr. Gould. It may be interesting to add a few further particulars of Kalm and his books, which we extract from the "Saturday Review" of May 7th last:—"Born in 1716, Kalm studied at Abo in Sweden, attracted the attention of Linnæus, became a first-rate botanist, travelled in Russia, and spent more than five months in England about a century and a-half ago. His object was to collect statistics, and make a minute and detailed survey of the system of English agriculture in existence at that time. It is to be noted that his experiences were confined to the home counties, and especially to certain places in Bedfordshire, Essex, and Kent. But there never was a man who, within a limited area, took greater pains to ascertain and record rural facts and statistics, or who brought more intelligence to bear on a subject for which he had been in a measure prepared by his previous training. The word 'agriculture' 'surprises by himself' a study of no inconsiderable magnitude; and though we meet with some amusing notes of the dress, the eating and drinking, and the social customs of our forefathers, the staple of the work is the farm and the plough. It is a Georgic in prose. Kalm, it seems, published three volumes in his lifetime, one-half of which related to America, and he had accumulated ample materials for a fourth volume, but they were burned in 1827. What we have before us is a translation of the whole of Kalm's first volume, and some hundred pages of his second. We understand from Mr. Lucas that this part has never before been translated. The voyage in America was taken in hand by Mr. J. Reinhold Forster in the last century, and may, no doubt, be found by bibliophiles who know where to look for it."—ED.

Woodfordienses"),[2] we find Kalm meeting George Edwards, of Stratford, "the great *ornithologus*," and referring to that naturalist's work with its "matchless copperplates."

On page seventy-four, *et seq.*, we have an elaborate account of the manufacture of vitriol from iron pyrites found near Harwich. A long and appreciative description of our Essex Elm trees occupies much space. "In My Lord Tilney's garden . . . there were high and long *allees* made only and solely of elm."

At Chelsea he sees

"the collection of plants which the great *Historicus Naturalis, Joh. Rajus* or *Ray*, himself collected and arranged, and with his own hand wrote the names under."

Kalm mentioned that Ray's collection was given by him to Samuel Dale, author of "Pharmacologia," afterwards it was borrowed by Dr. Sherard, who was said to have cut out or clipped any rare plant which he wanted for his own collection! Mr. Lucas shows in a note that this mutilation took place between 1718 and 1722. A description of the country between London and Woodford must be quoted :—

"The whole way there is nothing else but a succession of beautiful houses, fertile arable fields, and verdant meadows. At all the houses there was commonly a garden full of various beautiful trees. . . . The whole of the land was divided into inclosures, which were all surrounded by hedges of all kinds of planted trees, especially hawthorn, sloe, dog-rose, blackberry-bushes, holly, *Agrifolium*, together with a number of other trees which had come to grow in the hedges. . . . London's many towers appeared in the distance. . . . The roads are full of travellers, on foot and on horseback, in wagons and carts, who travel backwards and forwards, so that one often has, as it was, to steer through them."

Under date March 7th, 1748, Kalm refers to Epping Forest :—

"Immediately to the north and east of Woodford there lies a beautiful forest. . . . . The forest is high-lying. Rabbits and roe-deer are said to abound in it, though we did not see any when we passed through it. Nor did we find any plants in this forest in flower, excepting the trees named below, otherwise the ground was everywhere green. The trees had not been allowed to grow high, but after they had obtained a height of 9 to 12 feet they had polled them for firewood, or some other purpose. They had afterwards thrown out many branches, and thus made a crown."

2 Writing of Richard Warner, Kalm says: "Few can be compared to him in a peculiar disposition to be of service in all things, both to natives and foreigners. He had travelled much, had a deep insight into nearly all sciences, but particularly *horticulture*, in which his principal pleasure consisted. In his garden were nearly all the trees and bushes that could endure the climate of England, and these stood the whole year out in the fresh air and under the open sky."

He refers to the various trees, etc., which he saw in the forest—first the Holly, "It is much to be wished that it would grow in Sweden." The Hornbeam in abundance, Hawthorn, Beech, Oak, Furze, Dog-Rose, Ivy, Broom, *Ruscus aculeatus*, Spurge-Laurel, and others. He tells of flowers in bloom in gardens, Crocus, Snowdrop, etc.

Then the writer describes our Essex hedgerows with Pollard Oaks, Ashes, and Elms, and gives a list of all the plants and grasses he found in examining the hay in our stacks. In one place he speaks of *Prunus Padus* (bird cherry) being used as a hedge, surely a beautiful sight in early summer; also of *Prunus Sylvestris* (sloe) for the same purpose.

On page 159 we have a description of rabbit warrens, one of which was "between Waltham Abbey and Woodford." Mr. Warner describes Fairlop Oak as "one of the thickest" he had seen in England, and takes Kalm to look at it.

Of Woodford our author says much, describing houses and occupations of the people, and giving an illustration of the style of gates in use.

After "Notes on some branches of Rural Economy in Essex," is a long description of "My Lord Tilney's Magnificent House," enriched by a bird's-eye view of Wanstead Manor from Rocque's Survey (1745).

Towards the end of the work we have a reference to Fennel growing on the chalk slopes in the south of the county, and to Furze being used by the poor for fuel.

He describes the farmhouses in that part as resembling "gentlemen's houses more than farmers' houses." Speaking of the far-famed Essex calves, he says that the farmers

> "used to lay a great piece of chalk in a trough where they had their fatted calves, that the calves might lick it, which, in their opinion, will have the effect of making the flesh become whiter."

He notes the current belief that "cherries in Essex never attain the same agreeable flavour as in Kent, . . . on the other hand, pear trees flourish there well."

These are but a few of the references to Essex matters contained in the book, which, as a whole, is of more than passing interest, and will be a standard work for Englishmen interested in seeing the habits and customs of their forefathers as they struck a stranger in the middle of the eighteenth century.

I. Chalkley Gould.

NOTES ORIGINAL AND SELECTED.

The Skeleton of the Burnham Rorqual—According to the "Essex Weekly News" of July 1st, the skeleton of the Common Rorqual stranded in the river Crouch on February 12th, 1891 (see Mr. Crouch's account in ESSEX NATURALIST, v., pp. 124-128), and "which was ultimately purchased by Messrs. J. S. Prior, Cook, Kendall, and other local gentlemen, has been undergoing a thorough preservation process, rendering it milky white and beautifully clean. The skeleton, which measures nearly fifty feet in length, has now been purchased by Messrs. A. Newman and Bunting, who throughout Friday and Saturday had it 'arranged' at the Public Hall for public inspection. A notice board announcing the particulars attracted a good many strangers as well as inhabitants to view the 'mortal remains,' which weigh about a ton. The skeleton was conveyed on Monday to Southend, where it will be exhibited in a marquee throughout the season."

Pied Flycatcher (Muscicapa atricapilla) near Great Horksley.—On Friday, May 6th, I was outside Great Horksley Plantation with papa, and I saw a very pretty bird fly across the road. I told papa about it, but from my description he did not know what it was. When we were in the plantation we both saw it catching insects. A day or two after we found that it was the Pied Flycatcher, and it seems to be a rare bird in Essex. I thought that, perhaps, you would like to have a notice of it.—(Master) P. HARWOOD, Colchester.

Cæcilioides (Achatina) acicula among Human Remains.—At a meeting of the Club on December 2nd, 1890, (E. N. vol iv, p. 227), I exhibited specimens of this shell which had been found in vast numbers in a human skull, buried four feet deep near East Tilbury Church. In the "Journal of Conchology," for April (vol. vii., pp. 42, 43), the Rev. J. E. Somerville records the finding of quantities of these molluscs in a small bottle or lachrymatory, found at a depth of ten or twelve feet in a Roman cemetery at Ventimiglia, Italian Riviera. The shells were, of course, dead, and of all sizes, some full grown, others young. M. Bonfils, curator of the Mentone Museum, informed Mr. Somerville that he had also found *Cæcilioides* in the interior of earthenware pots from the Roman tombs.—W. COLE, Buckhurst Hill.

Deiopeia pulchella at St. Osyth.—On June 6th, I took a specimen of this rare moth at St. Osyth; a few minutes later I saw another, but having just swum a creek I was not prepared for it, or could easily have taken this also. In September, 1874, when shooting, I saw two specimens of this rare species in a stubble field at Birdbrook, in this county.—EDWARD A. FITCH, Maldon. [This insect was first captured in England in 1818, but with the exception of 1871, 1874, 1875, and 1876, when several specimens occurred, it has always been very rare and sporadic. This year nearly a dozen specimens have been seen or captured in such widely separated localities as Stamford Hill, N., Shorncliffe, Southsea, Christchurch, Dover, and Staffordshire. It is to be hoped that the progeny of these immigrants will make a good show in the autumn. It may be noted that *Myosotis* appears to be the favourite food plant of the larva, and in confinement it prefers *M. palustris*. A very interesting paper on the occurrence of the moth in England, by Mr. R. South, F.E.S., will be found in the "Entomologist," for June.—ED.]

Pond Life in the Forest.—Just now (May) the forest ponds are very prolific in all forms of lowly life. *Hydras*, *Rotifers*, *Volvox*, *Pundorina*, are very abundant in the ponds near the "Forest School," and *Volvox*, especially in some parts, may be found in thousands. Those put in a bottle have increased very much in a few days.

Among the captures was a green *Hydra* without arms. When taken it had all the appearance of having recently had a full meal, but had not the vestige of any tentacle. Fastened as it was by its foot to a weed, it looked like a diminutive green beer bottle, the top part being gorged and distended. I carefully removed the animal to a small bottle, and kept it under observation for some days. At the end of twelve hours from the first examination, arms began to grow. At the end of thirty-six hours two arms were grown, but were short, and the stump of a third was visible. In six hours more four arms were grown a good length, and another was visible. At the end of eighteen hours more it had only five arms, but a bud commenced growing out of its side. In forty-eight hours after this the bud had grown considerably, but still the animal had only five arms. After another forty-eight hours the bud had dropped off, and the creature had now six arms. After this it disappeared, being very likely devoured by some other animal.—A. P. WIRE, Leytonstone.

Neottia nidus-avis at Hazeleigh.—On June 8th, as Mr. Fredk. Spalding and I were walking through Hazeleigh Hall Wood, he called my attention to two fine spikes of the Bird's Nest Orchis. This is the first time I have seen it in this locality, but on the next day I found two other spikes about 100 yards further down the wood. The only record Gibson ("Flora of Essex," p. 308) gives for his district No. 6 is "Woodham Ferrers—Rev. T. Benson."—EDWARD A. FITCH, Maldon.

Vicia lutea at St. Osyth.—On June 5th, I found two or three good-sized patches of the yellow vetch (*Vicia lutea*) under the martello tower on St. Osyth shore. This plant is not included in Gibson's "Flora," but I do not think I can be wrong in my determination of the species.—EDWARD A. FITCH, Maldon.

Epping Forest Flora.—The July number of "Natural Science" contains the following remarks:—"In the pamphlet on the 'Organisation of Science' the author empties the vials of his contempt upon the compilers of county floras, which he calls 'a kind of drivel over which life, and time, and print are wasted.' The author seems to forget that if naturalists are born, not made, it is collecting that has a good deal to do with the bearing: most men begin as collectors, and if this work is to be discouraged as waste of time, the next generation of naturalists is likely to be much smaller than the present. Except with those who agree with the writer of that pamphlet, we think that most naturalists would strongly disapprove of the planting of wild plants from one district in the few small tracts of virgin land we have. We notice in the January number of the ESSEX NATURALIST that *Damasonium* has recently been found in a very well-known pond of Epping Forest.

> 'The thing is neither so very fine nor rare;
> But the question how the devil it got there'

is a problem that is seriously puzzling the botanists of the Essex Field Club. There can be no doubt that such a plant as *Damasonium* could not possibly have escaped notice, while it is difficult to see how its introduction can have been

effected by natural agencies. On the whole one is bound to conclude that a too enthusiastic member of some acclimatisation society must have planted it there. If this sort of thing is done extensively it would hopelessly destroy the interest in the distribution of our native plants, which is the principal incentive to study among a large class of local workers. If this be the true explanation of this case, if the Epping botanists could only find out the man who has helped to muddle up the Forest record, that pond would probably receive an addition to its fauna as well as its flora." [See the the following note by Mr. Powell.]

The Planting of Damasonium stellatum in Epping Forest.—In my recent sketch of the flora of Epping Forest (ESSEX NATURALIST, vol. vi., pp. 7 and 8), I mentioned the finding of this plant in a pond where it had most probably been planted. The surmise proves to be correct. Through the vigilance of a botanical friend the perpetrator of this reprehensible act has been quite recently discovered. It is the same individual whose plantings at Keston and elsewhere are noticed in the strong terms following in the current (July) number of the "Journal of Botany":

"British Botanists, especially London ones, will regret to learn that the introduction of plants into localities where they may become established is being carried on with considerable energy by a member of a London Natural History Society. Hampstead Heath and Keston Bog are two of the places where this pernicious and unscientific action has occurred; and *Parnassia* and *Pinguicula vulgaris* were planted in the New Forest bogs by the same individual. In this case it was possible to nullify the attempt; but the precautions then taken may easily be evaded, and it is to be feared that in some cases the imposition may be successful. We trust that the society referred to will take steps to dissociate itself from so disreputable a proceeding."

It is to be hoped that the castigation inflicted will be sufficient to deter the culprit from continuing his mischievous practices. Such impositions are bound to be found out; but in the meantime are likely to produce much trouble and perplexity, especially to young collectors.—J. T. POWELL, Clapton, July 7th, 1892.

Funeral Garlands.—In further illustration of this subject (*ante* pp. 99 and 105) Mr. T. Lowrey sends us the following extract from Hone's "Table Book": "In the year 1733, the clerk of the parish church of Bromley, in Kent, by his digging a grave in that churchyard, close to the east end of the chancel wall, dug up a funeral crown, or garland, most artificially wrought in filagree work with gold and silver wire, in resemblance of myrtle. . . . Besides these crowns (which were buried with deceased virgins), the ancients had also their depository garlands, the use of which was continued even till of late years . . . which garlands at the funerals of the deceased were carried solemnly before the corpse by two maids, and afterwards hung up in some conspicuous place within the church, in memorial of the departed person, and were (at least all that I have seen) made after the following manner, viz., the lower rim or circlet was a broad hoop of wood, whereunto was fixed, at the sides thereof, part of two other hoops crossing each other at the top, at right angles, which formed the upper part, being about one-third longer than the width; these hoops were wholly covered with artificial flowers of paper, dyed horn, or silk, and more or less beauteous, according to the skill or ingenuity of the performer. In the vacancy of the inside, from the top, hung white paper, cut in form of gloves, whereon was wrote the deceased's name, age, etc., *together with long slips of various coloured paper or ribbons.* . . ."

THE PRESERVATION OF MARINE ANIMALS FOR ZOOLOGICAL PURPOSES.

By J. T. CUNNINGHAM, M.A.

[The following brief exposition of the methods now employed in biological laboratories for the preservation of marine forms has been very kindly prepared by Mr. Cunningham, at our request, as a guide for those taking part in the dredging excursions of the Club, and in order to aid the collecting and preservation of specimens for the Club's Museum. The necessity for the employment of these refined methods of preservation, if specimens of any value to the zoological student or histologist are desired, has been well pointed out by Prof. Playfair McMurrick in the "American Naturalist": "Unfortunately for our students, especially those living inland, and depending largely for their knowledge of marine forms upon dried or preserved specimens in museums, the old-fashioned methods of throwing any material which the collector may find into a jar of alcohol, without further attention, or else drying it in the sun, are still almost the only ones made use of for the preservation of museum specimens. The result is that the majority of forms which the student has for study are either dried skeletons, or shrivelled up monstrosities giving no idea whatever of the actual appearance of the creatures supposed to be represented by them. How many college museums possess a specimen of coral showing in any recognisable form the polyps by which the skeleton coral was formed? Or how many have even a satisfactorily prepared Lamellibranch?" We feel sure that Mr. Cunningham's directions, bearing as they do the authority of an experienced naturalist perfectly acquainted with the work of the Marine Biological Laboratory at Plymouth, will be welcomed by those of our readers taking an interest in marine zoology. Should any difficulties arise in practice, we shall be glad to aid or to obtain aid in solving them, and we hope shortly to be enabled to supplement Mr. Cunningham's paper by one giving some practical hints on the methods of exhibiting the specimens to the best advantage, in bottles or jars, etc., for museum purposes.—ED.]

FOR centuries alcohol has been universally employed for preserving animals or preparations of parts of animals for zoological investigation or study, or for exhibition. Other liquids, such as glycerine, have been occasionally used; but alcohol has been found most generally useful, and it is at this day more indispensable to the zoologist than ever. In this country, for fiscal reasons, pure ethyl alcohol, or spirits of wine (whether absolute or diluted to a greater or less degree with water) is expensive, and it can only be obtained in

large quantities at a moderate cost in the form of methylated spirit, which is ethyl alcohol adulterated with methyl alcohol or wood spirit, and other impurities. The adulteration usually causes no difficulties to the zoologist, but it is essential that the methylated spirit should be capable of mixing with water in any proportion without producing any turbidity or any precipitate.

Modern improvements and refinements in the preservation of marine animals consist in the preliminary treatment of the specimens before they are finally placed in alcohol. The application of alcohol offers difficulties of two distinct kinds. In the first place there are physical difficulties depending on the difference of density between alcohol and water, and the absorption of water by alcohol. These difficulties present themselves in applying alcohol to a dead but otherwise fresh specimen in good condition. Alcohol coagulates the tissues and substance of which the specimen is composed, hardens them, and preserves them from putrefaction or any further change of any kind. But while it hardens thems it rapidly abstracts the water from them, and thus causes soft tissues to contract and shrink until the original shape and appearance of the specimen is entirely lost. To a great extent, or even in some cases entirely, these difficulties may be surmounted by adding the alcohol to the water which contains the specimen very gradually, or by the simpler method of placing the specimen successively in mixtures of water and alcohol in different proportions, beginning for instance with a mixture containing ten per cent. alcohol, and ending with one containing seventy or ninety per cent.

The other difficulties present themselves in dealing with living specimens. The original and primitive method was to plunge the living specimen into "strong spirit," so as to kill it and preserve it at the same time. The consequence of this is that in addition to the distortion and shrinking caused physically by the abstraction of water from the tissues, there occurs a still more violent contraction of all the muscles of the creature, produced by the irritating action of the alcohol on the sensory nerves. A great many of the lower marine animals are endowed with some contracting mechanism particularly adapted to the purpose of withdrawing the more delicate and important organs either into a hard protecting structure, such as a tube or shell, or into the interior of the rest of the body. Such animals are often extremely sensitive, and at the least irritation their beautiful and interesting organs disappear from view, remaining concealed

until perfect tranquillity and healthy surrounding conditions tempt the creatures to expand again and breathe or feed freely. The violence with which the capture of such animals is often necessarily accompanied causes them to be contracted when first obtained, and they contract whenever they are taken out of sea water, only expanding when submerged and left undisturbed for some time. Unless the necessary precautions are taken, the slightest attempt at killing the animals for preservation produces sudden and complete contraction, and the idea of obtaining dead specimens permanently preserved, in the condition which was natural to them when alive and expanded, seems incapable of realisation.

Nevertheless, the difficulties involved have in recent years been to a great extent overcome. The improvement and invention of methods of preservation has been made a special object at the Zoological Station of Naples, and the perfection of the specimens sent out from that institution has become celebrated all over the world. In 1890 the chief of the department by which the work of preservation was carried out was authorised to make public the methods he had adopted, with all their refinements, and these methods are described at length in a paper in the "Mittheilungen aus der Zoologischen Station zu Neapel," bd. ix. (1890) pp. 435—474. The paper has been translated or abstracted in various journals. A complete translation into French is published in the "Bulletin Scientifique de la France et de la Belgique," tome xxiii., part i. (1891), and an abstract so comprehensive as to be almost a complete English translation, will be found in the "Journal of the Royal Microscopical Society," of February, 1891, published by Williams and Norgate. The latter journal is easily accessible to English readers, and the summary of Lo Bianco's paper which it contains may be consulted for more minute details than are given in the present paper. It should be remembered that the reagents employed at Naples have long been in general use, as well as many of the methods described by Lo Bianco, and that, although he has invented many methods and improved others, his great success has been due, not so much to the use of processes unknown to others, as to his intelligence and patience, and to the skill begotten of long practice and scientific attention to details. Much of the renown of the Naples preparations is also owing to the abundant, varied, and beautiful fauna of the Mediterranean, and of the Bay of Naples in particular.

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OF THE

ESSEX FIELD CLUB.

The part of the 'Journal of Proceedings' the publication of which is announced on page 2 of the Wrapper of the present part of the E. N., completes the old series of 'Transactions' and 'Proceedings,' bringing up the reports to January 29th, 1887, after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of 'Transactions' and 'Proceedings' combined, with single title-page for each volume, and one volume each of 'Transactions' and 'Proceedings' with separate title-pages, together with various appendices. The parts were issued as follows, and the appendices indicated should be bound up with each volume:—

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The Essex Naturalist:

BEING THE

JOURNAL

OF THE

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EDITED BY

WILLIAM COLE,

Honorary Secretary.

Contents.

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VOL. IV., PART 2.

Edited by WILLIAM COLE, *Hon. Secretary.*

THIS Part is now published, and copies can be obtained at once by application to the Librarian. It contains extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of "Proceedings"), after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of "Transactions" and "Proceedings" combined, with single Title-page for each volume, and one volume each of "Transactions" and "Proceedings" with separate Title-pages, together with various Appendices.

The volume is, of course, *absolutely indispensable* to COMPLETE THE SET OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE CLUB, which will then consist of five volumes.

The printing of the limited edition of the part will cost about £50, and the Council has fixed the price at 5s. to Members, and 6s. 6d. to Non-members, post free (nett).

It is hoped that every Member will take a copy, and thus prevent serious loss to the Club by reason of the absolutely necessary expense of the publication of the work.

The sequence of the parts forming the old series of "Transactions" and "Proceedings" is set forth on page 3 of Wrapper of the present Part, and a full list of the Publications of the Club will be found on Wrapper of ESSEX NATURALIST for January-March, 1892.

FOR COPIES APPLY TO MR. A. P. WIRE, 1, SEATON VILLAS, BIRKBECK ROAD, LEYTONSTONE, E.

[*See page 3 of Wrapper.*

Sponges.—To preserve specimens of these merely as museum specimens it is not necessary to subject them to previous preparation, but merely to place them in 70 per cent. alcohol, changing the same several times in order that the specimen may be completely penetrated by it.

To prepare dried specimens, wash them first in fresh water for about two hours, then leave them for a day in strong ordinary alcohol, and afterwards dry them in the open air or in the sun.

Anthozoa.—The two principal divisions of this group are the Octactiniæ or *Alcyonaria*, and the Hexactiniæ, of which the Sea-anemones are the most familiar representatives.

Alcyonium digitatum, sometimes known as "Dead men's fingers," is very common on the British coasts, but it is difficult to preserve specimens with the polypes well expanded. The method to be employed is as follows: Place the specimen in clean sea-water until it is completely expanded, for which one may have to wait a day or two. The vessel used must be only large enough to contain the specimen, and when it is expanded the quantity of sea water must be reduced by means of a siphon until only enough is left to cover the specimen. Then a mixture is made of acetic acid (pure), 100 parts, chromic acid (1 per cent. solution) 10 parts, and a quantity of this mixture twice as great as that of the water containing the specimen is rapidly poured over the latter. The polypes are thus killed before they can contract. The specimen is removed after a few seconds into dilute alcohol of 30 per cent., whence it is transferred into alcohol of increasing strengths successively until it is in 70 per cent. A saturated solution of corrosive sublimate, made hot, may also be used in the same way.

Pennatula and *Gorgonia* may be killed in a similar manner; or the former may be taken suddenly when expanded from the sea water and plunged into the fixing liquid.

Actiniaria.—Sea-anemones are perhaps the most difficult of all marine animals to prepare either for exhibition or for study. They are extremely sensitive and very muscular, and the density of the tissues is such that it is very difficult to kill or paralyse the muscles before they contract, or to anæsthetize the sensory tissues completely. It often happens that when the operator believes a specimen is killed or rendered insensible in the expanded condition, and transfers it to some other reagent, it begins to contract violently, and

dies in the form of a shrunken, shapeless mass. Nevertheless, with care and practice considerable success may be achieved.

One species of anemone, *Anthea cereus*, or *Anemonia sulcata*, which is common enough on British coasts, is incapable of withdrawing its tentacles and enclosing them within the contracted walls of its body or "column." The difficulties involved in the preservation of most species are therefore absent in the case of this one. When it is well expanded in a quantity of water just sufficient to cover it, it is killed by the sudden addition of an equal quantity of a mixture of chromic acid (1 per cent.) and picro-sulphuric [1] acid in equal parts. It is left thus for five or ten minutes, and then its base is removed from its attachment and the specimen is suspended by the margin of the base, tentacles downwards, in a $\frac{1}{2}$ per cent. solution of chromic acid; after half-an-hour in this it is transferred to dilute alcohol, and subsequently to stronger alcohol.

Small anemones, such as *Corynactis*, and very small specimens of larger species, may be killed with saturated solution of corrosive sublimate poured over them in boiling condition.

The common red anemone, *Actinia equina*, or *mesembryanthemum*, is to be killed with a boiling mixture of 100 parts saturated solution of sublimate and 50 parts pure acetic acid, from which it is transferred after a second or two to chromic acid $\frac{1}{2}$ per cent.

In the case of *Heliactis bellis*, *Bunodes gemmaceus* and *B. rigidus*, when the specimen is fully expanded, the sea water is siphoned off from the vessel containing it until only enough is left to cover the specimen, and then a volume of chloral hydrate solution, 2 per 1,000, twice as large as that of the water left is added. This anæsthetizes the animal, and after a couple of minutes it is removed in the same manner, and cold concentrated solution of corrosive sublimate is poured in in considerable quantity.

To anæsthetize *Adamsia rondeletii* (the anemone which grows always on whelk shells inhabited by the large hermit-crab, *Eupagurus bernhardus*), tobacco smoke is employed. The specimen in a beaker with sea water is placed in a shallow dish containing a little water, and covered with a bell-jar. A metallic pipe filled with strong tobacco is fitted to a small pair of bellows and the tube introduced beneath the edge of the bell-jar; a small bent glass tube is also fitted beneath the edge of the jar to allow air to escape. By working the

1 Picro-sulphuric acid is made by adding two parts of sulphuric acid per cent. to a saturated solution of picric acid in water, then filtering and diluting the mixture with three times its volume of water.

bellows the bell-jar is filled with the dense fumes of the tobacco, and the whole apparatus is left for some hours. Then the fumigation is repeated in the evening, and the next morning an open bottle containing a little chloroform is placed under the bell-jar and left there for two or three hours. After this the anemone is usually found to have lost its irritability, and not to contract or move when touched, and it is finally killed and fixed in the expanded condition by a mixture of chromic acid (1 per cent.) ten parts, pure acetic acid 100 parts. It is left in this only a few seconds, and is then transferred to chromic acid $\frac{1}{2}$ per cent. for a few hours, and then to alcohol. This method would probably succeed well with *Tealia crassicornis*.

Hydromedusæ.—The fixed branching compound forms of the Hydrozoa such as *Obelia*, *Sertularia*, *Tubularia*, etc., can all be fixed with little difficulty by pouring suddenly over them hot concentrated sublimate solution when they are fully expanded in a small quantity of sea water. They must then be emptied out into cold water and washed for some time in a gentle current of the same, and then be transferred to alcohol of increasing strengths. The small delicate Medusæ, which are derived from the fixed hydroids, are killed in various ways. Many can be well fixed with a mixture of sublimate, saturated solution, and acetic acid, in the proportion of two parts of the former to one of the latter. Others are killed with acetic acid pure, and then transferred to a mixture of alcohol and chromic acid equal parts, in which they remain for fifteen minutes, after which they undergo the usual treatment with alcohol.

Another reagent very useful for Medusæ is chrom-osmic acid made by mixing together chromic acid (1 per cent. solution) 100 parts, and osmic acid (1 per cent.) two parts. Our common *Aurelia*, often occurring in summer in hundreds and thousands, is prepared by placing it in this mixture for about an hour, then rinsing it in fresh water and transferring it to weak alcohol. To avoid the flattening of the medusa it may be placed when in the alcohol, umbrella downwards, in a concave clock glass, or suspended in a loose muslin bag. *Rhizostoma* and other large medusæ may be prepared in the same way, or may be killed in a mixture of three parts of osmic acid (1 per cent.) to 100 of sea water. Specimens should only be left in the osmic until they have acquired a light brownish tinge, then washed in fresh water and transferred to weak alcohol.

Ctenophora.—Only *Hormiphora plumosa* (often called *Pleurobrachia*) and *Beroe ovata* occur commonly on the British coast. The

former is killed in the chrom-osmic mixture, in which it is to remain fifteen to thirty minutes, before being transferred to alcohol. *Beroë* is simply placed directly in alcohol, 70 per cent., but before immersion in this a short piece of wide glass tube is placed in the gastric cavity, a bubble of air being left in the tube so as to cause the specimen to float in the alcohol. The tube keeps the specimen in its natural cylindrical form, but great care must be exercised in the manipulation.

Echinodermata.—In order to prepare star-fishes with the ambulacral feet distended, they should be allowed to die in alcohol of 20 to 30 per cent., with their ambulacral surface uppermost. *Ophiuroidea* should be killed in fresh water and placed in alcohol when dead.

Sea-urchins are to be placed in a small quantity of sea water, and when their tube-feet are extended a mixture of acetic acid 100 parts, chromic acid (1 per cent.) ten parts, is poured suddenly over them. They must be removed into alcohol immediately afterwards, so that the acid may not have time to act on the shell. When placed in the alcohol two small holes should be made at opposite points of the shell to allow the alcohol to enter the interior, and care must be taken in transferring the specimens to stronger alcohol, that the interior is emptied and then refilled with the latter. To prepare sea-urchins dry, holes should be made in them in the same manner, and then they should be placed in 70 per cent. alcohol for a day or two, after which they can be taken out and left to dry.

Holothurians are extremely difficult to fix in their natural extended condition. The method to be followed with large specimens is to seize them when expanded with finger and thumb behind the base of the tentacles and plunge the anterior part of the body into pure acetic acid, while another person injects alcohol of 90 per cent. into the specimen *per anum* with a syringe. As soon as it is dead, the specimen is placed in 70 per cent. alcohol, a cork being placed in the anal orifice to prevent the escape of the injected liquid. Smaller specimens are treated in the same way, omitting the injection, and using forceps instead of the fingers.

Planarians are to be killed by pouring over them boiling corrosive sublimate in saturated solution, turning them out immediately they are dead into cold fresh water, and after washing them placing them in alcohol.

Nemerteans should be narcotized in a solution of chloral

hydrate in sea water of one part in 1,000. After six to twelve hours they are hardened in alcohol in long zinc boxes with a layer of wax at the bottom, being placed in extended position with a glass rod or similar implement, and if necessary fixed with pins stuck in the wax. In some cases the process may be much shortened by employing chloral hydrate at a strength of 1 per cent.

Sagitta may be well fixed in a mixture of 10 per cent. solution of sulphate of copper 100 parts, sublimate saturated ten parts, or in chromic acid 1 per cent. 100 parts, osmic acid 1 per cent. two parts.

Leeches, *e.g.*, *Pontobdella*, are to be killed in chromic acid $\frac{1}{2}$ per cent., extending them with a pin at each end in a dish with a wax bottom.

Polychæta, the more common marine worms of which so many species occur everywhere, succeed well when anæsthetized in a mixture of five parts of alcohol to 100 sea-water. They are to be left in this until they lose sensibility, which takes from two to twelve hours, and then may be hardened in alcohol 70 per cent., or in chromic acid 1 per cent. It is well to harden them first of all in a dish with wax bottom where they can be straightened, and to finish them in long glass tubes. They should be finally preserved in alcohol of 90 per cent. Worms which live in tubes must be carefully extracted before they are killed. *Serpulids* and some others can be made to quit their tubes by being placed in chloral hydrate one per 1,000, after which they are placed in cold saturated solution of corrosive sublimate and then washed in fresh water.

Crustacea.—The larger Decapods, such as crabs, are to be killed first in fresh water, care being taken not to leave them after they are dead, and are then placed directly in alcohol 70 per cent. The hermit-crabs (*Paguridæ*) should be transferred several times to fresh alcohol, and finally kept in 90 per cent.

Amphipods and Isopods can be placed directly in alcohol of 70 per cent.

To prepare **Cirripedia** such as *Lepas* (the Barnacle), they are allowed to die in 35 per cent. alcohol, when in most cases the cirri will remain extended; if not they can be gently pulled out with forceps. *Balanus* (the Acorn Barnacle) is placed directly in 70 per cent. alcohol.

Copepoda and marine Cladocera such as *Evadne*, Schizopoda such as *Mysis*, the larvæ of Decapods, and even the smaller adults such as the shrimp, *Hippolyte*, etc., are best killed with saturated

solution of sublimate. They may be taken out of the sea water separately with a pipette, or may be filtered out by means of fine muslin, or may be killed by simply adding the sublimate solution to the water in which they are swimming, afterwards decanting the mixture and replacing it with pure sublimate solution. Whenever sublimate is used for killing, the specimens should be washed for a long time, *e.g.*, an hour, in fresh water before being placed in alcohol.

Mollusca.—Lamellibranchs must be narcotized in sea water and alcohol (5 parts of the latter to 100 of former), remaining in it six to twelve hours, by which time they will usually be insensible, with the foot and siphons extended; then they can be transferred to 70 per cent. alcohol. It is well to place a piece of wood between the valves of the shell to prevent them closing again.

Gasteropods, such as *Patella*, *Buccinum* (whelk), etc., are to be treated in the same way. Another method which succeeds well with some species of *Natica*, and with *Nassa* and *Trochus*, is to place the animals for some days in a mixture of sea water and fresh water in equal parts, and then fix them with acetic acid.

Among Opisthobranchs Elysiidæ and Eolididæ are to be killed suddenly with pure acetic acid poured over them while expanded in a small quantity of sea water, and as soon as they are dead they must be transferred to weak alcohol.

Doris and allied forms must be first narcotized by adding 70 per cent. alcohol to the sea water containing them, and then suddenly killed with a flood of acetic acid or boiling sublimate. Large specimens of *Tritonia* are to be placed in fresh water to which are added some drops of acetic acid till they are dead, and are then placed in chromic acid $\frac{1}{2}$ per cent.

Cephalopoda.—The Octopods, such as *Eledone* or *Octopus*, are killed in chromic acid 1 per cent., in which they remain half an hour to two hours; they are then washed in fresh water, from which they are transferred to alcohol 70 per cent., changed repeatedly. Decapods, such as *Loligo*, *Sepia*, *Sepiola*, can be fixed in the same way, or directly in alcohol 70 per cent., care being taken to draw out the two tentacular arms as soon as the animal is dead.

Polyzoa.—Many species can be killed in the expanded condition, like Hydroids, with a flood of hot solution of corrosive sublimate. Other methods which sometimes succeed better are adding 70 per cent. alcohol to the sea water, or placing the specimens in chloral hydrate, 1 per thousand, before placing them in sublimate.

Tunicata.—*Appendicularia* should be placed for five minutes in the chrom-osmic mixture.

Clavellina and *Perophora* are placed in chloral hydrate 1 per thousand for six to twelve hours, and then killed with the mixture of ten parts chromic acid 1 per cent. to 100 parts pure acetic acid.

Ciona intestinalis is killed by adding the same mixture drop by drop to the vessel of sea water in which it is expanded; in about half an hour it is dead, and it is then transferred to chromic acid, 1 per cent., some of the same being injected into its interior with a pipette, and after about half an hour it is transferred to weak alcohol.

Of the compound Ascidians, *Botryllus* is best killed by narcotizing in chloral hydrate 1 per thousand, for an hour or two, and then killing with a flood of hot solution of sublimate.

Fishes.—Lo Bianco recommends both for Elasmobranchs and Teleostei simple immersion in 70 per cent. alcohol, an incision being made in the wall of the abdominal cavity, and the alcohol being injected into the cavity and changed repeatedly. But I have found that with Teleostei this method causes contraction of the tissues and folds in the skin, and that cold solution of corrosive sublimate is a much better reagent. After the fish have been in the sublimate solution for half an hour to two hours they must be washed for an hour or more in a current of fresh water and then transferred to 70 per cent. alcohol. Dog-fishes are best hardened in $\frac{1}{2}$ per cent. solution of chromic acid for some hours, with injection into the body cavity, then washed and transferred to alcohol. The colours of Teleosteans are not preserved in spirit, but may be kept to some extent in their original condition by placing the specimens after sublimate and washing, in glycerine and water, changing them constantly into less diluted glycerine, and finally keeping them in pure glycerine.

The embryos of Elasmobranchs, skates, and dog-fishes, may be fixed either in sublimate solution for about fifteen minutes, or in chromic acid 1 per cent., being washed in fresh water before they are transferred to alcohol.

GENERAL RULES TO BE OBSERVED.

In practising the methods above described there are certain principles which must be constantly remembered. Except in the few cases where a greater strength is recommended, alcohol of the

strength of 70 per cent. is to be always used for the final preservation of specimens in stoppered bottles or museum jars. When specimens are placed first in weak alcohol, 30 per cent. is used, and the intermediate strength to be employed is 50 per cent. Ordinary methylated spirit is about 90 per cent. in strength, or more; that is, it contains 10 parts of water to 90 parts of alcohol, and it must be diluted with the proper quantity of water to obtain the other strengths. It is sufficiently accurate to add 20 parts of water to 100 parts spirit for 70 per cent. alcohol, equal parts for 50 per cent., and 30 parts spirit to 100 parts water for 30 per cent. The most convenient measure to use is cubic centimetres, the measurement being made in tall glass jars graduated in those units.

In using corrosive sublimate and most other reagents it is advisable to use wooden forceps and wooden rods or quills for manipulation. The use of the fingers should be avoided as far as possible; if they are used the hands should be well washed with fresh water immediately afterwards. In flooding with sublimate or acetic acid, the small vessel containing the specimen in sea water should be placed in an empty pie dish or porcelain photographic dish, and the specimen may be washed out of the small vessel into the larger. An enema syringe is best for large injections; for small animals pipettes are used, made from a piece of glass tube drawn out at one end in a gas flame, and fitted at the other into an imperforate india-rubber teat. Finally it may be repeated that nothing but attention and care, together with practice, can ensure success in preserving marine animals.

The present paper only deals with preserving specimens entire for museum purposes. For histological microscopic investigation and special study of organs and tissues many other methods are in use; but, nevertheless, specimens properly preserved by the methods mentioned above usually have their tissues in a condition which is to some extent suitable for dissection and microscopic study. It may be mentioned here that small portions of Hydrozoa and Bryozoa prepared as above directed make beautiful microscopic preparations if stained with picro-carmine and mounted in Canada balsam in the usual way. The piece must be left in picro-carmine for half an hour, then washed in water, transferred to successively stronger mixtures of alcohol, and finally to absolute alcohol. After all the water is removed by the latter, the specimen is transferred to clove oil or turpentine, placed on a slide, a drop of Canada balsam dissolved

in chloroform or benzole is placed over it, the cover-glass is put on, and the mount is complete.

It is perhaps unnecessary to mention that corrosive sublimate is a dangerous poison if swallowed. It should be purchased in the dry condition and dissolved in warm water, and then left to cool. In using osmic acid care should be taken not to breathe the fumes of it or to let them act upon the eyes, as they are extremely irritating to the mucous membranes. Osmic acid is sold in sealed tubes, containing one gramme in the crystalline state ; it is soluble in cold water.

THE ESSEX FIELD CLUB.

Visit to the Museum of the Royal College of Surgeons.

Saturday, June 11th, 1892.

On the kind invitation of Prof. Charles Stewart, M.A. (*Hunterian Curator, and President of the Linnean Society*), a very pleasant and instructive visit was paid to the magnificent museum in Lincoln's Inn Fields, endeared to all naturalists as being the repository of John Hunter's specimens, and as the scene of the labours of Quekett, Owen, and Flower.

The party first assembled in the lecture theatre, where Prof. Stewart had arranged a series of very beautiful specimens illustrating the subject of symbiosis in the animal kingdom, and upon which he delivered a most instructive address, further illustrating various points with drawings upon the black-board. It is unnecessary to give any summary of Prof. Stewart's lecture, as symbiosis formed the subject of his Annual Address as President of the Linnean Society for the present year, and which will be published in the Proceedings of that Society.

On the proposal of Mr. Walter Crouch and Mr. J. Spiller, a very cordial vote of thanks was passed to Prof. Stewart for his address, and for his kindness in receiving the Club that afternoon.

The Professor then conducted the party over those portions of the museum more particularly interesting to the general naturalist, giving occasional demonstrations. The visit was thoroughly enjoyed and appreciated by all privileged to take part in it.

Field Meeting in the Writtle and Blackmore High Woods and in Writtle Park.

Saturday, June 25th, 1892.

This meeting was a heathland and woodland ramble, arranged at the suggestion of the conductor, Mr. Miller Christy, F.L.S., in order to enable members to inspect the fine woods of the Writtle district under more favourable conditions than on the last visit of the Club to the locality. This was on May 11th, 1889, and the day will be long remembered as one of the wettest excursions ever undertaken by the Club (see report in Essex Naturalist, vol. iii., pp. 203-208).

The ground traversed on the present occasion was almost exactly the same as on the previous visit, and consequently, as so extended a report of the latter was printed in our journal, it is unnecessary to chronicle the second visit at any length.

Some visitors went down to Ingatestone by early trains, and were enabled to inspect the quiet village and church. The main party started on the ramble about three o'clock, by the Mill Green Road, stopping to inspect the interesting Norman church of Fryerning, which was described by Mr. Chancellor in the report of the visit in 1889 (ESSEX NATURALIST, vol. iii., pp. 205-206), and need not be further referred to than to note that Mr. I. Chalkley Gould drew attention to a curious feature upon the tower, observing that "the picturesque tower, built *c.* 1500, when the church was in possession of the Brethren of the Hospital of St. John of Jerusalem, has upon the face of the merlons or raised portions of the battlements between the embrasures, singular little terra-cotta plaques which upon examination will be found (notwithstanding the weathering of some 400 years) to contain remains of heraldic badges. These appear to represent, among other designs, the Tudor Rose, the De Vere Mullet or Star, the Catherine Wheel, etc., suggesting the idea that when the Brethren raised the tower they had financial assistance from the powerful De Vere family and others, commemorating the fact by the insertion of these interesting plaques, which are certainly worthy of a closer examination than can be bestowed upon them on the present occasion."

Then Mill Green, a pleasant stretch of furzy common land, was crossed, and a visit paid to the curious hedge-bank on the edge of the common, discovered by Mr. Miller Christy, and described by him in the Trans. Essex Arch. Society, vol. ii. (*n. s.*), p. 357 (see also ESSEX NATURALIST, iii., 142 ; iv., 133). Here an abundance of fragments of ancient pottery were collected, the date of which appears to be somewhat doubtful. The ruins of the Hermitage or "Bedeman's Berg" were also again visited, and then a very pleasant ramble was taken through the luxuriant woods, permission to visit which had been kindly given by Lord Petre and Mr. Arthur Pryor. Many plants and insects were observed, but none calling for any special notice. It was evident that if the woods could be "worked" by good collectors, they would furnish a rich store of entomological and botanical specimens.

Tea was taken under the trees in Writtle Park, being admirably served by Mr. Hicks, of Chelmsford.

After tea an ORDINARY MEETING (the 134th) was held for the election and proposal of members, Mr. Christy in the chair. Messrs. John Flower, R. Z. Pitts, M.R.C.S., and Alfred Studholm were elected members. On the proposal of Mr. W. Cole, a vote of thanks was passed to Mr. Christy for his care in arranging the meeting.

A pleasant return walk to Ingatestone Station in the evening brought the meeting to an end.

NOTES—ORIGINAL AND SELECTED.

Colias edusa in Essex.—The promise of the spring with regard to the "Clouded Yellows" (*ante*, p. 99), has not been altogether fulfilled, but the weather has been unsettled and somewhat cold. A good many specimens of *C. edusa* have been seen near Maldon, Epping Forest, etc., and during the last few days I have observed about thirty specimens in the clover fields at East Mersea,

all males, with one exception. It is probable, if the weather improves, that the butterfly will increase in numbers; but I fear we cannot now anticipate a repetition of the prodigious flights of 1887. *Cynthia cardui* (summer brood) has appeared in very great numbers, frequenting the Black Knap-weed fringing the cornfields and lanes near the sea; patches of this plant with dozens of this insect, and "Red Admirals," "Blue," "Copper," "Wall," and "White" butterflies settled on and flitting about the blossoms in the sunshine, sometimes presented a marvellous spectacle of ever-changing colour.—W. COLE, East Mersea, August 15th, 1892.

Monotropa hypopitys (Yellow Birds-nest) in Epping Forest.—On examining a bundle of letters from the late Mr. James L. English, I find that on July 26th, 1887, he sent me specimens of *Monotropa* from Epping Forest, which he had just gathered, probably from some spot in the forest near Epping. The observation is worth recording, as the plant is rare in Essex, only two stations being given by Gibson: namely, Audley End and Danbury.—W. COLE, Buckhurst Hill.

Damasonium stellatum in Epping Forest.—Mr. Britten writes as follows in the "Journal of Botany," for August, and although it is true that the specimen found by Mr. Powell had been wilfully introduced (see *ante*, p. 117), Mr. Britten's remarks are interesting and suggestive:—"It is unfortunately only too certain that this pernicious practice of plant-introduction has been carried on lately, but I think it at least possible that the case of *Damasonium* may be one of survival. When living at High Wycombe, in 1867, I found the plant, in no large quantity, in one pond on Naphill Common. It decreased in abundance during the next year or two, and I searched for it in vain in the neighbouring ponds. On revisiting the place in 1890, I found it in its old habitat, and also, in much greater abundance, in a pond and marshy ground at some little distance. This year the plant is exceptionally luxuriant in this latter pond, the specimens floating in the water at some distance from the margin being the largest I have ever seen. There is no reason to suspect an introduction in this case; and it would be interesting to know whether *Damasonium* is one of the plants which disappear for a time and then re-appear. It was formerly frequent in the Wanstead and Epping Forest districts (see 'Flora of Essex,' p. 326), and Mr. Powell says it was 'found in Wanstead Park soon after it was thrown open to the public.' The 'English Botany' figure (t. 1615) is from a Wanstead specimen, and Sowerby gathered the plant 'frequently in Wanstead Park'; and Edward Forster notes on his specimens in Herb. Mus. Brit., 'In ponds and gravel-pits on the forest between Walthamstow and Wanstead.' I am inclined to doubt whether Mr. Powell is right in classing *Damasonium* as now existent in the forest area as an alien, but the lamentable action lately taken renders it impossible to come to any satisfactory conclusion."

Local Scientific Societies' Committee of the British Association.—We understand that successful meetings of this Committee took place during the Edinburgh Congress of the Association. Prof. Meldola, who has usually acted as Delegate of the Essex Field Club, was Chairman of the Committee, and Mr. T. V. Holmes (who is now Secretary) represented the Club. The subject of Local Museums was brought forward, and will probably form a leading item in the Agenda for the next year's meeting.

ON SOME PLATEAU DEPOSITS AT FELSTEAD AND STEBBING.

By J. FRENCH.

IN the Geological Survey Memoir illustrating sheet 47, the chapter on Post-Glacial Drifts (p. 64) is introduced by the following paragraph, by Mr. W. H. Penning:—

"Here and there on the hills and higher grounds are patches of loam and loamy gravel, never of any great extent or thickness, but forming portions of what once was probably a much larger extension. The fragments now left generally occupy slight depressions in the Boulder Clay or other bed on which they occur, and seem to pass down into it without any definite line of division. They occur at nearly all levels from the top of the Chalk escarpment down to the higher terraces of the present valley system."

To this Mr. Whitaker adds: "It is possible that some of these loams may be allied to the stony loam just described." The description of this loam is as follows (pp. 62, 63):—

"A strong [misprint for 'stony'] loam or clay that often occurs as a thin capping on the Boulder Clay, from the gradual decomposition of which indeed it seems to have originated. The lumps of chalk seems to have been dissolved out, whilst the insoluble flints, etc. have been left behind, and the colour has changed to a yellowish brown."

A careful examination of these deposits will, I submit, not only raise those probabilities to certainties, but will show that in these gravels and loams we have representatives of climatal and other conditions which have long since passed away.

The examination of the position and of the mineral character of the deposits in some sections in this neighbourhood afford material for discussion.

At Molehill Green, Felstead (three miles east of church), there is an exposure of Post-Glacial Gravel. It is represented in colour on the one-inch Drift Map as a loam, which is certainly an error as regards its western margin, although true for part of the Green itself. The sections made last winter about a furlong west of Whelpstone's Farm gave eight to ten feet of gravel resting on Chalky Boulder Clay. The position and composition of this gravel is important. A reference to the map will show that the place occupies nearly the summit of a promontory made by the curve of the river Ter. It does not quite

occupy the highest ground. That is to be found about a furlong to the north-east, and is about six feet higher, and is of Boulder Clay. The gravel is about sixty to seventy feet above the river.

This gravel rests upon the Boulder Clay, and as in its composition it has, so far as I can see, no bond of connection with that deposit, it could not well have been derived from its waste. It does, however resemble local Glacial Gravel (that underlying Boulder Clay), and may, therefore, reasonably be supposed to have been derived directly from it. But when we come to inquire how the transport was effected, and from what direction it came, we are met with a great difficulty. The promontory at the time of the deposition of the Boulder Clay was here probably surrounded on three sides by a considerable valley.[1] We should, therefore, be taking an unwarrantable position in supposing the Boulder Clay to have filled up the valley here, and so to have formed a bridge over which the gravel could pass, although it may have done so. It would be better to suppose that the gravel came from the west, where Glacial Gravels are now exposed at a mile distance, but at a somewhat *less* elevation.

The forces engaged in this transport must have been prodigious, whether submarine or due to melting ice after the elevation of land (there would certainly seem to be a hiatus between the underlying Boulder Clay and the gravel as shown by the sharpness of the juncture). Whatever may have been the agency, it was sufficient to transport boulders of upwards of seven pounds in weight.[2]

The onus rests with me to show that the Post-Glacial has no bond of connection with the Boulder Clay. This is difficult to prove, but the same difficulty applies to the Gravel *underlying Boulder Clay*. Anyone well conversant with the two deposits cannot possibly mis-

1 This I infer from the circumstance that the stream now occupies a depression in the London Clay, and that Boulder Clay in at least two places extends to nearly the bottom of this depression on Molehill Green, and at the same elevation London Clay is reached at a depth of less than ten feet. Continuing down the valley, but more towards the west, Boulder Clay extends nearly to the bottom. On the opposite side of the river, at Willows Green, *at about the same elevation* as at Molehill Green, London Clay is exposed as shown on the map, and at a little north-west of this, *at a much less elevation*, Boulder Clay rests on the slope. [On this statement Mr. Whitaker remarks as follows :—"This is clearly a case showing the irregular deposition of Boulder Clay, which cuts into London Clay in a sort of irregular channel. But the valley has been worn out since the deposit of Boulder Clay, and is cut through it and the gravel to the London Clay. The mapping distinctly makes the gravel underlie the Boulder Clay. Of course there may be later gravel also.—W. WHITAKER."] That marked on map as Glacial Gravel at this spot, is probably Post-Glacial, and is thinly spread at places. In the absence of sections which did not then exist, it could hardly have been marked otherwise than as Glacial. That at Peak's Hall, a little further up stream, I cannot as yet determine.

I may mention that I have notes of similar depressions in the London Clay which are partly occupied by Boulder Clay, extending along the present bed of the Chelmer. I hope to put them on record later.

2 I only found one stone weighing as much as forty pounds, and it is *possible* that this may have been dug from the underlying Boulder Clay, but I feel quite sure that this was not so. Although I broke the Boulder, I could make nothing of it, as it did not agree with any rock that I had before seen.

take Glacial Gravel for Boulder Clay derivatives.[3] The members of one are enclosed in a matrix of sand or sandy loam, and in the other of clay or chalky clay. In one the stones are much water-worn and abraded, and in the other the flints are often entire or sharply splintered, and seldom show any signs of water-wearing. Pieces of Oolitic rock, with fossils, are frequent in the Boulder Clay, but never occur in the Glacial Gravels hereabouts. Precisely the same may be said of the Post-Glacial Gravels under consideration.

When we consider the position of this gravel, occupying practically the highest land within nearly a mile radius, and remember that it belongs to the closing scenes of the glacial disturbance, we shall have a better apprehension of the work of denudation which has since been in progress, and of the great changes in contour which have occurred. This single instance, in fact, demonstrates the existence of Plateau Gravels which are now reduced to a remnant.

At Blewitt's Pit, Stebbing, about a mile N.N.E. of the church (old one-inch map, sheet 47), there is a deposit of very sandy loam, with large boulders, overlying Westleton Gravel, which is only to be accounted for on the supposition that this friable loam is the representative of a deposit now almost vanished. The loam is much too sandy and friable to be mistaken for weathered Boulder Clay. At any rate, I have not seen any weathered Boulder Clay at all like this deposit.[4] It has a faint tinge of purple, and were it not for the large boulders entombed, I should say it was a rain-wash derived from the Westleton Gravel. The loam occupies a considerable elevation, say sixty to seventy feet above the Stebbing Brook, but it is surrounded on three sides by rather higher land. These higher eminences now consist of Westleton Gravel or Boulder Clay.

There are other sandy loams in the vicinities of Willows Green, Fairwood Common, and Rayne, which appear to stand on the same footing as that at Stebbing; but we cannot in these cases separate so clearly the influence of surrounding beds.

These Plateau Gravels (in the sense that they overlie Boulder Clay) have been called Post-Glacial; but they have no other claim to that epithet, as evidence exists of arctic conditions obtaining posterior to the formation of those gravels. This is to be found

3 "But there are sometimes beds of Boulder Clay *in* this Gravel—not in the tract described perhaps and also there are beds of Gravel in Boulder Clay." W. Whitaker.

4 "In Suffolk I have seen, in section, Boulder Clay passing *laterally* into sandy stony loam (see Southwold Memoir). Some Boulder Clay is very sandy." W. Whitaker.

in the Plateau loams, a general description of which has already been quoted from the Survey Memoir.

At Causeway End, Felstead, three-quarters of a mile S.S.E. of church (marked erroneously on the old one-inch map as "Cobbler's Green"), a loam of this description has been worked for many years for bricks. It is over eight feet thick in one place, and it everywhere rests on Boulder Clay. Some curious facts have come out in the working of this deposit. The entombed flints are nearly all broken and, after the fracture occurred, they have at times sunk to the bottom of the loam. At other times, after the fracture, the pieces have separated laterally, sometimes as much as three inches of loam intervening, and those corresponding pieces may now be brought together and fitted again. Moreover, every piece has, since its fracture, been coated with a brownish-yellow deposit. A gradation in the character of the loam is also discernible, it becoming stronger in proportion to its approach to the Boulder Clay. Bricks made from the upper portion of the loam (but not so near to the surface as to be affected by modern weathering) cleave with facility. Those from the lower portion, in spite of much artificial working of the clay, are much more refractory.

At Great Saling Gravel Pit (near the church) a similar loam occurs, having some of these peculiarities, and, in addition, nodules of Boulder Clay retaining their chalk are enveloped in the mass. Fundamentally these loams appear to differ only from Boulder Clay in the angular character of their flints, and in the almost or complete absence of chalk; a resultwhich may be brought about by weathering alone, and that this was the agency there seems to be good evidence.

The cleavage of the rocks, and their juxtaposition in the loam points to the exertion of molecular forces such as those brought into play by the action of frost and thaw. Their position alone testifies to the changes having been made in place. That chemical agencies, giving rise to the yellow coating of the flint fragments, have been at work the following instance will show. A flint was found which had been broken into two pieces, which, although still in contact, had slid laterally. These were afterwards joined together by a siliceous cement which could only have been the result of chemical agencies.

The fracture of the flints by frost is easily explicable to those conversant with the fragile character of recently dug flints. They are then full of quarry water, upon which the least frost acts. The behaviour of soils under the action of frost and thaw is familiar to

most persons. These agencies cause a complete disintegration of the soil, and there is a sensible movement of the mass due to the redistribution of the molecules. If there are lumps of chalk in the soil (Boulder Clay) the change is more striking. In the case of complete penetration by frost, sufficient moisture being present, the lumps of chalk suffer disintegration, and when the thaw comes they are quickly broken up and diffused through the soil (see "Notes on the Prolonged Frost," ESSEX NATURALIST, vol. v., page 66). The effect of this diffusion is to make the soil afterwards more pervious to water; and the effect of rain-water containing carbonic or other acids then percolating through the soil is to attack the calcareous matter and gradually take it away in solution. Boulder Clay is ordinarily almost or quite impervious to water; but if, by any means, it can be completely penetrated by frost, a door is at once opened for the admission of atmospheric agencies, and this door will not again be closed until most or all of the calcareous matter is removed.

In order to apply this reasoning to the cases under consideration, we must suppose longer or colder winters than we have at present. My experience is that our winters make no appreciable difference to the weathering of the Boulder Clay when it is kept moderately dry.[5] The conditions required for change seem to be such as those now obtaining in some parts of Siberia or Canada, but not where the soil is permanently frozen, a thaw being essential to the work of decalcification. Cases are quoted where the loams extend to a depth of ten feet. In order to affect the Boulder Clay to such an extent, it seems that the winter temperature must have been much lower than at present, and the country correspondingly sterile; moreover, we know that the drainage was less perfect than at present, and the swamps may have assisted the frost materially in its work.

In inquiring as to when such arctic conditions prevailed, we must take into account the work done by erosion since. This is considerable, for some loams now occupy such a position that, supposing those conditions of frost to return again, the loams would, on account of the loss of their lateral supports, slide down the slope on the return of the thaw. In fact, a frost and thaw of that character would be prolific of landslips in England. The extent to

5 A perpendicular section of Boulder Clay made here about twenty years ago, with slightly overhanging ledge, has not suffered appreciably by weathering.

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OF THE

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The part of the 'Journal of Proceedings' the publication of which is announced on page 2 of the Wrapper of the present part of the E. N., completes the old series of 'Transactions' and 'Proceedings,' bringing up the reports to January 29th, 1887, after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of 'Transactions' and 'Proceedings' combined, with single title-page for each volume, and one volume each of 'Transactions' and 'Proceedings' with separate title-pages, together with various appendices. The parts were issued as follows, and the appendices indicated should be bound up with each volume:—

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OF THE

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EDITED BY

WILLIAM COLE,

Honorary Secretary.

Contents.

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VOL. IV., PART 2.

Edited by WILLIAM COLE, *Hon. Secretary.*

THIS Part is now published, and copies can be obtained at once by application to the Librarian. It contains extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of "Proceedings"), after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of "Transactions" and "Proceedings" combined, with single Title-page for each volume, and one volume each of "Transactions" and "Proceedings" with separate Title-pages, together with various Appendices.

The volume is, of course, *absolutely indispensable* to COMPLETE THE SET OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE CLUB, which will then consist of five volumes.

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The sequence of the parts forming the old series of "Transactions" and "Proceedings" is set forth on page 3 of Wrapper of the present Part, and a full list of the Publications of the Club will be found on Wrapper of ESSEX NATURALIST for January-March, 1892.

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See page 3 of Wrapper.

which this wearing away has occurred, therefore, represents the least time which has elapsed since the Boulder Clays were altered into loam.

Another deposit of quite a different character must now claim our attention. This is at Stebbing Downs, a little north of the village, or "Dunes," it might have been written, for the greater part of the upland of that place is a large sand-dune (that is, a heap of blown sand). Overlooking the Mount, and near to the brickyard, a pit has been worked for sand, and a notice of the underlying Westleton Gravel, etc., has already appeared in the ESSEX NATURALIST (vol. v., page 210). The upper six feet of sand, however, is a very singular deposit, and its age and true character were not at first apparent. An implement made out of a piece of conglomerate and a fragment of Roman pottery having lately been found in it, its age is not so uncertain.[5] Indeed, until quite recent times (of improving agriculture) the formation must have been still in progress. A close examination of its structure and material shows the bed to be a product of dry denudation, all of it having been drifted by the east wind. Small pieces of chalk from the size of a shot upwards, and almost always rounded, are collected in masses in different places. These were supplied by the Boulder Clay, whilst the sand was supplied by the Westleton Beds, both formations being exposed on the somewhat higher grounds to the east and north-east. The drifting of the sand is peculiar, and much resembles "false-bedding." Towards the south of Stebbing village, and on the same side of the brook, there is another upland deposit of sand differing slightly from that of the Downs, but probably of the same age. The sand here is cemented into masses by a ferruginous deposit.

Any attempt to judge of the ages of the three deposits of which we have treated is affected by difficulties which concern relative as well as absolute time. We may judge with a poor approximation of the rate of denudation now in progress; but we cannot say that it was the same in comparatively recent times, although times of greater sterility as shown by the Stebbing sands. Much less can we say anything of the times when those Plateau loams were made. With a lower winter temperature there was a greater erosion during thaw; but there were longer intervals of rest during frost, and we do not know whether the *débris* was removed at the same rate as at present or not.

The same difficulty is increased in judging of the early Post Glacial Plateau Gravels; erosion then was prodigious, but it may

5 I have (May 7th) since found a small bed of charcoal ashes under six feet of blown sand.

have only resulted in a shifting of local material. The rate at which the material was borne to the sea—the true measure of denudation—is at no time known.

In puzzling out the history of Post-Glacial change the counties of Norfolk, Suffolk and Essex are the volumes, so to speak, to be studied ; yet it is singular how much of these counties (compared to some others) has been neglected by geologists.

The comparative poverty of the indigenous fauna and flora, not only of England, but of Europe, can only be explained by reference to Quaternary deposits.[6] Thus in the small province just treated of, we make out one important point, and that is the gradual amelioration of climate. At first the conditions appear to be impossible for plant or animal life. Later, they are shown to be very unfavourable, and even in recent times those conditions were inclement, although greatly improved ; and but for artificial aid they would be so now.

In connection with this poverty of plant and animal forms (which may, however, have been exaggerated) we read of insular conditions and other secondary causes ; but we do not always or often consider that that poverty might be inferred, and its true cause ascertained, by the study of the ground under our feet.

NOTES—ORIGINAL AND SELECTED.

Cat Nursing an Otter, and Otters in Mersea.—On the 18th of April a man brought us a baby otter, which his dog had found in a rabbit's hole in a field called "Goyants," near Chapel End, East Mersea. The tracks of the mother had been previously seen, and an old lady, it was reported, had been much frightened by meeting the big beast in a neighbouring lane. "Goyants," as we christened our pet, was a quaint old-world-like little animal, lively, and occasionally pugnacious, and we were sanguine of rearing it as it took milk freely. Home at Buckhurst Hill it seemed comfortable enough in its warm basket before the kitchen fire. One morning we missed the otter, and after a search the little creature was discovered safe and cosy in our very maternal cat's basket, apparently on friendly terms with a solitary kitten. The cat must have taken considerable trouble to transport the otter to her own bed, and very fond and proud of her new kitten she seemed to be, judging from her self-satisfied purring. All went well for a time, but, alas! one morning, three weeks afterwards, poor little "Goyants" was found dead in the basket. No cause could be found for the calamity, as the night before he had seemed as lively as ordinarily, whistling vigorously when touched. I have had the animal preserved for the Club's museum.

6 My authorities for the poverty of the European Flora were Prof. Wright's book on the "Ice Age of America," and a paper by Grant Allen in the "Fortnightly Review" of some four years ago.

We have since heard that a female otter, accompanied by another young one, was smoked out and killed from a drain near the Pyefleet Channel, within sight of the "Goyants" meadow. It seems quite useless to remonstrate against the senseless destruction of these interesting animals. The slaughter in this case is more to be regretted, as I am told by the marshmen and labourers here that otters were unknown in the island before this. An East Mersea farmer, whose personal knowledge of the place extends back fifty years, assured us that he had never heard of one having been seen.—WILLIAM COLE, East Mersea.

Seal at Bradwell.—On June 21st, William Linnett shot a seal, which had been seen there several days previously, just off St. Peter's Chapel Point, Bradwell. It measured 4ft. 6in in length, 34½ in. in girth, and weighed 80lbs. Mr. Miller Christy and I saw the skin and skull at James Spittey's, Bradwell Waterside, on July 19th, and we believed it to be the common seal (*Phoca vitulina*), but were not sure.—EDWARD A. FITCH, Maldon.

Stork on the Stour River.—The "Essex County Standard," of September 17th, records that "a few days ago a fine female stork was shot on the River Stour, near Mistley, by Mr. A. Saunders." No indication of the species is given, but the editor makes the following remarks: "It is said this stork is the only specimen known to have appeared in the Stour within living memory [this statement is not correct]. Considering the sort of reception which they are likely to get, it is not strange that they are not often seen upon our hospitable shores. Probably if an angel were to alight upon this island for the purpose of paying one of those visits which are 'few and far between,' some gallant British sportsman would at once take aim in order to send the visitor to a taxidermist, and an account of his own prowess to the local paper. As soon as any uncommon bird or beast turns up it is marked for slaughter, no matter how inoffensive it may be, or how useful. The animal is shot, not in the interests of science, nor in the legitimate pursuit of 'sport,' but merely to satisfy curiosity and the instinct of destruction. It is a pity that this should be so, and we venture to hope that the next stork which turns up in the Stour may be left unmolested. At the same time we should strongly advise it to keep away." Since the above was in type, we find from a communication from Major W. S. Dawson, of Higham St. Mary, that the bird was a *tame* White Stork (*Ciconia alba*), but we retain the paragraph, as the occurrence may serve to explain some of the records of this bird in Essex and other counties (see "Birds of Essex," p. 188). Major Dawson writes:—"The appearance of a fine female stork in the Mistley marshes a short time ago, where it was shot by a local 'cachiatore' whilst standing on one leg, I can account for; he need not longer feel proud of his performance. For several months past my children were the happy possessors of a pair of white storks, which were brought to them from Austria when fledgelings. They grew up quite tame; would come when called by the names, 'Hans' or 'Delft'; would fly away high into the sky at times, soar about round Higham Church, perch there, and I believe next year would have built their nest upon the square tower had they been left alone. I had arranged to clip their wings during the time of migration this autumn. By next spring their wing feathers would have grown again, and they would have been well contented to remain with us. They were well known to the people about here, to whom it gave pleasure to watch their gyrations. Hans has, I hear, met with the same fate as his bride whilst standing on one leg in another marsh."

Frogs and Snakes in Mersea.—If the country people here are faithful observers, this head-line parallels that of the famous chapter in the Natural History of Ireland, for they tell me that there are no frogs or snakes on the island. I have certainly seen none, although many places appear to be fitted for them. Is a like absence of these animals in other places on the Essex coast known to any reader? Possibly the animals cannot cross the salt-water fleets, and any individuals accidentally introduced may be speedily destroyed by the numerous herons and voracious sea-birds always on the look out for anything promising a suitable meal.—W. COLE, East Mersea.

Clouded Yellow Butterflies in Essex.—Since the date of my last note (*ante*, p. 130) we have kept a good look out for *Colias* in the clover fields here. The changeable and somewhat stormy weather of a fortnight back, followed by exceedingly cold nights, apparently much diminished the numbers of these butterflies; but we have taken two specimens of *Colias hyale*, and several others were seen. *C. edusa* has been fairly abundant when the weather was favourable, and this day (September 16th), in spite of a stiff breeze blowing, I saw a considerable number of specimens (males and females), together with abundance of *Cynthia cardui*, in a large clover field on the borders of an escarpment overlooking the sea, but partially sheltered on one side from the wind by a high hedge. We were pleased to take, some days ago, two examples of the variety *helice*, together with an interesting specimen intermediate between that and the ordinary form of the female *edusa*. We had not previously seen *Colia helice* alive since 1877, when we found it somewhat commonly in a clover field at Woodford Bridge, Essex (see ESSEX NATURALIST, vol. ii., p. 170).[1] A large number of records in the current entomological periodicals attest the extent of the migration of *Colias edusa* this year, and the wide range of the irruption. Mr. Lane says ("Entomologist," Sept., p. 208), that it was fairly abundant at Chingford on August 14th, and one *helice* occurred.—WILLIAM COLE, East Mersea, Sept. 16th.

[Since writing the above, my sister saw *edusa* in our garden at Buckhurst Hill on September 20th, and again on the 28th, and other records have come in from Forest Gate, Woodford, High Beach, etc., as well as Mr. Fitch's interesting news from Maldon below. Mr. Harwood notes the capture ("Entom. Record," iii., 208) of five specimens of *C. hyale* at St. Osyth, Myland, and Lexden; and two others were seen.—W. C.]

Colias edusa and C. hyale near Maldon.—This has been quite an *edusa* year again. The butterfly has been common, almost abundant at times, everywhere in this neighbourhood, but not in the numbers that it occurred in 1877. I first saw *C. hyale* on August 16th; on the 23rd of the same month it was fairly common. My boys chased and caught over twenty, and I caught two at once in one sweep of the net. Several specimens of this same species were again seen on August 27th.—EDWARD A. FITCH, Maldon.

Lycæna corydon, and Colias edusa and helice in Epping Forest.—It may be interesting to note that on the 22nd of August I captured a freshly emerged male specimen of *Lycæna corydon* on Fairmead, Epping Forest. I may also add that during the past week I caught, besides many good specimens of *Colias edusa*, a fine example of the var. *helice*.—J. BERNARD ARGENT, Woodford Wells, 23rd August, 1892.

1 *Errata.*—In the two notes above alluded to, two printer's errors have escaped correction—in E.N., vol ii., p. 170, line nine from the bottom, for 1887 *read* 1877, and in vol. vi., p. 131, three lines from top, make the same correction.—ED.

[It is very interesting to hear that *L. corydon* still exists in the Forest. In 1859 it was observed somewhat commonly near Loughton and at Epping, and since then several records have been published (see E. A. Fitch's "Butterflies of Essex," in ESSEX NATURALIST, vol. v., p. 104). One would expect to meet with the insect on the Chalky Boulder Clay on the N.W. slopes of the Forest, but Fairmead is an unexpected locality. I *believe* that I once saw the butterfly near Stanstead —W. COLE.]

Hesperia lineola, *Ochs.*—Mr. Hawes, the original discoverer of this new British butterfly, which was first recognised in specimens taken at Leigh, Essex (see ESSEX NATURALIST, iv., p. 191), has now been enabled to work out the life-history of the insect, and gives a detailed description of the larva and its distinguishing characters as compared with that of *H. thaumas*, in the "Entomologist" for August. The food-plant is the coarse grass, *Triticum*, growing on the sea-walls near Leigh. Neither species pass the winter in the larval stage, as has been erroneously stated.

Local Names.—Here, in Mersea, the country people call the butterfly known in most places as the "Red Admiral" (*Vanessa atalanta*), "King Georges." The Black Knap-weed (*Centaurea nigra*) is known as "Arrow-head," and the red berries of *Arum maculatum* the children call "Snake's eggs," because, they say, they are so poisonous.—B. G. COLE, East Mersea.

Past Industries of Colchester.—Major J. E. Bale writes: "The manufacture of linen was carried on in Colchester up to the seventh decade of the last century, as Chapman's and Andre's map of Essex shows that the town possessed several 'Tenter Fields,' all necessarily contiguous to water supplies, *viz.*, several on the meadows to the north of the Castle, and down to the river, and others near Mersea Road. Thereabouts existed open supplies of spring water, now, for the most part, made tributary to the sewerage of the town. 'Tenter Fields' were spaces whereon the woven flax fabrics were bleached and treated in the open air during process of manufacture. Evidences are also found of the existence of factory buildings in their neighbourhood. Hence, on the visit of the Huguenot Society to Dedham a few weeks ago, the name 'Tenterfield' still existing there to designate the meadow from the river to the old mediæval factory buildings, elicited the circumstance that linen manufacture was carried on there previous to the occupation of the bay weavers, who re-adapted the building in question, as shown by constructive features in the fabric. In Mr. Laver's paper, read before the Society, casual allusion was made to the existence of 'fulling mills' in the rivers here. The map before-named, in Mr. Laver's possession, shows most of the water mills were 'fulling' or 'corn and fulling mills.' Such were East Mill and Middle Mill. This clearly explains the fact of 17,000 persons being employed in the bay-making industries, such being distributed over a large surrounding area, under more healthful conditions than usual in the factory systems of this day."

THE GEOLOGY OF THE DISTRICT AROUND DAGENHAM BREACH, ESSEX.

By T. V. HOLMES, F.G.S., M.A.I.

[*Read at Field Meeting on July 23rd*, 1892.]

IF we stand on the marshes six or seven feet below high water mark, near the lake which forms a pleasant memorial of the Dagenham Breach, and gaze around, we cannot but notice the contrast between the scenery of the Kentish side of the Thames and that of the Essex shore. Southward, beyond the marshes of Erith and Plumstead, we see the bold ridge of the escarpment of the Lower Tertiaries with the Chalk at its base, the London Clay capped by gravel rising above it at Shooter's Hill. Where the surface of this high ground is composed of Blackheath Pebble Beds its height above the river averages about 150 feet; but at Shooter's Hill the greatest elevation is about 420 feet. If, on the other hand, we look northward, we see, in the first place, the limits of the marsh on which we are standing indicated by the houses on the road connecting Barking and Rainham, which are on the southern edge of the low, broad plain of river-gravel which lies between the marshes and the higher ground beyond Ilford and

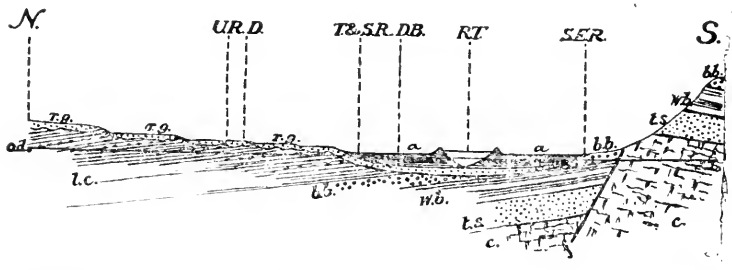

DIAGRAM SECTION FROM ROMFORD (N.) TO BELVEDERE (S.) SEVEN MILES.

(Showing the river-gravel and alluvium on the Essex side of the Thames, and the Lower Tertiary escarpment and fault on the Kentish shore.)

N. North. S. South. U.R. Upminster Railway.
T. & S.R. Tilbury and Southend Railway.
S.E.R. South Eastern Railway.
D. Dagenham. D.B. Dagenham Breach.
R.T. River Thames.
o.d. Ordnance Datum. l.c. London Clay.
b.b. Blackheath Pebble Beds. *w.b.* Woolwich Beds.
t.s. Thanet Sand. c. Chalk.
a Alluvium. r.g. River Gravel.
f. Fault.

Romford. This broad plain of river-gravel varies in height from about 12 to 15 feet above Ordnance Datum at its southern margin to more than 100 feet along the course of the new railway between Upminster and Romford, and around North Ockendon. About Ilford, Dagenham village, and Rainham it is below 50 feet. The old river-gravel not only rises above, but also extends below the alluvium of the marshes, as the following sections from Whitaker's "Geology of London and of part of the Thames Valley" show. North of Dagenham Lake a boring pierced (vol ii., p. 279):—

Yellow or marsh clay	3 feet.	
Peat	8 ,,	
Blue clay	8 ,,	
Gravel and sand	3 ,,	22 feet.

Again, south of the lake, we find:—

Yellow clay	2 feet.	
Blue clay	5 ,,	
Peat	8 ,,	
Blue clay	2 ,,	
Gravel and sand	7 ,,	24 feet.

The amount of peat and driftwood in the alluvium varies very much from place to place, but is usually very considerable. The proportion of driftwood-peat to peaty material resulting from the decomposition of reeds, etc., which have grown *in situ* is also very variable. At Tilbury Docks driftwood appeared only in a thin bed below two others composed chiefly of the remains of reeds; while at Albert Dock the thick peaty bed was chiefly made up of driftwood, the limits of the later being much more variable and ill-defined than those of the Tilbury beds. The most common mammalian remains in the alluvium appear to be those of red deer and oxen. Among the trees are trunks of oak, birch, alder, hazel, and yew. The peaty beds, as the sections given show, are interbedded with seams of marsh clay or mud, the whole series resting upon sand and gravel, river-deposits mainly of older date.

Beneath these river deposits are either Chalk or Tertiary Beds. At the north-eastern corner of Albert Dock there is Chalk, while at Barking and Dagenham village there is London Clay. Chalk, again, was found below seventy feet of river beds at Marshfoot Farm, a mile N.W. of Purfleet. Crossing the Thames, we find that at Crossness and Belvedere, on Erith marshes, Chalk could only be reached after passing, not only through the river deposits, but through the whole of

the Thanet Sand and Woolwich Series, with, here and there, some Blackheath Pebble Beds, and even a little London Clay.

We may now consider briefly the general geological structure of the district around us and the way in which its present scenery has been slowly evolved. The lowest formation, the Chalk, dips northward from its escarpment, along the line of the North Downs, beneath the Tertiary Beds of the London Basin, and rises again from beneath them in Hertfordshire and north-western Essex. But in addition to this general arrangement there is a slight anticlinal curve along the valley of the Thames which raises the Chalk to a higher level than it would otherwise possess there. In consequence of this anticlinal the quarries at the base of the Lower Tertiary escarpment opposite, and those at Greenhithe, Gravesend, and Cliffe, show the Chalk lying either level or with a slight southerly dip instead of a northerly one, the Tertiary Beds above necessarily partaking in this upturn. On the Essex shore the northward dip is speedily resumed, as shown between West Thurrock and the Mardyke, along the course of the new railway; the lowest formation seen at the surface over the greater part of Essex being the London Clay. Two lines of fault, also, though they have not greatly influenced the scenery, have had much to do with the variations in the nature of the beds underlying the river-deposits. One of these faults, which has a downthrow at Greenwich of about 100 feet to the north-west, ranges from St. John's railway station, along the northern margin of Greenwich Park, and may pass under the Thames a little west of Woolwich Dockyard. If produced so as to cross the Albert Dock, its presence may perhaps account for the fact that Chalk is found below the river-beds at the eastern end of the dock and Woolwich Beds at the centre and west. Another line of fault ranges nearly east and west at the foot of the Lower Tertiary escarpment between Woolwich and Erith, having a downthrow to the north. Hence the Lower Tertiary Beds are brought in again north of this line of fault and found beneath the river-deposits of Erith marshes.

But the chief influence in giving its present aspect to the scenery around has been the Thames. Beginning as a much more powerful stream, flowing at a much higher level, it once ran by Romford, Hornchurch, and North Ockendon, and thence by Stifford to Stanford-le-hope. It has since been occupied in deepening its valley and in taking a more southerly course. No doubt it once flowed at the foot of the Lower Tertiary escarpment, from which it is now sepa-

rated by the marshes of Erith and Plumstead, and to this extent its course is now, locally, more northerly than it was at no very distant date, speaking geologically. But while the Thames never ran south of the foot of the Lower Tertiary escarpment, it was during many ages slowly cutting its way from the northern edge of the broad river flats of Essex, and from a height of one hundred feet above its present level, to the position it now occupies. Were the rock underlying the river-gravel between Romford and the Thames Chalk, we should, doubtless, be able to trace distinct terraces at various levels, marking stages in the progress of the river southward and downward to its present position. Indications of these terraces are indeed visible here and there; but, owing to the softness of the London Clay underlying the river-gravel, they cease to be traceable in the course of a few yards, becoming merged in a vague slope. I have noticed a precisely similar state of things in Cumberland at a spot where the river Eden had cut terraces in soft, incoherent Glacial Drift. During its lateral progress southward, the Thames may have destroyed considerable areas of high ground. Mr. Whitaker (Geol. Lond., vol. ii., p. 14) gives the full thickness of London Clay in this district as about 450 feet. Of course we are only likely to meet with this thickness where the London Clay is capped by the conformable, or nearly conformable, Bagshot Beds ; where it forms the surface, or is covered by unconformable gravels or other deposits, it may be greatly attenuated, and is sure to be so to some extent. It is therefore somewhat remarkable that at Dagenham Hall there are 400 feet of London Clay beneath the old river-gravel, or almost as much as in the well of the Essex Lunatic Asylum at Brentwood, close to the outcrop of the Bagshot Beds, which cap the hill. Coming nearer to Dagenham, I note that at Upminster Rectory the London Clay, beneath old river deposits, was only 150 feet thick, while at Ilford, beneath similar beds, the greatest thickness recorded is 93 feet. Now at first sight it would seem probable that there would be more London Clay beneath the river deposits at either Upminster or Ilford than at Dagenham ; and certainly the existence of 400 feet at Dagenham seems to need some explanation. Last year, during the voyage of the Essex Field Club from Maldon to Chelmsford, I suggested (ESSEX NATURALIST, vol. v., p. 201) that the Bagshot outliers of Warley, Stock, and Billericay might owe their preservation, to a considerable extent, to their position on a long line of synclinal fold, the continuation of which, on the Kentish shore, appeared at

Shooter's Hill. It seems to me that at Dagenham Hall we have evidence of the continuation of this synclinal beneath the gravel flats of Essex, between Warley and Shooter's Hill. It is at least probable, therefore, that before the Thames in its lateral progress southward had planed away the original features of the ground, Bagshot outliers may have diversified the surface around Dagenham, where we now see but one unbroken flat of river-gravel.

AN ANGLER'S NOTES ON DAGENHAM LAKE.

By JOHN HILLIAR.

DAGENHAM Lake, or the "Gulf," as it is locally called, has long been a favourite resort of anglers, and has had a good reputation as a fishery. Twenty years ago it was a quiet, out-of-the-way water, with many secluded spots where an angler could sit quite hidden among the reeds, and oftentimes take in a few hours a basket of fish heavier than was convenient to carry away. The water is about forty acres in extent, and is fed by the Beam river, two small streams called the Goves, and the adjacent land drainage; the overflow and flood water passes away under the river wall, through sluices, into the Thames.

The following is a list of fishes which I have taken, or know to have been taken, from this water. There are most likely other species that I have not met with or heard of:—

Common Carp (*Cyprinus carpio*).—A few very fine specimens, weighing ten to fourteen pounds each.

Tench (*Tinca vulgaris*).—Small, to one pound each.

Bream or **Carp Bream** (*Abramis brama*).

White Bream or **Bream Flat** (*A. blicca*).

Hybrid Bream.

The breams were the most numerous fish in the lake, and specimens have been caught there weighing three and four pounds each.

Roach (*Leuciscus rutilus*).—The roach was next in abundance to the breams, generally small; but some few were caught weighing from one to one and a-quarter pounds.

Rudd or **Red-eye** (*Leuciscus erythrophthalma*).—Small fish, the heaviest eight to ten ounces.

Perch (*Perca fluviatilus*).—Very fine, from one to five pounds. Mr. Pennell records one of eight pounds taken in the lake.

Pike or **Jack** (*Esox lucius*).—All sizes, from quite small up to twelve and fourteen pounds each.

Eel, Common Sharp-nosed (*Anguilla acutirostris*).

Eel, Snig (*A. mediorostris*).

Trout are said to have been taken, but I have never seen any; and **Flounders** have probably been only accidental visitors.

This fishery has much deteriorated during the last ten years; the fishes now taken being fewer in number and much smaller in size than of old. The following circumstances have doubtless helped to cause this.

Some tons of fishes were poisoned a few years since, by the accidental admission into the lake, through a broken sluice, of an immense quantity of floating slime and other matters from the deodorizing works at the sewage outfall on the opposite bank of the Thames.

The direct flow of water from the Beam river (which at times caused a perceptible current through the lake) has been almost totally stopped, the old communication being choked up.

The smoke from steamships on the Thames, when a southerly wind is blowing, passes over the lake, and much soot falls upon the water. This is very injurious.

A large ditch communicating with a pool on the north side of the lake, and which used to be the great retreat for the larger fishes at spawning time, has been filled up. The new roadway now passes over it, and the communication is stopped.

The fishery would, I feel sure, soon improve if a new opening between this old spawning pool and the lake were cut, and the old direct flow from the Beam river renewed.

There has been much controversy on the subject of the sense of hearing in fishes; its existence being denied by some on account of the absence of auricular apertures, while asserted by others from practical experiment. An experience I have many times had at Dagenham may, to some extent, perhaps, be new or interesting, and may help to throw some light upon this subject.

I have seen thousands of fishes leaping out of the water at the same instant, over all the surface of the lake, as far as my sight could take cognisance. I knew that it was common to see shoals of fish leap out when suddenly attacked by a pike, but at such times the space covered would never exceed a few square yards, and that this very general appearance of fright must be from some very different cause.

On the same thing again occurring, I noticed that immediatel afterwards (not more than one or two seconds), I heard the boon. from heavy artillery ; these guns were being fired on the marshes far away, on the opposite side of the Thames.

These circumstances, repeatedly occurring in the same sequence, made it evident that the fishes felt the vibration in the water from the earth tremor caused by the explosions sooner than the waves of sound had travelled to and been heard by myself, thus proving that, although fishes may be deficient of visible auricular organs, they have a sense or perception of vibration which appears to be more than an equivalent ; inasmuch as they become aware of the effect produced by that which causes sound, sooner than such sound can reveal itself to our sense of hearing.

Although so near to London, the lake is occasionally visited by many wild fowl. I have seen upon it wild swans, geese, ducks, herons, widgeon, teal, gulls, and others.

Moor-hens and coots breed in numbers among the reeds, and thousands of starlings roost among the willows. Notwithstanding that the district is slowly waking up to commercial activity, some of the old quiet and repose is still left, some of nature's charms yet remain. The moor-hens may be heard calling to their chicks, the reed warbler still be seen flitting about while chirping his pretty little notes, thousands of swallows may be seen hawking for the flies over the surface of the water, and the lark is still heard carolling his joyous song as in the days long past.

THE ESSEX FIELD CLUB.

Field Meeting at Dagenham and "Parsloes."

Saturday, July 23rd, 1892.

Under the guidance of Mr. Walter Crouch, F.Z.S., and Mr. T. V. Holmes, F.G.S. (*Vice-Presidents*), an afternoon excursion was made to the southern part of this parish, and a pleasant time passed, the weather proving fine and genial. Prof. Boulger, F.L.S. (*Vice-President*), and Mr. David Houston, F.L.S., kindly acted as "Botanical Referees."

The party assembled at Dagenham Station at three o'clock, and before starting, Mr. Crouch gave a few notes on the parish and its surroundings, the northern parts of which had been visited by the Club in June, 1887 (see Essex Naturalist, vol. i., p. 143), when the moated house of "Valence," Becontree Heath, Chadwell Heath, and the moated site of "Marks" had been seen. The

parish of Dagenham, like the adjacent ones of Hornchurch and Upminster, is long and straggling, extending about seven miles from north to south, is barely two miles at the extreme width, and consists of 6,556 acres. On the north, the wooded heights of Havering, South Weald, and Upminster were pointed out, and eastward, over the River Beam (which is at its source known as the Bourn, and then as the Rom, as it passes through Romford), the Manor House of "Brittons" was seen, the ancient seat of the Ayloffes of Hornchurch.

Passing southward to the village, which consists of two "streets," the vicar, Dr. Moore, joined the party, and on the way to the church the remains of the large old house of the Comyns was shown, now divided into cottages; and the exterior of the vicarage, dating from 1663. The church is dedicated to Saints Peter and Paul, and here the notable features were pointed out by the vicar, and notes on the architecture and monuments were given by Mr. Crouch. The chancel is Early English work, and on the north side is a vicar's chancel. The nave and embattled tower, with spire, were rebuilt in 1800, at a cost of £6,000, a portion of the old tower having fallen at the end of the last century and destroyed part of the church. The *débris* was only partly removed, the remainder being left, and the flooring placed over it, so that until the restoration in 1878, the nave was about two feet above the level of the chancel, which was reached by steps. At this date the north gallery was also removed, and the ceilings of nave and chancel painted in a curious pattern of green trefoils and leaves. The original altar stone of Purbeck marble, with the five crosses representing the wound marks, was then discovered, broken in two pieces, and was placed on the top of the communion table; the piscina, also of Purbeck, was opened out, and the three-light east window filled with stained glass in memory of Rev. T. Lewis Fanshawe, father of the present owner of "Parsloes," who was vicar for forty-one years, dying in 1858. Among the monuments in the vicar's chapel is a fine one, with life-size standing effigies of Sir Richard Alibon, knight, who died in 1688, and his dame, by whom the memorial was erected. The inscription records that he was advanced by King James II. "to be one of the Justices of the Court of King's Bench, being the first of the Romish faith these 150 years." Close by, on the floor, are a series of slabs inscribed to the Uphill family. Richard Uphill was standard bearer to William and Mary, and Queen Anne, and died in 1717. Adjoining these is one in memory of Thomas Comyns, M.D., who died in 1656. On the walls are monuments to Jonathan Loyd, "faithful pastor of Dagenham," 1654, and an armorial one to James Harvey, of Wangye House, 1627, who had seventeen children. A notice of one of his daughters, Elizabeth, who married Richard Heigham, and her brass effigy in East Ham Church, may be found in the "Journal of Proceedings," E. F. C., vol. iv., p. cxlv.

On each side of the chancel walls are trophies of helmets, gauntlets, and a sword. On the north is an altar tomb of Purbeck, with effigies in brass of Sir Thomas Urswick of Marks, with his lady in "butterfly" head-dress, and thirteen children. He was M.P., Recorder of the City of London, and was knighted by Edward IV. in 1471 on the battlefield of Tewkesbury (the last of the Wars of the Roses). In all probability he rebuilt the half-timbered Manor House of "Marks." He died in 1479, and was here buried. No inscription is now remaining, and the brass of the four sons has been stolen during the last two years; but in Weever's time, 1631, a portion of the label bearing his name was extant. A careful copy of this brass was published by the Cambridge Camden Society in 1840, with notes by "E. I. C." From this we gather that nothing of his parentage or private life is

known. He was elected Common Serjeant of London, 1453, Recorder in 1454, and is then styled "a discreet and circumspect man," and elected "for his prudence and affability." In 1461 he represented London in parliament. He took the side of the House of York, and in 1471 he, with some of the aldermen "that hade reule of the cyte," let King Edward in at "dynertyme," and then took King Henry VI. and Archbishop Nevill, and put them "in warde" the next day.

On the 22nd of May, 1472, Sir Thomas was appointed Chief Baron of the Exchequer, and held this until his death, seven years later. Amongst his estates we find "the Manor of Marks with two messuages, a windmill, 360 acres of land, and 110s/ rent." He also held the Manor of Uphavering or Gobions, in Romford (Marks Gate), of Elizabeth, Queen of Edward IV., consisting of a messuage, 222 acres of land, and a rent of 8/1.

There are also memorial tablets to members of the Fanshawe family, and on the south wall to Jacob Uphill, 1662, the father of Richard, previously mentioned.

On the north wall of the nave are tablets to Thomas Waters, 1756, John Tyler of Mawney's, 1807, and one recording the munificent gift of £10,000 by Wm Ford, a farmer, in 1825, for the building and endowment of a free school at Dagenham. He also left £900 for clothing the poor. On the south side are memorials to Nathaniel and James Rogers, Alex. Millner, Jonathan Arnold, of Whalebone Cottage, 1857, John Guillemard, F.R.S., 1844, and William Stone, 1839. On either side of the tower are two small vestries.

The church and manor formerly belonged to the Abbey of Barking; and are therefore not mentioned in Domesday Book. They took the great tithes, which now form part of the endowment of the Free School at Brentwood, founded by Sir Antony Browne, and endowed a vicarage here. The present patron is Mr. T. C. Moore. The Rev. John Langhorne, D.D. (1735–1779), poet and joint author with his brother William of a Translation of "Plutarch's Lives," by which he is now best known, came here as curate in 1761, after his unrequited attachment to Miss Anne Cracraft, and here penned his "Hymn to Hope."

Mr. Crouch concluded his remarks by calling attention to a gravestone close by the door of the vicar's chancel, in memory of James Palmer, for twenty-four years clerk and sexton of this church, who met his death by the falling in of a grave in 1878. Beneath is a stanza from "Miss Kilmansegg," by Tom Hood, beginning "'Tis a stern and startling thing to think." The vicar then said that he had suggested the epitaph, and asked if it was not an appropriate one.

On leaving the church, the walk lay across the fields to Rippleside, where in olden times stood the Manor House of "Cockermouth." This, and even the name, has entirely disappeared, the modern residence of Mr. W. Varco Williams, named "Merrie-lands," being built on the site. John de Cockermouth held this of the Abbess of Barking, *temp.* Edward III. At the Dissolution it was sold to Sir Antony Browne.

Thence by way of Chequer's Lane the party arrived at Dagenham Level, and the margin of the Thames, overlooking the great Breach which occurred here on the 17th December, 1707. Permission to visit here had been accorded by Mr. Williams, the owner, and one of his sons kindly received the members and gave some details of the machinery, and the work on which they are engaged. Standing on the new wooden jetty, with the four lofty hydraulic cranes towering above, a paper was read by Mr. Crouch on the course of the river, the characteristics of the locality, and the incidents and repair of the great Breach (this paper will be printed *in extenso* in the next number).

Mr. Crouch then pointed out the Perry Dam, the two thatched fishing cottages; and the "Gulf" covering some forty acres was inspected. This lake was formerly highly valued by the London anglers, and we had with us a veteran of the rod in the person of Mr. John Hilliar, who was one of the *habitués* of the gulf for many years, and who kindly furnished some notes of his recollections of the spot, which are printed in the present number of the ESSEX NATURALIST (*ante* p. 146).

Notes on the Geology of the district were read by Mr. T. V. Holmes (see p. 142), whilst the botanists of the party looked after the plants, which were spoken of by Prof. Boulger and Mr. Houston, the botanical referees.

Return was then made to Rippleside, and by field paths to the avenue which leads to the ivy-grown mansion "Parsloes," the residence since 1619 of a branch of the Fanshawe family. Here, in the great drawing and dining-rooms, which, like the hall, are all panelled in oak, the usual high tea was admirably served by the contractor, Mr. Hicks, of Chelmsford, the present owner, Mr. John Gaspard Fanshawe, having kindly granted permission to the Club to visit the place.

A meeting (the 135th) was subsequently held on the lawn, Prof. Meldola, F.R.S. (*Vice-President*), occupying the chair. The Rev. E. Foley Evans, B.A. was elected a member of the Club.

After the formal business the following short account of the interesting Manor House and the Fanshawe family was given by Mr. Crouch, illustrated by plans, books, and copies of some of the more notable portraits, which, until recently, were preserved here at Parsloes:

SOME ACCOUNT OF THE MANOR OF PARSLOES AND THE FANSHAWE FAMILY

By WALTER CROUCH.

THE earliest mention of Parsloes, Passelowes (or Parslowes, as it is written in the will of W. Fanshawe, 1634) is in 1585, when it was described as containing 10 messuages, a cottage, 10 gardens, 2 orchards, 100 acres of arable, 20 of meadow, 50 of pasture, 30 of wood, and 40/- rent.

The entrance lodge (in the lane called Gale Street) and the avenues, nearly as far as the house, are in Barking Parish. The older portion of the present mansion, in the Parish of Dagenham, was probably built by, and was at any rate the residence of, Sir Hewit Osborne, son of Sir Edward, Lord Mayor of London, an ancestor of the Dukes of Leeds, who died in 1600. His son, Edward, sold it in 1619 to William Fanshawe, one of the "Auditors of his Majesties Duchie of Lancaster," and third son of Thomas Fanshawe, of Ware Park and Jenkins; who had acquired property in the neighbourhood some time before. The deed is dated 16th Feb., 16th of King James I., and the consideration is £1,150. Later on he purchased other land in the district, and in particular the site and remains of the Abbey of Barking. The present owner, Mr. John Gaspard Fanshawe, is the ninth holder of the estate, and seventh in descent from him. The house was well described in 1872 by Mr. H. W. King (Hon. Sec. Essex Archæological Society) in the privately printed "Notes of the Fanshawe Family."[1] The following is an extract:—

"During the two and a-half centuries that it has been in the possession of the Fanshawes, it has . . . . undergone much alteration, and at three very distinctly marked periods; the latest, and most extensive . . . . in 1814, when the mansion was somewhat enlarged, the walls were faced with new brick and furnished

1 Five parts of these were printed in quarto, 1868-72. They contain pedigrees, funeral certificates, extracts from registers and Bible, grant of augmentation of arms, and a number of early wills; and are well illustrated with cuts of arms, early plans of the estates, and autotypes of some of the portraits. These original documents were mainly furnished by Mr. Edward J. Sage, of Stoke Newington, and are copiously illustrated by notes on persons and places from his pen.

throughout with battlements, and many windows of pointed form were inserted. Its plan now consists of a centre hall, and two transverse wings. The hall is lighted upon the west, and panelled throughout with small square panelling. The ceiling is modern. The stone fireplace[2] is on the east side, near the lower end; but this, as well as those in the servants' hall, kitchen, and library, was brought from the more stately Elizabethan mansion of Eastbury House. All are enriched with carving.

"Between the years 1619 and 1634, William Fawshawe appears to have added a large apartment at the north end of the house (now the drawing-room), also panelled with oak, with fine Jacobean carving over the mantelpiece. The floors of the hall, drawing-room, and library are of oak, and the two first were no doubt laid when the respective rooms were built; but that in the library came from Eastbury House. The library was erected by the Rev. John Fanshawe about 1814, on the site of the south gable."

An extensive collection of books is still stored here; but the more valuable, including the original MSS. of various Fanshawe writings, memoirs, and a copy of the 1632 folio of Shakspeare, with the extensive series of family portraits, have been removed to Mr. Fanshawe's house at Pimlico. Amongst the portraits may be specially mentioned a very fine one of the famous Sir Richard, by Dobson; his wife, Lady Fanshawe, a portrait which has been engraved several times, and is affixed to her "Memoirs"; Sir Simon, with a back ground of Naseby-field; and Sir Thomas and Lady Fanshawe, by Lely. Many of these had come from Ware Park, which was sold in 1668, and from Jenkins sold about 1705.

Still remaining in the hall are the horns of wapiti and two of moose, brought by the present owner's uncle, Sir Gaspard le Marchant (from whom he derives his name), from Nova Scotia, of which place he was Governor.

The garden front of the house is largely covered with ivy; the gardens proper cover about four acres, and the well-timbered park and avenues, sixty-two acres.

The original stock of the Fanshawe family hail from Fanshawe Gate, near Dronfield, in county Derby. A younger son, Henry Fanshawe, who was appointed Remembrancer of the Court of Exchequer, appears to have been the first settled in or near London, and held leases of Clay Hall and Valence. His first wife was Thomazine Hopkins of Carswell (Barking Side), who died 1562. He died at his London house in Warwick Lane, and was buried at Barking; the heralds attending his funeral being Clarencieulx, Kinge of Armes, and Rougedragon Poursuyvant. His second daughter and co-heir (by his second wife, Dorothy, daughter of George Stonerd of Loughton), married Timothy Lucy of Valence (E. N, 1887, p. 144). His third son, William, was the founder of the Parsloes branch. His daughter Alice married Sir Christopher Hatton of Clay Hall (see E. N., 1891, p. 185-6) and Margaret, Sir Benjamin Ayloffe of Brittons.

The eldest son became Sir Henry Fanshawe, the father of Thomas, who was made K.B. at coronation of Charles I., and created Viscount Fanshawe, 1651, who was compelled to sell Ware Park on account of heavy losses incurred as a Royalist during the Civil War. From his son, in a direct line, sprung the fifth and last Viscount, who died 1716; and his daughter Mary married Sir Thomas Cambell of Clay Hall (E. N., 1891, p. 186), who died in 1665: it is supposed by the Great Plague. The most prominent member of this family, however, was Sir Richard Fanshawe, Baronet (brother of the first Viscount), born in 1608. His father died when he was but eight years of age. In 1623 he entered Jesus College, Cambridge, and in 1627 travelled abroad to learn foreign languages. In 1630 he was Secretary to the Embassy in Spain. At the outbreak of the Civil War he attended the king to Oxford, where he met his kinswoman, Anne Harrison, whom he married in 1644. He was then Secretary of War to Prince Rupert. Whilst here he received the degree of Doctor of Laws. He was created a Baronet in 1650. Later on he was taken prisoner at the

2 These are all engraved in "Clarke's Eastbury," folio, 1834. Each have separate designs with spandrels all carved. On the shields of the one in the library, have been affixed the metal crests of the Fanshawe family.

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'TRANSACTIONS' AND 'PROCEEDINGS'

OF THE

ESSEX FIELD CLUB.

The part of the 'Journal of Proceedings' the publication of which is announced on page 2 of the Wrapper of the present part of the E. N., completes the old series of 'Transactions' and 'Proceedings,' bringing up the reports to January 29th, 1887, after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of 'Transactions' and 'Proceedings' combined, with single title-page for each volume, and one volume each of 'Transactions' and 'Proceedings' with separate title-pages, together with various appendices. The parts were issued as follows, and the appendices indicated should be bound up with each volume:—

		s.	*d.*
Vol. I. With 'Proceedings.' [*Title*—'Transactions' of the Epping Forest and County of Essex Naturalists' Field Club.]	President's Inaugural Address . .	0	6
	Part 1 (September, 1880) . . .	1	0
	„ 2 (December, 1880) . . .	2	0
	„ 3 (February, 1881) . . .		
	Title and Index—First List of Members and Rules.		
Vol. II. With 'Proceedings.' [Same Title.]	Part 4 (June, 1881)		
	„ 5 (October, 1881)	5	6
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	„ 2 „ „ (Dec., 1886) .	3	0
	Title and Contents.		
Vol. IV. 'Proceedings' only. [*Title*—'Proceedings' of the Essex Field Club.] Price 10s. 6d.	Part 1, Vol. IV. ('Proc.') (June, 1885) .	3	0
	„ 2 „ „ (Pub. Mar., 1892)	6	6
	With Appendices III. and IV.		
	Title, Index, &c.		
	Appendices I. and II.	1	0

Volumes I. and II. can only be supplied with *Complete Sets, of which very few copies remain.* The complete set of 5 vols. (unbound) is £2 16s.

For other publications of the Club, see wrapper of ESSEX NATURALIST, January-March, 1892.

N.B.—A reduction of 25 per cent. from the above prices is allowed to Members.

BIOLOGICAL TEACHING IN ESSEX.

I am very pleased to announce that the TECHNICAL INSTRUCTION COMMITTEE of the Essex County Council are inaugurating for the Session 1892–3, a system of Practical Biological Instruction, by or under the direction of Mr. David Houston, F.L.S., Staff Teacher in Biology to the County Council.

In addition to Pioneer Lectures and Demonstrations, and local classes for the study of plant and animal life, the two following COUNTY CLASSES will be carried on. The course of instruction will be *systematic* and *practical*, and they present a golden opportunity for those residents in Essex wishing to commence the study of Biology, whether as a branch of technical instruction bearing on their several employments, or with a view of teaching in the county. The Classes at present sanctioned are:

I. A Class for Practical Instruction in Botany as applied to Agriculture and Horticulture (limited to fifteen), to be held in Chelmsford on Mondays, from eleven to three or four o'clock.

II. A County Normal Class for *Practical Instruction* of Elementary Botanical Teachers desirous of working under the County Council, to be held in the Laboratory of the Birkbeck Institution, London, on Saturday mornings.

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WILLIAM COLE.

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The Essex Naturalist:

BEING THE

JOURNAL

OF THE

ESSEX FIELD CLUB.

EDITED BY

WILLIAM COLE,

Honorary Secretary.

Contents.

The authors alone are responsible for the statements and opinions contained in their respective papers.

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"JOURNAL OF PROCEEDINGS OF THE ESSEX FIELD CLUB."

VOL. IV., PART 2.

Edited by WILLIAM COLE, *Hon. Secretary.*

THIS Part is now published, and copies can be obtained at once by application to the Librarian. It contains extended reports of all meetings of the Club from February 23rd, 1884, to January 29th, 1887 (together with Title and Index to vol. iv. of "Proceedings"), after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of "Transactions" and "Proceedings" combined, with single Title-page for each volume, and one volume each of "Transactions" and "Proceedings" with separate Title-pages, together with various Appendices.

The volume is, of course, *absolutely indispensable* to COMPLETE THE SET OF THE "TRANSACTIONS" AND "PROCEEDINGS" OF THE CLUB, which will then consist of five volumes.

The printing of the limited edition of the part will cost about £50, and the Council has fixed the price at 5s. to Members, and 6s. 6d. to Non-members, post free (nett).

It is hoped that every Member will take a copy, and thus prevent serious loss to the Club by reason of the absolutely necessary expense of the publication of the work.

The sequence of the parts forming the old series of "Transactions" and "Proceedings" is set forth on page 3 of Wrapper of the present Part, and a full list of the Publications of the Club will be found on Wrapper of ESSEX NATURALIST for January-March, 1892.

FOR COPIES APPLY TO MR. A. P. WIRE, 1, SEATON VILLAS, BIRKBECK ROAD, LEYTONSTONE, E.

[See page 3 of Wrapper.

battle of Worcester, 1651; and on his release lived in retirement in London and Bengy, Herts, mainly occupied in literary work. His translation of Guarini's "Il Pastor Fido" appeared in 1647, and as many as five editions subsequently appeared; in 1652 translations of Horace and Virgil; and in 1655 the folio "Lusiad of Camoens, newly put into English"—Mr. Fanshawe has now in his possession a small folio MS. of this on vellum, beautifully penned by himself, with exquisite drawings and portrait, evidently a labour of love—in 1658, "La Fida Pastora," a Latin translation of Fletcher's "Faithful Shepherd," a rare little octavo, with engraved title and curious device of the name Fanshawe. At the Restoration, he again emerged, and soon was sent as Envoy Extraordinary, and subsequently as Ambassador, to Portugal, where he arranged the marriage of King Charles II. with the Infanta Catharine of Braganza in 1662. Returning the next year, he was made a Privy Councillor, and sent Ambassador to the King of Spain.[3] He died in Madrid, 1666, of a fever, in the fifty-ninth year of his age; "from which place his bodie was brought by his disconsolate Ladie,"[4] and subsequently buried at Ware. A handsome monument with Latin inscription, which cost £200, was erected by Lady Fanshawe, who was also buried there in 1679-80. They had fourteen children, but most of these died when young. Their "dear and only son" died unmarried in 1694, and the Baronetcy became extinct.

His wife wrote the well-known "Memoirs of Lady Fanshawe," the original MS. of which, in folio, is still in Mr. Fanshawe's possession. It is bound in old red leather, and bears on either side the device of the Fanshawe arms, quartered with the augmentation granted in 1649, in remembrance of the loyalty of the family and the sacrifices they had sustained. The second motto, "In Cruce Victoria," was adopted at this time, and to this a touching reference is made in the MS. A large folio copy of this memoir, illustrated with engravings, prints, etc., of people and places mentioned, and bound in morocco, with silver clasps and designs exquisitely chased, has been made by the present owner. The original MS was written in 1676 for the instruction of her only surviving son, and contains description of her husband and his career, pedigrees of both the families, and record of their lives and travels. It remained in MS. till 1829, when it was published from a very imperfect copy, edited by Sir N. Harris Nicolas. Her portrait, from the Parsloes original, was engraved as a frontispiece. It was well received, and a new edition came out in 1830. She was indeed a notable woman, intellectual like her husband, and for over twenty years his true "helpemeet"; enduring with firmness privations and dangers—the lot of all who espoused the Royalist cause—reminding us of the lines in his own song, "The Royalist," 1646:

> "We do not suffer here alone,
> Though we are beggar'd, so's the King."

It would take too much space to give even the bare titles of the books which have been written by or on the family of Fanshawe. In the catalogue of the British Museum there are about thirty-four entries. A fine engraving of Sir Richard, from an unknown original, was done by Faithorne.

It is somewhat strange to find that the knightly and lordly branches of this distinguished family have all died out, their estates sold, the mansions demolished, and all the portraits, MSS., and books, etc., preserved in the house of Parsloes, the seat of a branch which never claimed or had a title.

Unfortunately, the mansion is not in occupation; all the hoarded treasures which have, in my remembrance, adorned its antique walls, have been removed.

> "And the shadows are lying grim and tall,
> Alone in the stillness here;
> And the burying dust creeps over all,
> And a hush is everywhere."

3 In John Evelyn's Diary, there may be found many entries referring to my "my cousin, R. Fanshawe," whom he appears to have greatly esteemed.

4 Funeral Certificate in the Heralds' College.

On the motion of Mr. Crouch, which was seconded by Professor Meldola, a cordial vote of thanks was passed to Mr. John Gaspard Fanshawe for the permission so freely given to visit Parsloes, and the meeting concluded by Professor Meldola tendering the thanks of the Club to the Directors of the day.

The return ramble, as the evening shadows fell, was made across the fields and market gardens by Upney Lane to Barking Station, and on the way the site of "Jenkins" was pointed out. This was an earlier estate of the Fanshawes, and of far greater importance, being valued at the death of Thomas Fanshawe in 1600, at nearly £2,000 a year. It passed out of the family in 1705. The house, which is described by Smart Lethieullier, as "a very large, old timber house, moated round, with gardens, etc.," was pulled down later on. The large fishponds and traces of the terraces alone remain to mark the spot of this erstwhile important manor. The modern house is known as "Manor Farm," the earlier name of "Jenkins" being now entirely forgotten.

British Woodlands.—It appears from a recent return that ten years ago the woodland surface of Great Britain was computed at 2,458,000 acres. By the year 1888 the acreage thus occupied had risen to 2,561,000 acres, and the measurements taken in 1891 show a further advance to 2,695,000 acres. Of the 134,000 acres thus added to the approximate woodland area of Great Britain, 96,000 acres are assigned to England, 31,000 acres to Scotland, and 7,000 acres to Wales. The largest woodland area to be found in England is the county of Hampshire, with 122,574 acres; Sussex, with 122,073 acres comes second; while the four counties of Hants, Sussex, Surrey, and Kent possess between them nearly a fourth of the English woods and plantations. These four counties have upwards of 11 per cent. of their surface thus occupied. In Scotland, Inverness-shire has no less than 169,000 acres of woodland, this being the largest area of woodland in Great Britain.

The Porbeagle Shark (*Lamna cornubica*) near Harwich.—A specimen of this shark, eight feet long, was exhibited in our market on Saturday last, October 8th. It is said to have been taken off Harwich, in a fishing net. On the east coast it seems to be much more rare than on the southern and western coasts, and the occurrence may therefore be worth recording in THE ESSEX NATURALIST. —HENRY LAVER, F.L.S., Colchester.

[It is probable that the fish referred to by Dr. Laver is that noticed as follows in the "Essex County Standard" for October 8th :—"On Sunday afternoon, Oct. 2nd, the fishing lugger 'Elizabeth Mary,' of Shoreham (Captain Eli Haylor), came into harbour and brought with her a young shark which the crew captured in their net while fishing for mackerel about 10 o'clock on Saturday night, and at a distance of three or four miles from the Longsand Light. The men feeling something heavy in their net, five of them were obliged to hold on, and with great difficulty they managed to draw in their net and found to their astonishment that they had landed a shark, which they found upon measuring to be between nine and ten feet in length and several feet in girth, and weighing quite five cwt. In the encounter with the animal their gaff was broken and their net damaged to the extent of about £1. The shark had four rows of teeth, and altogether looked a most formidable customer to tackle. On Monday morning some of the crew of the lugger took the animal up to Ipswich for exhibition purposes, and if possible to find a customer for it."]

DAGENHAM BREACH.

By WALTER CROUCH, F.Z.S. (*Vice-President*).

[*Read at Field Meeting, 23rd July, 1892.*]

IT is almost impossible to realise what was the original course and extent of the great Estuary which has at last dwindled down into the waters which now form the River Thames.

In remote ages was deposited from an ancient sea some 600 feet of chalk. On this, from a shallower sea, or broad estuary, the deposit

River Wall and Lake, Dagenham.

By Edmund M. Wimperis, after a sketch by Dr. Smiles.

of the London Clay was formed, until in historic times we find the present river; flowing eastward from Thames Head,[1] near Cirencester, some 160 miles to Teddington (? Tide-end-ton), and thence, as a tidal river, down to the German Ocean. The Basin, or depression, through which it flows, drains "a very large tract, extending over 6,160 square miles, in fact, more than one-seventh of all England."[2]

1 This is but one of the many sources, which meet together at Lechlade, Gloucestershire.

2 Huxley: "Physiography," 1881, p. 16.

The present course, however, is entirely due to the hand and mind of man; for without his restraining influence, exhibited by the long line of embankments on both sides of its length, from Kew downwards to below Tilbury, the river would long ago have broken away from its present channel, inundating at one place, and casting up the *débris* at another; scouring out a new course as its waters rushed along. At what periods the earliest embankments were formed is a matter for conjecture. Camden, Dugdale, and others considered them the work of the Romans; perhaps they made the start, for they were workers as well as fighters, and have left us substantial remains of their strength and skill; but, so far as I am aware, we have no evidence to prove this; and we are too old to believe any longer the story of our childhood, which transformed the stakes which hold the mud together into the weathered thigh-bones of their dauntless soldiers.[3]

But we do know that the various owners of land and marsh abutting on the river border have been constantly engaged, as far back as we can go, in repairing and reforming these artificial boundaries; and that where neglect in so doing has occurred, the penalty has been paid in the shape of serious damages by flooding and great inundations — that the giant river has aroused now and again, stretched out his mighty arms, devastated large tracts, and paralysed for a while the strongest efforts of man.

We have, however, positive information of the first enclosure of Plumstead Marsh, which extended to Lesnes, in a folio MS.: "Augustini Eccl: Cantuar: Annales," under the year 1279. "Eodem anno inclusus erat primo mariscus de Plumstede per Abbatem de Lessnes mari."[4] This marsh, on the *right* bank of the river, nearly opposite, was again inundated in 1522, through a breach in the wall at Erith, and the land was not wholly recovered until 1606.

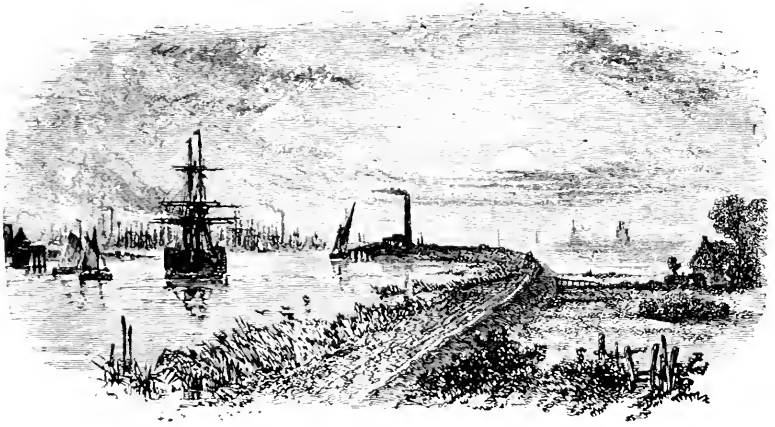
Nowhere, perhaps, can we better see and comprehend than at this spot the artificial character of the river boundaries; and the words written some twenty years ago by our Hon. Member, Henry Walker, F.G.S., in his "Rambles round London" (1871), will give

3 The reader may be referred to Mr. F. C. J. Spurrell's important paper in the "Archæological Journal" (vol. xlii., p. 269), entitled "Early Sites and Embankments on the Margins of the Thames Estuary," for information as to the probable periods of the formation of the early embankments. Mr. Spurrell is inclined to class them all as comparatively modern—the earliest as clearly post-Roman, and probably mediæval.—Ed.

4 *Vide* Lambarde, "Perambulation of Kent, 1576," who quotes from the original MS. in Corpus Christi College, Cambridge.

a better idea of this than any words of mine ; and are of interest to us, to-day, assembled here :—

"What the country below London would be without its river embankments may easily be seen at Dagenham. Dagenham is celebrated in the annals of the Thames engineers. It is here that the skill and persistence of man in conflict with nature has been tasked to the utmost in the endeavour to keep the river a captive. Here at Dagenham (on the north bank of the river, and a little to the south of the village) we may stand on an embankment which rises to a height of forty feet above the low-water level of the river, and prevents it from entirely changing its course. We might multiply instances to show how largely the Thames of to-day is the gift of civilisation rather than of nature—the creature as well as the servant of man." P. 120.



The Thames from Dagenham Bank, looking up the River.
By R. P. Leitch, after a sketch by Dr. Smiles.

Again, in his recapitulation, he writes :—

"In these, its declining years, the mighty creature has fallen captive to man. With shrunken bulk, and in a narrower channel, the Thames now winds an imprisoned course. Its vaster life and meridian years were lived before human annals began." P. 148.

With regard to the extent of these "walls," we must remember that along its whole course the river is fed by inlets, creeks, and streams, and, to secure these from the inflow of the highest spring tides, the banks have had to be continued far up on either side, until the higher ground is reached. In the early chronicles and

records of the abbeys and religious houses which had lands abutting on the river we find continual mention of these under the term "innings," and the repairs were always keeping them well employed.

Altogether, the walls or embankments, and these "innings," have been reckoned by Dr. Smiles and others to run some 300 miles.[5]

In various parts of the river wall are openings through into the meadows, so that the water could either be admitted or held back as required. These, from the year 1259, were known as "water gangs,"[6] and were, of course, guarded by a sluice gate.

So important was the proper maintenance and upkeep of the banks and sluices, both to the individual owners and the nation, considered, that special privileges were granted by the Crown for this end. For instance, the Abbess of Barking, who also held lands here, had license to cut wood or timber through the forest, even in the fence months, for the repairs of breaches caused by inundation; and in later times, when the maintenance of the water-way became of still greater importance, the various landowners were taxed to pay for the upkeep.[7]

Notwithstanding this, we can scarcely wonder, seeing the enormous extent of the long line of walls, that the care and vigilance necessary has not at all times been constant. The ordinary wear and tear, apart from negligence and bucolic supineness, has always been tending to produce weak spots, with the inevitable result that breaches have occurred as a consequence of such neglect.

On both shores we have many records of such breaches, and the consequent flooding of the lands on the Kentish, or *right*, bank at Lambeth, Southwark, Bermondsey, Greenwich, Plumstead, Erith, etc., and on the *left* shore from Wapping and Limehouse down to

5 Some interesting notes on these "Earth-walls on the banks of the Thames" may be read in Pehr. Kalm's "Account of his visit to England," etc., 1748, now translated for the first time, 8vo., 1892, pp. 344-5 and 357. Kalm was a pupil of the great Linnæus, and the notes mentioned are evidence of his accuracy and careful observation:—"It was pleasant to go on this wall, and see that when the water in the river stood at its highest, the land and meadows, together with the ploughed fields immediately inside the wall, were much lower than the surface of the water in the river. It was also at high-water a pleasure to see how great ships in the river were moving at a much higher level than the land itself, which at a little distance made a pretty appearance." – PEHR KALM, July, 1748, p. 345.

6 *Vide* Dugdale, "The History of Imbanking and Drayning," 1662 folio. In this work is a vast amount of information, extending over a period of 350 years—from the 8th of Edward II.—regarding those appointed to look after the works and repairs on both sides of the Thames, and the Breaches and reclamations of "drowned" lands and marsh lands.

7 At a Session of Sewers held at Romford 36 Eliz. for the recovery of Havering Marsh, then overflown and drowned, and for "preventing the like to Dagenham level, it was decreed that Dagenham Creek should be immediately inned: and that whereas the said drowning had been occasioned by a breach in the wall of Will. Ayloff of Hornchurch Esq.; he, the said William to pay the summ of five hundred pounds; and the Land-holders of Dagenham certain rates by the acre for all their marsh grounds lying in the said level; *viz.*, the Lands on Dagenham side, against the said Creeks at £265, and the lands on the Havering levell the sum of £700."—DUGDALE, pages 81-2.

West Thurrock and Canvey Island. There is no need, however, to detail all these.

In some notes that I gave at our meeting at West Ham in June, 1886 ("Journ. Proceedings E. F. C.," vol. iv., p. clxxxviii.), an instance was given of the overflowing of the River Lea, and the Channel sea, when the monks of the Abbey of Stratford Langthorne had to leave that spot, and removed to Burgestede, near Billerica. Here, at Dagenham, in 1376, a breach occurred, and the nuns of Barking Abbey had to seek the shelter of higher ground.

In 1621 a breach again occurred here, which was stopped by Cornelius Vermuyden,[8] who then "inned" the whole of Dagenham Creek, and erected a kind of sluice at the mouth of the watergang. This sluice[9] was a strong gate suspended on hinges, which opened only outward, and closed as the tide rose and pressed against it.

It was this sluice which blew up on the 17th December, 1707, in consequence of a great flood of *river* water, coincident with an extremely high spring tide,[10] and a violent N.E. wind, and thus began the Great Breach, which has made the name of Dagenham famous.

Had this been promptly repaired, or a small dam made, it could easily have been stopped; for the gap was at first only fourteen or sixteen feet across. But this was delayed, and the constant wash of the waters in and out of the level each tide, soon widened the gap to about 100 yards, and gulled or deepened it to twenty and thirty feet in some places.

Then the waters spread, and some thousand acres of land in the Dagenham and Hornchurch levels were covered, passing up on the west by Chequer's Lane and beyond Rippleside, branching out in a northerly direction right through Dagenham village (two miles away from the river), and beyond even that, along the course of the Beam River.

Throughout the winter the washing away of the soil continued; about 120 acres were scoured out by the tides, and the *débris* carried into the river and deposited, thus forming a shelf or bank about a mile in length, stretching halfway across the river, and threatening a very serious impediment to the navigation.

From Mr. William Boswell's little octavo volume entitled: "An

8 A Dutch engineer, well known in after years in connection with the drainage and reclamation of the so-called Bedford Level and Fen District. He was knighted for his services in 1629.

9 A sluice proper opens like a gate, on hinges. A sluice gate which moves up and down in groves on either side, like the ancient portcullis, is technically called "a clow."

10 Every few years an abnormally high spring-tide will occur, which floods the lower districts of Lambeth, etc., at the present time.

Impartial Account of the Frauds and Abuses at Dagenham Breach," etc., published in 1717, we learn that "When it first happed, the Society of the Trinity House at Deptford, fearing that the work might bring a charge on them, took care to free themselves by delivering a formal judgment to the House of Commons, that the breach was not any obstruction to navigation," so that the matter rested entirely with the landowners and the Commissioners of Sewers.

So the landowners set to work in their own interest, but in a poor and half-hearted way. First they employed John Motte and John Cole, who worked by the day, but were soon obliged to desist. Then James Harvey took it up, and was paid twenty shillings a day, and made some little progress.

Afterwards a contract was entered into by William Jackson for the sum of £6,000 on completion of the work; and after a few months he was joined by John Ward, of Hackney, and then by Colonel Bennet, Mr. Lethieullier, and others. They spent altogether some £28,000, and at last stopped the breach; but on the first boisterous tide the work gave way.

The means chiefly employed up to this time had been the driving of rows of large piles and sinking of earth and stone in enormous quantities; old ships laden with chalk and stones were brought into the gap and then scuttled. An old government ship, *The Lion*, was given, which they filled, and then scuttled in the breach; but the next high tide flowed in with such force that the vessel was broken up, and the channel was found deeper than it had been before, being fifty feet.

Thus the owners had spent more than the value of the land, and after nearly seven years, having gained no advantage by the outlay, deemed their lands to be lost.[11]

Then the navigation of the river became a pressing matter, for the bank of material washed out by the tide was increasing. The question was taken up by the House of Commons, and in 1714 (Anno 12 Annæ c. 17) "An Act for the speedy and effectual Preserving the Navigation of the River of Thames by stopping the Breach in the Levels of Havering and Dagenham in the County of Essex and for ascertaining the Coal Measure" was passed. In the Preamble it is stated to be "of the utmost importance as well to the city of

11 "Reasons demonstrating that the Breach in the Levels of Havering and Dagenham hath already done . . . damage to the navigation of the Thames."—S. sheet, fol. 1714.

"The Case of the Land owners of the levells of Havering and Dagnam" (sic).—S. sheet, fol. 1715(?).

London as to the trade of this whole kingdom," and that "The navigation of the said River is in Danger of being utterly destroyed. To defray the cost, a tax was levied for ten years, from 10th July, 1714, on every ship coming into the port of London, to pay 3d. per ton, Coasters 3s. each voyage, Colliers 1d. per chalder, Coasting Hoys not chargeable. Sect. 16 exempts the Harwich weekly passage Boat. Sect. 17 provides "that nothing in this Act contained shall charge the Two Colchester Packet Boats above four times in the year with the said duties of 3s. a voyage, they going weekly from Wivenhoe to London with Bays, Says, and Perpetuanas, and from London to Wivenhoe with Wool to be manufactured at Colchester."[12]

Under this Act, the trustees, of whom the Lord Mayor was one, met at Guildhall in August to receive proposals, when Mr. Boswell tendered £19,000, which, at the second meeting, he reduced to £16,500, Captain Perry's sum being £24,000. This was to stop the main breach, remove the bank in the river, and make good the walls from the halfway tree to Raynham Creek.

Boswell's proposal was accepted, and in Captain Perry's book, "An Account of the Stopping of Daggenham Breach," 1721, he details the methods Boswell intended to use; but he appears to have changed his way several times, finding that he could not secure a firm, level bottom for his pontoons, as the scour was so great. Perry also states that his floodgates opened only outward, and were not designed as sluices, and that they admitted more water at flood tide than was discharged at ebb. He made several attempts, but failed to do the work; and the trustees applied to Perry for the details of *his* plan.

The opening by this time had been greatly extended, both in depth and width, forming a gulf over two miles in length.

Captain Perry's plan was approved by the trustees, and he at once began the work, buying material, engaging workmen, and hiring a yard at Rotherhithe, in which he prepared a sluice, and fashioned the "dove-tailed" piles. At the same time he set men to work at the Breach, as the walls gave evidence of slipping.

Boswell complained of the trustees' action in superseding him,

12 The following independent testimony to the enormous traffi: on the river, was penned only a few years after the time of this flood:

"It is impossible to express the untold multitude of ships and vessels which sail up and down this river daily, especially in the summer time, when ships, in some of the narrower places, can hardly avoid running into each other, and often at the same time, cause each other great damage."
P. KALM, 1748. Trans. by JOSEPH LUCAS, 1892.

and petitioned Parliament against Perry's plan,[13] alleging that mathematicians had declared it to be impracticable. He also got a surveyor to estimate what he had already spent, and what it was worth to a new undertaker[14]—the amount expended being £8,396, and that it was worth £3,762.

A Parliamentary Committee was then appointed, and Perry closely examined as to his methods. At the end, "one of the members thus spoke the sense of the committee: 'You have answered us like an artist, and like a workman; and it is not only the scheme, but the man, that we recommend.'"[15]

Amongst other witnesses was one who said the scheme was impossible. He was asked if he had ever spoken to Perry, or knew his plans, or had been to see the Breach; to all of which he answered, "No." After ten weeks their report was presented to Parliament, who declared that the trustees had done their duty. Later on, Perry complained of this delay as a detriment to him, the prices of timber and ironwork having, in the interim, risen twenty per cent.

A brief survey of the methods adopted by Captain Perry are worthy of note, inasmuch as they proved so thoroughly effectual. Up to the present, as you may see, the dam so skilfully contrived remains as strong and powerful to resist every tidal pressure as it was at the time he built it.

He first fixed up two sluices in firm land forty feet in breadth, with a foundation down to low-water mark. Each had two drawers to move up and down (a clow, though not mentioned under this name); he then cut a canal to allow the water to flow to the sluices; and in this way at once relieved the pressure by allowing the tide to have free course.

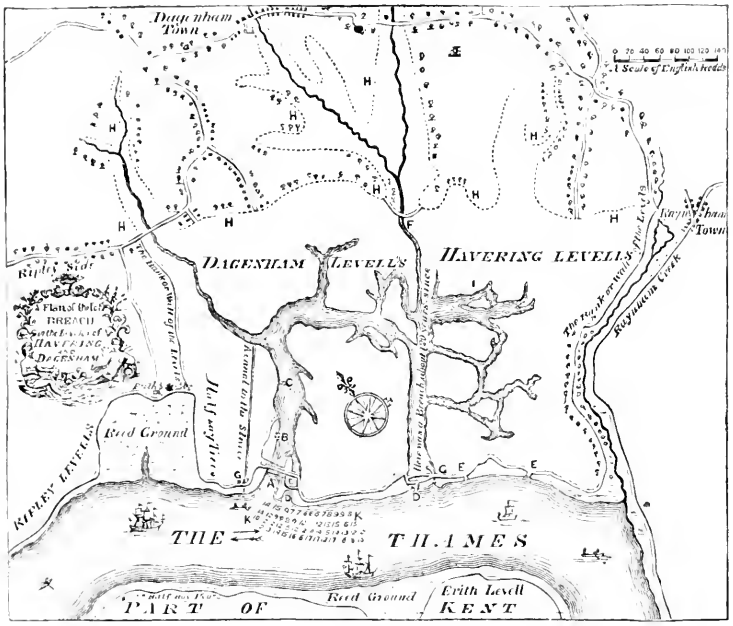
He then began the foundations of the dam across the Great Breach, driving first a series of fir piles, seven to eight inches thick, and throughout their length dovetailed into each other, as deep as they would go—some six or eight feet. These formed a foundation stretching quite across the Breach, and extending some twenty or thirty feet into the banks, and were designed to prevent the underscouring which had occurred at previous attempts. He at the same time began to fix foot-wharves on each side, some twenty feet in

13 The two printed folio sheets, addressed to the House of Commons, dated 1715 and 1716(?), relating to the case of W. B. with the Trustees may be seen in the British Museum.

14 Boswell's "Impartial Account," etc., 1717, already quoted.

15 Smiles's "Lives of the Engineers," vol. i., p. 70.

breadth and forty feet distance from the line of piles. These were filled with chalk, etc., with a strong bed of chalk outside. As the piles were driven, the filling of the foot-wharves with chalk continued till they met in the middle of the creek, and the spaces on either side between the piles and wharves were filled with earth and stones. The dam was thus completed to a little over low-water level, and



PERRY'S PLAN OF DAGENHAM BREACH.

A.—The dam whereby the Breach was stopped.
B.—The site of Boswell's works.
C.—The site of the landowners' works.
D.—The site of Perry's sluices.
E.—The site of Boswell's sluices.
F.—A dam and sluice made for recovery of the meadows shortly after the Breach had occurred.
G.—Small sluice for drainage of the land water.
H H.—The dotted line represents the extent of the inundation caused by the Breach.
I.—Places where stags' horns were dug up.
K.—Parallel lines showing the depth at low water at every sixty yards distance from the shore.

then the banks of earth were raised on the dam. The narrow canal which he cut to relieve the pressure, was then filled up, and the sluices removed, leaving a large body of inland water, of which a great deal was drawn off by the ordinary small sluices in subsequent years. The sheet of deeper water now remaining, and known as "The Gulf," covers about forty acres of ground.

Perry in his book (pp. 84, 86), gives various details and computations of the cubical contents of the dam, and calculations of pressure to prove "that the Weight of Earth of which the Dam was compos'd was more than six times superior to the Weight of Water pressing on the Outside of the Breach on the Day when the Accident happen'd, without taking notice of the Wall of Earth rais'd upon the Dam, or the Counter-pressure of about twenty-six foot depth of Water which was on the Inside."

Altogether these labours, including the repair of the walls, removal of sandbank, etc., took five years, and were not accomplished without failures. In 1717 a high tide almost demolished the work done, and on two subsequent occasions inundations occurred; but at last, in 1720, he completed the contract, having spent the sum of £40,472 18s. $8\frac{3}{4}$d, Of this he had received the consideration money, £25,000, agreed in the covenants, and later on a sum of £15,000 was granted to him by Parliament; but still he was a considerable loser by the transaction.

During the works they came upon the Moorlogg, a vein of different kinds of wood, partly rotten—yew timber, not decayed, brushwood and hazel-nuts—doubtless a portion of the submerged forest of which remains have been found in the Plumstead Marshes. Stags' horns were also found. (*Vide* plan, marked I.)

From some printed papers dated 1724-25, proceedings at law appear to have been contemplated, in which John Perry was the appellant and Boswell respondent; but of this I know nothing further.

From first to last this memorable Breach must have cost at least £80,000, and took thirteen years before it was stopped effectually.

The repair and upkeep of the river banks after this time was performed under the control of the Commissioners of Sewers, who made periodical visits of inspection, and then used to dine at a house which had been erected here.

This ultimately gave rise to an association of noblemen and gentlemen for the purpose of fishing in the enclosed "Gulf." This club was founded on the 13th of June, 1792, and from the "Articles of Agreement for the Government of the Dagenham Breach Co.,"[16] we find the six original members were Sir Thomas

16 The unpublished original of this is in the collection of Mr. E. J. Sage, of Stoke Newington, and for this and other information I am much indebted to him.

Dundas, Bart., Sir Hugh Palliser (Governor of Greenwich Hospital), Sir Joseph Banks, F.R.S., Edward Hulse, Charles Alexander Crickitt, M.P., and Bamber Gascoigne, Esquires. They appear to have taken a lease, and the object of the club was "for maintaining and keeping in repair the Houses and Premises, &c., Boats, Tackle, & Nets"; and "that the Society should be united as much as possible in social and friendly intercourse." For this end arrangements were made for meetings. A steward was appointed to live in the house, and look after the stock of wines, etc., and provision made by a clause for the nomination of six new members, of whom four were elected—Robert (afterward Sir) Preston, of Woodford, William Smith, of Barking, John Pardoe, of Leyton, and the Earl of Sandwich. They improved the house, and erected stabling for thirty horses. On some occasions as many as ten four-in-hands have been seen on the road to the Breach. Among the members, later on, were James Hatch, of Claybury, Edmund Antrobus, and some Members of Parliament. This club lasted till 1812, when it was broken up. The property then belonged to Sir Edward Hulse, who sold the furniture, etc.

But something more permanent survived; for there is little doubt that to these gatherings we may trace the origin of the ministerial "Whitebait Dinners," which have only been discontinued in recent times. Mr. Timbs, in his "Club Life of London," tells the story; but, in the face of the information contained in the original documents just mentioned, the details are probably not strictly accurate. To Sir Robert Preston it is probably due, as he says, that Mr. Pitt was first invited, and that the invitation became a yearly one, the place of meeting being altered to Greenwich, in consequence either of its being nearer to London, and more easily reached, or perhaps the change took place after the club had broken up. Pitt, however, died in 1806, some six years before this.

Some years later, the "Gulf" and land was let to Richard Webb, of Belmont Castle, Purfleet, who erected the two cottages.[17] He subsequently sold his interest to Joseph Fry, of Plashett, and in the "Memorials of Sir T. Fowell Buxton" may be seen some letters dated from Dagenham Breach. It was here that his wife, Mrs. Elizabeth Fry, spent, in her later years, the summer months; and her brother, Samuel Gurney, also came, and kept a boat here. He

17 From MSS. of Mr. Edward J. Sage, who has also kindly given me access to origina sources of information, relating to the various dock schemes, in his collections.

became the purchaser on the failure of the firm of Fry and Chapman.

In 1848, Mr. Charles Hulse (brother of Sir Edward) and Mr. Edward Sage, of Furze House, Marks Gate, took a lease of the Gulf and cottages for forty-two years. They spent £2,000 in erecting a large ice-house, for the supply of the London market and the Barking fishermen, who then used 10,000 tons per annum in icing their flat fish. This building was 100 feet long, 45 feet wide, and 22 feet in height. This ice-house has been pulled down, and also the old Breach or Beach House, the view of which, taken in 1790 for the "European Magazine," is so familiar to print collectors.

In 1854, a plan of Dagenham Dock was made by George Remington, engineer; and in 1855, an Act of Parliament obtained to form a dock, with Sir John Rennie as engineer. Of this scheme the directors named in the Act were Sir Edward Hulse, Bart., Charles Hulse, Edward Sage, and two others; but owing to great derangement in the money market, attendant upon the war with Russia, nothing was done towards the making of the docks.

A new scheme was brought out on 9th August, 1862, called "The Dagenham (Thames) Dock Company," with Sir John Rennie, C.E., F.R.S., and John Murray, M.I.C.E., as engineers. The proposal was to raise £300,000 capital in £10 shares, to purchase the lake and about 80 acres of land, making 140 acres in all, for the sum of £50,000, and then to construct a dock deep enough for the largest vessels, with an entrance 70 feet wide, and with 2,000 feet of wharf frontage. A portion of the work was begun, but it was ultimately abandoned. Another proposal for docks was made in 1868. In 1875, the "Gulf" and land, in all about 184 acres, was sold.

The "Gulf" has for many years been the resort of anglers, and known as "The Dagenham Lake Subscription Water." A great variety of fish, such as carp, roach, bream, perch, eels, pike, etc., abound, and some of large size have been taken. Many years ago Mr. Edward Sage caught a pike scaling over twenty-three pounds. The perch are often over four pounds, and one of his captures is preserved which weighed six pounds one ounce.

Mr. Samuel Williams is the present owner, and material is now being brought down to fill up the saltings, for which hydraulic machinery and plant has been erected.

The management of these levels, at the present time, is under

the direction of Commissioners, who are appointed by the Crown, and now extends from Rainham Creek to East Ham Levels, and up to Walthamstow; but not including the borough of West Ham.

These Commissioners receive presentments from the Marsh Jury, and any repairs that may be ordered or required are carried out under the superintendence of the Marsh Bailiff.

A few notes on the career of Captain John Perry may not be unacceptable. He was born in 1669, the second son of Samuel Perry, of Rodborough (Glouces.). At an early age he joined the Royal Navy, and in September, 1693, we find he was captain of the *Cignet* fire-ship, which was lost during a fight. For this loss he was tried, and sentenced to ten years' imprisonment, and to pay £1,000 fine. He employed his enforced quiet in writing "A regulation for Seamen, wherein a method is humbly proposed whereby their Majesties' Fleet may at all times be speedily and effectually Mann'd," etc. To this he appended "A short narrative of his case relating to the loss of the said ship in company of the Diamond-Friggat." This is dated from the "Marshalsea Prison, Dec. 18th, 1694," and was published in small quarto, 48 pages, 1695.[18]

He appears, however, to have been soon released, for in 1698 he was recommended to the Czar Peter, who was then in this country, and he engaged him at a salary of £300 a year to open communication between the Volga and the Don Rivers, where he was employed for three successive summers; and also to assist in the formation of a Royal dockyard and Russian fleet. He remained there some years, but left in 1712, after many disappointments and trouble in getting money. In 1715, he published his octavo volume on "The State of Russia under the Present Czar," with a map. On his return, as we have already seen, he was employed here till 1720, and the next year brought out his book on the Breach; and was also employed about the harbour at Dublin. In 1727, he brought out a folio volume, "Proposals for the Draining the Fens in Lincolnshire," and whilst he was employed in the work took up his residence at Spalding; where, on 16th April, 1730, he was elected a member of "The Gentlemen's Society," and is described as an engineer, and adventurer for draining Deeping Fens. This well-known Literary and Antiquarian Club was founded in 1710,[19] and numbered amongst its early members Sir Isaac Newton, Sir Hans Sloane, Sir John

18 These statements, compiled from Capt. Perry's own books, are no doubt correct, although they differ in detail from several notices of his life which have been published at various times.

19 For further information about this club, *vide* "Nichol's Literary Anecdotes."

Evelyn, Dr. Ducarel, and Dr. Stukely; and was in close communication with the Royal Society and the Society of Antiquaries. Whilst Dr. Stukely was secretary of the latter, a regular communication of minutes took place, extending over forty years.

Captain Perry died at Spalding, and was there buried. In the Church of St. Mary and St. Nicholas, on the wall of the south aisle, is a memorial, with this inscription:

To the memory of
John Perry esq: in 1693
Commander of his Majesty King William's
ship the Cignet, 2nd son of Samuel,
of Rodborough in Gloucestershire gent, and of
Sarah his wife, daughter of Sir Thomas Nott, K^t
He was several years comptroller of the
marine works to Czar Peter, in Russia, and
on his return home was employed by
Parliament to stop Dagenham Breach, which
he effected, and thereby preserved the
navigation of the river Thames, and
rescued many private families from ruin
He after departed this life in this town, and
was here interred Feb. 13^th 1732; aged 63 years.
This stone was put over him by the
order of William Perry, of Penthurst in
Kent, his kinsman and heir male.

In conclusion, let me say that we are to-day visiting some of the very lowest land in our county; but whether here in the marshes and levels on the margin of the great river, where mind has signally triumphed over matter, or on such heights as Havering, Laindon, or Danbury overlooking it, we may still quote the couplet of Michael Drayton in his "Poly-Olbion" (1580), and rejoice that

"Essex is our dower, which greatly doth abound
With every simple good that in the isle is found."

[I am greatly indebted to Dr. Smiles for kindly allowing me the use of Perry's Plan, and the two illustrations from his own sketches, which so well pourtray the features of the high river wall at Dagenham. The woodcuts were made by James Cooper, and appeared in Smiles' "Lives of the Engineers," vol. i., 1861. I have also to thank Mr. John Murray for procuring the clichès; and the Rev. M. H. Marsden, vicar of Spalding, for comparing the Epitaph on Perry as here given with the original tablet.]

IMPORTANT NOTICE TO MEMBERS OF THE CLUB AND TO LIBRARIANS, &c.

'TRANSACTIONS' AND 'PROCEEDINGS'

OF THE

ESSEX FIELD CLUB.

The part of the 'Journal of Proceedings' the publication of which is announced on page 2 of the Wrapper of the present part of the E. N., completes the old series of 'Transactions' and 'Proceedings,' bringing up the reports to January 29th, 1887, after which date the publication of THE ESSEX NATURALIST (the present organ of the Club) commenced. The old series consists of three volumes of 'Transactions' and 'Proceedings' combined, with single title-page for each volume, and one volume each of 'Transactions' and 'Proceedings' with separate title-pages, together with various appendices. The parts were issued as follows, and the appendices indicated should be bound up with each volume:—

		s.	*d.*
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	Part 1 (September, 1880) . . .	1	0
	„ 2 (December, 1880) . . .	2	0
	„ 3 (February, 1881) . . .		
	Title and Index—First List of Members and Rules.		
Vol. II. With 'Proceedings.' [Same Title.]	Part 4 (June, 1881)		
	„ 5 (October, 1881)	5	6
	„ 6 (July, 1882)	7	6
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Vol. III. With 'Proceedings.' [*Title*—'Trans.' of the Essex Field Club.] Price 16s.	Part 7 (June, 1883)	10	6
	With two Appendices.		
	„ 8 (April, 1884)	5	6
Vol. IV. 'Transactions' only. Price 8s.	Part 1, Vol. IV. ('Trans.') (June, 1885) .	5	0
	„ 2 „ „ (Dec., 1886) .	3	0
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Vol. IV. 'Proceedings' only. [*Title*—'Proceedings' of the Essex Field Club.] Price 10s. 6d.	Part 1, Vol. IV. ('Proc.') (June, 1885) .	3	0
	„ 2 „ „ (Pub. Mar., 1892)	6	6
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Volumes I. and II. can only be supplied with *Complete Sets, of which very few copies remain.* The complete set of 5 vols. (unbound) is £2 16s.

For other publications of the Club, see wrapper of ESSEX NATURALIST, January-March, 1892.

N.B.—A reduction of 25 per cent. from the above prices is allowed to Members.

COMMUNICATIONS FOR THE "ESSEX NATURALIST."

In the early part of the year I printed an appeal to the readers of THE ESSEX NATURALIST to interest themselves in its welfare, and to aid me in the difficult task of editing by sending short papers and suitable notes of occurrences appertaining to the special subjects for the study of which the Essex Field Club was founded, for consideration and publication. I am sorry to say that this request has led to but scant response. As we are now approaching the end of another year, I venture again to call upon our friends and members for such aid, in the hope that it will be more freely and systematically rendered during the coming year.

Every reader could with but little trouble render most welcome assistance. Not only are longer and more important memoirs desired, but the greatest aid would be given by the communication of SHORT PAPERS, NOTES, and of books, periodicals, newspapers, etc. (*or extracts from the same*), containing matter (reports, captures, natural history, antiquarian or other "finds," topographical descriptions, news of the exposure of geological sections, etc.), likely to be useful for THE NATURALIST or for the information of the council and officers.

I would VERY GRATEFULLY receive promises from members and others of *systematic searching of periodicals, etc., for such information as above.* If extracts are sent they should be in a form as nearly as possible for publication. MSS. should be written on *one side of the paper only*, with *wide* spaces between the lines, and with *wide* margins.

Further, as the Winter Session has now commenced (the first meeting will be held at Loughton Public Hall on November 19th), PAPERS, and EXHIBITS for the MEETINGS are greatly desired, and I shall be glad to hear from those having such in preparation.

[It would greatly assist if exhibitors of objects at meetings would themselves prepare short descriptions of them for publication, and hand the same to me *at the meetings.*]

I feel sure that the members, thus appealed to, will exert themselves to aid the officers in carrying on the work of the Club in accordance with the objects for which it was founded. They should hold themselves responsible, in some measure, for the progress of the Club, and look upon themselves as a band of "enthusiasts" gathered together for the study and investigation of the natural history of Essex. I most sincerely hope that during the year 1893 our Journal will be freely used for recording observations original and selected, and as a *monthly* medium of intercommunication between lovers of natural science dwelling in, or having a friendly regard for, our interesting county.

WILLIAM COLE,

Hon. Secretary and Editor.

Buckhurst Hill,
October, 1892.

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BRITISH ANNELIDS.

WITH ESPECIAL REFERENCE TO THE EARTHWORMS OF ESSEX.

By REV. HILDERIC FRIEND, F.L.S.

(*Continued from page 111.*)

MY frequent appeals for help in this study have met with a very heartless response from the nature-lovers of Essex. But for the kindness and courtesy of two friends my articles must have come to an untimely end, and even now they appear likely to remain imperfect, unless a few ardent workers will come forward, and by one united effort render the work complete.

Following up our subject where it was left in THE ESSEX NATURALIST for July (*ante* pp. 107-111), we come now to the study of the second group of *Allolobophora*, which I have designated the MUCIDA group. As I have already indicated, in a footnote on p. 109, considerable strides have been taken in our knowledge since that article was first penned, and new worms have been discovered which will make a further revision necessary; but for the present I will retain the name, and place under it all those worms which most naturally fall under this designation. I may in the first place give a brief summary of the characteristic of the group, after which, a detailed account of each species will appropriately follow.

ALLOLOBOPHORA: § 2, MUCIDA.

A group of worms found almost exclusively in fields and pastures; not averse to poor soil, which they greatly benefit, but sometimes found in rich soil, as in cultivated fields and gardens. Unlike the true earthworms (*Lumbrici*), they usually have the tail cylindrical. I may point out, what other observers appear never to have indicated, that in *Lumbricus* the flattened tail is of immense value to the worm as it lies partly exposed in its burrow. The Mucid Worms seldom adopt this habit, hence the posterior extremity differs in shape. The head or lip is only partially dovetailed into the first ring or peristomium; the male pores are usually placed on prominent papillæ on the fifteenth segment, and the girdle is frequently large and closely fused. Under the girdle, on alternate or consecutive segments, are the papillæ known as the *tubercula pubertatis*. In colour the worms vary from a deep sea-green to yellow, orange, flesh-red, clay, and sienna-brown. They emit, when irritated, a peculiar mucus (whence the name of the group)

In some cases it is slimy, but clear; sometimes it has a peculiar smell, and frequently it is turbid. In one instance the mucus is so thick and yellow that the medium has to be frequently changed if the worms are to be well preserved. They are tolerably uniform in size, the average length being about three inches. The setæ are in four couples, and the members of each couple are nearly close together. The internal structure is interesting, and in the case of one new species (*A. cambrica*, Friend, not, however, found in Essex as yet), it is only by the study of the internal anatomy that we can be absolutely certain which species is under examination. I shall, however, adhere as much as possible to my rule to make the identification of species possible by the enumeration of external characters alone. The foregoing account may be compared with the brief diagnosis on page 109.

SPECIFIC CHARACTERS.

1. **Allolobophora chlorotica**, Savigny. The best known member of the whole group is the Green Worm. It is one of our most ubiquitous species, and may be readily recognised by its unique appearance and habit. It is found in gardens and fields, but most frequently under stones in pastures, or by the side of watering places frequented by cattle. Here, an inch or two under the soil, or covered by the stones and other things, it will be found sluggishly coiled up in a ring, and looking very like a dirty, repulsive caterpillar. Unlike the bulk of his brethren, he ignores the truth that

> "He who fights and runs away
> May live to fight another day."

He neither fights nor runs. Perhaps he feels secure in his ugliness, or knows that, like the cuttle-fish or skunk, he can play a dirty trick if need be, and cover his foe with fœtid mucus.

The worm, when extended, is seldom more than three inches long, and the girdle appears to be in the centre of the body. This is owing to the greater diameter of the front segments, which, though only thirty in number, extend over as great a space as sixty behind the girdle. Such variety exists in the colour, shape, size, and habit of the worm that it will be necessary, when the details have been more fully worked out, to create some new forms and varieties; but for the present we will put the whole of the forms under the aggregate title. The colour ranges from sea-green, through a dirty green, to a dull yellow or clay colour. Sometimes it is almost flesh-coloured,

when it is very difficult, especially with preserved specimens, to decide whether it is a true Green Worm or not. The male pores are prominent on segment 15, the girdle begins with the 29th or 30th, and ends on the 36th or 37th segment. I believe that the normal number of segments in this genus is eight, but it varies considerably.

On the underside of the girdle we observe three pairs of teats or pores, situated on segments 31, 33, 35. These are the puberty pores (*tubercula pubertatis*). At certain seasons there are also to be found between these pores and the male pores some small sacs containing life-germs. These are the *Spermatophores*. If any irritating substance touches the worm, it pours forth from the openings down the back, known as the dorsal pores, the characteristic turbid fluid of which I have already spoken. The dorsal pores commence between the 4th and 5th segments. Internally the prominent feature is the three pairs of spermathecæ which stand forth conspicuously among the other essential organs.

I have received it from Bush Wood and another place on the eastern side of the forest, through the kindness of Mr. George Day, F.R.M.S., while Mr. Allen of Canning Town, my most indefatigable friend and fellow-worker, has sent it from Purfleet, Rainham, Plaistow (with well-marked variety *pallescens*, Eisen), Woolwich, and different parts of Epping Forest.

2. **Allolobophora mucosa**, Eisen. The Mucous Worm is not so abundant as *A. chlorotica*, from which it differs in several essential particulars. The girdle does not fall near the centre of the body, but occupies the end of the first third. The tail portion is therefore about twice as long as the head. The worm is delicate, of a flesh-colour, semi-transparent when clean, so that the blood vessels can be well seen, and the course of the hæmal fluid observed. The lip is exceedingly delicate, ramified in every direction with very fine blood-vessels; the male pores are easily observed, and the girdle is composed of seven or eight segments, usually beginning on the 26th and ending on the 32nd. The pores or band (*tubercula pubertatis*) cover three consecutive, not alternate, segments, namely 29, 30, 31, and the dorsal pores commence, as in the Green Worm, between the fourth and fifth. There is a total of about 100 segments in the body, the length being, as a rule, three inches or a little more. When irritated the Mucous Worm exudes a fluid which contains a considerable quantity of white granular matter, which forms a coat around the body of the worm resembling lime or plaster-of-Paris. There is one

peculiarity about this worm which renders it very easy of identification. When placed on its back it will be seen that the under surface of the girdle forms an oval, or tends to a circular shape. Eisen first observed and figured this very accurately, in his account of the worms of Scandinavia.

Mr. Allen has sent me specimens from Plaistow, and Mr. Day from one or two localities around Epping Forest.

3. **Allolobophora turgida**, Eisen. The Turgid Worm has been a crux for the student of earthworms, but thanks to the industry of a few patient workers, who prefer accuracy to fame, we have at last been able to see it satisfactorily differentiated from all the other species with which it was formerly confused, and can give it a definite character. It is larger than the last and of a duller hue, being usually of a greyish colour behind, with an orange girdle and flesh-coloured head. The girdle extends over segments 28 to 34, and if a specimen which is passing into the adult stage is carefully examined, the puberty pores will be found to occupy two alternate segments—31, 33. In the Green Worm the same segments are occupied, but there are three pairs, extending to the 35th, while there is a marked difference in their shape and appearance. If a perfectly adult Turgid Worm is examined the pores will be found so swollen as to appear to cover the intervening segment, when it will be difficult for anyone but an adept to distinguish it from the next species. While the dorsal pores of the two foregoing are between segments 4 and 5, and are easily identified, in the Turgid Worm they begin between 10 and 11, and are found with difficulty. This is one feature which marks off the members of the group, and it is accompanied by another. The Green and Mucous Worms deposit a solid substance with their mucus ; this and the next do not.

I have to record the Turgid Worm for Epping Forest, Purfleet, Rainham, Plaistow, Barking, Woolwich, and elsewhere ; the consignments in each case reaching me through Mr. Allen and Mr. Day.

4. **Allolobophora trapezoidea**, Dugès. Eisen did splendid service by his careful diagnosis of worms twenty years ago, but it has been left for Rosa in Italy, and myself in this country, to complete the unravelling of the tangled skein into which previous writers had brought the whole subject of earthworm diagnosis. In former years several species were lumped together under the title of the Common Worm (*Lumbricus communis*, Hoffmeister). Now we have entirely discarded this vague and misleading epithet, and given to each

species, which it has been possible to analyse carefully, a definite title. The name now before us has been in use for half a century, but it was lost during the dark middle ages of this century, and has only now begun to resume its rightful position. It is somewhat difficult for anyone but an expert to distinguish this species from the foregoing. They are very closely related, but in England at least, whatever may be the case on the Continent, they are capable of being treated as distinct species. The Trapeze Worm is larger than its fellow, the shape is somewhat different, the number of segments usually greater, and the puberty band extends, even in the case of the not yet mature worm, over three consecutive segments, namely, 31, 32, 33. A slimy mucus is exuded as in the case of the Turgid Worm, but there is seldom, if ever, a solid substance deposited. It is frequently found mixed up with the last, and in fact with any or all of the foregoing.

My Essex specimens are from Bush Wood, Debden Slade, Epping Forest, and Plaistow. The only other worm which is at present known to belong to this group in Great Britain is the Welsh Worm (*A. cambrica*, Friend), which has some of the characters of the Green Worm, along with others of the Mucous Worm. I include it for the guidance of collectors in the table following, though it has not, up till the present, reached me from Essex.

This is the most complete account that has yet been published of this group, and I should like my next instalment to be equally full. This, however, cannot be, unless several members residing in the country will examine fallen trees, decaying timber, old leaf manure, and other vegetable *débris*, and send me the results. There are half-a-dozen species of worms belonging to the Dendrobænic group, and as several of them have been sent to me in large quantities from Norfolk and Sussex, the bulk of them, if not all, will occur in Essex. Living worms should be sent in tin boxes with soft moss, not tightly packed, but sufficiently well filled to keep the worms from being damaged in transit, and addressed 4, The Grove, Idle, Bradford.

[For Tabular view of the MUCIDA group of *Allolobophora* see the following page.]

TABULAR VIEW OF THE MUCIDA GROUP OF ALLOLOBOPHORA.

§ 2. Mucida	Segments occupied by			Setæ.	Averages.		
	Girdle.	Band.	Dor. Pore.		Length.	Segments.	Colour.
1. *Chlorotica*, Savigny, 1828.	29-37	31 : 33 : 35	$\frac{4}{5}$	4 couples	2 to 3 inches	90-130	Green, dirty yellow or clayey, exudes yellow fluid.
2. *Mucosa*, Eisen, 1873.	26-32	29-31	$\frac{4}{5}$	4 couples	3 inches	100-120	Flesh-coloured. White deposit from mucus.
3. *Turgida*, Eisen, 1873.	28-34	31 : 33	$\frac{10}{11}$	4 couples	3 to 4 inches	100-120	Grey, flesh-coloured head, slimy, not turbid mucus.
4. *Trapezoidea*, Dugés, 1837.	27-34	31-33	?	4 couples	4 inches	110-160	Closely resembles *A. turgida*.
5. *Cambrica*, Friend, 1892.	29-37	31 : 33 : 35	$\frac{4}{5}$	4 couples	2 inches	80-100	Exactly like *A. mucosa*. Fluid somewhat sparse.

NOTES ON THE REPORT OF THE CONFERENCE OF DELEGATES OF THE CORRESPONDING SOCIETIES OF THE BRITISH ASSOCIATION, HELD AT EDINBURGH, 1892.

THE Report of the Edinburgh Conference has already been printed, and copies of it have been sent to the secretaries and delegates of the Corresponding Societies. But as these societies are at present forty-two, and as the average number of members in each is probably over 300, it is obvious that the British Association can hardly be expected to send copies of the Report to individual members. Yet, as it is most desirable that the local Societies should co-operate as fully as possible with the British Association, I was directed, as secretary to the Corresponding Societies Committee, to forward with the Report a list of the Committees appointed by the Association, also a letter from which I here extract the concluding paragraph:

"I am also requested by the Corresponding Societies Committee to ask you to urge upon your Society, and its members individually, the importance of taking part in the work of as many of the Committees mentioned in the accompanying list as may be found practicable in your district. For further particulars concerning the work of these Committees communications should be addressed to their respective secretaries or to the secretary of the British Association."

These Committees are altogether seventy in number, but the co-operation of the Corresponding Societies is important only with regard to eleven or twelve of them. The discussions at the Conference of Delegates are confined to subjects about which it is especially necessary that the delegates should exchange views and experiences, so that either those Societies which happen to be somewhat backward in any special subject may learn from the more advanced therein, and a common standard of work be attained; or some united course of action be fixed upon.

One Committee is concerned with the production and collection of meteorological photographs; and at Edinburgh the desirability of obtaining photographs illustrating the damage done by floods, whirlwinds, etc., the difficulties of taking such photographs, and the work done in this department by certain Societies, were discussed and some photographs exhibited. Another Committee exists in order to collect and preserve geological photographs. A large number of these was exhibited, and it was thought important that

some uniform plan of photographing geological subjects should be adopted. Also that the plates used should be orthochromatic or isochromatic.

The co-operation of the Corresponding Societies was also sought by the Committee appointed to consider the Circulation of Underground Waters in the permeable formations of England; by that to record the positions of Erratic Blocks; and by that appointed to collect evidence on the rate of erosion of the sea coasts of England and Wales.

The two subjects, however, which caused most discussion at Edinburgh were the disappearance of native plants and the destruction of wild birds' eggs. As regards the native plants, an interesting letter from Mr. Leo Grindon was read dealing with their disappearance in the district within a radius of fifteen miles round Manchester. Mr. Grindon remarked that the wild, uncultivated moorlands had remained unchanged. But agricultural improvements, which had converted peatmosses and sandy wastes into comparatively fertile land, had caused the local disappearance of certain moss and moor plants, while the dye-polluted streams were forsaken by the Forget-me-not and other water-loving species. As regards the wilful destruction of plants, Mr. Grindon thought that the herb-doctors or "medical botanists" had caused much destruction of those supposed to have medicinal value, such as the *Erythræa centaurium*. Dealers in roots for gardens also caused much damage, as they sometimes completely stripped certain spots of certain kinds of ferns, of primroses, and of cowslips. Rev. Canon Tristram added that in Durham, during his lifetime, some of the most interesting species of plants and also some of the most remarkable varieties of butterflies and moths had been thus exterminated.

It would be interesting to know the experience of Essex botanists and entomologists in this matter. On the one hand there can have been no transformation of moor and moss into agricultural land in Essex at all comparable to that which has taken place in some of the northern counties, nor are dye-polluted streams a new and hideous feature of this district. But the dealers in ferns, primroses, and other plants for the London market have probably been even more destructive than those of Manchester and Durham.

An interesting account was given at Edinburgh by the Rev. E. P. Knubley of the destruction of wild birds' eggs owing to the rapacity of dealers and collectors. One collector living in Edinburgh was

said to have over 100 eggs of the golden eagle. And in the case of the great skua, which nested in the Shetland Isles, not a single chick had been reared in 1890 on the whole of the Foula colony, while in 1891 all the eggs of the first laying were taken and sold to dealers. It was remarked during this discussion that if there were no collectors there would be no dealers. And the following resolution, moved by the Rev. E. P. Knubley, and seconded by Mr. E. B. Poulton, was agreed to :

"The Conference of Delegates, having heard of the threatened extermination of certain birds, as British breeding species, through the destruction of their eggs, deprecates the encouragement given to dealers by collectors through their demands for British-taken eggs, and trusts that the Corresponding Societies will do all that lies in their power to interest and influence naturalists, landowners, and others in the preservation of such birds and their eggs."

I may add that during the Conference a strong feeling was manifested that field clubs should make it one of their first objects to teach their members to preserve, not to destroy, rare plants and animals.

Turning to the various branches of study included in the term Anthropology, I must now state that Mr. Brabrook called attention to the proposed Ethnological Survey which is being organised by a committee of delegates from the Society of Antiquaries, the Anthropological Institute, and the Folk Lore Society. This joint committee hoped shortly to be able to send to the Corresponding Societies detailed suggestions as to the mode of carrying out the work. Dr. Garson remarked that local societies intending to explore ancient dwellings, burial places, etc., might receive valuable hints from the Committee in Aid of Anthropological Exploration, 3, Hanover Square, of which Gen. Pitt Rivers is chairman. And a strong general feeling was evinced that the Corresponding Societies should do their utmost to aid in the preservation of Ancient Remains. Mr. Gray remarked that the Belfast Naturalists' Field Club not only protected Ancient Remains, but also photographed them, an example which seems worthy of imitation.

With regard to Field Clubs and the increase of their usefulness, Canon Tristram thought that archæology should be included among their subjects of study, and Mr. Brabrook considered it absurd to look at man merely from a natural history point of view, and to ignore his archæological aspects. Canon Tristram also touched upon the danger of allowing field excursions to partake too much of the character of picnic parties. On this last point it may be worth

mentioning that some months ago I learned that a Field Club, once scientifically active and useful, had recently become so effete through frequent indulgence in gratuitous meals, that excursions not including tea at some big house were attended by but four or five members, including the president and director! Wherever the picnic spirit is allowed to prevail in a Field Club, the scientific spirit necessarily declines, and gastronomic members should bear in mind that with the loss of scientific status invitations to tea also disappear.

The subject of Local Museums was discussed chiefly by Canon Tristram. He thought they should contain, solely or mainly, local products. He mentioned that many museums had gone to utter decay for want of an endowment. Those at Newcastle, York, Manchester, Liverpool, and Norwich were all endowed, while that at Lynn, in Norfolk, for want of an endowment was mouldering away. Museums were, he added, of little use without a curator, and local societies should try to promote interest in the local museum so that an endowment fund, to allow of a curator being kept, might be raised by the help of wealthy residents and the County Council. This subject is one that will probably be discussed at much greater length during the meeting of the British Association at Nottingham, next year.

T. V. HOLMES,
Hon. Secretary Corresponding Societies Committee; Delegate, Essex Field Club.

I add a list of those British Association Committees of whose existence the Corresponding Societies should be more especially aware :—

Corresponding Societies Committee. *Chairman.*—Professor R. Meldola. *Secretary.*—Mr. T. V. Holmes. Mr. Francis Galton, Sir Douglas Galton, Sir Rawson Rawson, Mr. G. J. Symons, Dr. J. G. Garson, Sir John Evans, Mr. J. Hopkinson, Professor T. G. Bonney, Mr. W. Whitaker, Mr. W. Topley, Mr. E. B. Poulton, Mr. Cuthbert Peek, and Rev. Canon H. B. Tristram.

To organise an Ethnographical Survey of the United Kingdom. *Chairman.*—Mr. Francis Galton. *Secretary.*—Mr. E. W. Brabrook. Dr. J. G. Garson, Professor A. C. Haddon, and Dr. Joseph Anderson.

Ascertaining and recording the Localities in the British Islands in which evidence of the existence of Prehistoric Inhabitants of the Country are found. *Chairman.*—Sir John Lubbock. *Secretary.*—Mr. J. W. Davis. Sir John Evans, Professor Boyd Dawkins, Dr. R. Munro, Mr. Pengelly, Dr. Hicks, and Professor R. Meldola.

To investigate the Physical Deviations from the Normal among Children in Elementary and other Schools. *Chairman.*—Sir Douglas Galton. *Secretary.*—Dr. F. Warner. Mr. G. W. Bloxam, Mr. E. W. Brabrook, and Dr. J. G. Carson.

To consider proposals for the Legislative Protection of Wild Birds' Eggs. *Chairman.*—Mr. Thomas Henry Thomas. *Secretary.*—Dr. C. T. Vachell. Professors W. N. Parker, Newton, and Leipner, Mr. Poulton, and Canon Tristram.

Recording the Position, Height above the Sea, Lithological Characters, Size, and Origin of the Erratic Blocks of England, Wales, and Ireland, reporting other matters of Interest connected with the same, and taking measures for their preservation. *Chairman.*—Professor E. Hull. *Secretary.*—Mr. P. F. Kendall. Professors W. Boyd Dawkins, T. McK. Hughes, T. G. Bonney, and J. Prestwich, and Messrs. C. E. De Rance, R. H. Tiddeman, J. W. Woodall, and Prof. L. C. Miall.

The Rate of Erosion of the Sea-coasts of England and Wales, and the Influence of the Artificial Abstraction of Shingle or other material in that action. *Chairman.*—Mr. W. Whitaker. *Secretaries.*—Messrs. C. E. De Rance and W. Topley. Messrs. J. B. Redman and J. W. Woodall, Maj.-Gen. Sir A. Clarke, Admiral Sir E. Ommanney, Capt. Sir G. Nares, Capt. J. Parsons, Capt. W. J. L. Wharton, Professor J. Prestwich, and Messrs. E. Easton and J. S. Valentine, and Professor L. F. Vernon Harcourt.

The Circulation of the Underground Waters in the Permeable Formations of England, and the Quality and Quantity of the Waters supplied to various Towns and Districts from these Formations. And that a Digest of the eighteen Reports should be prepared by the Committee, and sold in a separate form. *Chairman.*—Professor E. Hull. *Secretary.*—Mr. C. E. De Rance. Dr. H. W. Crosskey, Sir. D. Galton, Professor J. Prestwich, and Messrs. J. Glaisher, P. Kendall, E. B. Marten, G. H. Morton, W. Pengelly, J. Plant, I. Roberts, T. S. Stooke, G. J. Symons, W. Topley, Tylden-Wright, E. Wethered, and W. Whitaker.

The Rate of Increase of Underground Temperature downwards in various Localities of dry Land and under Water. *Chairman.*—Professor Everett. *Secretary.*—Professor Everett. Professor Lord Kelvin, Mr. G. J. Symons, Sir A. Geikie, Mr. J. Glaisher, Mr. Pengelly, Professor Edward Hull, Professor Prestwich, Dr. C. Le Neve Foster, Professor A. S. Herschel, Professor G. A. Lebour, Mr. A. B. Wynne, Mr. Galloway, Mr. Joseph Dickinson, Mr. G. F. Deacon, Mr. E. Wethered, Mr. A. Strahan, and Professor Michie Smith.

Considering the advisability and possibility of establishing in other parts of the country Observations upon the Prevalence of Earth Tremors similar to those now being made in Durham in connection with coal mine explosions. *Chairman.*—Mr. G. J. Symons. *Secretary.*—Mr. C. Davison. Sir F. J. Bramwell, Mr. E. A. Cowper, Professor G. H. Darwin, Professor Ewing, Mr. Isaac Roberts, Mr. Thomas Gray, Sir John Evans, Professors Prestwich, Hull, Lebour, Meldola, and Judd, Mr. M. Walton Brown, Mr. J. Glaisher, Professor C. G. Knott, Professor J. H. Poynting, and Mr. Horace Darwin.

The Collection, Preservation, and Systematic Registration of Photographs of Geological Interest. *Chairman.*—Professor J. Geikie. *Secretary.*—Mr. O. W. Jeffs. Professors Bonney and Boyd Dawkins, Drs. V. Ball and T. Anderson, and Messrs. A. S. Reid, E. J. Garwood, W. Gray, H. B. Woodward, J. E. Bedford, R. Kidston, W. W. Watts, J. W. Davis, and R. H. Tiddeman.

The Application of Photography to the Elucidation of Meteorological Phenomena. *Chairman.*—Mr. G. J. Symons. *Secretary.*—Mr. A. W. Clayden. Professor R. Meldola and Mr. John Hopkinson.

NOTES—ORIGINAL AND SELECTED.

Seasonal Changes in the Fallow Deer.—The Hon. Gerald Lascelles has some interesting notes in the October "Zoologist" on the changes of colour in the fallow deer as observed in the New Forest. He thinks that "the change of coat that takes place in this species when, as in the New Forest, in a perfectly wild condition has escaped the notice of naturalists, and that a description of what annually occurs among these deer may be of interest. In the New Forest, during May, June, July, and August, *all* the fallow deer are uniformly of a light red colour, spotted thickly on the flanks with white and light grey spots—such, in fact, as in parks are termed 'fallow' deer. In September the coat begins to change, and by November *all* the deer are uniformly a very dark brown, almost black, on the back and sides, shading off to a light dun on the flanks, belly and legs, without any spots at all. The white patch below the tail is unaltered, but is rather more conspicuous in winter than in summer, owing to the darker colour of the animal. In some individuals the spots in summer are brighter and more numerous than in others; in winter there is but little difference, except that the bucks are, as a rule, slightly lighter in shade than the does. Both of these winter and summer colours are common enough in parks; but in every case that has come under my observation, those deer which are red and spotted in the summer, remain of the same hue in the winter; and those which are dark or black at one season of the year remain of that colour during the whole twelvemonth. What would be interesting to know is, whether in other places where fallow deer are genuinely wild—not where semi-domesticated deer have been turned out, and allowed to breed—the same biennial change of colour takes place, and if so, how it comes about that confinement in a confined space has altered the habit of the species, as in most parks it certainly has." In all probability, the deer in our own Epping Forest are at least as ancient as those in New Forest, and we should be glad to hear from anyone who has observed them carefully at different times of the year whether there are in them any seasonal changes similar to those observed by Mr. Lascelles. The dark colour of our deer would mask the changes in tint, but still *some* differences may exist between that of the summer and winter coats.—ED.

Capture of Otters near Chelmsford.—According to the "Essex County Standard" of October 8th, a fine bitch otter was trapped on the navigation river, near the third lock, a few miles from Chelmsford, and is alive, in the possession of the lock-man. About a fortnight ago a male was similarly caught and killed in the same place, and was found to weigh upwards of 23 lbs. The female is nearly as large.

A Fine Pike at Heybridge.—"Mr. Frank Anderson, a well-known member of the Maldon Angling Club, fishing in the Chelmer Navigation the other day, near Heybridge, captured a fine pike, which measured 2 feet 10½ inches from snout to tail and 7½ across the side. It scaled 11 lbs. 12 ozs."—'Essex County Standard," November 19th, 1892.

Clouded Yellow Butterflies in Essex in 1892.—The "Entomologist" for November contains some additional records, which may be inserted as supplementary to those printed *ante* pp. 130, 140. Mr. Laddeman writes that "on the 23rd of August, I captured four *Colias edusa*, two males and two females, and saw about forty others, on a piece of rough ground near the rifle range at High Beach, Epping Forest. On the 24th, I saw another fly across the road near the 'Wake Arms.' The greater proportion of those seen appeared to be males." Mr. F.

Kerry reports from Harwich that *C. edusa* and *C. hyale* have been fairly plentiful there during the latter half of August, this being the first time he had seen *C. hyale* in the neighbourhood. The males of *edusa* were much in excess of the females, the average being ten males to one female. The variety *helice* was not seen. Mr. C. Spiller records *C. edusa* in plenty and one *C. hyale*, at Southend; and the Rev. F. A. Walker writes that *edusa* was not uncommon at Walton-on-the-Naze in August, and that one *hyale* was taken. At Brentwood, Mr. E. Baxter reports that *edusa* commonly occurred during August and September, not only all over his district, but also on the railway banks further down the line. He also took one var. *helice* and seven *C. hyale*. Lord Waldegrave saw *edusa* on the rifle range at Rainham in August. Mr. Buckell says that *C. edusa* has been plentiful in and about the Lea Valley. We shall be glad to publish any further Essex records, more especially of *C. hyale*, and from the W., N.W., and N. parts of the county.—Ed.

Lepidoptera of the Essex Marshes.—Mr. F. G. Whittle writes as follows to the "Entomologists' Record" for September:—"I found *Dichrorhampha plumbagana D. plumbana*, and *Psyche radiella*, on the 6th of May, at Benfleet; *Stenopteryx nocturella* (common), *Heliodes arbuti*, *Euproctis affinitana*, *Argyrolepia arcana* (one only), *Spilosoma menthrasti*, and larvæ of *Eriogaster lanestris*, on the 29th of May, near Benfleet; *Sericoris littorana*, *Agaistis bennetii*, *Fumea reticella*, at Shoeburyness, on the 6th of June, but not a single larva of *Bombyx castrensis* was seen on this occasion, although many well advanced larvæ were found a fortnight later. *Coleophora salinella* and *C. artemisicolella* were taken on the 10th June, at Benfleet, and a pair of *Eupethecia subumbrata* netted in the middle of June, at Shoeburyness. *Tortrix costana* occurred on the 24th of June, in the same locality, whilst *Lucania phragmitidis*, *Dichrorhampha politana*, *Ephippiphora trigeminana*, *Catoptria hypericana*, *Homæosoma binævella*, and *Crambus selasellus* were taken on the 15th July, at Benfleet. On the 18th July, *Catoptria scopoliana* and *Eucheria jacobææ* were on the wing, the latter in fair condition, whilst larvæ of the same species—adult and young—were on the food-plant. *S. noctuella*, *Cynthia cardui*, and *Plusia gamma* were common on the Essex Marshes in May. I was particularly pleased to take *Fumea reticella*. It occurred so freely that, in a short visit, I was able to take thirty-one specimens."

A Brilliant November Meteor seen in Essex.—A Braintree correspondent of the "Essex County Chronicle" states that at 1.33 a.m. on Monday, November 17th, "a very large and beautiful meteor appeared to start from the centre of the heavens, somewhat east of the planet Jupiter, and descend to the earth about one point to the west of the North Star. The nebula appeared like an immense star, intensely bright and glittering, and the tail, which reached high up in the sky, was a most beautiful mixture of coloured fire, of pale yellow, mauve, blue, etc. It only disappeared when it seemed close to the earth." The meteor was also observed by several persons in the neighbourhood of Braintree, Superintendent Elsey and P.S. Barnard were driving up Panfield Lane, Bocking, at 1.33 a.m., when they observed the aërial visitant. Superintendent Elsey has seen many similar phenomena in various climes, but he says he had never before seen one so beautiful. The "tail" of the meteor, he says, stretched far into the heavens, and was resplendent with bright blue, pale yellow, mauve, and other hues. As the meteor apparently came close to the earth it seemed to disappear as if it had dropped in some fields close by. At Chelmsford the meteor was seen by P.C. Everett, who says that the meteor's flight was followed by a loud

rumbling. P.C. Batten, who was on duty near All Saints' Church, Springfield, was very much afraid the meteor was descending directly upon him.

October Rainfall at Chelmsford.—Mr. F. Chancellor has communicated to the papers particulars of the rainfall in Chelmsford during the month of October for the past twenty-five years. In October just elapsed Mr. Chancellor registered 3·60 inches of rain, this being exactly the same amount which was registered in 1875. The driest October experienced during the quarter of a century was that of 1879, when only 0·73 inches was registered; and the wettest by far was October, 1880, when 6·26 inches of rain fell. In 1876 the register marked 0·91 inches, and in the other years it varied from 1·97 to 4·18. The rainfall for last month was heavy at Chelmsford, though not so much rain fell there as in other parts of the county. At Ramsey, near Harwich, 7·21 inches was registered, while 5·19 inches fell at Sudbury.

Celtic Vases at Great Clacton.—In June last, as some workmen were digging gravel on Mr. P. Smith's farm at Bull Hill, Great Clacton, they found four vases about three feet from the surface. Unfortunately the workmen were not aware of the value of their discovery, and took no pains to get the vessels up without injury, or to save the pieces. Mr. Smith managed to save the least injured, and has presented it to the Colchester Museum. No note was taken as to their position or contents, but it appears to have been a Celtic burial of the usual character. A large vase, accompanied by smaller drinking and food vessels, was found, but there are no indications of a tumulus. The vase sent to the Museum is six inches high and four and a-half inches wide at the mouth, ornamented by numerous depressed rings formed by a twisted thong. The inside is very smooth, and the fragments of flint in the composition of the paste are rather smaller than usual. It is well burnt, and is of a red colour.

Dutch Tobacco Pipes.—The queer little tobacco pipes (called "Dutchmen" by the country people) that one finds in excavations near sites of ancient settlements and old banks in parts of Essex may be worthy of a passing note. They are often found when repairing the sea-walls at Mersea and elsewhere, and I have one dredged up from the estuary of the Blackwater. Mr. Bernard Smith ("Notes and Queries," June, 1854) said of them:—"The pipes found in such abundance in the bed of the Thames, and everywhere in and about London, I believe to be of Dutch manufacture. They are identical with those Teniers and Ostade put into the mouths of their boors, and have for the most part a small-pointed heel, a well-defined milled ring around the lip, and bear no mark or name of the maker. Such were the pipes used by the soldiers of the Parliament whenever they encamped." The late Mr. Charles Keene (of "Punch") was very fond of smoking out of these pipes, and some months ago Mr. H. Savile-Clarke gave some interesting reminiscences of the Keene pipes in the "Pall Mall Gazette":—"When first I met Mr. Charles Keene, a good many years ago now, at the studio of a friend in Danes Inn, he was smoking one of those curious little clay pipes so familiar to all who knew him. We had some talk about it, and I understood him to say that such pipes were the earliest made in this country, and that they were often found when turning up any part of the foreshore of the Thames. They have a very small bowl like a thin barrel, and a thick stem; with a curious little heel under the bowl, so that the pipe can be put down without spilling any of the ash. The smallness of the bowl was, of course, due to the high price of tobacco in the days when these pipes were first used. . . . . It may be noted that the bowls of these pipes are very thick, while the bore of the genuine

ones is about the eighth of an inch in diameter, and never (as in the forgeries) in the middle of the stem, but almost always close to the top or bottom of it. Forgeries—that is to say, modern pipes on this pattern—are very common, and are better made as to the bowls. I may add that smoking these little pipes is an acquired taste, for they are rather hot until they become seasoned, while they hold so little that your tobacco pouch seems never to be out of your hands."—B. G. COLE, Buckhurst Hill.

The Common Seal of Colchester.—The well-known Essex antiquary, Mr. J. Horace Round, writes as follows to the "Essex County Standard" of October 29th :—

"Seven years ago (1885), there was exhibited before the Royal Society of Antiquaries an impression of a common seal of Colchester till then virtually unknown, attached to a deed of 1379. Dr. Percival, who wrote an account of it (which Dr. Laver copied into our local Archæological transactions), was of opinion, from its rude workmanship, that the seal might date 'from the middle or end of the thirteenth century.' As the impression exhibited was imperfect, the 'legend' has remained in doubt, antiquaries having failed to restore it, the suggested reading ran :—

'S . . . . . Burg[*ensium ville C*]olcestrensis' on one side; and on the other: 'Quam crux insignit Helenam C[*olcestria gig*]nit.'

I am now in a position to supply the true reading of this curious 'legend' :—

COLCESTRENSIS SUM BURGI COMMUNE SIGILLUM
QUAM CRUX INSIGNIT HELENAM COLCESTRIA GINGNIT.

Both lines, it will be seen, are hexameters, and both have a rhyming syllable at the *cæsura*. They may be rendered thus :—

(*A.*) 'I am the common seal of the burgh of Colchester.'

(*B.*) 'Colchester gave birth to Helen, whom the cross renders famous.'

St. Helen is seen brandishing the cross accordingly on the seal. This rendering assumes that the barbarous 'gingnit' was used for 'genuit.'

There was also, I think, a third seal, of small size, which appears to be wholly unknown, but was in use in the sixteenth century. It was of good design, and was probably employed by the bailiffs."

An Ancient MS. Recipe Book.—Our member, Mr. J. C. Shenstone, of Colchester, has lately presented to the library of the Pharmaceutical Society of London, an old manuscript recipe book of great interest; and at the first ordinary meeting of the Society for the session, held in London on November 9th, a short account of it was, by request of the President, given by Mr. Shenstone. He said that he had found the book in looking through some old business papers. The first portion of it was in the cramped but neat writing of the seventeenth century, but the first dated entry was: "John Richardson, his Book, July ye 30, 1713.' A recipe was given for Great's "Nost Vinum." Mr. Great was a Colchester apothecary of repute, and was maker of the "Candied Eringo," first manufactured by his master, Thomas Buxton, apothecary, and Alderman of Colchester at the time of the Civil War. Some of the recipes are curious, as, for instance, the following :—

"R. The parings of Stone Horse hoofs, rinds of Cheshire cheese, shreads of Scarlet cloth, all these cut small and burnt in a chaffing dish, sett in a close stove, over the smudge. *Probatum est* Dr. M."

The miscellaneous recipes include: "To make a Girl or Maid a good colour," "A Fume against ye Plague," "Shoe Balls," etc. Altogether the book gives a

curious picture of pharmacy at the end of the seventeenth and beginning of the eighteenth centuries.

The MS. of Morant's "History of Essex."—The Rev. Cecil Deedes, writing in "Notes and Queries," refers to the collection of MSS. in the Colchester Museum, presented in 1871 (?) by Mr. Hills, of Colne Park, and also alludes to the statements made concerning them by Alderman Harvey and others to the effect that they are the work of William Holman, of Halstead, and that they really are the manuscript of Morant's "History of Essex." Mr. Deedes points out that the supposition that Morant was not entitled to the credit of the compilation of the history of Essex requires more confirmation, and asks in whose handwriting are these particular MSS. A writer in the "Essex County Standard" of October 15th is decidedly of opinion that the MSS. are "in the hand-writing of Mr. Holman, that they practically form a great portion of the manuscript of Morant's 'History of Essex,' and that much of them is derived from Thomas Jekyll's collections. Mr. Holman sold his collection to Morant, and though Morant undoubtedly 'compiled' and added to the matter, Mr. Holman's very complete collection deserves the credit of being the foundation of Morant's 'History of Essex.'" Writing on October 20th, the Rev. C. L. Acland, the late Hon. Curator of the Colchester Museum, says: "Holman's MS. History of Essex was sold by him (then minister of an Independent congregation at Halstead) to the Vicar of Halstead, whose name, I am sorry to say, I cannot call to mind. Morant was at that time assistant-curate at Halstead, and his signature appears as witness to the deed of sale. Of this I am quite sure. I saw the deed of sale many years ago. It was shown to me by Mr. J. B. Harvey. I was under the impression that he deposited it, with the rest of the Morant MSS., in the Museum; but as I have looked for it carefully since his death, and failed to find it, I am probably mistaken on this point. I wish I had taken a copy of it. I am sorry I cannot give fuller details, but of the main fact I am quite certain. How Holman's MSS. passed into Morant's possession I do not know. That Morant was very much indebted to Holman's History I am quite sure, though I do not remember that he ever owns the indebtedness. Reference to the Parish Register at Halstead would be useful." [Some particulars of William Holman in connection with a MS. catalogue of papers used by him in compiling his "History of Hinckford Hundred," exhibited by Mr. Cole, will be found in ESSEX NATURALIST, vol. iii., pp. 160-161.]

Colchester Castle.—The editor of the "Antiquary" writes as follows in the November number:—"In the course of the formation of the new public park in the grounds surrounding the Castle of Colchester, some walls have been unearthed which are of some interest, as showing that there was a fortress on this spot in Roman times. On the west, north, and east sides of the Castle Bailey are large earthen ramparts, and in a cutting through the north-west corner a wall was found, having distinct and unmistakable Roman characters; and from the area inclosed by it a cloaca was uncovered, arched over with Roman bricks, and plastered inside and on the bottom with hard red mortar, usually considered Roman. These discoveries rather support the theory of the late Rev. H. Jenkins, that the present keep is also a Roman building, as it may be fairly argued that, if the outworks were of this period, the remaining portion of the fortress is also of the same age. It is easily to be seen that many of the characters, relied on to prove the Norman origin of the keep, are clearly insertions into an older building, so that after all the late Rev. H. Jenkins and those who follow him may be correct in their determination of the date of its erection.

PUBLICATIONS OF ESSEX FIELD CLUB.

ESSEX FIELD CLUB, SPECIAL MEMOIRS, VOL. I.

"REPORT ON THE EAST ANGLIAN EARTHQUAKE OF APRIL 22ND, 1884."

By Prof. RAPHAEL MELDOLA, F.R.S., F.C.S., F.R.A.S., M.A.I., &c.; and WILLIAM WHITE, F.E.S., Member of Geologists' Association.

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ESSEX FIELD CLUB, SPECIAL MEMOIRS, VOL. II.

"THE BIRDS OF ESSEX:

A CONTRIBUTION TO THE NATURAL HISTORY OF THE COUNTY."

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N.B.—A reduction of 25 per cent. from the above prices is allowed to Members, excepting on the "Birds of Essex" and the Annual Subscriptions to the "Essex Naturalist."

COMMUNICATIONS FOR THE "ESSEX NATURALIST."

In the early part of the year I printed an appeal to the readers of THE ESSEX NATURALIST to interest themselves in its welfare, and to aid me in the difficult task of editing by sending short papers and suitable notes of occurrences appertaining to the special subjects for the study of which the Essex Field Club was founded, for consideration and publication. I am sorry to say that this request has led to but scant response. As we are now approaching the end of another year, I venture again to call upon our friends and members for such aid, in the hope that it will be more freely and systematically rendered during the coming year.

Every reader could with but little trouble render most welcome assistance. Not only are longer and more important memoirs desired, but the greatest aid would be given by the communication of SHORT PAPERS, NOTES, and of books, periodicals, newspapers, etc. (*or extracts from the same*), containing matter (reports, captures, natural history, antiquarian or other "finds," topographical descriptions, news of the exposure of geological sections, etc.), likely to be useful for THE NATURALIST or for the information of the council and officers.

I would VERY GRATEFULLY receive promises from members and others of *systematic searching of periodicals, etc., for such information as above.* If extracts are sent they should be in a form as nearly as possible for publication. MSS. should be written on *one side of the paper only*, with *wide* spaces between the lines, and with *wide* margins.

Further, as the Winter Session has now commenced (the first meeting was held at Loughton Public Hall on November 19th), PAPERS, and EXHIBITS for the MEETINGS are greatly desired, and I shall be glad to hear from those having such in preparation.

[It would greatly assist if exhibitors of objects at meetings would themselves prepare short descriptions of them for publication, and hand the same to me *at the meetings.*]

I feel sure that the members, thus appealed to, will exert themselves to aid the officers in carrying on the work of the Club in accordance with the objects for which it was founded. They should hold themselves responsible, in some measure, for the progress of the Club, and look upon themselves as a band of "enthusiasts" gathered together for the study and investigation of the natural history of Essex. I most sincerely hope that during the year 1893 our Journal will be freely used for recording observations original and selected, and as a *monthly* medium of intercommunication between lovers of natural science dwelling in, or having a friendly regard for, our interesting county.

WILLIAM COLE,

Hon. Secretary and Editor.

Buckhurst Hill,
November, 1892

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OF THE

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EDITED BY

WILLIAM COLE,

Honorary Secretary.

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BRITISH ANNELIDS.

WITH ESPECIAL REFERENCE TO THE EARTHWORMS OF ESSEX.

By REV. HILDERIC FRIEND, F.L.S.

(*Continued from page 171.*)

ALTHOUGH Eisen discovered an example of a worm which lived among decaying timber upwards of twenty years ago, and named it the "Tree-haunter" (*Dendrobæna*), yet the species or group was never studied in a consecutive and exhaustive manner, either at home or abroad, until I took it up two years ago, and published my results in the "Journal of the Linnean Society" for 1892 (*Zoology*, vol. xxiv., pp. 292 *seq.*). Since that sketch was written, I have been able to extend my researches and add more than one fact of very great biological interest and importance to those already known. My present paper will be limited to a notice of this third group of worms belonging to the genus *Allolobophora*.

ALLOLOBOPHORA: §3, DENDROBÆNA.

The worms belonging to this group are of two kinds. They can (with some exceptions, perhaps) live either in the soil or in the timber of decaying trees. Their habitat materially affects their size, colour, shape, and appearance. So much is this the case that it is in some instances almost impossible to decide whether the terrestrial species is the same as the dendrobænic or not. This is a point of extreme interest, as we have here a means of studying, in careful detail, the effect of environment on species, and the possible ultimate development of species from varieties. The varieties which frequent trees are invariably of a warm brown colour on the back, with the girdle and under surface lighter. They seldom exceed one and a-half inches in length, and have an octangular-shaped tail, due to the wide disposition of the setæ, which are in eight almost equidistant rows. The prostomium may not cut the peristomium at all, or it may perfectly bisect it. The girdle occupies from five to eight segments, commencing somewhere between the 24th and 31st. The male or spermiducal pores are on segment 15, usually with prominent papillæ, which in one case extend over the two adjoining segments. The clitellar papillæ (*tubercula pubertatis*) are either absent, or occur on two or three consecutive, never on alternate, segments. The first dorsal pore is usually between the 5th and 6th segments. I have found spermatophores only on the terrestrial forms of two species.

Out of the hundreds of dendrobænic forms examined from all parts of the kingdom, during every period of the year, I have hitherto failed to observe these organs. The forms which frequent trees secrete a small quantity of yellow fluid from the dorsal pores, but several of the terrestrial forms of the same species are incapable of doing so. This is another curious fact which merits further investigation.

There are four well-marked species known to occur in Great Britain, in addition to five forms or varieties. I shall be obliged to depart from the arrangement adopted in my memoir referred to above in some points, owing to the discoveries which I have made since its publication. I formerly proposed the "Celtic Worm" (*Allolobophora celtica*, Rosa) as the type of this group; but I now prefer, for reasons to be given hereafter, to go back to Eisen's type (*Dendrobæna boeckii*), and base our English species thereon. Unfortunately, this species is at present unknown to Essex. In the following enumeration, I shall specify all the British forms known to me at the close of 1892, giving localities for those only which are found at present in Essex.

1. **Bœck's Worm** (**Dendrobæna bœckii**, Eisen). The original description of this worm as a new species and genus appeared in 1873. The genus was separated from *Allolobophora* chiefly on the ground that the setæ were wide apart. This character, however, is variable, and we find in other species of worms, as, for example, *A. profuga*, Rosa, a similar arrangement. Eisen gives this brief account of the genus. "Male pores on segment 14 (=15 English method), setæ everywhere equidistant, except in the case of the two highest (on the back), which are somewhat wider apart than the others. The lip cuts into the peristomium to a distance of three-fourths the diameter." He says the species under description is the same as *Lumbricus puter*, Eisen, an account of which he had published two years before. The girdle in the type occupies, as a rule, the five segments 29 to 33, three of which (31, 32, 33) carry the clitellar papillæ (*tubercula pubertatis*). The anal segment is somewhat pearshaped. The lip cuts deeply into the first ring, but does not completely bisect it. There are somewhat prominent papillæ carrying the male pores. The first dorsal pore is well seen between the fifth and sixth segments. The worm is about one and-a-half inches, or twenty-five to thirty-five millimetres, in length, and contains a total of eighty to 100 segments.

The colour is reddish brown, with lighter girdle and under-surface. Hitherto I have found it only in the north, and I believe it would occur plentifully in the pine forests of Scotland. It is without known varieties, and forms an admirable type.

2. **Eisen's Worm** (**Lumbricus eiseni**, Levinsen), is the first Essex representative of this group which I had the pleasure to examine. It is not a true *Lumbricus*, although it has some affinities with that genus, especially if we examine the terrestrial form. The dendrobænic type closely resembles Boeck's worm in colour. The setæ, however, are arranged in four couples which are wider apart than in the true earthworms. The lip and peristomium form a perfect mortise and tenon, as in Lumbricus. There are seven to ten girdle segments, but usually the clitellum covers the 24th to the 31st. It specially delights in old decaying tree stumps. I have received from Essex, however, not only the typical dendrobæne, but also a terrestrial variety, which differs so widely from the type that I have named it var. *gracilis*, on account of its very slender appearance. It is usually about an inch in length, or at most one and a half inches, and is composed of some ninety to 100 segments. The tail is somewhat flattened and spatulate, as in the true Lumbrici, when the worm lives in the soil; but angular when found in trees. The variety also has a beautiful iridescent play upon the back which the type has not. There are no papillæ on the girdle (*i.e.*, *tubercula pubertatis*), and those which carry the male pores on segment 15 are but slightly developed. The variety differs from the type in colour, shape, and habitat, but not in the position of the different organs. My Essex specimens of var. *gracilis* are from the side of a ditch, Becton Road, Plaistow Marsh, collected by Mr. W. Allen. The type came from an old tree stump in Epping Forest.

3. **The Celtic Worm** (*Allolobophora celtica*, Rosa), like the preceding, has both a terrestrial and a dendrobænic form. They differ so widely in appearance that I was for a good while unable to decide whether or not to regard them as distinct species. The form described by Rosa under this name is found in the soil. The tree-dweller (var. *rosea*, Friend) ought to be the type as representing the genus *Dendrobæna*. The prostomium or lip does not cut backwards into the first ring, as is the case with the foregoing. The setæ are in eight rows. The ground form is of a violaceous colour on the back, whereas var. *rosea* is a warm rosy brown. The male pores in Rosa's species are on papillæ which affect the two adjoining segments by

their size, whereas in the dendrobænic form they are exactly like those of the other tree-frequenters. This is the sole distinguishing mark between the two forms.

The girdle occupies six segments (31-36), two of which carry papillæ (32: 34). The first dorsal pore is between segments 5 and 6, and modified setæ occur on 31, 32, 35, while tumidities are found on the 9th (or 10th), 25th, and 26th segments. There are about 100 segments in the average worm. So far I have not seen the terrestrial form from Essex; but among some *Dendrobænes* taken

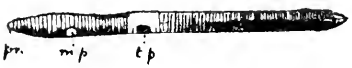

Fig 1.

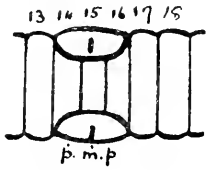

Fig. 3.

Fig. 2.

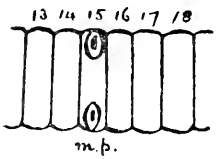

Fig. 4.

Explanation of Figures.

Fig. 1.—*A. celtica*, Rosa, as found in England; nat. size.
Fig. 2.—Var. *rosea*, Friend. Magnified 2 diameters.
m.p. Male pore on segment 15.
pr. Prostomium or lip.
t.p. Tubercula pubertatis on girdle segments.
Fig. 3.—*A. celtica*, Rosa. Segments 13-18.
Fig. 4.—Var. *rosea*, Friend. Segments 13-18.
m.p. Male pores on segment 15.
p. papillæ or cushions extending over segments 14-16; enlarged.
All the figures are diagrammatic.

from old trees in Epping Forest I have found one or two specimens of var. *rosea*. Spermatophores are found on the terrestrial form.

4. The Gilt-tail (*Allolobophora subrubicunda*, Eisen), is the most ubiquitous and protean species in the group, and it can adapt itself in a wonderful way to its environment. I find no fewer than three well-marked forms or varieties, in addition to the typical tree-haunting species. These merit a note. The type is found inside old decaying timber, or under the bark of rotting trees. It resembles the other three species in its brown colour, wide setæ, pallid lip, and other particulars. The girdle usually begins on the 25th, and ends

on the 31st segment, and the clitellar papillæ (*tubercula pubertatis*) are on segments 28, 29, 30. The under side of segment 16 is tumid, so that it may easily be mistaken for the 15th, which carries the male pores. Other segments are also frequently marked by similar tumidities.

Forma *arborea*, Rosa, seems scarcely a distinct species, although it has been so ranked. It has papillæ on two girdle segments (29, 30), and is smaller than the type. In every other respect they seem to be identical. I have specimens of this form from Epping Forest.

Forma *constricta*, Rosa, has also been reckoned a distinct species; but I have examined a series collected in Sussex by the side of a set kindly presented to me by Dr. Rosa himself, and I fail to see any real difference, except in the constriction of the segments.

Var. *pallescens*, Friend, is the true "Gilt-tail" of the angler, and sometimes attains a considerable size. It is very much lighter than any of the other species and varieties, and exceedingly delicate-looking. It emits a large quantity of yellow fluid when irritated, and is a most useful worm for bait. I have received a very fine set from Mr. Allen, collected under old rags where manure is deposited at West Ham. I have also had either the type or one of the forms from Woolwich, Chingford (*arborea*), through the kindness of Mr. W. Allen; and from Bushwood and other parts of Epping Forest, through Mr. George Day, F.R.M.S.

I append a tabular view, marking with an asterisk those which are at present on record for Essex. I am sorry that I cannot congratulate my readers on their enthusiasm, or the efforts they put forth to make the worm-fauna of this county better known. If they had a tithe of the zeal of my Irish correspondents—who have added several new species to our lists, we should be able, probably, to fill up nearly all the blanks which still remain in our catalogue.

I have received a very interesting aquatic worm (*Dichæta curvisetosa*, Friend) from Chelmsford, which I hope shortly to figure and describe in THE ESSEX NATURALIST. Meanwhile, I once more appeal for living specimens, sent in tin boxes filled with moss, and addressed 4, The Grove, Idle, Bradford.

[The table of the Dendrobæna group of *Allolobophora* is given on the next page.]

TABULAR VIEW OF THE DENDROBÆNA GROUP OF ALLOLOBOPHORA.

§ 3. Dendrobæna.	Clitellar segments.	Tubercula pubertatis.	Total segments.	Length.	Prostomium.	Setæ.	Colour, shape, etc.
1. *D. lorcki*, Eisen, 1873.	29-33	31 : 32 : 33	90-100	1-1½ inches	Cuts ⅔rds peristomium.	Eight rows	Dark brown ; octangular.
2. **L. eiseni*, Lev., 1883. *Var. *gracilis*, Fr.	24-31	0	90-110	1½ inches	Entirely bisects peristomium.	4 pairs close	Like last. The variety is exactly like a young Lumbricus.
3. *A. celtica*, Rosa, 1886. *Var. *rosea*, Fr.	31-36	33-34	90-110	1½ inches	Cuts peristomium slightly or not at all.	4 pairs wide	The variety resembles No. 1, but the terrestrial form has different shape and colour.
4. **A. subrubicunda*, Eisen, 1873. **F. arborea*, Rosa. *F. constricta*, Rosa. Var. *pallescens*, Fr.	26-31	28 : 29 : 30 29 : 30 0 28 : 29 : 30	80-130	1-3 inches	Partially cuts the peristomium	4 pairs wide	In colour and shape like No. 1, except var. *pallescens* which is large, pale, fatter on the ventral surface, and frequents rich soil.

SOME MINOR PROBLEMS CONCERNED IN THE LOCAL DISTRIBUTION OF ANIMALS AND PLANTS IN THE NEIGHBOURHOOD OF FELSTEAD, ESSEX.

By J. FRENCH.

THE distribution of animal forms in a great river which flows through several degrees of latitude occurs under circumstances of which we can more or less give an account. Climatal changes there affect the distribution, both directly and indirectly. In small streams, such as our Essex rivers, this disturbing element is eliminated, yet inequalities of distribution still prevail, and it is clear, therefore, that some other explanation must be sought.

Our first case of this inequality of distribution will be that of the Fresh-water Molluscs. In the account of the Chelmer Expedition (ESSEX NATURALIST, vol. v., p. 253), among the list of aquatic mollusca observed, is *Planorbis corneus*. This shell is not now to be found above Hartford End, either recent or fossil. We may, perhaps, therefore regard it as a new introduction. In the same list occurs *Neretina fluviatilis*. If this shell now lives above Hartford End it is exceedingly rare. I believe it to be extinct. As a fossil, in the Alluvium it is common, and we may therefore suppose it to have retreated down stream. *Ancylus lacustris* I have never taken in the Chelmer above Hartford End, and I believe it to be rare, or quite extinct, there, although it is frequent enough in the ponds about Felstead. These instances are sufficient to show that there is a difference in the distribution of the molluscs in the Chelmer as the estuary of the river is approached.

Some other cases of local distribution appear to have a bearing on this question. The following table, compiled for the neighbourhood of Felstead, will illustrate cases :—

NAME.	In Ponds.	In the River Chelmer.
Bythinia tentaculata	Rare	Common
Valvata cristata	Frequent	Not known
Planorbis carinatus	Frequent	Rare
Limnæa stagnalis	Common	Not known
Ancylus lacustris	Frequent	(?)
Ancylus fluviatilis	(?)	Common
Planorbis nautileus	Frequent	(?)
P. nitidus	Frequent	Not known

In considering this list, I believe that we are quite clear of recent introductions, as some of these species are found fossil, and others are scattered in isolated directions, often far apart, and precluding by their remoteness the idea of modern introduction. This distribution agrees with the localities given in conchological works, and we thus find that the anomaly is pretty general the country throughout. Why should some forms, therefore, thus prefer the river to the pond, and *vice versa?* That it is a matter of preference appears from the two or three cases already quoted of distribution in the Chelmer, for we may say with regard to them that they have the passage open to other districts, where the conditions of sustenance and increase appear to be the same, although the water is not so still and deep, nor perhaps so warm. In the case of ponds there is the same element of still water, etc., but the way is not so open to allow of migrations. Considering the various agencies that are still at work in the dispersal of Fresh-water Molluscs, it is not safe to conjecture how the present state of distribution has been brought about; yet it is instructive to look back at the known history of the county as furnished by the river Alluvium, and to see in that past history how the work of distribution was immensely facilitated for these forms. With the river consisting of a series of standing pools, it would seem that all the pond molluscs might there have been represented, whilst a way remained open for their easy distribution.

We will now turn to the Fish fauna of the same localities. Observations of over thirty years bear witness to the great changes in the species of this class in the Chelmer at Felstead. Forty years ago the river was full of Pike; now there are none. Trout then were extremely rare; now they are common. Thirty years ago Roach were plentiful, and were much in excess of Dace; now the reverse is the case. At that time the river literally swarmed with Minnows; now they have diminished by at least nine-tenths. Twenty to twenty-five years ago Perch were very common; now they are rare. The causes that are said to have operated may be thus stated. The Pike of forty years ago were artificially introduced. These throve for some time amazingly, and were thought to have destroyed the Trout previously existing. After a time the Pike died out, and the Roach, Minnows, and other small fish increased to an extent unknown before. The Perch are said to have been artificially introduced, and they flourished well for a time, but in a few years died out. The paucity of small fish now is said to be due to the increase

of the Trout. Allowing this to be a reasonable solution of sudden changes, it throws no light on such questions as the apparently permanent distribution of different species in the different parts of the stream. Thus, below the Walthams, Perch and Pike have been observed for, I believe, all the years of the present century, and many persons can speak to a number of species permanently established there which have no representation further up stream.

Pond fish show great tenacity of life or adaptability to circumstances. This becomes very obvious in the event of a dry summer. Ponds are then sometimes reduced to mud, and all traces of fish disappear; yet, after the lapse of one or two seasons, without restocking, the same kind of fish will be found in the pond as before the drought. I have observed this to occur more than once. This adaptability to circumstances shows itself in another way. In certain ponds in this neighbourhood fish do not attain their average size, but (probably from insufficient food) spend their lives and reproduce their species as dwarfs. In the case of Tench this is notorious. If we allow the weight of that fish to be two pounds when full-grown, we shall have to divide that weight by eight to give the maximum weight of the largest fish in some of the Tench ponds here. It certainly is not common in other organisms to find generation after generation reproduced under such untoward circumstances. Experiments with these Tench have shown that they are capable of considerable increase in size. A number of fish were transferred to a pond in which much phosphatic matter had accumulated. These fish grew very fast, and attained the normal size quickly. The experiment has been again and again repeated, with similar results. This, I think, goes to prove that the distribution of fish in the river is independent of lack or abundance of food.

Although there are agencies independent of artificial stocking, by which fresh-water fish may be transferred from one pond to another, I do not think that in this locality these extraordinary agencies, as they may be called, are often brought into play. My reason for making this statement will soon appear. The table on next page represents the fish fauna of some ponds included within a circle, with a radius of a mile, having its centre about a mile south of Felstead Church.

This is the present distribution of fish in those ponds. It was substantially the distribution of thirty-five years ago, as I can personally testify, and I have evidence to the same effect, the result of a

PONDS. (× signifies that the fish is present.)	Stickleback.	Tench.	Roach.	Rudd.	Carp.	Eels.	Pike.
Pond No. I.	×	×	×	×	×	×	
,, ,, II.	×	×					
,, ,, III.	×	×	×	×		?	
,, ,, IV.	×	×	×	×		×	
,, ,, V.						×	
,, ,, VI.	?	×				?	
,, ,, VII.		×					
,, ,, VIII.	×	×				×	×
,, ,, IX.	×	×					
,, ,, X.					×		
,, ,, XI.	×						

personal knowledge, extending back sixty years. The only variable quantities appear to be the eel and stickleback, and these are easily accounted for. The eel will sometimes leave the water and travel from one pond to another, even across a gravel road. The stickleback, although not so shown in the table, is the most ubiquitous of all our pond fish ; but it must be remembered that it has often a water communication denied to larger species. It will live in very shallow ditches, which here, for the last half century at least, have been effective barriers against other fish.

In this brief notice of the aquatic molluscs and the fish, the element of temperature or still water seems to play an important part in the distribution, for, however well the fish may be capable of

adapting themselves to some untoward circumstances which would mean death to other organisms, the very general restriction of certain forms to ponds, and others to swift streams, leaves no other solution than that the stillness or temperature of the water is the important factor. Given, therefore, the river basin and the low-lying lands, another period of lakes and morasses, and perhaps some increase of woodland to assist in the preservation of moisture, there would seem to be nothing to hinder the universal distribution of all the forms now peculiar to their several localities.

Taking now the distribution of the land mollusca, we are assisted by a historical data which appertain sparingly to the water molluscs, and not at all to the fish. These are the fossil remains of some shell-marls. In vol. iii., page 14, of THE ESSEX NATURALIST, I gave a table of thirteen species from these deposits. Seven of these species are now locally extinct, four are very rare and probably locally extinct, and two, frequent or common in the past, are now rare. The substantial truth of that list I have since verified more particularly, and although the number of species in it may be increased,[1] it will not need material alteration. It is very difficult to account for this change among the land molluscs, the more so that two species, now very rare, seem to have been common, say in Roman times or somewhat earlier. These are *Helix arbustorum* and *Cyclostoma elegans*, both having been found in shell-marl connected with an artificial lake (see E. N., vol. vi., page 35). Of the former Mr. Christy wrote me some time ago that in his neighbourhood (Chignal St. James) he was astonished at the former abundance of these shells, and their present rarity, which is also my experience. Yet the conditions, except that the land is better drained, so far as we know, have not altered. Of the latter species (*C. elegans*) I have given some account (E. N., vol. iv., page 92). It is true that in some places the Boulder-clay has wasted, and if it is true that the animal requires a limestone habitat, this fact may, in some measure, account for its disappearance. It would be interesting to know whether *Cyclostoma* occurs as a fossil in Essex south of the line of Boulder-clay. A peculiarity of its distribution is that, although common on the Chalk hills of Charlton, on the opposite bank of the Thames, it does not now live in South Essex.

For the disappearance of the thirteen forms mentioned in the

1 Mr. Christy calls attention to *Helix aspersa* as not having been named, but it appears to be unrepresented in the older marls.

list which have passed, or are passing away, we can assign absolutely no reason, nor does it seem that we are on the road to a solution; their food even, for the most part, is not known.

Some forms, on the other hand, now living in fair numbers, but not represented in the marl, seem to claim to be regarded as new introductions. It is true that negative evidence is always suspicious, but it is also true that the marls have been well examined. There is no reason that we know for the preservation of one shell more than another; therefore, if they had lived on the spot, we might reasonably suppose that their remains would have been found. The largest of these apparently new introductions is *Helix virgata*. In my own parish (Felstead) it is rare. In an adjoining parish (Stebbing) it is in one part very common, occurring literally by thousands. It is quoted by Mr. Crouch (E. N., vol. iv., page 210) as occurring near Barking Creek. It is also included in Dr. Laver's list. (Trans. E. F. C., vol. ii., p. 95). Its absence from the marls is very striking, as it is a conspicuous shell, and gives us every reason for believing it to be a new arrival.

I may here add that I am continually expecting the arrival of four other large forms which, on the same reasoning, have never before visited this neighbourhood. They are the two *Paludinas*, *Unio tumidus*, and *Planorbis corneus*. The first is common in South Essex and surrounding counties, the second in many parts of Essex and surroundings, and the last, long a resident in South Essex, occurring fossil in the Thames alluvium, has now reached Chelmsford, as we have seen.

Our local list of reptiles furnishes but little from our present point of view. The case of the Common Ringed Snake and the Adder demands a passing notice. From what information I can obtain, which is confessedly fragmentary, they both appear to be dying out in a tract of land say ten miles wide, beginning at Danbury Common and extending northwards as far as the river Stour. Thus, in the Sampfords and Bardfields, both species appear to be extinct. At Finchingfield and Wethersfield and Stebbing, snakes are very rare and adders are unknown. In the neighbourhood of Felstead both have markedly diminished within the last forty years, whilst at Danbury Common both species still survive in numbers, although the snakes are much in excess of the adders. I have taken much trouble to obtain information as to my own neighbourhood, and believe I am correct in saying that the adder is now

extinct here. The last certain case of one being seen dates back ten years, and my informant in this case, an old poacher, but a good observer, says that previous to that he had noticed that they were very rare, although in his younger days he had killed a great many. In many years' peregrination of lonely fields I have never to my knowledge seen one. Snakes now can hardly be marked as frequent, although they were formerly common. Occasionally they will gain something like a footing in a secluded hedgerow, but in a short time they disappear again. I believe them to be great travellers in the spring, as they may be then sometimes met with by the roadside and in frequented footpaths; but as the summer advances they must be sought for in the most retired situations, particularly by the river side. I can give no sufficient reason for their diminution, but I have been reminded that their distribution may be a matter of very delicate poise—a slight change of drainage, for instance, depriving them of food. They are always hunted and killed where possible, but that has probably been a normal condition of their existence, and it must be remarked that the hunting population has not increased. There has been a slight reduction in the population in the last two decades. As regards the adders, the enclosure of common lands may have played an important part in their extinction. Fairwood Common, near Leigh, was long a stronghold of the adder, but its enclosure probably sealed their doom. They are very rare, if at all to be found there now.

In treating of the distribution of plants many difficulties arise. They are subject to so many disturbing elements. The field, too, is so exceedingly wide that only a small portion can possibly be treated of. Nevertheless, observations confined to a limited area will supply interesting cases.

We have here to do with an element that has not been obvious in the departments treated of, and that is the "Struggle for Life." Undoubtedly this enters as a potent factor, although not the omnipotent one. Like the Fish, Molluscs, and Reptiles, a margin will remain in the problem of distribution which is completely beyond our ken.

The local history of almost any vigorous plant will furnish illustration. We will take the family of Crowfoots, which are well represented in Essex, and are perfectly adapted to its loams and clays. Strong and vigorous, they might reasonably be supposed to hold their own were the struggle for life all that is concerned. Have

they really done so? Judging from the records in an old book, I believe that in the earlier years of this century the Greater and Less Spearwort (*Ranunculus lingua* and *R. Flammula*) were much more common in Essex than at present. The first is now extinct in my neighbourhood, and the second is confined to two or three small ponds about two or three miles distant from each other; and from the situation of these ponds it can only be regarded as a lingering form.

But the common Buttercups which now adorn the meadows show a disposition to vary in numbers, which may be placed upon record, but cannot be accounted for. As showing a tendency to weakness or diminution, I should adduce among these familiar forms that of *R. acris*. It has to give place to *R. bulbosus* and to *R. repens*. Whether this be due to inherent weakness or to unsuitability of soil, I do not know. The plant has a variable habit which may only be another expression for a frequent want of robustness. Anyway, in the struggle for life, it is ousted by the two forms mentioned; and, besides this, it seems to be under difficulties in regard to its seeding. It now occurs most abundantly and attains its greatest vigour in alluvial meadows. A field was here laid down for grass some fourteen years ago, and the first two or three years neither buttercup nor daisy appeared. Then *R. bulbosus* appeared in solitary patches, which gradually spread, and now the meadow compares well with an old one in regard to its buttercups and daisies; but among these *R. acris* is as yet rare, although it is well represented in the adjoining meadows, and apparently had an equal chance of establishing itself. It is quite in accordance with what we know of forms living under unsuitable conditions that the reproductive organs should early be affected; but, in this case, we are uncertain whether the conditions *are* unsuitable.

Ranunculus repens, the Creeping Crowfoot, on the other hand, must be regarded as an aggressive species. Always holding its own, and continually invading a neighbour's territory, it would, were it not for artificial checks, soon overrun a district and reach its culminating point.

We will now take a less known family, that of the Orchids. Their distribution will be a standing problem for a long time, and its solution has been complicated by recent researches on the fertilization of the plants. We have about eleven species of Orchids at Felstead. Of these, some four or five may be regarded as common or frequent,

but the rest are sporadic. Some two or three are remnants of an ancient woodland flora, and are consequently confined to narrow limits. Among the sporadic species is the Bee Orchis. As I have never found this except on very chalky Boulder-clay, I infer that its distribution in Essex is confined to the limits of that deposit or to the districts in which the chalk outcrops. This appears to be a case in which geological causes have solely controlled the distribution of a plant. It would be interesting to know if the Bee Orchis occurs away from either of these deposits in Essex. According to the localities given in Gibson's "Flora of Essex," it does not. The Fly Orchis appears to stand on the same footing.

The occurrence of sporadic forms does not seem to be in any way connected with the advent or departure, or rather the local increase or decay, of species. It rather seems to be connected with those conditions for the preservation of the germs of plants which are often found in the earth, but which are said to be hard to imitate artificially. The subject has been so often discussed since the days of Gilbert White, that some apology is almost necessary for its introduction. The tendency is, I believe, to discredit the statements of many observers. Of one remarkable case I was an eye-witness. From thirty-five to forty years ago the Bee Orchis grew by a wood-side here in quantities. There is good evidence of this. For about twenty years afterwards no plant was known to have occurred there, nor within one or two miles of the spot, although diligently sought for during most of those years. A few square yards of turf were then removed, and the following year five plants of the Bee Orchis came up and flowered at that place. It would seem that this case is very similar to some quoted by Gilbert White.

Something which may be likened to the rotation of crops also appears to be bound up in this question of the preservation of germs. A pond containing a little water produced in abundance *Potamogeton* for two or three years. This died out, and the naked Horse-tail (*Equisetum*) reigned in its place and grew very vigorously, although no other plants of the species occurred for a mile at least. After a few years the *Equisetum* was succeeded by Sedges, which are now failing. It seems almost certain that the germs were already there, and only awaited their opportunity for sprouting.

The dispersal of the seeds of plants is due to various agencies—wind, water, animals, etc., and is therefore an uncertain and incalculable element. But although these agencies may be ever at hand,

and their possibilities great, it does not follow that they are always successful. A few illustrations may be quoted. In the Chelmer at Felstead, at a certain place there grow Yellow Water-lilies and a species of large Rush. These have retained their situation for more than thirty years : but they have made no progress either up or down stream during that time, thus showing that, although they have flowing water agency continually at hand, they certainly do not always use it. In careful and long-continued examination of the floating *debris* of the river at flood time, I have found but very few seeds of any kind. In the river silt, which is periodically removed from the bed of the river here, seeds are also rare. Those occurring most frequently (indeed I do not remember to have observed others) are Bistort, Comfry, and Teasel, inhabitants of the river's bank.

In THE ESSEX NATURALIST (vol. vi., page 76), mention is made of the Water Soldier (*Stratiotes*) as being an inhabitant of a certain pond at Saling during the last fifty years. None of the various agencies for seed dispersal appear to have been brought into play in that case for a very long time. Near Leighs Priory, there grows a variety of Oak with curiously gnarled branches, some specimens of which must be from two to three hundred years old. I do not remember to have seen any trees with exactly their peculiarity further than about a mile from that centre, and should say that all now living are connected by descent. If that be the case, we must put the acorn down as sometimes a slow traveller. Some field crops, (clovers, etc.) of fifty years' standing, have not yet succeeded in establishing themselves by the wayside. Many more instances might be quoted of this partial or slow distribution, which is perhaps connected especially with those plants the seeds of which have no special adaptation for diffusion. In those plants having a feathery pappus, and eminently adapted for wind-agency, the opposite state obtains, they being widely and equally diffused. This is well illustrated by the growth of thistles this year, which are to be found in meadows and fields alike, a vast multitude.

This incalculable element of diffusion is still further complicated by curious anomalies. Some plants do not even produce ripe seeds, but depend upon certain other offshoots for the perpetuation of their species. This obviously excludes some of the agencies for their diffusion, and would, one would think, tend to their extinction. The Horse-radish (*Cochlearia armoracia*) belongs to this class. A cottage garden here was ploughed up many years ago, in which was

a large bed of Horse-radish. For some years subsequently the leaves were hoed off once in the spring and reaped in the autumn, and in the winter the crowns *occasionally* fell a victim to the ploughshare. This adverse treatment was not excessive, yet the plants only lived about twenty years.

The Common Elm (*Ulmus campestris*), (seedless in England) on the other hand, makes its way well in North Essex. It is the commonest tree in the hedges, and may be said to flourish in the Blackwater valley above Braintree, and seems to delight in striking its roots into the Westleton gravel and sands which there predominate. There are some very fine trees at Saling Grove, and on the village green there, there is a magnificent specimen which girths twenty-one feet at five feet from the ground. It perhaps exceeds a hundred feet in height, and at the top has produced a sport which may be called a tree in miniature.

The nidus upon which a seed falls directly affects the distribution of plants, and in some cases ultimately gives a character to the landscape. Thus we often speak of the prevalence of an arenaceous or calcareous flora, which is equivalent to stating the final outcome of distribution for that locality. In Essex these results are not so marked; the variety of forms bearing some proportion to the variety of soils. We are not quite without evidence as to the difficulties plants have met with in colonizing our county. In my neighbourhood there are a few lanes in which the Chalky Boulder Clay is exposed with scarcely any covering of surface soil, and at some places none at all. The flora of those lanes is, as regards individuals, very meagre, and has been such for the last half century. If therefore plants can make no headway with their present wealth of numbers and immediate contiguity, what a sad disadvantage they must have been at in earlier Post-Glacial times. It may even be conjectured that the colonisation of East Anglia fell behind some other counties.

I would here call attention to the general appearance of wild vegetation in North Norfolk as compared with that of Essex and South Sussex—say the neighbourhood of Hastings, or within twenty miles of it. Hedgerows might be taken from Essex and transferred to Sussex, and *vice versa*, without the possibility of detection; yet this does not hold for North Norfolk. Many species are conspicuously different there, and the proportion of those remaining are vastly altered; yet the soil agrees with that of Essex, whilst that

of South Sussex (sandstone principally) is quite different. I do not know whether it has ever been suggested that North Norfolk may represent an older state of vegetation.

Another disturbing element in distribution is the agency of man. The farmer has enclosed the commons and cut down the woodland; he has taken away our Bracken and other sand-loving plants, and has drained our wet meadows and so exterminated the Adder's-tongue and Sundew and other bog-loving plants. On the other hand, his introductions have not been commensurate. Where it is possible to compare modern lists with ancient ones, the Essex flora cannot be said to have gained. Some charges are occasionally made against collectors and herbalists, but these have but little weight in a neighbourhood like Felstead. Some species of pretty flowers have gradually been transferred to cottage gardens; but it is questionable whether they would have survived in the circumscribed areas now allowed to wild flowers.

This circumscribed area introduces more prominently the factor known as the struggle for life, and the final outcome of that struggle must tend to the local extinction of many forms. It will be necessary to give some details. We have at Felstead the meadows, hedgerows, and small woods allowed to wild plants. The meadows now, as we have before said, are so well drained as to be almost unable to support any bog forms, although a few linger. The hedgerows and woods may be taken together, as from time to time the rank vegetation of either is cleared away.

First in the early spring comes the *Arum* ("Lords and Ladies"), and as it has the bank pretty much to itself up to flowering time it is very common. Later comes the Ground Ivy (*Glechoma*) and several other forms sufficient to set up a competition for space, and none of these, although familiar enough, can be regarded as so evenly distributed as the *Arum*. As the season advances the competition becomes very keen, and results in the establishment of a few forms proper to the ditch, hedge, or bank as the case may be. The ditches here generally produce in abundance Figwort and *Epilobium*, or Reed and Sedge. The hedges (of Whitethorn) become overrun with Briar, Bramble, Honeysuckle, Vetch, or *Clematis*. The banks chiefly produce Campion and *Stellaria*, and later on various plants in diminished numbers as they may get the chance to pierce the otherwise dense foliage. The law is that in a hedge long neglected the vegetation is divided among a few forms. On the other hand, if

the rank vegetation is cleared away year by year, the hedgerow will be prolific of species and individuals. Any botanical collector can verify this statement. In a new clearing certain species will sometimes become very prominent and give one the idea of great vigour (Jack-by the-Hedge, *Sisymbrium alliaria*, is a good example). Yet on reflection it must be seen that such plants are only tenants at will, and if they had no assistance from the hand of man (in removing obstructions) they must inevitably in a few generations become locally extinct. Thus we see that in our restricted areas the struggle for life by itself ultimately results in the local extinction of many forms and in the preservation of a few.

These notices of plants might be expanded to almost any extent. I have quoted a well-known family, the Crowfoots, and, in opposition, a family less well-known, the Orchids. We are in a better position sometimes to deal historically with the less well-known. Notices of their occurrence are in most lists definitely stated, whereas the common forms are disposed of with a passing notice. This is unfortunate, for the mere collation of present with past lists would often reveal incipient changes of distribution which could not be other than instructive. It becomes therefore a question as to whether a chronicle of abundant forms and the conditions under which they maintain that abundancy is not a desideratum.

To recapitulate briefly, we have found that the various species of Freshwater and Land Mollusca are distributed unevenly in localities separated by only a few miles and where direct communication is often possible. That in time not long past their distribution was greatly different from that at present obtaining.

As regards the Fish, that in the river where communication is still open certain species affect different parts of that river and that the food supply appears to take no part in this separation. That, withal, fish show much adaptability to circumstances, as seen in cases of pond fish. These pond fish may be from their mode of occurrence descendants of ancestors many generations removed.

That among Reptiles Snakes are diminishing in a certain tract in Essex from causes which cannot be certainly stated, and that the extinction of Adders in the same tract may be due to the enclosure and cultivation of the Commons.

As regards the Plants, that they seem to show for any particular locality a period of culmination and decay. That sporadic forms seem to be connected with the preservation of germs which takes place

in the earth. That the dissemination of the seeds of plants being entrusted to wind, water, animal, or other agencies, introduces an element which it is not possible to calculate. That, although the possibilities of these agencies are very great, they may not be in continual operation, as there is evidence to show that in some cases plants spread very slowly. That some apparent anomalies in distribution may arise from those plants which are incapable of propagating themselves by seed.

That the nidus on which a seed falls also affects distribution, and that certain peculiar floras are due to this cause, although Essex may not be looked upon as a typical county in that respect. That the difficulties of plant colonization in Essex as shown by present difficulties with raw boulder clay must in earlier times have been very great.

Then has been noted the similarity and dissimilarity of our Essex wild vegetation compared with certain tracts north and south of the county.

Lastly, that the hand of man has been instrumental in extinguishing certain forms in this locality, and has perhaps been instrumental in saving a few others, but that on the whole there is a diminution of native forms. That man has also circumscribed the area and so brought into more prominent play the factor known as the struggle for life. That the ultimate outcome of this struggle for life, although sometimes checked by the farmer in clearing away rank vegetation, must deprive us of many fragile forms which still survive as rare plants. That our historical knowledge of common species is often very imperfect, and that observations of them should be put upon record in order to detect incipient changes in distribution.

Recorded observations are infinitesimal contributions to the sum of human knowledge, yet this sum of knowledge goes but a little way in unravelling problems in which life is concerned. Take these problems of distribution for instance. They have their root in geological time, where the evidence is for the most part swept away. Moreover, if we could question every species as to its history, we could not question every individual as to its environment, both of which are indispensable considerations in any acceptable solution of these problems.

MIGRATION OF *PIERIS BRASSICÆ* OBSERVED AT HARWICH.

By F. KERRY.

THERE has been, this summer, an immense immigration of *Pieris brassicæ* from the Continent to this portion of the east coast. On Thursday, the 11th of August, and for several days after, large numbers of this butterfly were to be seen coming over the sea, and many were drowned in the water. The lobster catchers, who fish about five or six miles from the shore, told me you could not look anywhere over the sea without seeing white butterflies making for the shore, all coming from the S.E. and flying N.W. At Harwich thousands of the *Pieris* could be observed in the gardens busily depositing their eggs, with dire consequences to the vegetables. The resulting *larvæ* must have been present in millions. Nearly all the broccoli, cabbage, savoys, and brussel sprouts were eaten up, nothing remaining of the plants but the main ribs.

No one in this neighbourhood remembers a similar visitation before. Ichneumons (probably *Apanteles glomeratus*, L.) have destroyed the greater part of the *larvæ* in some gardens. At the "Phœnix Hotel," Dovercourt, quite four-fifths of the caterpillars were so destroyed; while at the Trinity Houses, about two hundred yards off, the *pupæ* are in considerable excess of the yellow patches of Ichneumon cocoons; I took 250 *pupæ* there in about ten minutes, thus demonstrating the prodigious numbers of the insects.

[We have pleasure in giving prominence to Mr. Kerry's note, inasmuch as such observations have an important bearing upon all theories of the distribution and erratic appearance of various species of insects in Britain. There can be little doubt that many of our insects, such as the *Colias*, *Parameus cardui*, *Plusia gamma*, and others which appear occasionally in great numbers, and may then disappear or become very rare for years together, are migratory; and that the specimens which occasionally delight our eyes in numbers are either immigrants or the immediate offspring of immigrants from the Continent. More than twenty years ago the immense swarms of "Lady-bird" beetles (*Cocinella*) which made their appearance on parts of the English coast attracted much popular attention, and led to alarming outbursts of "newspaper science." Several direct observations of immigration of insects into England are on record. A very remarkable instance was given in THE ESSEX NATURALIST for 1888 (vol. ii., p. 158), the insect being a Dragon-fly (*Libellula quadrimaculata*) observed off the Essex coast near Shoeburyness.—ED.]

THE OLD TRACK FROM LONDON TO EPPING.

By W. C. WALLER, M.A., F.S.A.

THE old main road from London to Epping, as readers of Mr. Winstone's book ("Extracts from the Minutes of the Epping and Ongar Highway Trusts," 1891) are aware, ran through Chigwell, Abridge, and Theydon Gernon. But there was also another route, available, at any rate, for travellers on horseback, as we learn from Pepys' Diary. On February 24th, 1659-60, Pepys rode, he says, from London to Foulmer, within six miles of Cambridge, by way of Ware and Puckridge. On the 27th he returned, with a companion, by way of Saffron Walden; the road thence to Epping, where they stayed the night, being "pretty good, but the weather rainy." On the 28th, he continues, "Up in the morning, then to London through the forest, where we found the way good, but only in one path, which we kept as if we had rode through a kennel all the way." The precise force of the word "kennel," as used here, is not quite easy to determine. If the path had been turned into a sort of channel, or water-course, by the rain already referred to on the previous day, Pepys would hardly have called the way good, as he does in his description of it: although it is probable that what he thought a good road, we should regard as a shockingly bad one. Possibly he meant merely a straight, narrow track.

Which way, then, did Mr. Pepys and his friend come on their journey to London? The answer seems to be ready to our hands in an old map, drawn somewhere between 1604 and 1626, which is preserved among the Hatfield House MSS. (Cecil Papers: Ba., $^{5}/_{33}$), and entitled "Part of New Lodge half walke . . . " (New Lodge, it may be noted in passing, seems identical with Sotheby's, or, as it is now called, Fairmead Lodge, near High Beach.) The map in question shows a nearly straight track running as from Epping Church direct to Fairmead. It is marked "London way from Eppinge," and passes east of "Copthall Parke," "Woodridden Groundes," and what is marked as "Wilson's Lodge," which apparently stood on the site of the one already referred to as Sotheby's. North-east of this lodge, across and beyond Faymeade, a house called "Standing" is depicted. The direction of the track is from north to south, with a trend westwards, if we follow the orientation of the map itself.

After a comparison with later Surveys, one inclines to come to the conclusion that Mr. Pepys, on leaving Epping, followed the line of

the present road until he came almost to the site of the Wake Arms. At that point, as Mr. Winston has shown us, the older way bore off to the right. From there the horsemen made their way past what is now known as "The King's Oak" (with its highly forestal tarred fence!) down to Wilson's lodge: thence, across Fairmead Bottom to the Warren; and so, over the high ground, to the top of Buckhurst Hill. This latter part of the journey we are enabled to fill in, from indications afforded by a Survey of the Manor of Loughton, made in 1730, and now in the possession of the Rev. J. Whitaker Maitland. This interesting document depicts what is called "The Stulpway to Waltham" as starting from "The Great Road to Epping" at a point nearly opposite to the Roebuck Inn (compare Chapman and André's Survey of 1772), and running straight up to Loughton Warren, and past the south-west corner of it. Perhaps some contributor to THE ESSEX NATURALIST can tell us exactly what a "stulpway" was?

NOTES—ORIGINAL AND SELECTED.

Another Porbeagle Shark (*Lamna cornubica*) on the Essex Coast.—On December 8th, Mr. Henry Gentry, of St. Osyth, and others, captured a shark of this species in the estuary of the Colne, just opposite the second Martello Tower. It was a male, 7 ft. 10 inches long, and gave some trouble in the landing. This is the second specimen I have seen this winter from the Essex coast. (See *ante*, p. 154.) In the "Daily Graphic" for December 10th appeared a description and illustration of this fish and its captor. It was there described as a "Blue Shark," but incorrectly. It was unquestionably a Porbeagle; the distinctive characters of these two species makes the identification a very simple matter.—HENRY LAVER, F.L.S., Colchester, December 19th, 1892.

Black Cap (*Sylvia atricapilla*) in November.—On November 16th, Mr. Pettitt showed me a specimen of the Black Cap which he had that morning shot near Lexden. It was probably an immature male, and he informs me there are many others in the same district, and also that he sees them every year during November. It is not probably generally known that this species lingers with us so late; at all events I was not aware of the fact.—HENRY LAVER, F.L.S., Colchester.

Iceland Gull at Harwich.—On December 3rd I was fortunate enough to shoot a specimen of the Iceland Gull (*Larus leucopterus*) in the harbour here. I think it has attained its second year's plumage, as it has a few pearl-grey feathers on its back. I think that this is the second specimen recorded for Essex, the other having been shot on the River Colne on January 1st, 1887; this bird was also in my possession (see "Birds of Essex," p. 262).—F. KERRY, Harwich.

Agrotis saucia at Woodford.—As we hear of *Agrotis saucia* having turned up in many fresh or unusual places this season, it may interest the craft to know

that I have, this autumn, taken four specimens in my garden at Woodford. All in my collection previously were taken at Folkestone.—CHAS. OLDHAM, Woodford, November 11th, 1892.

Agrotis saucia in Mersea.—One of the entomological events of the past season has been the abundance of this species. During September and the early part of October, I was at Mersea, and "sugared" every favourable night, my ground being the small garden attached to our cottage, containing about a dozen suitable trees. *Agrotis saucia* first put in an appearance on September 1st, and a few continued to come to the sweets nearly every night until the 22nd, when they suddenly increased in numbers, and continued to do so night by night. When I left the island on October 5th, the moths were still common and in fine condition. Several specimens were also taken at light and at ivy blossom.—B. G. COLE, Buckhurst Hill, December, 1892.

Cymatophora ocularis and "Sugaring" in Epping Forest.—On July 1st I had the good fortune to capture, in Epping Forest, a fine specimen of *Cymatophora ocularis*; and on the 5th, an example of *Leucania turca*. As I had visited the Forest every season for the last fifteen years and not seen either species before, I thought the fact worth recording. During the first three weeks of July I found sugar attractive to moths in Epping Forest. The species most common were *Noctua brunnea*, *N. augur*, *N. festiva*, *Xylophasia hepatica*, *Aplecta nebulosa*, *Miana strigilis*, *Gonophora derasa*, *Euplexia lucipara*, and *Tryphæna pronuba*. Many others came in lesser numbers.—CHARLES OLDHAM, Woodford, Nov. 24th, 1892.

Sake's (commonly called "Snake's") Lane, Woodford.—In 1888 some notes on the name of this lane, by Mr. Walter Crouch and Mr. N. F. Robarts, appeared in THE ESSEX NATURALIST (vol. ii., pp. 269-70). Their contention was in favour of "Snake's" being a corruption of "Sake's," which occurred in an old document in Mr. Crouch's possession. That a man named "Sake" lived, and was once a landowner in Woodford, is clear from his will, proved in the Court of the Archdeacon of Essex, Oct. 2, 1504 (75, Stephyn). He desires to be buried in Woodford Churchyard, and leaves 3*s.* 4*d.* to the "hie aulter," and a new Torche, price 6*s.* 8*d.*, to the church. To each of his daughters, Agnes and Jonan, he leaves, *i.a.*, 20*s.*, to be paid equally by him that is in possession of his land called "Long Hylls," and him that hath his land called "Hakfoste."—W. C. WALLER, Loughton.

London Smoke and Vegetation.—It would be an interesting study for those naturalists living near London to attempt to define the limits where the London smoke affects the vegetation. It is not difficult to get a rough estimate of this by steeping boughs of trees in water and watching the discolouration. There is generally none in pure country air; but the stems of trees in the vicinity of London are very retentive of carbon, and tell the tale quickly. Some rough observations made in the neighbourhood of Bostal Heath and Wickham Cemetery, below Woolwich, and, of course, south of the Thames, show that at those places (quite twelve miles from London Bridge) the influence is very apparent; but it dies out towards Belvidere, a few miles further away. Assuming thus a diameter of twenty-four miles, we have, in round numbers, 450 square miles of vegetation more or less affected by smoke. What inferences may be drawn from this I cannot say; but possibly the radiation of heat may be checked by this canopy and this may permanently raise the temperature somewhat. A note made of the distance at which vegetation is affected would certainly be useful for future comparison.—J. FRENCH, Felstead.

PUBLICATIONS OF ESSEX FIELD CLUB.

ESSEX FIELD CLUB, SPECIAL MEMOIRS, VOL. I.

REPORT ON THE EAST ANGLIAN EARTHQUAKE OF APRIL 22ND, 1884."

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Nature, January 21st, 1886.

ESSEX FIELD CLUB, SPECIAL MEMOIRS, VOL. II.

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N.B.—A reduction of 25 per cent. from the above prices is allowed to Members, excepting on the "Birds of Essex" and the Annual Subscriptions to the "Essex Naturalist."

COMMUNICATIONS FOR THE "ESSEX NATURALIST."

In the early part of the year I printed an appeal to the readers of THE ESSEX NATURALIST to interest themselves in its welfare, and to aid me in the difficult task of editing by sending short papers and suitable notes of occurrences appertaining to the special subjects for the study of which the Essex Field Club was founded, for consideration and publication. I am sorry to say that this request has led to but scant response. As we are now approaching the end of another year, I venture again to call upon our friends and members for such aid, in the hope that it will be more freely and systematically rendered during the coming year.

Every reader could with but little trouble render most welcome assistance. Not only are longer and more important memoirs desired, but the greatest aid would be given by the communication of SHORT PAPERS, NOTES, and of books, periodicals, newspapers, etc. (*or extracts from the same*), containing matter (reports, captures, natural history, antiquarian or other "finds," topographical descriptions, news of the exposure of geological sections, etc.), likely to be useful for THE NATURALIST or for the information of the council and officers.

I would VERY GRATEFULLY receive promises from members and others of *systematic searching of periodicals, etc., for such information as above.* If extracts are sent they should be in a form as nearly as possible for publication. MSS. should be written on *one side of the paper only*, with *wide* spaces between the lines, and with *wide* margins.

Further, as the Winter Session has now commenced (the first meeting was held at Loughton Public Hall on November 19th), PAPERS, and EXHIBITS for the MEETINGS are greatly desired, and I shall be glad to hear from those having such in preparation.

[It would greatly assist if exhibitors of objects at meetings would themselves prepare short descriptions of them for publication, and hand the same to me *at the meetings.*]

I feel sure that the members, thus appealed to, will exert themselves to aid the officers in carrying on the work of the Club in accordance with the objects for which it was founded. They should hold themselves responsible, in some measure, for the progress of the Club, and look upon themselves as a band of "enthusiasts" gathered together for the study and investigation of the natural history of Essex. I most sincerely hope that during the year 1893 our Journal will be freely used for recording observations original and selected, and as a *monthly* medium of intercommunication between lovers of natural science dwelling in, or having a friendly regard for, our interesting county.

WILLIAM COLE,

Hon. Secretary and Editor.

Buckhurst Hill,
November, 1892.