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THE

ESSEX NATURALIST :

BEING THE

Journal of the Essex Field Club.

EDITED BY

WILLIAM COLE,

Honorary Secretary.

VOLUME V.

JANUARY—DECEMBER, 1891.

“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.]

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1891.



J. J. Smallwood

"It is to the development of Provincial Museums that we must look in the future for the extension of intellectual pursuits throughout the land."

PROF. EDWARD FORBES.

"The value of a Museum does not consist so much in the number as in the order and arrangement of the specimens contained in it."

AGASSIZ.

"I would urge all persons belonging to Field Clubs, not selfishly to retain the specimens they gather, but to deposit them where they may be of use to their fellow-explorers. . . I earnestly advocate and petition for the formation of an entirely Local Museum."

PROF. PHILLIPS.

"I believe that the most useful museum . . . is that which is devoted to the natural objects of its locality. It gives a stimulus to observe and collect; it adds an interest to every object contributed, in the relation which each specimen bears to its collector, and the circumstances attending its recognition. Well carried out, such a museum is helpful to science in fixing a date to the fauna and flora of the district, and in giving the material means of contrasting it with the conditions of both at a later period."

SIR RICHARD OWEN.

"All schools and museums, whatsoever, can only be, what they claim to be, and ought to be, places of noble instruction, when the persons who have a mind to use them can obtain so much relief from the work, or exert so much abstinence from the dissipations of the outside world as may enable them to devote a certain portion of secluded, laborious, and reverent life to the attainment of the Divine Wisdom, which the Greeks supposed to be the gift of Apollo, or of the sun, and which the Christian knows to be the gift of Christ."

RUSKIN.

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The Essex Naturalist:

BEING THE
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WILLIAM COLE,
Honorary Secretary.

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The Editor of "THE ESSEX NATURALIST."

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"THE ESSEX NATURALIST,"

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his *Portrait* in the *Bedchamber* *at* *Windsor*

by *W. Verelst* *del.* *1714*

THE
ESSEX NATURALIST:

BEING THE

Journal of the Essex Field Club

FOR 1891.

THE CRYPTOGAMIC FLORA OF KELVEDON
AND ITS NEIGHBOURHOOD, TOGETHER
WITH A FEW COAST SPECIES; COMPILED
FROM THE HERBARIUM AND NOTES
MADE BY THE LATE E. G. VARENNE,
M.R.C.S.

By E. D. MARQUAND.

[*Read February 28th, 1891.*]

THE following lists have been carefully compiled from the collections, notes, and memoranda made during a period of over forty years by my valued friend, the late Mr. E. G. Varenne, surgeon, of Kelvedon, who died on the 22nd of April, 1887, at the age of seventy-five.¹ As a contribution to the Cryptogamic Flora of the county of Essex, so far as at present known, these lists cannot fail to be of great interest and value, since they embody the labours of an acute botanist whose researches in this department of science have never yet been published.

Although possessing a wide practical acquaintance with all sections of plant life, it was as a lichenologist that Mr. Varenne excelled; the lichens were to him especial favourites, and of these he had, by a lifetime of study, acquired a critical knowledge surpassed by very few British botanists. His last work was the compilation of the lichen list which follows, the introductory preface to which unhappily remains in too rudimentary a condition to be available for the purposes of this paper.

¹ A short memoir of Mr. Varenne (with portrait) by Prof. Boulger, is printed in the present volume.—E.D.

The other lists I have prepared from a thorough examination of the specimens in his extensive herbarium (so far as they relate to the county of Essex) and also from the copious notes in his own neat hand-writing in the text-books he used. In numbers of cases two or more gatherings of the same species were made in the same locality at different dates; but I have not considered it needful to give more than one of these, and that always the earliest.

The number of cryptogams now recorded is as follows: Mosses, 160 species and 10 varieties; Hepaticæ, 22 species; Lichens, 208 species and 141 varieties and forms²; Fungi, 136 species; Seaweeds, 36 species; Fresh-water Algæ, 129 species: amounting in all to 842.

As regards the names and classification here adopted the mosses and hepaticæ follow the order of the second edition of the "London Catalogue" (1880); the lichens, Leighton's "Lichen Flora," third edition (1879); the fungi, Cooke's "Handbook of British Fungi" (1871); the seaweeds, Harvey's "Manual of British Marine Algæ" (1849), and the remaining section Hassall's "History of the British Fresh-water Algæ" (1845). In the last case I am well aware that the nomenclature is in a great measure obsolete; but as the list is mainly drawn up from marginal notes in Mr. Varenne's copy of Hassall, I have not ventured upon any attempt to modernise it—which indeed would have been a task presenting considerable difficulty, and might have led to serious error.

Although some of the stations indicated in the lists lie beyond the neighbourhood of Kelvedon, strictly so called, the great bulk of the localities are situated in that region of the county of which Kelvedon forms the centre, and therefore I trust that no very grave inaccuracy has been committed in giving to this paper its present title.

The cryptogams of Essex form only a portion, though naturally the most important one, of Mr. Varenne's extensive botanical collections, the whole of which are now in my possession. Wherever he went for his annual outing he brought home stores of gatherings for future study. Dartmoor he knew well botanically, and his manuscript lists of the mosses, hepaticæ and lichens he collected there are very full and valuable. West Cornwall he knew even better than Dartmoor; and during his repeated visits to Penzance it was my privilege to accompany him in his rambles over the rugged cars and breezy

² In the Rev. J. M. Crombie's paper on the "Lichen Flora of Epping Forest, and the Causes affecting its Recent Diminution" (Trans. Essex Field Club, vol. iv., pp. 54-75), only 136 species and 28 "forms" of lichens are recorded from the forest districts.—ED.

moors of the Land's End, and to point out many a rare plant which made his eyes glisten with delight.

But it was not the acquisition of a rarity, merely as such, that gave him pleasure ; it was the seeing and gathering for himself in its own native habitat any unfamiliar form—moss or hepatic, lichen, fungus or alga—and the subsequent leisurely examination of it at home, with his microscope and his books ; for it was a characteristic of Mr. Varenne that he would take nothing for granted—he would never accept a name without verifying it by every available means—after which it would be duly tabulated in his own methodical way. Even on his deathbed the recollection that he had inadvertently entered a lichen under a wrong name disturbed his peace of mind, and caused him uneasiness until the error was rectified.

It is very probable that some of Mr. Varenne's early hunting-grounds have long since lost their botanical features, and that many of the plants enumerated below are now extinct in the localities specified. If so it will but add to the value of the present record, the publication of which is a humble tribute to the memory of one to whom I was attached by strong ties of personal friendship and esteem.

MOSESSES.

Sphagnum acutifolium, Ehr. West Bergholt Heath, 1860. Woodham Walter Common, and Galleywood Common, 1862. Var. *purpureum*, Schpr. Tiptree and Bergholt Heath, 1862.

S. intermedium, Hoffm. Woodham Mortimer Common, 1862.

S. rigidum, Schpr. High Beach, 1883.

S. subsecundum, Nees. Tiptree Heath and West Bergholt Heath, 1860. Warley Common, 1883. Var. *contortum*, Schultz. Galleywood Common and Bergholt Heath, 1862. Pods Wood, Tiptree Heath, 1865. Var. *obesum*, Wils. High Beach, 1883. Var. *auriculatum*, Schpr. Galleywood Common, 1882.

S. cymbifolium, Ehr. West Bergholt Heath, 1860. Woodham Walter Common, 1863. Warley Common, 1866. Var. *squarrosulum*, Nees. Bog, Pods Wood, 1860.

Systegium crispum, Hedw. Kelvedon, 1861.

Gymnostomum microstomum, Hedw. Inworth, 1862. Sible Hedingham, 1864. Kelvedon, 1880.

Weissia viridula, Brid. Kelvedon, 1860.

- W. mucronata**, Bruch. Near Halstead, 1875.
- W. cirrhata**, Hedw. Kelvedon, 1860.
- Dicranella cerviculata**, Hedw. Banks, Woodham Walter, 1862. On a common at Little Baddow, 1864. Pods Wood, 1875. Warley, 1882.
- D. varia**, Hedw. Kelvedon, 1861.
- D. heteromalla**, Hedw. Braxted, 1860. Woodham Walter, 1862.
- Dicranum scoparium**, L. Great Totham, 1861. Woodham Walter Common, Tiptree Heath, and Wickham, 1862.
- D. palustre**, Brid. West Bergholt Heath and Woodham Walter Common, 1862.
- Campylopus fragilis**, Br. and Schpr. Chauntry Wood, 1873.
- C. pyriformis**, Brid. Wood near Woodham Walter, 1863.
- Leucobryum glaucum**, L. Tiptree Heath, 1860. Wood near Woodham Walter Common, 1863. Wood near Warley Barracks, 1866. High Beach, 1883.
- Pleuridium nitidum**, Hedw. Wood near Inworth Church, 1863.
- P. subulatum**, L. Totham and Braxted, 1861.
- P. alternifolium**, Br. and Sch. Totham, 1861. Kelvedon, 1866. Wood at Braxted, 1868.
- Sphærangium muticum**, Schreb. Kelvedon, 1860.
- Phascum cuspidatum**, Schreb. Kelvedon, 1860.
- Pottia cavifolia**, Ehr. Kelvedon, 1845. Rivenhall, 1861.
- P. minutula**, Schwg. Braxted; Kelvedon, 1860.
- P. truncata**, L. Kelvedon, 1860. Tiptree Heath.
- P. intermedia**, Turn. Kelvedon, 1881.
- P. wilsoni**, Hook. Near Wivenhoe, 1864.
- P. heimii**, Hedw. Bank of Stour near Manningtree, 1863. Dovercourt, 1865. Near Alresford Creek, 1876.
- P. starkeana**, Hedw. Kelvedon, 1845. Feering, 1880.
- P. lanceolata**, Dicks. Feering, 1860. Kelvedon, 1862. Yeldham, 1863.
- Didymodon rubellus**, Br. and Sch. Inworth, 1861. Near Halstead, 1875.
- Ditrichum homomallum**, Hedw. Mile End, Colchester, 1873.
- Trichostomum rigidulum**, Sm. On a tree in Kelvedon Meadows, 1873. On top of piles in the river, Kelvedon, 1876.

- Barbula ambigua**, Br. and Sch. Kelvedon, 1862.
- B. aloides**, Koch. Kelvedon, 1862. Halstead. Near Yeldham, 1865.
- B. atrovirens**, Sm. Amongst *Pottia heimii*, Alresford Creek, 1876.
- B. cuneifolia**, Dicks. Military road, Colchester, 1860. Near West Bergholt Mill, 1862. Near Wivenhoe, 1876.
- B. marginata**, Br. and Sch. Kelvedon, 1866.
- B. muralis**, L. Kelvedon, 1860. Var. *æstiva*, Schultz. Kelvedon, 1868. Nayland, 1881. Var. *incana*, Wils. Kelvedon, 1876.
- B. unguiculata**, Dill. Kelvedon, 1860. Copford, 1882. Var. *cuspidata*, Bry. Eur. Marks Tey, 1881.
- B. fallax**, Hedw. Braxted, 1860. Kelvedon, 1861. Tiptree Heath, 1862. Yeldham, 1865.
- B. hornschurchiana**, Schultz. Colchester Castle, 1864.
- B. revoluta**, Schwg. Oyn's Brook Bridge, 1860. Buttress of Kelvedon Church, 1863.
- B. brebissonii**, Brid. On a tree in the meadows at Widford, 1876.
- B. subulata**, L. Kelvedon, 1860.
- B. lævipila**, Brid. Kelvedon and Braxted, 1860.
- B. latifolia**, Br. and Sch. Kelvedon, 1860. Notley.
- B. ruralis**, L. Kelvedon, 1860. Feering.
- B. intermedia**, Brid. On the stones of Kelvedon Church, 1877.
- B. papillosa**, Wils. Trees, Inworth, 1860.
- Ceratodon purpureus**, L. Kelvedon, 1845. Rivenhall, 1860.
- Grimmia apocarpa**, L. Kelvedon, 1860. Witham, 1862. Tiptree Heath, 1863. Rivenhall, 1873.
- G. pulvinata**, Dill. Kelvedon, 1860.
- Racomitrium canescens**, Hedw. Tiptree Heath, 1860.
- Zygodon viridissimus**, Dicks. Inworth: Rivenhall, 1860. Easthorpe, 1864.
- Z. conoideus**, Dicks. Tree, Kelvedon Meadows, 1866.
- Ulota bruchii**, Hornsch. Wood at Mile End, near Colchester, 1863.
- U. crispa**, Hedw. Chantry Wood, 1861. Wickham: Felix Hall Shrubbery, 1862. Flories Wood; Great Tey, 1883.

- Orthotrichum anomalum**, Br. and Sch. Feering, 1862. Halstead; Colchester; Kelvedon, 1866. Hatfield Forest, 1873.
- O. affine**, Schrad. Kelvedon, 1860. Woods at Wickham; Alresford, 1876.
- O. stramineum**, Hornsch. Kelvedon, 1863. Lyston, 1865.
- O. pumilum**, Dicks. On an ash-tree, Kelvedon, 1873.
- O. tenellum**, Bruch. Kelvedon and Feering, 1862. Pods Wood, 1868.
- O. pallens**, Bruch. On an ash-tree, Kelvedon, 1874.
- O. diaphanum**, Schrad. Rivenhall, 1860.
- O. lyellii**, H. and T. Wood at Copford, 1863. Felix Hall Woods, 1864. Messing, 1868.
- O. leiocarpum**, Br. and Sch. Near Halstead.
- O. sprucei**, Mont. Old pales near the Chelmer, Chelmsford, 1866.
- Ephemerum serratum**, Schreb. Kelvedon, 1860. Braxted, 1864.
- Physcomitrella patens**, Hedw. On damp garden ground, Kelvedon, 1877.
- Physcomitrium pyriforme**, L. Kelvedon, 1861. Riverside, Braxted, 1866.
- Funaria fascicularis**, Dicks. About Kelvedon, Langford, &c., on gravel and clay, 1861. Halstead, 1875.
- F. hygrometrica**, L. Kelvedon, 1860.
- Bartramia pomiformis**, L. Pods Wood Lane, 1860.
- Philonotis fontana**, L. Galleywood Common, and West Bergholt Heath, 1862.
- Leptobryum pyriforme**, L. On the brick of a culvert, Feering, 1860.
- Webera nutans**, Schreb. Braxted, 1861. Woodham Walter Common, and Wickham, 1862. Wood at Warley, 1866.
- W. carnea**, L. Kelvedon, 1861. Marks Hall.
- Bryum pendulum**, Hornsch. Kelvedon, 1862.
- B. inclinatum**, Swartz. Kelvedon, 1860.
- B. intermedium**, W. and M. Kelvedon, 1860.
- B. bimum**, Schreb. Kelvedon, 1860. Tiptree, 1865. Brightlingsea Common, 1866.
- B. erythrocarpum**, Schwg. Tiptree Heath; Roman Wall, Colchester; and Rivenhall, 1862. Kelvedon Church wall, 1863.
- B. atropurpureum**, W. and M. Kelvedon, 1860.

- B. cæspiticium**, L. Kelvedon, 1860. Beckingham and Inworth, 1861.
- B. argenteum**, L. Kelvedon, 1860.
- B. capillare**, L. Kelvedon and Inworth, 1860.
- B. pallens**, Swartz. Near Kelvedon, 1862. Pods Wood, 1875.
- Mnium affine**, Bland. Copford. Felix Hall Shrubbery, 1882.
- M. undulatum**, Hedw. Kelvedon, 1860. Woodham Walter Common, 1863.
- M. hornum**, L. Pods Wood Lane, 1860.
- M. punctatum**, Hedw. Brook bank on Chedingsell Grange Farm, 1861.
- M. subglobosum**, B. and S. Woodham Walter Common, 1862.
- Aulacomnion androgynum**, L. Totham, 1861. Plentiful in Baddow, 1864. Inside an old decayed willow trunk by riverside, Feering, 1882.
- A. palustre**, L. Tiptree Heath, 1860. Woodham Walter Common; Galleywood Common; West Bergholt Heath, 1862. Warley Common, 1866.
- Tetraphis pellucida**, L. Woodham Walter Common, 1862.
- Atrichum undulatum**, L. Braxted, 1860.
- Pogonatum nanum**, Neck. Tiptree Heath, 1860.
- P. aloides**, Hedw. Gravel-pit, Totham, 1861.
- Polytrichum formosum**, Hedw. Pods Wood, 1860. Chaulkney Wood, 1861. Wickham, 1862. Woodham Walter, 1863.
- P. piliferum**, Schreb. Tiptree, 1860. Warley Common, 1880.
- P. juniperinum**, Willd. Totham, 1861. Woodham Walter Common, 1862. Warley Common, 1880.
- P. commune**, L. Tiptree Heath, 1860. Woodham Walter Common, 1862. Warley Common, 1866.
- Fissidens bryoides**, Hedw. Kelvedon, 1860.
- F. exilis**, Hedw. Kelvedon Hall Wood, 1879.
- F. incurvus**, W. and M. Bank, Kelvedon Hall Wood, 1861.
- F. viridulus**, Wils. Kelvedon, 1860. Braxted, 1862.
- F. taxifolius**, L. Kelvedon, 1860.
- Fontinalis antipyretica**, L. Pond on Allshots Farm, Kelvedon, 1860.
- Cryphæa heteromalla**, Hedw. White Notley, 1860. Kelvedon, 1862.

- Leucodon sciuroides**, L. Messing, 1860.
Neckera complanata, L. Prested Hall Wood, 1860.
Homalia tricomanoides, Schreb. Rivenhall, 1860.
Leskea polycarpa, Ehr. Kelvedon, 1860.
Anomodon viticulosus, L. Kelvedon, 1860.
Thuidium tamariscinum, Hedw. Braxted, 1860.
Thamnum alopecurum, L. Kelvedon, 1860.
Pylaisia polyantha, Schreb. On an elm-tree, Ewell Hall Farm, 1861.
Isothecium myurum, Poll. Kelvedon, 1860.
Homalothecium sericeum, L. Kelvedon, 1860.
Camptothecium lutescens, Huds. Kelvedon, 1860.
Brachythecium albicans, Neck. Donyland Heath, 1860.
 Banks of the Colne, near Wivenhoe, 1863.
B. velutinum, L. Kelvedon, 1860.
B. rutabulum, L. Kelvedon and Cressing Temple, 1860.
 Chaulkney Wood, 1861. Inworth, 1862.
Eurhynchium myosuroides, L. Kelvedon, 1860.
E. striatum, Schreb. Kelvedon, 1860.
E. piliferum, Schreb. Kelvedon and Donyland, 1860. Banks of the Colne, near Wivenhoe, 1863.
E. swartzii, Turn. Kelvedon. 1861.
E. prælongum, Dill. Kelvedon, 1860.
E. pumilum, Wils. Inworth, 1862. Aldham, 1864.
Rhynchostegium tenellum, Dicks. Inworth, 1861.
R. confertum, Dicks. Great Braxted, 1860.
R. megapolitanum, Bland. Kelvedon, 1862. Copford, 1882.
R. murale, Hedw. Kelvedon Church, 1860.
R. ruscifolium, Neck. Kelvedon, 1860.
Plagiothecium denticulatum, L. Pods Wood Lane, 1860.
 Chantry Wood, 1873. Chaulkney Wood, 1882.
P. sylvaticum, L. Chaulkney Wood, 1861.
Amblystegium serpens, L. Kelvedon, 1860. Copford, 1882.
A. irriguum, Wils. On the wall by Feering Mill dam, 1866.
A. riparium, L. Waste water near Kelvedon Mill, 1860.
 River Chelmer, 1866.
Hypnum aduncum, L. Tiptree Heath, 1873.
H. kneiffii, Schpr. West Bergholt Heath, 1860. Galleywood Common, 1862.

- H. intermedium*, Lind. Lingwood Common, 1864.
H. fluitans, L. Kelvedon, 1860. Tiptree Heath, 1861.
 Var. *falcatum*, Schpr. Warley Common, 1866.
H. uncinatum, Hedw. Tiptree Heath, 1860.
H. filicinum, L. Kelvedon; near Bergholt; Braxted; Mes-
 sing, 1860. Banks of the Colne near Yeldham, 1865.
H. commutatum, Hedw. Hickmore Fen Wood, 1862.
H. cupressiforme, L. Kelvedon; Feering, 1860. Chantry
 Wood, 1861. Var. *lacunosum*, Wils. Kelvedon, 1861.
H. resupinatum, Wils. Braxted, 1860. Donyland Hall,
 1884.
H. molluscum, Hedw. Rivenhall, 1860.
H. stellatum, Schreb. Galleywood Common. West Bergholt
 Heath, 1862. Lingwood Common, near Danbury, 1864.
H. cordifolium, Hedw. Wood at Totham, 1861.
H. cuspidatum, L. Kelvedon, and near Felix Hall, 1860.
H. schreberi, Ehr. Tiptree Heath, 1860. Galleywood
 Common, 1862. Woodham Walter Common, 1863.
H. purum, L. Kelvedon, 1860. Galleywood Common,
 1882.
H. stramineum, Dicks. Woodham Walter Common and
 West Bergholt Heath, 1862.
Hylocomium splendens, Dill. Tiptree Heath, 1860.
H. squarrosum, L. Tiptree Heath, 1860.
H. triquetrum, L. Chaulkney Wood, 1861.

HEPATICÆ.

- Marchantia polymorpha*, L. Kelvedon, 1844. Feering,
 1860.
Lunularia vulgaris, Mich. Great Baddow, 1882.
Riccia glauca, L. Kelvedon, 1863.
Ricciella fluitans, L. Layer Marney, 1861.
Frullania dilatata, L. Kelvedon, 1860.
Radula complanata, L. Kelvedon.
Porella platyphylla, L. Kelvedon; Colchester.
Lepidozia reptans, L. Warley, 1883.
Lophocolea bidentata, L. Kelvedon and Braxted, 1861.
L. heterophylla, Schrad. Braxted Woods and Inworth, 1861.
Trichocolea tomentella, Ehr. Woodham Mortimer Com-
 mon, 1862.

- Blepharozia ciliaris*, Nees. Tiptree Heath, 1862.
Scapania undulata, Dill. Tiptree, 1861. Bergholt Heath, 1862.
S. nemorosa, L. Chauntry Wood.
Diplophyllum albicans, L. Marks Hall, 1863.
Plagiochila asplenioides, L. Chaulkney Wood, 1860.
Jungermannia crenulata, Sm. Tiptree Heath, 1862.
J. inflata, Huds. Tiptree Heath, 1863.
Nardia scalaris, Schrad. Kelvedon, 1861.
Pellia epiphylla, L. Woodham Walter Common, 1882.
Aneura multifida, Dill. West Bergholt Heath.
Metzgeria furcata, L. Braxted, 1861.

LICHENS.

- Collema pulposum*, Bernh. Feering, Yeldham. f. *granulatum*, Sw. On limestone, Kelvedon; Salcot. f. *tenax*, Ach. On earth, Kelvedon.
C. limosum, Ach. Kelvedon, Feering. On clay.
C. crispum, Huds. On gravel, Kelvedon, Feering, Yeldham. Roman Wall, Colchester.
C. cheileum, Ach. On the mortar of walls, Feering.
Leptogium microphyllum, Ach. Old elm, Kelvedon, 1882.
L. biatorinum, Nyl. Bank at Inworth, 1863.
L. tenuissimum, Dicks. Hedge-bank, Inworth; Braxted; Kelvedon.
L. pusillum, Nyl. Bank at Messing, 1863.
Sphinctrina turbinata, Pers. On *Pertusaria communis*, Inworth.
Calicium chrysocephalum, Ach. Old elm, Braxted.
C. aciculare, Sm. Old elms, Kelvedon.
C. trichiale, Ach. Var. *ferrugineum*, Borr. Old oak post, Great Tey; Coggeshall.
C. melanophæum, Ach. Palings, Braxted. Oak post, Kelvedon.
C. hyperellum, Ach. Old oak, Messing.
C. trachelinum, Ach. On oak post and boarded building, Kelvedon.
C. quercinum, Pers. Old wood, Inworth; Kelvedon; Coggeshall.
C. curtum, Borr. Old wood, Kelvedon; Braxted.
C. subtile, Pers. Old tree and old boarding, Kelvedon.

Coniocybe furfuracea, Ach. Sandy bank, Braxted, and Marks Hall.

Trachylia tigillaris, Fr. Old paling, Braxted.

T. tympanella, Fr. Old posts, &c., Kelvedon.

T. stigonella, Fr. On Pertusaria, Marks Hall.

Bæomyces rufus, D. C. On earth, Tiptree Heath; Warley.

Cladonia pyxidata, Fr. Banks, Kelvedon. Var. *fimbriata*, Hoffm. Braxted Park wall. Hedge-bank, Myland. f. *cornuto-radiata*, Leight. Mile End, Colchester.

C. gracilis, Hoffm. f. *hybrida*? Tiptree Heath. Var. *chordalis*, Ach. Tiptree Heath.

C. furcata, Hoffm. Tiptree Heath, Braxted.

C. cornucopioides, Fr. Braxted Park wall.

C. digitata, Hoffm. Var. *macilenta*, Hoffm. Old paling, Kelvedon, Copford. Brick wall, Braxted.

C. florkeana, Fr. Var. *bacillaris*, Ach. Tiptree Heath.

Cladina sylvatica, Hoffm. Tiptree Heath.

C. rangiferina, Hoffm. Tiptree Heath.

C. uncialis, Hoffm. Tiptree Heath.

Usnea barbata, L. f. *hirta*, L. Trees, Kelvedon. f. *plicata*, L. Trees, Kelvedon.

Alectoria jubata, L. Paling, Braxted. Trees, Pods Wood.

Evernia furfuracea, Mann. Wooden fence, Braxted.

E. prunastri, L. On palings and trees, Braxted; Kelvedon; Feering. The yellow form, Copford.

Ramalina farinacea, L. Trees and palings, Kelvedon; Braxted.

R. fraxinea, L. f. *teniaformis*, Ach. Trees, Kelvedon. f. *ampliata*, Ach. Trees, Kelvedon.

R. fastigiata, Pers. On trees, Kelvedon.

R. pollinaria, Ach. f. *humilis*, Ach. On old boarded barn, Rivenhall. f. *elatior*, Ach. On trees, Kelvedon.

R. evernioides, Nyl. Trees, Feering; Kelvedon; Totham.

Cetraria aculeata, Fr. f. *typica*, Leight. Tiptree Heath. f. *muricata*, Ach. Paling, Kelvedon; Tiptree Heath.

Peltigera canina, L. Banks, Kelvedon.

P. spuria, Ach. Bank, Kelvedon.

P. polydactyla, Hoffm. Grassy bank, Great Tey.

Parmelia caperata, L. On trees, &c., Kelvedon; Braxted.

P. olivacea, L. Kelvedon.

P. physodes, L. On trees and palings. Var. *recurva*, Leight. Braxted, on trees. Var. *labrosa*, Ach. On fir-branches, Kelvedon. Old palings, Braxted; Colne.

P. reddenda, Stirt. Trees, Kelvedon; Feering.

P. perlata, L. On trees, Kelvedon; Feering; Inworth; Easthorpe.

P. borreri, Turn. Trees, Kelvedon; Braxted Park; Inworth.

P. fuliginosa, Dub. f. *olivacea*, Leight. On trees and palings, frequent but barren, Kelvedon; Inworth, &c.

P. acetabulum, Neck. On elm, ash, and lime trees, Kelvedon; Coggeshall; Rayne; Great Braxted; Witham; Felix Hall Park; Rivenhall; Lyston.

P. saxatilis, L. On trees and pales. Easthorpe, in fruit; Kelvedon.

Physcia parietina, L. Trees and walls, Kelvedon. Var. *aureola*, Ach. Brick walls, Kelvedon; Chipping Hill. Var. *laciniosa*, Duf. On trees, Kelvedon; Yeldham. Var. *lychnea*, Ach. On trees, frequent, Kelvedon. On walls, Earl's Colne. At base of old elms, Kelvedon, of a dark orange-yellow. Var. *polycarpa*, Ehrb. Willow-tree, Rivenhall. Palings, Kelvedon and Walton. f. *cinerascens*, Leight. Elms, Kelvedon.

P. ciliaris, L. Trees, Kelvedon. Old wall, Chipping Hill. f. *actinota*, Ach. Trees, Kelvedon.

P. pulverulenta, Schreb. On trees, Kelvedon. Ashy-grey form on horse-chestnuts, Kelvedon, 1884. f. *pityrea*, Ach. On trees, Braxted; Kelvedon. On mosses on walls, Chipping Hill; Feering. f. *angustata*, Hffm. On moss, Kelvedon.

P. obscura, Ehr. On trees, Kelvedon; Feering.

P. adglutinata, Flk. On elm and ash trees, Kelvedon. On wall, Braxted. On a culvert, Feering.

P. erosa, Borr. Base of old elm. Messing.

P. astroidea, Clem. Kelvedon.

P. stellaris, L. Trees, Kelvedon; Totham; &c. Var. *leptalea*, Ach. Ulting, near Maldon, Mr. Piggott. Var. *tenella*, Scop. On trees, walls, and palings, Kelvedon; Chipping Hill; Lyston; Rivenhall. Var. *caesia*, Hffm. On brick walls, trees, and slates, Kelvedon; Coggeshall; Great Tey.

Squamaria saxicola, Poll. Frequent on brick walls, and on tiles, Kelvedon. Var., with margin of apothecia albo-pulverulent, on a tile, Kelvedon.

Placodium murorum, Hffm. On mortared walls and brick walls, Kelvedon; Colne; Feering; Mistley. *f. lobulatum*, Smrft. On stone, Chelmsford.

P. decipiens, Arn. On walls, Kelvedon; Mistley. On flint wall, Thetford, in small round spots.

P. callopismum, Ach. *f. plicatum*, Wedd. Mortared walls, brick walls, and sandstone, Kelvedon; Coggeshall.

P. miniatum, Hffm. *f. obliteratum*, Pers. On limestone, Coggeshall.

P. citrinum, Ach. Trees, palings, brick walls, and mortared walls, Halstead Kelvedon; Feering; Braxted.

P. chalybæum, Duf. Limestone, Coggeshall.

Lecanora vitellina, Ach. Old palings and walls, Kelvedon. Var. *coruscans*, Ach. Palings, Kelvedon. Var. *epixantha*, Nyl. Kelvedon.

L. candelaria, Ach. On willow and horse-chestnut, on palings and old boarded barns, Kelvedon; Great Tey; Lyston. *f. granulosa*, Leight. On paling, Great Tey.

L. glaucocarpa, Whlnb. *f. pruinosa*, Sm. Great Coggeshall; on limestone, T. B. Hall.

L. squamulosa, Schrad. Sandstone, Feering, 1881.

L. fuscata, Schrad. Sandstone, Feering; Kelvedon.

L. sarcopsis, Whlnb. Kelvedon.

L. varia, Ehrb. Old palings, Kelvedon; Great Tey; tree, Braxted.

L. atra, Huds. On old walls, abundant, Kelvedon. *f. corticola*, Larbal. On trees, Messing; Kelvedon.

L. circinata, Pers. On limestone, Coggeshall.

L. sulphurea, Hffm. Old walls, Kelvedon; Great Tey; Chip-ping Hill. Variable as to colour.

L. symmicta, Ach. On palings, old posts, and rails, Kelvedon; Feering; Pods Wood; Coggeshall. Var. *aitema*, Ach. Kelvedon.

L. expallens, Ach. On palings, Kelvedon. Var. β . Ach. (*orosthea*, Sm.) Trunk of horse-chestnut, Kelvedon.

L. subfusca, L. On trees, Gosfield. *f. allophana*, Ach. Trees, Rivenhall; Kelvedon; Messing. *f. parisiensis*, Nyl. Kelvedon. *f. rugosa*, Pers. Kelvedon. *f. argentata*, Ach. On trees and brick walls, Kelvedon; Wivenhoe; Coggeshall; Totham. *f. contumescens*, Rob. Upper branches of trees, Kelvedon. *f. atrynea*, Ach. Brick walls, palings, ash-tree, sandstone, Braxted; Kelvedon; Feering;

Messing. f. *epibrya*, Ach. On moss, on old walls, Kelvedon. f. *chlarona*, Ach. Palings and trees, Coggeshall; Kelvedon; Totham; Troyes Wood. Often with *Sphaeria epicymatia* on its apothecia.

L. galactina, Ach. On brick, mortared walls, and old palings, Kelvedon; Feering. f. *dispersa*, Pers. On mortared wall, and on sandstone, Kelvedon.

L. hageni, Ach. On palings, trees, mortared walls, Osey Island; Goldhanger; Kelvedon; Braxted. Var. *pallidior*, Larb. Ash-tree, Kelvedon.

L. gibbosa, Ach. Coggeshall, on limestone. f. *vulgaris*, Th. Fr. On oolite, Gosfield. On sandstone, Kelvedon.

L. calcarea, L. f. *concreta*, Schær. Limestone, Coggeshall.

L. parella, L. Tiles and brick walls, Kelvedon. f. *pallescens*, L. Walls, Kelvedon. f. *tumidula*, Pers. On trees, Kelvedon; Bocking. On boarded building, Easthorpe. Old gate-post, Coggeshall. f. *turneri*, Sm. Trees, Kelvedon.

L. rupestris, Scop. f. *calva*, Dicks. Old mortared wall, Kelvedon.

L. angulosa, Ach. On elm, apple, poplar, and old paling, Kelvedon; Rayne; Halsted; Messing; Myland; Rivenhall; Totham.

L. albella, Pers. Kelvedon, on aspen-tree.

L. aurantiaca, Lightf. Var. *salicina*, Lightf. Elm-trees, Halstead; Steeple Bumpstead. Var. *erythrella*, Ach. On sandstone, paling, sea-bank, Kelvedon; Goldhanger. Var. *inalpina*, Ach. Brick wall, mortared wall, old paling, Kelvedon; Feering; Messing.

L. ferruginea, Huds. f. *corticola*, Leight. Elm and apple trees, and old gates, Feering; Messing; Kelvedon; Rivenhall.

L. cerina, Ehrh. On trees, Kelvedon; Colchester; Easthorpe; Osey Island; Wivenhoe. On maple, Braxted Park. Var. *cyanolepra*, D.C. On aspen, Kelvedon; Easthorpe. Var. *chlorina*, Fw. On sandstone boulder, Great Tey. Var. *stillicidiorum*, Horn. Goldhanger. Form with fuscous apothecia. Paling, Kelvedon; Wivenhoe.

L. pyracea, Ach. Elm-tree, mortar, sandstone, paling, Braxted; Halstead; Coggeshall; Kelvedon; Osey Island. Var. *ulmicola*, D.C. On horse-chestnuts, old willows, aspens, and elms, frequent, Coggeshall; Kelvedon; Witham; Braxted. Var. *holocarpa*, Ehr. Old paling; flint stone, Kelvedon; Coggeshall.

L. arenaria, Pers. On sandstone, brick walls, Coggeshall; Chipping Hill.

L. phlogina, Ach. On elm, Kelvedon ; Braxted ; Rayne.

L. sophodes, Ach. On slates, on Colchester Roman wall ; and on sandstone, Kelvedon ; Colchester. *f. exigua*, Ach. Palings, Walton-on-Naze ; Kelvedon ; Coggeshall. *f. metabolica*, Ach. On sandstone, Kelvedon. Brick wall, Coggeshall. *f. lecideoides*, Nyl. Old paling, Kelvedon, 1884.

L. erysibe, Ach. Trees and walls, Kelvedon ; Halstead ; Feering. *f. fusco-cinerea*, Mudd. On hedge-bank, Inworth.

L. arthrocarpa, Dub. *f. fuscella*, Schær. Fir-trees, Kelvedon. Wood, Totham.

L. hæmatomma, Ehrh. On limestone, Coggeshall.

Pertusaria dealbata, Ach. Ash-tree, Rivenhall ; Kelvedon.

P. communis, D.C. Trees, Pods Wood, Messing ; Braxted ; Kelvedon ; Marks Hall.

P. melaleuca, Sm. Tree, Mile End, Colchester.

P. fallax, Pers. Trees, Kelvedon ; Wickham ; Marks Hall ; Pods Wood.

P. velata, Turn. Palings, Kelvedon ; Braxted. *f. variolaria-aspergilla*, T. and B. Oak-tree, Marks Hall, mixed up with *P. communis*.

P. faginea, Ach. Trees, brick walls, palings, old posts, Kelvedon, &c.

P. globulifera, Turn. Ash-trees, Kelvedon ; Inworth.

P. pustulata, Ach. On trees in woods, Kelvedon ; Yeldham ; Bentley ; Braxted ; Messing.

P. leioplaca, Ach. Trees in woods, Kelvedon ; Braxted ; Pods Wood.

Urceolaria scruposa, L. On brick walls and trunks of oak and elm, Kelvedon ; Braxted ; Feering. *f. bryophila*, Ach. On mosses on old walls, Kelvedon.

Phlyctis agelæa, Ach. On trees, oak and ash, Kelvedon ; Braxted ; Messing ; Copford ; Halstead ; Hatfield Broad Oak.

Lecidea ostreata, Hffin. On very old oak palings and posts, abundant where it grows, Rivenhall ; Kelvedon ; Marks Hall ; Aldham.

L. friesii, Ach. Old oak post, Inworth, 1884.

L. fuliginosa, Tayl. K—C— C. dissolves the crust. Sandstone, Kelvedon.

L. dispansa, Nyl. On flint stones, Tiptree Heath ; Wickham ; Witham.

L. crustulata, Ach. On flint stones in fields and roadsides, and on sandstone in a wall, Great Tey ; Tiptree ; Kelvedon.

L. flexuosa, Fr. Old palings, Copford.

L. decolorans, Flk. Kelvedon.

L. dubia, Borr. On the boarding of an old barn, Kelvedon.

L. quernea, Dicks. On oaks, Kelvedon ; Easthorpe.

L. enteroleuca, Ach. Brick walls, tiles, and sandstone, Kelvedon ; Feering. Corticole, Kelvedon ; Copford ; Witham ; Great Tey.

L. minuta, Schaer. Tree, Great Braxted.

L. tenebricosa, Ach. Gelat. hymenea I. blue. Tree, Pods Wood ; Braxted ; Hickmore Fen Wood.

L. parasema, Ach. Trees, old palings, walls, Feering ; Coggeshall ; Kelvedon ; Messing ; Rivenhall. Var. *tabescens*, Korb. On oak, Pods Wood. Var. *flavens*, Nyl. On palings, Feering ; Copford. Var. *elaeochroma*, Ach. Trees and palings, Witham ; Kelvedon ; Rivenhall ; Feering ; Baddow ; Lyston ; Walton-on-Naze.

L. uliginosa, Schrad. On earth, Warley Common ; Mile End, Colchester. f. *fuliginosa*, Ach. Old railings and ancient oak, Kelvedon ; Bocking. On the mortar of an old building with *Verrucaria nigrescens*.

L. coarctata, Sm. f. *elacista*, Ach. Wall, and on surface of a sand-pit, Braxted ; Copford. f. *involuta*, Tayl. Brick copings, sandstone walls, Kelvedon ; Great Tey ; Braxted ; Coggeshall. f. *glebulosa*, Sm. Essex, T. B. Hall. f. *ornata*, Smft. Wall, sandy bank, Braxted ; Bergholt ; Copford.

L. fuscoatra, Ach. Sandstone, bricks, tiles, Coggeshall ; Kelvedon ; Chipping Hill ; Feering. f. *fumosa*, Ach. Brick walls, Kelvedon ; Braxted ; Messing. f. *meiosporiza*, Nyl. Brick wall, Kelvedon.

L. sub-kochiana, Nyl. On sandstone, Kelvedon.

L. taylori, Salw. Coggeshall.

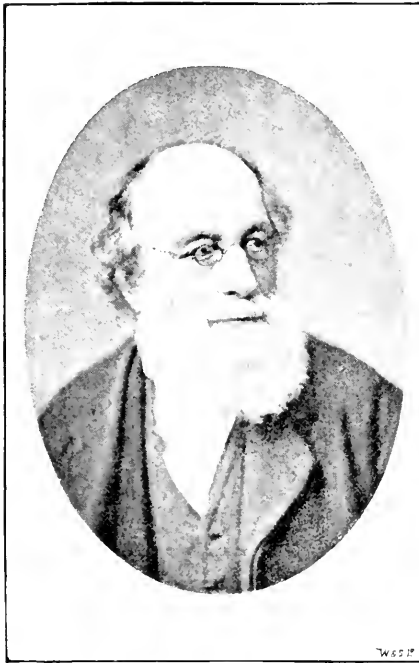
L. contigua, Fr. Var. *aggerata*, Mudd. Kelvedon.

L. confluens, Web. Tiptree, rocks, conglomerate gravel. f. *laevigata*, Leigh. Kelvedon.

L. canescens, Dicks. Chiefly on elms, Kelvedon ; Feering ; White Notley ; Inworth. (In fruit at Tattlingstone, Suffolk).

L. disciformis, Fr. Kelvedon ; uncommon.

L. myriocarpa, D.C. f. *chloropolia*, D.C. Old trees and pal-



EZEKIEL GEORGE VARENNE, of Kelvedon.

Born 1811. Died 1887.

ings, Kelvedon; Great Tey; Messing. f. *pinicola*, Ach. On elm, willow, fir, and horse-chestnut, Kelvedon; Coggeshall. f. *leprosa*, D.C. On elm, Kelvedon. f. *quercicola*, Rabh. On an oak, Kelvedon. f. *saprophila*, Ach. On paling, Kelvedon.

L. nigrītula, Nyl. Elm-tree, Kelvedon.

L. chalybeia, Borr. Flint stones, Tiptree Heath; Witham; Wickham.

L. grossa, Pers. On elms, Kelvedon; Rivenhall; Gosfield Hall, Mr. Piggott.

L. anomala, Fr. Kelvedon; Pods Wood; Messing; Felix Hall Park; Mile End, Colchester; Hickmore Fen Wood.

L. tricolor, With. On various trees, Kelvedon; Wickham; Mile End, Colchester; Troyes Wood; wood at Gosfield; Lyston.

L. ehrhartiana, Ach. Old wooden barns, Rivenhall; Easthorpe; Messing; Kelvedon. Apothecia liable to be destroyed by an insect pest.

L. caradocensis, Leight. Kelvedon; Marks Hall.

L. incompta, Borr. On an old tree, Great Braxted, 1883.

L. alboatra, Hffm. Trees, Kelvedon, &c. f. *populorum*, Mass. On poplar and ash-trees, Kelvedon; Coggeshall. f. *epipolia*, Ach. On tombstones; on flint in a wall, Kelvedon; Messing; Coggeshall. On old mortared wall, Ashdon.

L. dilleniana, Ach. On Brightlingsea Church wall. Habitat destroyed by the restoration of the church.

L. aromatica, Sm. Old wall, Kelvedon.

L. sphæroides, Dicks. Kelvedon; Feering.

L. umbrina, Ach. On sandstone, Kelvedon.

L. milliaria, Fr. f. *terrestris*, Fr. Tiptree Heath.

L. phacodes, Korb. On aged elm, Braxted Park, 1884.

L. sabuletorum, Flk. On moss on walls, Feering; Kelvedon.

L. premnea, Ach. On old trees, Marks Hall; Rivenhall; Kelvedon. Common in parks.

L. endoleuca, Nyl. On trees, Kelvedon; Braxted; Marks Hall; Wivenhoe; Great Tey; Sible Hedingham.

L. rubella, Ehr. On elms and other trees, Kelvedon; Aldham; Hickford Fen Wood; Braxted Park.

L. effusa, Sm. Var. *fuscella*, Fr. On trees in woods and parks, Kelvedon; Felix Hall Park; Fairstead; Great Tey. Var. *cinereo-pruinosa*, Mudd. Chelmsford, Mr. Piggott.

L. petræa, Wulf. f. *fuscescens*, Leight. On sandstone, Kelvedon.

L. tantilla, Nyl. On old rails and oak fences, Kelvedon ; Feering.

L. parmeliarum, Smrft. On the crust of *Lecidea quercea*, Dicks. Easthorpe.

L. parasitica, Fl. On *Pertusaria communis*, Braxted, 1883.

Opegrapha herpetica, Ach. f. *vera*, Leight. Chelmsford, Mr. Piggott. f. *rubella*, Pers. On a tree, Rivenhall. f. *rufescens*, Pers. On trees, Totham Wood ; Messing.

O. atra, Pers. On British and other trees and on a wooden barn, Kelvedon ; Fordham. f. *denigrata*, Ach. On ash-tree, Kelvedon ; Colne. f. *nigrita*, Leight. On birch and ivy and old barns, Kelvedon ; Woodham Walter ; Coggeshall. f. *parallela*, Leight. On trees, Kelvedon ; Inworth ; Woodham Walter. f. *hapalea*, Ach. On a tree near Orwell station. f. *arthonoidea*, Leight. On trees, Kelvedon ; Marks Hall ; Stoke-by-Nayland.

O. turneri, Leight. On trees and palings, Colne ; Kelvedon.

O. saxicola, Ach. Var. *chevallieri*, Leight. On old mortar, Kelvedon.

O. varia, Pers. f. *pulicaris*, Lightf. On trees, Kelvedon ; Epping Forest ; Dr. Crombie. f. *notha*, Ach. On trees, Kelvedon ; Braxted. f. *diaphora*, Ach. On trees, Braxted ; Kelvedon. f. *tigrina*, Ach. Kelvedon. f. *tridens*, Ach. Kelvedon.

O. vulgata, Ach. f. *vulgata*, Ach. On elm, ash, yew, Kelvedon ; Braxted ; Messing ; Woodham Walter. f. *stenocarpa*, Ach. On old willows, elm, oak, Great Braxted ; Kelvedon. f. *subsiderella*, Nyl. On elm, yew, Kelvedon ; Messing.

O. lyncea, Sm. On old oaks, Kelvedon ; Rivenhall ; Braxted.

Stigmatidium crassum, Dub. On hornbeam, Great Braxted ; Epping Forest, 1873.

Arthonia lurida, Ach. On oak, Halstead.

A. vinosa, Leight. On trees, Hickmore Fen Wood ; Pods Wood ; Messing. Var. *pineti*, Korb. Kelvedon ; Pods Wood. Wood near Gosfield.

A. punctiformis, Ach. On oak, Kelvedon ; Braxted ; Inworth ; Marks Hall.

A. astroidea, Ach. On ash, Braxted ; Kelvedon ; Inworth.

A. epipasta, Ach. Braxted.

A. swartziana, Ach. On trees, Kelvedon ; Braxted ; Beckingham ; Pods Wood ; Wickham ; Great Tey, Feering.

A. cinnabarina, Wallr. On trees. Var. *kermesina*, Nyl.

f. rosacea, T. and B. Easthorpe ; Rivenhall ; Woodham Walter.
f. marginata, T. and B. Kelvedon ; Woodham Walter ; Rivenhall ; Great Tey. Var. *pruinata*, Del. *f. dubia*, T. and B. Great Tey ; Kelvedon. Var. *anerythrova*, Nyl. On trees in woods, Kelvedon ; Braxted ; Great Tey. *f. detrita*, T. and B. Kelvedon.

A. pruinosa, Ach. On old palings, and boarded buildings, Kelvedon ; Coggeshall.

A. anastomosans, Ach. On young oak, Braxted, 1863.

Graphis elegans, Sm. Loughton.

G. scripta, Ach. *f. minuta*, Leight. On trees, Kelvedon.
f. varia, Leight. Kelvedon. *f. horizontalis*, Leight. Kelvedon.
f. divaricata, Leight. Wood at Totham. Var. *serpentina*, Ach. Kelvedon. *f. eulypa*, Ach. Kelvedon ; Marks Hall ; Baddow ; Hickmore Fen Wood. *f. spathea*, Ach. Copford. *f. tremulans*, Leight. Chelmsford, Mr. Piggott. *f. radiata*, Leight. Pods Wood.

G. dendritica, Ach. *f. smithii*, Leight. Hickmore Fen Wood ; Pods Wood ; Messing. *f. acuta*, Leight. Wood, at Messing. *f. obtusa*, Leight. Epping Forest, Dr. Crombie.

G. inusta, Ach. *f. vera*, Leight. Inworth ; Hickmore Fen Wood. *f. elongata*, Leight. Pods Wood ; Messing. *f. simpliciuscula*, Leight. Marks Hall ; Inworth ; Pods Wood ; Messing. *f. macularis*, Leight. Pods Wood ; Marks Hall.

G. sophistica, Nyl. On trees, Kelvedon. *f. flexuosa*, Leight. Marks Hall. *f. radiata*, Leight. Marks Hall ; Baddow. *f. divaricata*, Leight. Great Braxted ; Totham. Var. *pulverulenta*, Sm. On trees in woods. Kelvedon ; Terling ; Halstead ; Braxted ; Messing ; Totham. Var. *dendriticoides*, Leight. Kelvedon ; Troyes Wood.

Mycoporum miserrimum, Nyl. On young oaks in woods and hedges, Great Braxted ; Great Tey ; Marks Hall.

Verrucaria papillosa, Ach. Inworth. Var. *acrotella*, Ach. On flint stones in fields, Great Tey ; Kelvedon ; Coggeshall.

V. mutabilis, Borr. Kelvedon.

V. mauroides, Schær. On sandstone, Kelvedon.

V. nigrescens, Pers. Sandstone, flintstones, and mortar, Kelvedon ; Coggeshall ; Great Braxted.

V. plumbea, Ach. Brightlingsea.

V. glaucina, Ach. Old mortared wall, Kelvedon.

V. furcella, Turn. Old mortared wall, Ashdon.

V. macrostoma, Duff. Coggeshall, old wall.

V. viridula, Schrad. On sandstone, mortared walls, and brick walls, Kelvedon; Feering; Coggeshall; Mistley; Braxted. Roman wall, Colchester.

V. rupestris, Schrad. On a piece of chalk, Kelvedon. Oyns Brook Bridge.

V. muralis, Ach. Mortared and brick walls, Kelvedon.

V. subalbicans, Leight. On mortar, Kelvedon.

V. calciseda, D.C. On limestone, Coggeshall.

V. gemmata, Ach. Trees, Hickmore Fen Wood; Kelvedon.

V. conformis, Nyl. Tree, Kelvedon.

V. epidermidis. Birch-trees, Kelvedon. Var. *analepta*, Ach. Kelvedon; Myland; Great Tey. f. *fallax*, Nyl. Young oaks, Braxted; Mile End, Colchester. f. *cinereo-pruinosa*, Schær. On a tree, Kelvedon.

V. punctiformis, Ach. On holly, Colne Engaine.

V. biformis, Borr. On willow and other trees, Kelvedon; Rivenhall; Felstead; Witham.

V. salweii, Leight. Old mortared wall, Kelvedon.

V. rugulosa, Borr. On an old tile, Kelvedon.

V. chlorotica, Ach. f. *carpinea*, Schær. Colne Engaine.

V. nitida, Weig. Trees, Kelvedon; Messing. Var. *nitidella*, Flk. Rivenhall; Kelvedon.

V. glabrata, Ach. Var. *dermatodes*, Borr. On trees, Braxted; Rivenhall.

V. albissima, Ach. On birch, Braxted; Pods Wood, Kelvedon.

V. epipolytropia, Mudd. Parasitic on *Squamaria saxicola*. On a tile, Kelvedon.

V. hymenogonia, Nyl. Kelvedon; Messing; Mistley.

Melanotheca gelatinosa, Chev. On hazel, Kelvedon.

FUNGI.

Agaricus (Amanita) strobiliformis, Fr. Meadow, Braxted 1876.

A. (Lepiota) rachodes, Vitt. Wood, Braxted, 1875. Kelvedon, 1880.

A. (Tricholoma) gambosus, Fr. Pasture, Great Tey, 1877. Rivenhall, 1877. Easthorpe, 1878.

A. (Clitocybe) geotrupus, Bull. Braxted Rectory Park, 1875.

A. (Pleurotus) leightoni, Berk. In a cellar, Kelvedon, 1883.

- A. (Claudopus) enosmus**, Berk. On dead elm-trees, Kelvedon, 1873 and 1881.
- A. (Pholiota) durus**, Bolt. Kelvedon, 1874.
- A. (Pholiota) spectabilis**, Fr. Kelvedon, 1874 and 1881.
- A. (Naucoria) semiorbicularis**, Bull. Pasture, Kelvedon, 1876.
- A. (Panæolus) campanulatus**, L. Rivenhall Park, 1876.
- Polyporus fulvus**, Fr. On elm, Kelvedon, 1881.
- Corticium læve**, Fr. Kelvedon, 1880.
- Lycoperdon saccatum**, Vahl. Kelvedon, 1879.
- Didymium physarioides**, Fr. Near Kelvedon Hall Woods, and at Braxted, 1875.
- Arcyria punicea**, P. Kelvedon, 1879.
- Cyathus striatus**, Hoffm. Braxted, 1883.
- C. vernicosus**, D.C. Great Tey, 1881.
- Phoma radula**, B. and Br. On yew, Feering, 1881.
- P. depressum**, B. and Br. Kelvedon, 1881.
- Leptothyrium ribis**, Lib. Kelvedon, 1881.
- L. juglandis**, Lib. Kelvedon School-grounds, abundant, 1865.
- Dothiora sphæroides**, Fr. Ash-trees, Kelvedon, 1881.
- Piggottia astroidea**, B. and Br. Kelvedon, 1872.
- Discella carbonacea**, B. and Br. Braxted, 1873.
- Torula ovalispora**, Berk. Kelvedon, 1880.
- T. pulvillus**, B. and Br. Inworth, 1880.
- T. pulveracea**, Corda. Kelvedon.
- Phragmidium mucronatum**, Link. Kelvedon, 1873.
- P. bulbosum**, Sch. Kelvedon, 1851.
- P. gracile**, Grev. On raspberry, Kelvedon, 1871.
- Puccinia arundinacea**, Hedw. Kelvedon, 1871.
- P. graminis**, Pers. Kelvedon, 1865. Wivenhoe, 1873.
- P. coronata**, Corda. Kelvedon, 1873.
- P. polygonorum**, Link. Kelvedon, 1860.
- P. vincæ**, Berk. Kelvedon, 1874.
- P. sparsa**, Cooke. Kelvedon, 1878.
- P. compositarum**, Sch. Kelvedon, 1865.
- P. syngenesiarum**, Link. Kelvedon, 1870.
- P. malvacearum**, Corda. Kelvedon; Feering; Rivenhall, 1874.
- P. discoidearum**, Link. Kelvedon, 1865. Braxted and Feering, 1875.

- P. glomerata*, Grev. Kelvedon, 1873.
P. umbelliferarum, D.C. Kelvedon, 1865.
P. apii, Corda. Kelvedon, 1877.
P. lychnidearum, Link. Kelvedon, 1865.
P. epilobii, D.C. Kelvedon, 1877.
P. prunorum, Link. Kelvedon, 1865. Feering, 1867.
P. circææ, Pers. Kelvedon, 1873.
P. pulverulenta, Grev. Kelvedon, 1871.
P. fabæ, Link. Kelvedon, 1851.
Tilletia caries, Tul. Allshots Farm, Kelvedon, 1872.
Ustilago carbo, Tul. On barley, 1871 [locality not stated].
U. longissima, Tul. Kelvedon, 1876.
U. hypodytes, Fr. Alresford, 1874.
U. utriculosa, Tul. Kelvedon, 1851.
U. receptaculorum, Fr. Kelvedon, 1874.
U. antherarum, Fr. Kelvedon, 1870.
Uromyces apiculosa, Lev. Kelvedon, 1865. Feering,
 1872.
U. ficariæ, Lev. Wood, Braxted, 1873.
U. appendiculata, Lev. Kelvedon, 1865.
Coleosporum tussilaginis, Lev. Braxted, 1851. Kelvedon,
 1865.
C. petasitis, Lev. Kelvedon, 1865.
C. sonchi-arvensis, Lev. Kelvedon, 1865.
Melampsora populina, Lev. Kelvedon, 1865. Feering,
 1871.
M. salicina, Lev. Kelvedon, 1865. Braxted, 1873.
M. euphorbiæ, Cast. Kelvedon, 1851.
M. tremulæ, Tul. Chaulkney Wood, 1878.
Cystopus candidus, Lev. Kelvedon, 1851.
C. cubicus, Str. Kelvedon, 1871.
Uredo potentillarum, D.C. Tiptree Heath, 1873. Colne
 and Copford, 1877.
U. hypericorum, D.C. Inworth, 1853.
U. confluens, D.C. Wood, Braxted, 1873.
Trichobasis caricina, B. Wood, Colne, 1877.
T. oblongata, B. Chaulkney Wood, 1877.
T. suaveolens, Lev. Kelvedon, 1851.
T. geranii, B. Kelvedon, 1865.
T. betæ, Lev. Kelvedon, 1851.

- Lecythea epitea*, Lev. Little Braxted, 1877.
L. mixta, Lev. Kelvedon, 1865. Braxted, 1877.
L. saliceti, Lev. Marks Hall.
Ræstelia cancellata, Reb. Inworth, 1869.
R. lacerata, Tul. Kelvedon, 1878.
Æcidium albescens, Grev. Inworth, 1878.
Æ. tragopogonis, Pers. Great Tey, 1877.
Æ. crassum, Pers. Near Kelvedon.
Æ. berberidis, Pers. Kelvedon, 1853.
Æ. r. nunculacearum, D.C. Kelvedon, 1872. Braxted,
 1873.
Æ. urticæ, D.C. Witham, 1873.
Æ. compositarum, Mart. Kelvedon, 1852. Var. *tussilaginis*, Pers. Little Braxted, 1867.
Æ. violæ, Sch. Kelvedon, 1880.
Æ. geranii, D.C. Kelvedon, 1852.
Æ. primulæ, D.C. Inworth, 1880.
Æ. rubellum, Pers. Kelvedon, 1853.
Tubercularia granulata, Pers. Kelvedon, 1868.
Helminthosporium tiliæ, Fr. Felix Hall Park, 1872.
Macrosporium sarcinula, Berk. Kelvedon, on pea-pods,
 very abundant, 1871. On ivy-leaves, 1881.
M. cheiranthii, Fa. Var. β . *betae*, Cooke. Feering, 1872.
M. brassicæ, Berk. Kelvedon, 1866.
M. concinnum, Berk. On leeks, Kelvedon, 1878.
Cladosporium dendriticum, Wallr. On pears, Kelvedon,
 abundant, 1876.
C. epiphyllum, Nees. Kelvedon, 1872.
Peronospora infestans, Mont. Kelvedon, 1871.
P. gangliiformis, Berk. On *Sonchus oleraceus*, Kelvedon,
 1871.
P. urticæ, Casp. Kelvedon, 1871.
P. schleideniana, De By. Kelvedon, 1871.
Polyactis vulgaris, Ik. On grapes, greenhouse, Kelvedon,
 1877.
P. fascicularis, Corda. On *Iris pseudacorus* in decay, 1880
 [no locality given].
Oidium concentricum, B. and Br. Kelvedon, 1872.
O. erysiphoides, Berk. On vegetable-marrows, Kelvedon,
 1884.

- Sphærotheca castagnei*, Lev. Kelvedon, 1865.
Uncinula adunca, Lev. Kelvedon, 1871.
U. bicornis, Lev. Kelvedon, 1865.
Phyllactinia guttata, Lev. Kelvedon, 1865.
Podosphæria kunzei, Lev. On apricot-leaves, Feering,
 1884.
P. clandestina, Lev. Kelvedon, 1870.
Microsphæria grossulariæ, Lev. Kelvedon, 1870.
M. mougeotii, Lev. Kelvedon, 1865.
M. penicillata, Lev. Kelvedon, 1865.
Erysiphe lamprocarpa, Lev. Kelvedon, 1865.
E. martii, Link. Kelvedon, 1865.
E. montagnei, Lev. Kelvedon, 1871.
E. tortilis, Link. Kelvedon and Braxted, 1865.
E. communis, Schl. Kelvedon and Inworth, 1865.
Peziza salm-nicolor, B. and Br. On the earth in a fern-
 pot, Kelvedon, 1881.
P. domestica, Sow. Kelvedon, 1882.
Patellaria lignyota, Fr. Feering, 1882.
Claviceps purpurea, Tul. Kelvedon, 1871.
Rhizisma acerinum, Pers. Kelvedon, 1851.
Hysterium angustatum, A. and S. Colne.
Epichloe typhina, Berk. Kelvedon, 1852. Alresford, 1878.
Dothidea rubra, Pers. Kelvedon, 1851.
D. ulmi, Fr. Kelvedon, 1851.
D. trifolii, Fr. Kelvedon, 1873.
Diatrype quercina, Tul. Inworth, 1880.
D. verrucæformis, Fr. Braxted, 1873.
Massaria currei, Tul. Kelvedon, 1881.
Sphæria apotheciorum, Mass. Kelvedon.

MARINE ALGÆ.

- Fucus vesiculosus*, L. Walton, 1867.
F. serratus, L. Walton, 1867. Harwich, 1876.
Himanthalea lorea, Lyngb. Walton, 1867.
Dictyota dichotoma, Huds. Walton, 1867.
Punctaria plantaginea, Roth. Harwich, 1876.
Elachistea fucicola, Vel. Maldon, 1867.
Cladostephus verticillatus, Light. Walton, 1845.
Sphacelaria scoparia, L. Walton, 1845.

- Ectocarpus littoralis*, L. Walton, 1845.
Bostrychia scorpioides, Gm. On the lower part of stems of *Spartina stricta*, Wivenhoe, 1873.
Polysiphonia atrorubescens, Dillw. Essex coast.
P. byssoides, Good. Walton, 1845.
Corallina officinalis, L. Walton, 1867.
Jania rubens, L. Harwich, 1876.
Nitophyllum laceratum, Grey. Walton, 1867.
Plocamium coccineum, Huds. Walton, 1845.
Rhodymenia ciliata, L. Walton, 1845.
R. palmata, L. Harwich, 1876.
Gracilaria confervoides, L. Walton and Harwich, 1867.
Chondrus crispus, L. Southend, 1864.
Polyidern rotundus, Gmel. Walton, 1845.
Furcellaria fastigiata, Huds. Walton, 1845.
Ceramium rubrum, Huds. Maldon, 1844. Walton, 1867. Harwich, 1880.
Griffithsia setacea, Ell. Walton, 1867.
Cladophora rupestris, L. Southend, 1844.
C. lætevirens, Dill. Walton, 1845.
Conferva litorea, Harv. Walton, 1873.
C. linum, Roth. Southend, 1844.
Enteromorpha intestinalis, L. Blackwater River, 1844. Maldon, 1868.
E. compressa, L. Walton, 1845.
E. erecta, Lyngb. Wivenhoe, 1875.
E. clathrata, Roth. Wivenhoe, 1873. Maldon.
E. percursa, Ag. Maldon, 1868. Wivenhoe, 1873. Mistley, 1880.
Ulva latissima, L. Maldon, 1884. Harwich.
Porphyra laciniata, Light. Maldon, 1867.
P. vulgaris, Ag. Southend, 1844.

FRESH-WATER ALGÆ.

- Vaucheria dillwynii*, Ag. Kelvedon, 1850.
V. repens, Hass. Kelvedon, 1850.
V. hamata, Vauch. Kelvedon, 1850.
V. terrestris, Vauch. Kelvedon, 1850.
V. aversa, Hass. Kelvedon, 1850.
V. ornithocephala, Ag. Kelvedon, 1850.

V. sessilis, Vauch. Kelvedon, 1850.

V. geminata, Vauch. Kelvedon, 1850.

V. racemosa, Vauch. Rivenhall, 1850. Kelvedon, 1865.

V. ovoidea, Vauch. Kelvedon, 1850.

V. polysperma, Hass. Pond, Messing, 1880.

Batrachospermum confusum, Hass. Near Kelvedon Bridge. Brook, Feering Hill, 1855. Ditches, Coggeshall Meadows, 1859.

B. stagnale, Hass. Rivenhall Water, 1850. Kelvedon, 1855. Coggeshall Meadows, 1859. Oyns Brook, Messing, on submerged branches and roots, 1880.

B. moniliforme, Hass. Kelvedon, 1850. Rivenhall Brook, 1858.

B. vagum, Ag. Rivenhall, 1858.

B. atrum, Harv. Brook near Kelvedon Bridge, 1855. Tip-tree Heath, 1860.

Draparnaldia glomerata, Ag. Kelvedon, 1850.

D. plumosa, Ag. Blackwater River, Kelvedon, 1850.

D. elongata, Hass. Ditch, Easthorpe Lane, 1880.

D. nana, Hass. Braxted, 1859.

Chætophora endiviæfolia, Ag. Rivenhall, on decaying leaves, 1850. Pond, Kelvedon, 1862. Near Hatfield Broad Oak, 1873.

C. tuberculosa, Hook. Pond, Rivenhall, 1858. Fountain, Coggeshall Road; Kelvedon, 1858. Pond, Ewell Hall, 1859.

C. elegans, Ag. Tey, 1850. Feering Moors, 1855. Kelvedon, 1867.

C. pisiformis, Ag. Ditch, Easthorpe Lane, 1880.

Zygnema orbiculare, Hass. Brook, Easthorpe, 1859.

Z. interruptum, Hass. Waste water beyond Kelvedon (Everett's) Mill, 1858. Abundant at bottom of river there, 1859. Near Maldon, 1858.

Z. serratum, Hass. Colne, near Chaulkney Mill, 1876.

Z. nitidum, Ag. Kelvedon and Tiptree Heath, 1850.

Z. belle, Hass. Kelvedon, 1850. Pond near Marylands, Braxted, 1859. Brickfield, Inworth, 1883.

Z. neglectum, Hass. Gore Pit, 1865.

Z. decimum, Ag. Rivenhall, 1858. Witham, 1859.

Z. quininum, Ag. Blackwater River, Kelvedon, 1855. Pond and ditch on Langley's Farm, Kelvedon, 1858.

- Z. varians*, Hass. Kelvedon and Braxted, 1850. Pond near Ewell Hall, 1855. Feering, 1859.
- Z. æstivum*, Hass. Ditch, Church Hall, Kelvedon, 1858. Easthorpe, 1876.
- Z. malformatum*, Hass. Rivenhall, 1858.
- Z. catenæforme*, Hass. Kelvedon, 1880.
- Z. gracile*, Hass. Pond near Kelvedon Hall, 1865.
- Z. commune*, Hass. Feering, 1867.
- Z. flavescens*, Hass. Messing, 1858. Brickfield, Inworth, 1883.
- Z. inæquale*, Hass. Kelvedon, 1850.
- Z. tenuissimum*, Hass. Kelvedon and Feering, 1883.
- Z. woodii*, Hass. Kelvedon, 1850.
- Z. affine*, Hass. Inworth, 1883.
- Z. mirabile*, Hass. Near Doewra's Mill, Kelvedon, 1858. Easthorpe Lane, and pond on Ewell Hall Farm, 1859. Messing, 1869.
- Z. hassallii*, Jenner. Rivenhall, 1850. Gore Pit, 1855. Kelvedon, 1858.
- Z. quadratum*, Hass. Kelvedon, 1850.
- Z. jenneri*, Hass. Braxted, 1850. Kelvedon, 1883.
- Z. insigne*, Hass. Feering, 1850.
- Tyndaridea anomala*, Ralfs. Claypit, Messing, 1858. Easthorpe, 1859.
- T. lutescens*, Hass. Bergholt Heath, 1862.
- Mesocarpus scalaris*, Hass. Kelvedon and Feering, 1883.
- M. intricatus*, Hass. Kelvedon and Feering, 1883.
- M. parvulus*, Hass. Kelvedon and Feering, 1883.
- Mougeotia genuflexa*, Ag. Kelvedon, 1850. Pond, Gore Pit, 1855.
- Zygonium ericetorum*, Kutz. Tiptree Heath, 1850.
- Vesiculifera paludosa*, Hass. Cranes Pond, 1865.
- V. fasciata*, Hass. Pond near Rook Hall, 1865. Feering, 1867.
- V. sphærica*, Hass. Pond near Kelvedon Hall, 1860. Ditch in Coggeshall Hall Meadows, 1866. Kelvedon, 1883.
- V. flavescens*, Hass. Rivenhall, 1850.
- V. hexagona*, Hass. Ditch, Western's Meadows, 1855. Tiptree Heath, 1865.
- V. mulleri*, Hass. Kelvedon, 1850.

V. rothii, Hass. Kelvedon, 1850. Near Birch Holt, 1859. Cranes Pond, 1865.

Bulbochæte setigera, Ag. On *Ranunculus trichophyllus*, 1851. [No locality given].

Cladophora glomerata, Dillw. Kelvedon, 1844. Messing, 1850.

C. crispata, Sm. Kelvedon; Tiptree, 1850.

Conferva linum, Roth. Ditch, Dovercourt, 1865.

Coleochæte scutata, Breb. Var. β . on a leaf of *Hypnum fluitans*, pond near Kelvedon Hall, 1860.

L. yngbya zonata, Hass. On stones in the waste water near Braxted Mill, 1855. Kelvedon, 1858.

L. muralis, Ag. Kelvedon, 1850.

L. copulata, Hass. Ditch near sea-wall, Dovercourt, 1865.

L. thompsoni, Harv. On a stick in a pond, Kelvedon, 1858

L. floccosa, Ag. Kelvedon, 1850. Birch Holt, 1855. Messing, 1858. Feering, 1883.

L. punctalis, Hass. Near Docwra's Mill, Kelvedon, 1855. In an aquarium, attached to *Ranunculus aquatilis*, 1858. Felix Hall, 1865. Tiptree Heath, 1880.

L. vermicularis, Hass. Ditch, Feering Moor, 1855. Tiptree Heath, 1858. Pond on Ewell Hall Farm, 1859.

Hydrodictyon utriculatum, Roth. Blackwater River, Kelvedon, and abundantly in the back ditch at Docwra's Mill, 1859.

Oscillatoria limosa, Ag. Near Docwra's Mill, Kelvedon, 1855.

O. cinerea, Hass. Kelvedon, 1858.

O. tenuis, Ag. Inworth, 1850. Kelvedon, 1855.

O. muscorum, Ag. On *Hypnum ruscifolium*, Kelvedon, 1863.

O. contexta, Carm. Kelvedon, 1850.

O. decorticans, Grev. Wall near Kelvedon Mill, 1858.

Microcoleus repens, Harv. Kelvedon, 1868.

Raphidia angulosa, Hass. Feering, 1867.

R. viridis, Hass. Feering, 1867.

Spirillum jenneri, Hass. Kelvedon, intermixed with *Oscillatoria tenuis*, 1859. Feering and Braxted Hall, 1880.

Anabaina flosaquæ, Bory. Kelvedon. Near Dovercourt, 1865.

A. impalpebralis, Bory. Kelvedon, 1865. Yeldham, 1866.

Nostoc commune, Vauch. Kelvedon, 1844.

N. foliaceum, Ag. Messing, 1880.

Ulva bullosa, Roth. Kelvedon, 1850. Oyns Brook, Messing, 1858.

U. crispa, Light. Kelvedon, 1850.

Tetraspora lubrica, Ag. Blackwater ditches, Kelvedon, 1847.
On stones in brook at Rivenhall, 1848.

T. gelatinosa, Desv. Kelvedon, 1845.

Enteromorpha intestinalis, Link. Kelvedon, in the rivers and ditches, abundant.

Botrydium granulatum, Grev. Kelvedon.

Palmella cruenta, Ag. Kelvedon, 1850.

Hæmatococcus vulgaris, Hass. Kelvedon.

Glæoprium mucosum, Berk. Feering and Braxted, 1850.

Coccochloris protuberans, Spreng. Kelvedon, 1859.

C. hyalina, Meneg. Kelvedon, 1850.

C. mooreana, Hass. Kelvedon, 1850.

Closterium ehrenbergii, Meneg. Kelvedon, 1858.

C. moniliferum, Ehr. Feering, 1880.

C. rostratum, Ehr. Feering, 1880.

C. lunula, Ehr. Kelvedon, 1880.

C. acerosum, Ehr. Feering, 1880. Inworth, 1883.

Scenedesmus acutus, Meyen. Kelvedon, 1883.

Meloseira varians, Ag. Kelvedon, 1858. Feering, and Long Melford, 1865. In the Chelmer at Chelmsford, 1866.

Achnanthes minutissima, Kutz. Feering Moors, 1865.

Tabellaria flocculosa, Ag. Kelvedon, 1858.

Diatoma vulgare. Bory. Kelvedon, 1850.

D. elongatum, Ag. Feering, 1865.

Fragilaria hyemalis, Lyng. Feering, 1880.

F. rhabdosoma, Ehr. Chelmer at Broomfield, 1865. Kelvedon, 1867.

Gomphonema truncatum, Ehr. Kelvedon, 1858.

G. cristatum, Ralfs. Kelvedon, 1867.

G. berkeleyi, Grev. Feering Moors, 1865. Brook in Ewell Hall Lane, Kelvedon, 1867.

Cymbella turgida, Hass. Kelvedon, 1864.

Navicula phœnicenteron, Ehr. Kelvedon, 1867.

N. palea, Hass. Feering, 1880.

N. lanceolata, Ehr. Kelvedon, 1845. Feering Moors, 1865.

Exilaria capitata, Ehr. Kelvedon, 1865.

E. ulna, Ag. Kelvedon, 1865.

E. fasciculata, Kutz. Rivenhall, 1844. Feering, 1865.

Gyrosigma hippocampa, Ehr. Ditch, Kelvedon, 1880.

Nitzschia elongata, Hass. Kelvedon, 1880.

Sphinctocystis librilis, Hass. Pond, Messing, 1880.

Frustulia viridis, Kutz. Kelvedon, 1880.

Encyonema prostratum, Kutz. Among *Zygnema interruptum*, in the river at Kelvedon, 1870.

THE BIBLIOGRAPHY OF ESSEX.

AN influential Committee, consisting mainly of members of the Essex Field Club and the Essex Archæological Society, has been formed for the purpose of arranging for the compilation and publication of a comprehensive Bibliography of Essex, which shall enumerate all books, pamphlets, magazine articles, maps, prints, and other publications that wholly or largely treat of the Topography or History of the County of Essex; or that have been written by, or about, prominent natives of, or residents in, the county; together with all works that have been published within its borders. Lord Rayleigh has consented to act as *President*; Mr. F. Chancellor, *Treasurer*; and Messrs. E. A. Fitch and Miller Christy *Hon. Secretaries*. When the work is considered sufficiently complete, the MS. will be offered to the Essex Field Club, for publication as one of the "Special Memoirs."

On Wednesday afternoon, March 18th, the first meeting of the Committee was held in the Shire Hall, Chelmsford. Dr. Henry Laver, of Colchester, was voted to the chair, and others present were Messrs. Thomas Bird, Romford; Fred Chancellor, Chelmsford; Wm. Cole, Buckhurst Hill; E. Durrant, Chelmsford; Arthur J. Furbank, Chelmsford; J. Chalkley Gould, Loughton; J. C. Shenstone, Colchester; Miller Christy, Chelmsford; E. A. Fitch, Maldon and W. H. Dalton. It was agreed that the Association should be known as the "Essex Bibliographical Committee," and it was resolved that it should consist of not more than thirty members, and that the contribution of each member should be two guineas. Lord Rayleigh, who wrote expressing his approval of the scheme, was elected President of the Committee, Mr. Chancellor, Treasurer, and the election of the Hon. Secs. was confirmed. Messrs. G. Alan Lowndes, Bird, Durrant, and Gould, with the Officers, were appointed an Executive Committee, with power to add two other members to their number. The General Rules for the guidance of the Executive Committee were agreed to, and it was understood that a set of complete rules to be observed by the compilers would at once be drawn up, together with a typical set of specimen title-slips, &c. Any further information will be gladly given by the Hon. Secretaries, Mr. E. A. Fitch, *Brick House, Maldon*, and Mr. Miller Christy, *Chelmsford*. The members of the Club are strongly urged to aid the Committee in any way in their power—a good bibliography of the county would be of the greatest service to all interested in Essex.

THE ESSEX FIELD CLUB.

ORDINARY AND ANNUAL GENERAL MEETING, AND SPECIAL MEETING.

Saturday, January 31st, 1891.

[The members from a distance assembled in the Museum during the afternoon, where they examined the loan collections from South Kensington, and some explored the environs of the town. Tea was taken at the "Saracen's Head" Hotel, the President in the chair.]

THE Eleventh Annual General Meeting of the Club was held in the Essex and Chelmsford Museum, New Bridge Street, Chelmsford (kindly placed at the disposal of the Council by the Committee of the Museum), at half-past six o'clock, Mr. E. A. Fitch, President, in the chair.

Previous to the Annual Meeting, an ORDINARY MEETING (the 121st) was held. The Rev. W. S. Lach-Szyrma, M.A., was elected a member.

The meeting then resolved itself into the

ELEVENTH ANNUAL GENERAL MEETING.

The minutes of the tenth Annual Meeting, held on February 1st, 1890, were read and confirmed.

The Secretary (Mr. W. Cole) read the Annual Report of the Council for 1890 (see p. 35).

Mr. Walter Crouch read the Treasurer's Annual Statement of Accounts, which had been duly audited by Mr. C. Ridley and himself (see pp. 40, 41).

On the motion of Mr. Avery, seconded by Mr. Corcoran, the report and statement were received and adopted.

Mr. Float and Mr. Day were chosen as scrutineers of the ballot for the election of new members of Council and officers for 1891, the President remarking, alluding to the nominations for the Council, that it was the first "contested election" of the Club.

The following members retired from the Council in accordance with Rule III.:—Messrs. W. J. Argent, G. C. Harcourt, N. F. Robarts, and Thomas Royle.

To fill the four seats so rendered vacant, the following members were proposed at the meeting on December 30th, 1890: Messrs. H. Cohn, Edmund Durrant, A. J. Furbank, T. B. Linley and J. H. Porter.

While the votes were being counted, Mr. F. Chancellor (Chairman of the Committee of the Essex and Chelmsford Museum) accorded all a very hearty welcome in the name of the Museum authorities, and at the request of the President, spoke of the Loan Collection of Indian Art fabrics and Art specimens which had been placed in the Museum by the South Kensington authorities to illustrate a course of lectures on India which had been carried on during the winter. He also alluded to the collection of Geological specimens, formed by the late Rev. E. S. Wright, rector of Vange, which had been bequeathed to the Museum, and recently handed over by his son and daughter.

The scrutineers reported that the following had been elected into the Council: Messrs. H. Cohn, E. Durrant, A. J. Furbank, and J. H. Porter.

They also reported that the following had been elected as officers for 1891 : *President*, Mr. E. A. Fitch ; *Treasurer*, Mr. A. Lockyer ; *Hon. Secretary*, Mr. W. Cole ; *Assistant Hon. Secretary*, Mr. B. G. Cole ; *Librarian*, Mr. A. P. Wire.

Mr. Fitch warmly thanked the members for re-electing him as their President. In accordance with the unwritten law of the Club, he had exceeded the usual term of office, but his colleagues were anxious that he should continue during the settlement of the scheme of amalgamation, and as he had taken very great interest in the question of the Museum he was very happy to assume the pleasant duties of President for another year. As so much important business lay before the meeting, he had thought it best to omit the usual Address on this occasion.

Mr. Varley proposed a vote of thanks to the officers, which was seconded by Mr. Cohn, and carried unanimously.

The President then declared the meeting a SPECIAL one, for the purpose of considering the scheme for the amalgamation of the Essex and Chelmsford Museum with the Club, and other matters, in accordance with the notice given at the last meeting.

The President then read the scheme (which is printed in full in the *ESSEX NATURALIST*, vol. iv. pp. 236-241, and also separately) and in doing so alluded to the cordial relations which existed between the present Committee of the Museum and the Club, and the friendly way in which the somewhat difficult negotiations for the amalgamation had been carried on by the Joint Committee appointed for the purpose. The scheme had been unanimously passed by the Joint Committee and by the Council of the Club, and it was now submitted to the members.

Professor Meldola, in an earnest speech, strongly recommended the scheme to the favourable consideration of the meeting. The formation of a really good local Museum had always an object with the Club—they had made progress in gathering materials, and a scheme had been much discussed some years ago, but they had never been able to meet with sufficient support. The present scheme had been carefully drawn up by their Secretary, and had been fully considered and unanimously agreed to by the representatives of the two bodies ; it had been received with approval by all their colleagues, and as far as he could learn by all the members. If a local Museum was to be established in Essex, Chelmsford was certainly the best site for it—as being the county town, and as occupying a very central position. He therefore begged to move :—

“That the plans for the amalgamation of the Essex and Chelmsford Museum with the Essex Field Club, and for the establishment of a Local Museum, as set forth in the scheme, be adopted.”

Dr. Thresh, as an inhabitant of Chelmsford, and as a member of the Club, seconded the resolution. He pointed out the advantages to the county town, and the advantages which would accrue to both the Field Club and Museum by the amalgamation, adding that the Museum would be built up and made worthy of Essex by the labours of the Field Club, and the latter would add a local habitation to its name. Unfortunately in many respects Chelmsford had not taken the position which a county town might be expected to take, more particularly in regard to education. It was quite time some effort was made to shake off this indifference, and to realise that there were responsibilities as well as privileges attaching to the position of county town of such a district as Essex. With the erection of a new Grammar School one reproach would be wiped away ; whilst, by the amalgamation of the Field Club and Museum, another would be removed.

Mr. J. Taylor owned to a feeling of regret that the words “Chelmsford Museum” did not in any way form part of the title of the new Society.

The President pointed out that the Committee had thoroughly considered the

matter, and they had decided to unite the two bodies under the name of "The Essex Field Club," thinking that as Chelmsford would get the Museum it did not much matter, and that there would be very serious objections to altering the title of the Club. There was really not much in the point, as the proposed institution would be the Museum of the Essex Field Club at Chelmsford—the greater included the less. The objection was also answered by Mr. Chancellor, Mr. F. H. Meggy, Mr. J. C. Shenstone, and Professor Boulger, Mr. Chancellor saying that he thought the substance was worth far more than the shadow. Mr. Meggy complimented the Committee on their very comprehensive and able scheme, and gave it his hearty support. Professor Boulger hoped there would be no note of discord emanating from Chelmsford, and pointed out that, as a county institution, they would be in a far better position to appeal for funds than as a merely local society.

The resolution was passed unanimously amid cheers.

In reply to a question from the President, Mr. Chancellor, as Chairman of the Committee of the Essex and Chelmsford Museum, stated that the scheme had been passed unanimously by the Committee and by the Subscribers to the Museum.

On the recommendation of the Council it was also agreed that if and when the amalgamation takes effect, the annual subscription of *new* members elected after the date of such event shall be £1 1s., with an entrance-fee of 10s. 6d. (to include the ESSEX NATURALIST, post-free as published), and that the life-membership shall be £10 10s. *plus* the entrance-fee.

The President said that the next subject to be brought before the members was the important scheme of technical instruction, which had been prepared with very great care by the Secretary, with the assistance and advice of several scientific men and teachers, and which had been submitted to the County Council, many members of which body had favourably received it. The Parliamentary Committee had appointed a sub-committee to consider the question of technical instruction in the county under the authority of the recent Acts of Parliament, and they had consented to receive an important deputation from the Club on Monday next, so that the details of the Club's scheme might be brought before them. He asked the Secretary to read the scheme.

The Secretary read the scheme, which is fully set out in the last volume of the ESSEX NATURALIST (vol. iv. pp. 259-262), and which had been printed in a separate form and extensively circulated.

Professor Meldola, who has had a very large experience in connection with technical education, spoke in high terms of the scheme, dwelling on the great advantage there would be in establishing one really good centre, which must be much more beneficially productive than if the money were frittered away in small sums. He gave a happy definition of what technical education is, namely, "science applied to human industries."

Professor Boulger was equally warm in favour of the project. His only objection was that the Council did not ask enough; he noticed that the word "minima" was used in connection with the sums asked for in the scheme, and he rather thought that instead of five or six centres there ought to be five-and-twenty. No county had yet propounded any such comprehensive scheme as this, and it was greatly to the credit of the Club that they had taken the lead in this important matter.

The President said it was very probable if the County Council were satisfied with what the Field Club did in a small way, to begin with, they would be inclined to make a much larger grant than was now asked for.

Mr. Shenstone thoroughly backed up the idea of an efficient central organisation.

Mr. W. G. Shadrake, a member of the Leyton School Board, said he had no doubt that many of the local bodies who had sent in applications to the County Council for a share of the money had done so simply with the view of being in it when the plunder was divided. (Laughter). He regarded the small sums they were likely to get as a white elephant, as they would be too small to be of any practical use for technical education. He believed many of them would be willing to withdraw their applications, and to petition the County Council in favour of the scheme of the Field Club. He should be very glad to bring forward a motion of that kind at the Board of which he was a member.

Several other members took part in the discussion, and the unanimous opinion appeared to be that the scheme was one well worthy of support, but no vote was taken on the subject.

This brought to a close one of the most interesting and fully-attended Annual Meetings ever held by the Club (members came from all parts of the county, as well as from London, to attend), and genuine enthusiasm was shown in the two schemes which came under discussion. The arrangements for the meeting in the Museum, the tea, etc., were very kindly undertaken by Mr. Durrant, to whom the best thanks of the Club are due.

DEPUTATION TO THE COUNTY COUNCIL, MONDAY, FEBRUARY 2ND, 1891.

By invitation, a deputation from the Club, consisting of Sir Henry Roscoe, M.P., F.R.S. (one of the authors of the Technical Instruction Act, 1889), Prof. W. H., Flower, C.B., F.R.S. (Director of the British Museum), Prof. Meldola, F.R.S. (City Guilds Technical College), Prof. Boulger, F.G.S., Mr. F. W. Rudler, F.G.S. (Director of the Museum of Practical Geology), and Mr. W. Cole, Hon. Sec., waited upon the Parliamentary Committee of the Essex County Council, at 35, New Broad Street (Mr. E. N. Buxton, Chairman of the Parliamentary Committee, presiding), to advocate the central scheme of Technical Education in Essex, put forward by the Council of the Essex Field Club. Lord Rayleigh, Secretary to the Royal Society, was unavoidably prevented from being present. The speakers strongly urged the claims of the Essex Field Club to bear some part in any work for the promotion of scientific and technical instruction in the county, and bore testimony to the high position the Club had attained by reason of its excellent publications, and steady adhesion to one plan of work. They explained the broad features of the Club's scheme (fully set out in the last volume of the *ESSEX NATURALIST*, vol. iv. pp. 259-62), and insisted on the great importance of establishing a central institution, in addition to making any grants for local purposes. The scheme would provide such a central body, and would send competent teachers and lecturers, furnished with apparatus for practical class-teaching, into the rural districts, thus bringing high-class instruction to the very doors of the country and agricultural folk, and affording them advantages from the grant almost equal to those possessed by the urban populations.

After answering some questions, and being assured by the Chairman that their views would receive due consideration, the members of the deputation withdrew.

ORDINARY MEETING, SATURDAY, FEBRUARY 28TH, 1891.

THE 122nd Ordinary Meeting was held in the Town Hall, Leyton, at 6.30, Mr. E. A. Fitch, President, in the chair.

The following were elected members of the Club: Messrs. Gerald Christy, W. W. Duffield, A. C. Freeman, J. D. L. Lamarque, Norman Lott, H. B. Rowan, Augustus A. Timbrell, C.C., and Mrs. M. E. Marsh.

The President nominated the following as Vice-Presidents during his year of office: Messrs. E. N. Buxton, J.P., Aldm., C.C., Walter Crouch, F.Z.S., Henry Laver, M.R.C.S., F.L.S., F.S.A., and the Right Hon. Lord Rayleigh, F.R.S.

The Librarian announced the additions to the Library by gift, purchase and exchange, and thanks were voted to the donors.

Prof. Meldola called attention to the work of the Committee appointed by the British Association "to report upon the application of photography to the elucidation of meteorological phenomena, and to collect any photographs of such phenomena." He distributed copies of the circular issued by the Committee, and hoped that all members who were practical photographers would aid in the work.

Mr. Fitch read a paper entitled "A Day on the Crouch River," being an account of a day's "fishing" with a trawl-net in company with Mr. Crouch last summer. In illustration of the paper were exhibited preserved specimens of the species obtained, comprising Crustacea, Mollusca, Echinodermata, Sponges, &c. Many of the species had never before been recorded from Essex, thus showing that there was plenty of work for the members to do in the department of marine zoology.

Prof. Meldola, in proposing a vote of thanks to Mr. Fitch, said that he looked upon the paper as quite a typical one for a Naturalists' society—it was a careful record of actual work done and observations made in their own district, and he should like to see more papers of the kind communicated to the Club.

Mr. Crouch read "Notes on a Female Specimen of the Common Rorqual (*Balaenoptera musculus*) lately stranded near Burnham, with remarks on the Balaenopteridæ (Finner Whales)." In illustration of the paper Mr. Crouch showed a long series of drawings, diagrams and prints, and Mr. A. P. Wire also showed some drawings.

Remarks on the paper were made by Mr. Gillham, Mr. A. C. Freeman, the President, &c., and a cordial vote of thanks was accorded to the author.

The Secretary read for Mr. J. French a paper entitled "Notes on the late prolonged Frost," upon which a short discussion arose, carried on by Prof. Meldola, Mr. Wire, Mr. Fitch, and others, the latter reminding members that such notes were just the kind of communications they desired for the *ESSEX NATURALIST*.

The introductory portions of an elaborate paper on "The Cryptogamic Flora of Kelvedon and its neighbourhood; compiled from the collections and notes made during half a century by the late E. G. Varenne," was read for Mr. Marquand (see *ante*, pp. 1-30), by the Secretary, who referred to the very valuable character of the paper, and moved a very hearty vote of thanks to Mr. Marquand for the trouble he had taken in compiling the lists.

A very large number of specimens, drawings, photographs, &c., were exhibited by Mr. Crouch, Mr. Fitch, Mr. Wire and others, and the usual service of light refreshment brought the meeting to a close.

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR ENDING DECEMBER 31st, 1890.

[Read and adopted at the Annual Meeting, on January 31st, 1891.]

THE Council is glad to report that the considerable accession of new members which commenced some few years back still continues, and more than compensates for the usual number of resignations and removals from various causes. During the past year 42 persons have joined the Club. Until the Council

finally decides on the course of action with regard to members in arrear with their subscriptions it is difficult to state the exact number of members. It may be put provisionally at about 420.

In accordance with the intimation in last year's report, the Council very carefully considered the important question of the revision of the rate of subscription, and eventually, with some reluctance, decided to recommend the members to adopt the following proposals :—

That the Subscription shall remain as before, viz., 10s. 6d. per annum, but that each member wishing to receive the "Essex Naturalist" shall subscribe a further sum of 4s. 6d. in advance in each year towards the expenses of publication, postages, &c.

That the Life Membership shall be £8 8s.

The reasons for these proposals were fully put before the members in a special circular (which is set out in the E.N., vol. iv., pp. 228, 229), and need not be repeated here. The question was simply whether the publications should be curtailed, with an almost certain injury to the usefulness and prestige of the Club, or whether the members should voluntarily tax themselves with an increased subscription, and so enable the Council to carry on the work with vigour. The latter course was adopted, and the Council feels assured that when the slight difficulties and friction consequent upon any changes of the kind have passed away, the new rules will work well.

The Council much regrets that, notwithstanding every reasonable economy, the payments on the general account have again exceeded the receipts, and the balance on the wrong side is now £76 4s. 4d., as against £41 18s. 10d. on the 31st of December, 1889, being an increase of £34 5s. 6d. A considerable portion of this is, however, accounted for by the exceptionally heavy printers' bill which was carried over from 1889, viz., £46 2s. 6d., as compared with the one now due, viz., £25 2s. 3d., and it is confidently anticipated that, under the operation of the new rules as regards subscriptions, the debtor balance will rapidly disappear, and the expenditure be eventually brought well within the income.

It will be observed by the balance-sheet that fair progress has been made in collecting the overdue subscriptions, which have figured to so serious an extent in former reports. Of the amount due at the end of 1889 a sum of £40 was estimated as good, and of this about £35 (in subscriptions and entrance-fees) had actually been received by the 31st ultimo, and £2 12s. 6d. has since come in. In round figures this item stood at about £80 at the close of last year, and of this the Treasurer estimates £40 as good, £20 as doubtful, and £20 as bad. Every effort will be made to render it as productive an asset as possible, but the above is as sanguine a view as can be safely adopted in the light of painful experience.

The Council desires to direct attention to the fact that the amount of unpaid subscriptions almost exactly corresponds with the excess of payments over receipts, so that if the ladies and gentlemen who are in default had duly discharged their obligations to the Club (as the Council had a perfect right to expect) the accounts would have exhibited at least an equilibrium, instead of a considerable deficit.

In last year's report allusion was made to the proposed renewed attempt to establish a Local Museum in Essex. This very important subject has received great attention during the year. The Committee appointed in 1889 to draw up a scheme for the amalgamation of the Essex and Chelmsford Museum with the Essex Field Club, has now agreed upon such a scheme, which will be placed before the members at the Annual Meeting. As that meeting will be devoted to a discussion of the scheme, it is unnecessary to enlarge upon it here. [It is set

out in full, E.N., iv., pp. 236-241.] The Council commends it with confidence to the members, feeling assured that the establishment of such an institution would not only be of the greatest service to the Club and its members, but would also be the means of stimulating a love for science and the practical study of Nature throughout the county. When the scheme is finally accepted by the members, a committee will be appointed to make an appeal for the necessary funds, not only to the members, but also the public generally, by means of meetings, circular letters, etc. The Club will have an excellent cause to promote, and the Council has high hopes that the appeal will prove successful.

In connection with the proposed Museum, allusion should be made to the important subject of Technical Education, which has received so great an impetus from the passing of the Local Taxation Act, 1890, under which Act very considerable sums are placed in the hands of the County Councils for the promotion of the teaching of technical subjects and the elements of science. The County Council of Essex will have a sum estimated at £17,000 for these objects. In response to a public notice issued by the County Council, the Secretary, on behalf of the Council of the Club, made an application for a grant under the Act for the purpose of giving practical instruction in science and technical subjects. This application has been supplemented by the publication of a detailed scheme for Technical Instruction in the county, copies of which will be laid upon the table at the Annual Meeting, and which will be printed in full in the *ESSEX NATURALIST*. [See E.N., iv., pp. 259-262.] The scheme is now under consideration by the County Council. Should the Club's application for a grant be acceded to, the question of the establishment of a Museum and Laboratory will receive additional importance, the practical carrying out of the Educational scheme being closely connected therewith.

The Ordinary and Field Meetings of the Club have certainly not lost interest during the past year. They have all been well attended, and it is with great satisfaction that the Council is enabled to reiterate this statement. We are now entering upon the twelfth year of the Club's existence, and it is a legitimate subject of congratulation, that, with no change of methods, and with a close adhesion to matters of local interest, the supply of papers and addresses shows no signs of diminution, and the Field Meetings continue to be carried on most successfully. During the year fourteen Ordinary and Field Meetings have been held. At these meetings the following papers have been read, or have been communicated direct to the Editor for publication in the *ESSEX NATURALIST*, those marked with an asterisk having already been printed:—

* "Bird Migrations: Being the Presidential Address delivered at the 10th Annual Meeting." E. A. Fitch, F.L.S.

* "Suggestions on the Collecting and Study of the Minute Fungi of Essex." Dr. M. C. Cooke.

* "The Threatened Destruction of the Essex Oyster Culture." William Rome, F.S.A.

* "Suggestions for the Formation of a County Herbarium." J. C. Shenstone, F.R.M.S.

"An Historical Sketch of Waltham Abbey and its Foundation, with a Description of its Architecture" (*Address*). G. H. Birch, F.S.A.

"On some Abnormal Forms of Vegetation." Part II. (*Lecture*.) Charles Browne, M.A., F.S.A.

* "Notes of Geological Rambles in the Braintree District in connection with the Easter Excursion of the Club." W. H. Dalton, F.G.S.

* "Chelmsford Water Supply." T. V. Holmes, F.G.S.

* "Remarks on Collecting Diptera." G. H. Verrall, F.E.S.

- * "On the Occurrence of *Cyclostoma elegans* in a living state at Felstead." J. French, with Remarks by W. H. Dalton.
- * "The 'Silting up' of the River Roding." Henry Stock.
- * "The Sanitary Condition of Essex." Dr. J. C. Thresh.
- * "On the Nature of some of the Gravel Patches in Essex" (*Review*). T. V. Holmes, F.G.S.
- * "Concerning certain Rivers in Essex." Thomas M. Blackie, F.S.A.
- * "The Channel of Drift in the Valley of the Cam" (*Review*). T. V. Holmes, F.G.S.
- * "The Lapland Bunting; an Addition to the Avifauna of Essex." Rev. H. A. Macpherson, M.A.
- * "John Ray, the Naturalist." Prof. Boulger, F.L.S.
- * "Rats and Mice in Essex." E. A. Fitch, F.L.S.
- * "The Threatened Destruction of the Essex Oyster Culture." Editor.
- * "Memoir of the late John Brown, F.G.S., of Stanway." A. P. Wire.
- * "On the Undulations of the Chalk in Essex." W. H. Dalton, F.G.S.
- * "Note on Punctured Pottery found at Fryerning." F. W. Reader.
- * "Notes on the Carices of the Epping Forest Area." Robert Paulson.
- * "Danbury Camp, Essex." F. C. J. Spurrell, F.G.S.
- * "An Essex Curlew Sandpiper." Rev. H. A. Macpherson, M.A.
- * "On some Sections between West Thurrock and Stifford, on the Grays and Upminster Railway." T. V. Holmes, F.G.S.
- * "Hæsten's Camps at Shoebury and Benfleet, Essex." F. C. J. Spurrell, F.G.S.
- * "The Estuaries of the Orwell and the Stour." Dr. J. E. Taylor, F.G.S.
- * "The Early Magnetic Experiments of Gilbert of Colchester." Prof. Sylvanus P. Thompson, D.Sc., &c.
- * "Note on the Upminster Brickyard, 1890." W. H. Dalton, F.G.S.
- * "*Acidalia marginepunctata* in Essex." E. A. Fitch, F.L.S.
- * "Benjamin Allen, of Braintree." E. A. Fitch, F.L.S.
- * "Notes on the Mineral Spring on Tyler's Common." Walter Crouch.
- * "Notes on *Hydrobia jenkinsi*." Edgar A. Smith, F.L.S.
- * "List of Land and Fresh-water Mollusca occurring in the Neighbourhood of Bishop's Stortford." Edwin G. Ingold.
- * "Essex Meteorological Records." Rev. T. A. Preston, M.A., F.R.Met.S.
- * "Notes on *Dipsacus sylvestris* and *D. pilosus* and their Natural Relationship." J. French.
- * "The Butterflies of Essex." E. A. Fitch, F.L.S.
- * "Biographical Notice of Ezekiel George Varenne." Prof. G. S. Boulger, F.L.S.

In addition many short papers and notes have been printed, as well as extended reports of the meetings of the Club.

Field Meetings have been held at Kelvedon and Coggeshall, when the members were most hospitably received at Felix Hall, by Captain R. B. Colvin (High Sheriff) and Mrs. Watson; at Waltham Abbey, when Col. W. H. Noble kindly allowed a visit to the Government Powder Mills, and acted as cicerone; in Epping Forest; at Walton-on-Naze; a dredging excursion in company with members of the Ipswich Scientific Society on the Orwell and Stour; at Colchester, in memory of Dr. Gilbert, the first electrician, in company with the members of the Gilbert Club, on which occasion a most brilliant reception was accorded to the Societies by the Mayor, in the Town Hall; at Tyler's Common and Upminster Hall, where again the Club was received most cordially by our kind member Mr. G. P. Hope, and lastly the 11th Annual Cryptogamic Meeting was held in Hatfield Forest, by courteous permission of our member Mr. J. Archer Houlton. In the last report the Council gratefully acknowledged the hospitality and friendliness so often freely shown to the Club. What was then said can but be repeated—such kindnesses form some of the most pleasant reminiscences of each year's work. Full reports of the above meetings appear in the ESSEX

NATURALIST, but the Council takes this opportunity of acknowledging the great assistance received at the Field Meetings from the following :—

Rev. C. L. Acland, Mr. G. F. Beaumont, Mr. G. H. Birch, Mr. J. Britten, Mr. C. Browne, Mr. W. Carruthers, Messrs. Christy, Son and Norris, Mr. R. T. Cobbold, Dr. M. C. Cooke, Mr. Walter Crouch, Mr. W. H. Dalton, Mr. E. A. Fitch, Mr. G. W. Hewitson, Mr. E. M. Holmes, Mr. T. V. Holmes, Rev. H. J. Kenworthy, Dr. H. Laver, Mr. G. Masee, Prof. Meldola, Col. W. H. Noble, Mr. J. N. Paxman, Mr. G. E. Pritchett, Lord Rayleigh, Mr. J. C. Shenstone, Dr. J. E. Taylor, Prof. Silvanus Thompson, Mr. W. Whitaker, and others.

The Field Meeting Committee was not re-appointed last season, and the Secretaries do not propose to ask for its renewal, at any rate for the present. The business at the Field Meetings is often so closely interwoven with the ordinary routine of the Club, and with the preparation of the circulars and editing of the journal, that anything like a dual control was not found to work well. The better plan appears to be for the Conductors at each meeting to work with the Secretaries in arranging the details of such meeting. This was the method pursued last season, and its success was most encouraging. In this connection the Secretaries have to thank Mr. Walter Crouch, Mr. Shenstone, Mr. Beaumont, Mr. Pritchett, Dr. Laver, and Mr. W. H. Dalton, for most useful assistance.

The second volume of the Club's "Special Memoirs" under the arrangement with the author alluded to in last year's report was published early in the year. The book has been reviewed most favourably by the press, and it is likely to be exceedingly useful to ornithologists, both local and general. The Council has to thank Mr. A. P. Wire for the great care taken by him as publisher of the book on behalf of the Club.

The Library has steadily increased, but the large arrears of books needing binding still remains a serious difficulty. A considerable number of local books and pamphlets have been purchased, but the much-needed sets of standard works on Natural Science are still among the things hoped for. Pending the proposed amalgamation of the Libraries of the Essex Field Club and the Chelmsford Museum, it is still a moot point whether the catalogue should be printed yet.

The Editor has almost completed the preparation of the MS. of Pt. 2, vol. iv. of the old "Proceedings," and a plan for its publication will be shortly brought forward.

Four parts of the ESSEX NATURALIST have been published within the year, comprising 282 pages, many of small type. The last part of vol. iv. is now being printed, and the Editor then proposes to issue a part comprising the numbers for January-April, 1891, after which the *monthly issue will be resumed* as an experiment until the end of the year. The Council and Editor are persuaded that this step will much increase the interest and usefulness of the NATURALIST, but the permanent continuance of a monthly publication must necessarily depend upon the amount of support (in subscriptions and in literary and scientific aid) accorded to the Council and Editor in their efforts for the benefit of the Club.

A considerable amount of attention has been given by the Council to schemes for the compilation of a "Bibliography" of Essex, a work much needed. When the plans are matured, an announcement on the subject will be made to the members and the public.

The coming year will, in all probability, be an eventful one in the history of the Club. A great amount of labour has been bestowed on the preparation and carrying on of the schemes for enlarging its sphere of work. But the Council is confident that the time and labour will be well spent if the result is the establishment of the Club on a firm basis as a county institution.

THE ESSEX FIELD CLUB.

TREASURER'S ACCOUNT OF INCOME AND EXPENDITURE.

For the Year ending 31st December, 1890.

Dr.

Cr.

	£	s.	d.		£	s.	d.
To Transfer to Special Memoirs Publication Account (paid in 1889 on account of "Birds of Essex")	1	0	0	By Balance from 1889 (excess of payments over receipts)	41	18	10
.. Subscriptions, 1886	2	12	6	" Printing and illustrating "Essex Naturalist"	126	6	10
" " 1887	4	4	0	" General Printing, Stationery, and Binding	23	8	6
" " 1888	7	4	0	" Postage of "Essex Naturalist" and Circulars, and Officers' Correspondence	33	13	3
" " 1889	17	14	0	" Incidental Expenses (Parcels, Messengers, Traveling, Coal, Gas, &c., &c.)	14	11	6
" " 1890	164	0	6	" Secretary—Grant for Clerical Assistance	25	0	0
" " 1891	4	14	6	" Rent of Headquarters	20	0	0
" Entrance Fees	22	11	6	" Hire of Meeting-rooms	2	10	0
" Donations	0	18	0	" Fire Insurance (seven years)	2	5	0
" Sales of Publications	13	14	10	" Purchase of Books, Magazines, and Newspapers	10	18	3
" Balance of Denehole Exploration Fund	2	15	9	" Fees to Lecturers	4	4	0
" Balance (excess of payments over receipts)	76	4	4	" Subscriptions to Societies, &c.	4	11	0
				" Loss on Field Meetings	8	6	9
					£317	13	11

LIFE COMPOSITION ACCOUNT.

To Balance from 1889	115	0	6
" Life Compositions received, 1890	10	10	0
	£125	10	6
By Balance to 1891	125	10	6

ESSEX WORTHIES.

II.—EZEKIEL GEORGE VARENNE, OF KELVEDON.

By PROF. G. S. BOULGER, F.L.S., F.G.S.

[Read, December 30th, 1890.]

BOTANY in England owes more perhaps of its many-sided progress to the unostentatious labours of those enthusiastic students of Nature who have appeared but little in print than to its most voluminous expositors. Among such enthusiasts Essex has benefited by the work of Samuel Dale, Edward Forster, William Williamson Newbould and Ezekiel George Varenne. Mr. Varenne was of Huguenot descent, and his father being resident medical officer of Marylebone Infirmary it happened to be in that building that the future botanist was born, May 6th, 1811. He received his medical training at Westminster Hospital and at his father's Infirmary and became in 1832 a licentiate of the Society of Apothecaries and in the following year a member of the Royal College of Surgeons. In 1832 he was appointed surgeon to the Nottingham Cholera Board of Health and he seems to have settled in practice at Kelvedon about 1847. Here he passed the remainder of his life, retiring from practice some time before his death, which was preceded by an illness of two years' duration. He died April 22nd, 1887, aged seventy-five years, and was buried in the churchyard of the parish. He was a scholar and a linguist as well as a naturalist, widely read and most careful in observation. In botany he may well have received part of his training, if not his first stimulus, from William Frederick Goodger, resident apothecary to the Marylebone Infirmary from 1811 to 1832, and Richard Rozea, a surgeon practising in the same parish about the same time. The herbarium formed by these two gentlemen in the London district between 1815 and 1823 was presented to Mr. Varenne about 1862.¹ Though in this his favourite recreation he worked largely at the Cryptogamia, especially mosses and lichens, he also did good service among flowering plants. He seems to have taken that special interest in "critical" species that marks the thorough botanist. He collected *Rubi*,² *Carices*, *Potamogetons*, and species of *Rosa*, *Chenopodium* and *Chara*; whilst his papers, mainly

¹ Timmen and Dyer, "Flora of Middlesex," p. 308.

² Gibson, "Flora of Essex," p. 98.

in the third and fourth volumes of the "Phytologist" (first series) are on similarly difficult groups. He is credited by Gibson with the addition of nine species to the county list, in addition to the casuals *Alyssum calycinum* and *Lepidium draba*. They are :—

Ceratophyllum submersum, 1833.

Carex elongata, 1844.

Filago apiculata, 1848.

Galeopsis ochroleuca, 1848.

Enanthe pimpinelloides, 1861.

Potamogeton rufescens, 1861.

And *P. prolongus*, *P. zosterifolius*, and *P. flabellatus*, in 1861 or 1862.

From this list we also gather that Varenne had made some progress in botany and had at least visited St. Osyth as early as 1833. He continued to annotate his copy of Gibson's Flora down to 1884. These annotations will be utilised in the new edition of that work and it is to be hoped that his manuscript cryptogamic matter will also see the light.

In politics he was an ardent Liberal, acting for several years as secretary to the Kelvedon Liberal Association, and working very hard to secure the return of his friend and neighbour, Sir T. B. Western. For upwards of fifty years of his life he was a total abstainer and he took a leading part in starting the local Band of Hope. The Kelvedon Gas Company, of which he was at various times both secretary and chairman, and other local institutions, shared his public-spirited interest; and since, though a Churchman, he was a firm believer in unsectarian education and had an intense hatred of anything savouring to his mind of bigotry, he acted for many years as secretary to the British School.

He was elected a member of the Essex Field Club on December 17th, 1881, but it was always a matter of regret that no scientific communications to the Club were ever received from him. His features betokened the alertness of his mind: his grey hair curled from a head by no means completely bald; his high forehead, slightly-arched and bushy eyebrows, and eyes whose brightness was not concealed by his glasses, his aquiline nose and somewhat large but firm mouth all showed his strength of character; whilst his full white moustache, whiskers and beard lent to his features the gentleness of age. His memory will long live in the affection of those who knew him. The portrait accompanying this notice (Plate 11) is from

the last photograph taken, and is considered by Mr. Marquand a very good likeness.

His valuable herbarium and manuscript materials for a lichen-flora of the county were, according to his direction, handed over by his widow to Ernest D. Marquand, Esq., a botanical friend of many years' standing.³

I am indebted to Mrs. Varenne and to "The People's News," of April 28th, 1887, for some of the materials for this notice.

The only papers with which Varenne is accredited in the Royal Society's Catalogue (vol. vi. p. 110) are the following, all in the third and fourth volumes of the old series of the "Phytologist," 1848-1853:—

1. "Occurrence of *Filago apiculata* near Great Braxted, Essex." Phyt. iii., 1848, 305-6, 385.
2. "Botanical Notes on Plants chiefly growing in Essex, with Observations on some of the Localities mentioned in Hooker and Arnott's 'British Flora,'" *id.* iv., 1851, 89-94.
3. "Occurrence of *Cuscuta hassiaca*, Koch, near Witham, in Essex," *id.* iv., 1851, 382-4.
4. "Notes on Plants observed in the county of Essex during the year 1851," *id.* iv., 1852, 544-8.
5. "Observations on (*Eranthe fluviatilis*, Coleman," *id.* iv., 1852, 673-6.
6. "Botanical Notes and Observations on Plants observed in Essex," *id.* iv., 1853, 1109-15.

THE METEORITE OF NOVEMBER 20th, 1887.

AT the meeting of the Essex Field Club held on November 26th, 1887, attention was called to an "earthquake shock" or explosion which had been reported from various parts of Bedfordshire, Cambridgeshire, Essex, Hertfordshire and other counties as occurring on the morning of November 20th. In the report of the meeting in the *ESSEX NATURALIST* (vol. i. p. 277) the Editor stated that a considerable amount of information had been collected since the meeting, showing, in the opinion of Mr. G. J. Symons, that the phenomena observed had not been occasioned by an earthquake, but were probably the result of the explosion in the air of a large "bolide" or meteorite. It was promised that full particulars would be given in a future number. Finding, however, that but few observations comparatively had been made in Essex, and that Mr. H. G. Fordham, F.G.S., of Odsey Grange, near Royston, purposed

³ The "Cryptogamic Flora of Kelvedon," compiled by Mr. Marquand from the Herbarium, and notes of Mr. Varenne, is printed in the present volume of the *ESSEX NATURALIST* (pp. 1-30), and prefixed to this are a few personal reminiscences of the botanist by Mr. Marquand.—ED.

bringing a report of the occurrence before the Hertfordshire Natural History Society, the Editor abandoned the idea of drawing up a separate account (for which he had collected much material) and he accordingly left the matter in more competent hands.

By an oversight no further reference to Mr. Fordham's paper has been made in our pages; it appeared in the "Transactions of the Hertfordshire Natural History Society," vol. iv. pp. 33-62. The appearance of the remarkable meteor of December 14th recalled the occurrence of the great "bolide" of 1887, and it seems desirable, even thus late, to print a short notice of Mr. Fordham's observations and conclusions, referring those readers specially interested to the paper itself, which is an admirable example of careful recording of natural phenomena.

The general result of the information obtained was that a sound, variously described, and, naturally enough, in the first instance regarded as arising from an earthquake, was heard about twenty minutes past eight on the morning of Sunday, the 20th of November, over an area

"Extending east and west from near Bury St. Edmunds in Suffolk to Upper Lamborne on the western border of Oxfordshire, south to Watford and Reading, and north to St. Neots, Ri-ley in the north of Bedfordshire, Sulgrave in Northamptonshire, and an isolated point near Leamington; the sound being accompanied in many places by a movement of the air of sufficient force to cause windows to rattle and light objects to move. Bury St. Edmunds and Upper Lamborne are on an E.N.E. and W.S.W. line about 150 miles apart."

According to Mr. Fordham's data the sound was heard in 153 distinct localities, distributed among the following eleven counties:—Suffolk, 1; Essex, 6; Cambridgeshire, 19; Huntingdonshire, 3; Bedfordshire, 34; Hertfordshire, 43; Northamptonshire, 2; Buckinghamshire, 16; Warwickshire, 1; Oxfordshire, 15; and Berkshire, 13.

Mr. Fordham's estimate of six stations in Essex at which the sound was heard is certainly too low—we have records from the following places in the county:—Arkesden, Audley End, Birchanger, Broxton, Chesterford, Chishall, Clavering Debden, Elmdon, Elsenham, Farnham, Finchingfield, Heydon, Newport, Saffron Walden, Stanstead, Mountfitchet, Wendon, &c.

From Hertford, and from Solihill, near Birmingham, about the same time on November 20th, a meteor was seen; from Hertford passing towards the westward, from a point about N.E. to a point

about W.N.W., and from Solihull at a point reported to be due S. of that place. Elsewhere the foggy state of the atmosphere appears to have prevented the meteorite from being seen.

Mr. Fordham admits the difficulty of bringing the whole number of records into complete harmony, but he thinks that the following deductions seem fairly to arise from a consideration of the various reports:—

(1) That a meteorite of considerable magnitude passed across central England at a very high velocity at 8.20 a.m. on the morning of November 20th, 1887; (2) that its track may be laid down approximately on the map as passing over East Harling, Newmarket, Barrington, Aylesbury, Thame and Wantage; (3) that its elevation was, at East Harling, between twenty and thirty miles, and was in the latter part of its course between five and ten miles; (4) at the points in the neighbourhood of Amptill, Thame, and Abingdon and Wantage, explosions took place which account for the sounds and shock reported by numerous observers; and (5) that the explosion in the Abingdon-Wantage district terminated the course of the meteorite by final dissipation of its mass either in solid fragments or as gaseous products of its combustion.

The report is furnished with a map showing the area in which the meteorite was observed and laying down approximately its course. There is also a very useful list of references to records of former phenomena of the kind.

[Among the letters collected for the intended report is one from Mr. Workington Smith in which he gives some interesting particulars of a similar bolide which passed over Dunstable about forty years ago. As Mr. Smith believes that no report has been published of this we print his notes here:—"A gigantic meteor fell here [Dunstable] about 1849, in the summer, about 11 p.m. A few people saw it, but all heard it; amongst others my wife that now is. Old people remember it. They say it was a very dark but very starlight night, when suddenly a terrific rush and explosion was heard in the air. The people who saw it say that the whole sky was one mass of fire and sparks, and of different colours. My wife was going to bed at the time, and although the shutters were closed (she was downstairs) the room was illuminated as if by the sun of mid-day. She says the sound was like a 'ton of coal being suddenly thrown down in front of the house.' She was so stunned and frightened that she dare not leave the room or go to the door, but at length she heard some neighbours speaking in the street, and then she went to the door. From them she learned of the sky being one mass of fire just before. When she looked out the stars were shining as usual and all was calm."

Puffin at Bures.—Mr. Pettit has a Puffin (*Fratereula arctica*), for preservation, caught at Bures on the river Stour a few days since, a rather unusual locality for such a sea-loving bird, but the late stormy weather may have driven it out of its course.—HENRY LAVER, F.L.S., Colchester, January 17th, 1891.

VITAL STATISTICS FOR THE COUNTY OF ESSEX.

By JOHN C. THRESH, D.Sc., M.B., F.R.Met.Soc., etc.

(*Medical Officer of Health for the Chelmsford and Maldon Rural Sanitary Districts.*)
[Read March 21st, 1891.]

THE following statistics have been compiled from the returns of the Registrar-General for the several quarters of the year 1890.¹

The population of Essex in the middle of 1890, according to the Registrar-General's method of estimation, will be 676,410, but, as I pointed out last year, the probability is that this is too low. Calculating the population of the rural and urban districts separately I estimate the population at 743,390. The census to be taken this spring will show which is the more correct. The rates given in the tables which follow, and having reference to the whole country, are based upon the higher estimate.

Marriages.—During the year 4,625 marriages have been registered in the county, giving an annual rate of 12·4 per 1,000 persons living as compared with 12·0 for the three preceding years.

Births.—The number of births registered was 23,254, giving a birth-rate of 31·3 per 1,000 persons living. The mean rate for the preceding three years was 33·1, so that the decline is steadily continuing.

Deaths.—During the year 12,873 deaths have been registered, giving a death-rate of 17·3 against 17·7 for the preceding ten years and 15·1 for the year 1889.

The number of deaths of infants under 1 year was 3,196, giving a mortality of 137 per 1,000 children born. This is above the average and considerably higher than the rate which obtained last year, *viz.*, 113 deaths per 1,000 births.

The deaths from all causes included 1,785 from the seven principal zymotic diseases, giving a death-rate of 2·4 per 1,000, which is about the mean for the preceding ten years, but considerably higher than the rate for 1889 which was only 1·6.

In the following table the death, birth, marriage rates, and infantile mortality, are compared with the corresponding rates for England and Wales.

¹ For the summary of the Sanitary Condition of Essex for the ten years, 1875-1888, and for the year 1889, see Dr. Thresh's paper in *ESSEX NATURALIST*, vol. iv. pp. 97-99. - Ed.

PER 1,000 PERSONS LIVING.

1890.	Marriage Rate.	Birth Rate.	Death Rate.	Death Rate from Zymotic Disease.	Death of chldrn under 1 year per 1,000 children born.
Essex	12'4	31'3	17'3	2'4	137
England and Wales	15'0	29.7	19'2	2'03	151

DEATH-RATES PER 1,000 OF POPULATION IN THE VARIOUS SUB-REGISTRATION DISTRICTS.

Registration District.	Typhoid Fever.	Seven principal Zymotic Diseases.	All causes.
West Ham	·19	3.1	17.9
Epping	·17	2.5	18.6
Ongar	·20	2.1	15.7
Romford	·36	2.3	18.8
Orsett	·28	3.4	20.9
Billericay ^a	·43	1.9	17.6
Chelmsford	·12	2.3	16.6
Rochford	·79	2.2	16.7
Maldon	·25	1.7	17.8
Tendring	·06	1.4	16.5
Colchester	·03	1.2	19.4
Lexden	·00	·7	17.3
Halstead	·00	·4	18.0
Braintree	·04	1.1	17.6
Dunmow	·06	·7	16.6
Saffron Walden	·00	·6	15.8

^a Including the County Asylum.

There is no doubt that the death-rates have been considerably affected by the influenza epidemic which prevailed in the spring. In some parts of the county the medical practitioners assert that fully 50 per cent. of the population were attacked. The number of deaths directly attributable to the disease was small, but there is every reason to believe that indirectly it considerably increased the mortality.

METEOROLOGY.

The following table is compiled from the daily observations made at the Climatological Station of the Royal Meteorological Society at Chelmsford. Latitude $51^{\circ}44'$ N. Longitude $0^{\circ}30'$ E. Height above sea-level 135 feet.

	Mean Tempera- ture.	Mean Daily Range.	Relative Humidity.	Num. of Rainy Days.	Rainfall.
January	42·8	12·0	90·	17	2·04
February	37·6	10·1	93·	7	1·03
March	42·7	16·6	88·	11	2·09
April	45·2	17·4	73·5	9	1·15
May	53·4	21·8	67·	9	1·93
June	57·8	19·2	77·	16	2·12
July	59·7	18·1	80·	15	4·41
August	59·5	18·6	79·	14	2·73
September... ..	57·8	18·	94·	6	·67
October	48·3	17·4	87·	10	1·11
November... ..	41·7	13·2	91·	21	2·07
December... ..	28·2	12·3	90·	9	·75
Total				144	22·10

The lowest temperature recorded was on December 22nd, when the min. thermometer registered $4^{\circ}3$ or nearly 28° below freezing point. The highest temperature, $79^{\circ}5$, was recorded on August 6th. The atmosphere was dryest during May, when the relative humidity was only 67·4. The air was most moist during February and September, yet this latter month was the month of least rainfall. Probably this coincidence had some relation to the extensive prevalence of typhoid which commenced in that month. The rainfall for the year was a little below the average for the past ten years, Mr. Impey's register at Bloomfield Hall giving 22·5 in. as the average for that period.

A Dry February.—Mr. W. H. Penrose, J.P., of the Rookery, Dedham, writes as follows: "A month without a drop of rain is beyond my former experience. Such has been the month of February, 1891, the moisture registered being the result of the dense fogs so generally experienced. .01 inch (fog) was registered on Feb. 4, 6, 20, 22, 23, 24, 25, and 26; and .01 inch on Feb. 1 (white frost). The total for the month was .09 inches."

ESSEX WORTHIES.

III.—WILLIAM GILBERT, OF COLCHESTER, FOUNDER OF THE SCIENCE OF ELECTRICITY.

By SILVANUS P. THOMPSON, D.Sc., B.A., F.R.A.S., &c.

(Principal and Professor of Physics, City and Guilds Technical College, Finsbury.)

[A Lecture delivered at the Meeting at Colchester, July 5th, 1890.]

AMONG the worthies whose names have made famous the “spacious times of great Elizabeth,” none in this nineteenth century deserves greater honour than Dr. William Gilbert, President of the Royal College of Physicians, and Physician in Ordinary to Her Majesty the Queen.¹ His name, though less familiar to the general public, is known to every electrician as that of the man who not only rescued from empiricism and mysticism the subject of the magnet, but who also founded the theory of the compass by his demonstration of the magnetism of the globe. In an age when the fantastic philosophies of the schoolmen still prevailed he calmly worked out the inductive method of reasoning from the known to the unknown, trying his arguments by the touchstone of experiment. Nor is even this his greatest glory. What Shakespeare is to the drama—what Raleigh is to geography—what Drake is to naval warfare—what Bacon is to philosophy—that, and more than that, is Gilbert to the science of electricity. There were dramatists before Shakespeare, geographers before Raleigh, naval heroes before Drake, and philosophers before Bacon, but there were no electricians before Gilbert. He stands forth not merely as the brilliant exponent of the science of electricity, he is its absolute founder. His great work, “*De Magnete*,” published in 1600, after many years of patient, laborious, and costly research, drew the attention of all the learned men of Europe, and won for him an undying fame.

“I extremely admire and envy the author of *De Magnete*,” wrote Galileo, the famous astronomer. “I think him worthy of the greatest praise for the many new and true observations which he has made.”

“Gilbert shall live till loadstones cease to draw,
Or British fleets the boundless ocean awe.”

sang Dryden in his Epistle to Dr. Charlton.

¹ A considerable amount of information respecting Dr. Gilbert was given in the report of the meeting at Colchester, in the *ESSEX NATURALIST*, vol. iv. pp. 174-185.—ED.

Fuller, in enumerating the worthies who have adorned the county of Essex, quaintly writes of him as follows: "*Mahomet's tombe at Mecha is said strangely to hang up, attracted by some invisible Loadstone; but the memory of this Doctor will never fall to the ground, which his incomparable book 'De Magnete' will support to eternity.*"

What manner of man this was, and why we ascribe to him honours so unique, it is our present task to set forth.

William Gilbert, or Gilberd, as his name is sometimes spelled, was born, in 1540, in Colchester, of which ancient borough his father, Hierom Gilberd, was at one time Recorder.

Of his boyhood little or nothing is known; indeed it is surprising that there is little to chronicle about so great a man beyond the dates of a few salient events in his career. In May, 1558, being then eighteen years old, he matriculated at St. John's College, Cambridge, at which university he remained for eleven years. At the end of 1560 he proceeded to his bachelor's degree; and on March 21st, 1560, he was admitted as a Fellow on Symson's Foundation. In 1564 he "commenced" M.A. For the two following years he was mathematical examiner in his college, and appears to have turned his attention to medicine; for on May 13th, 1569, he was admitted M.D.; and on December 29th of the same year was elected to a Senior Fellowship. After this he left England to travel in foreign countries. His precise course of travel is unknown; but he made the acquaintance of many persons of distinction in the great historic universities, with some of whom he is known to have been subsequently in correspondence. Passages in his published works show him to have resided in Mantua, Venice, and other cities; and his knowledge of geography was very considerable. He returned to England in 1573, and was at once made a Fellow of the Royal College of Physicians. On November 27th, 1577, was granted to him the coat of arms which is figured behind the title-page of his book, and was subsequently emblazoned in carved stone upon his tomb. From 1581 till 1590 he was Censor of the Royal College: he was its Treasurer from 1587 to 1591, and again from 1597 to 1599. In 1600 he was made President, an honour which he did not long retain, as he died on November 3rd, 1603, aged sixty-three years. He was never married; but the name of the family was preserved by his four brothers, one of whom, by a curious circumstance also named William, was a proctor in the Court of Arches.

Seventy years later there was living at Burnt, Ely, another

William Gilbert, a clergyman, who bore the same arms ; presumably, therefore, a descendant of the same family. The Gilbert family still exists, scattered chiefly over the county of Norfolk.

It is stated by Hervey that Gilbert expended upon his magnetic researches no less considerable a sum than £5,000. His experiments with loadstones lasted for many years, and he possessed a remarkable collection of them. He also had many instruments, some of which are figured in his book. He himself devised some forms of instruments for navigation, which are described in a subsequent work by Thomas Blundeville. His charts, globes, magnets, instruments and manuscripts he bequeathed at his death to the possession of the Royal College of Physicians. He received a pension from Queen Elizabeth, by whom he was much esteemed. It is said, I know not on what authority, that he was the only man to whom she left anything in her will. You have also a tradition amongst you, doubtless derived from reliable sources, that Queen Elizabeth once visited the Doctor at his house in Colchester.

To estimate the magnitude of his achievements in science it is requisite briefly to review the state of knowledge with respect to magnetism and electricity before the appearance of his epoch-making work.

The property of the loadstone to attract pieces of iron, or other loadstones, was a fact known to antiquity, and explained as usual by the ascription of magical or occult powers. Pliny mentions that a ring of iron hung to a loadstone can attract a second, and the second a third, until a chain of rings hangs from the stone : an experiment also described in poetry by Lucretius. Lucretius also was aware that magnetic forces are not screened off by the interposition of other metals ; for he mentions the attraction of iron toward a brazen vase within which a magnet was enclosed. Nothing more appears to have been known about the magnet until about the eleventh century, when the directive power of the loadstone became known. This discovery, so important in the history of navigation, is variously attributed to the Chinese, the Arabians, and to an Italian named Flavio Goia, who lived at Amalfi, in the thirteenth century. Gilbert himself states that the mariners' compass was first brought to Italy from China, in 1260, by the famous traveller, Marco Polo. On the other hand, in the Icelandic chronicle of *Are Frode*, which was written about the end of the eleventh century, there is a distinct record of the use of the loadstone for directing the seaman.

Further, Cardinal de Vitri, who wrote a History of Jerusalem about the year 1200, also describes the magnetised needle as indispensable in navigation. An obscure author, Peter Peregrinus, whose existence was for long considered mythical, and who wrote a letter upon magnetism reputed to be of a date at the end of the thirteenth century, describes the fact that the north-pointing end or region of one loadstone will attract the south-pointing end or region of another loadstone. Peregrinus's letter was certainly published as a small book of forty-three pages, small quarto, at Augsburg, in 1558. On 14th of September, 1492, Columbus, when about 200 leagues west of the European coast, noticed for the first time the declination of the compass needle from the true north. According to Gilbert, the same discovery was made (in 1498) by Sebastian Cabot. But it was not till the middle of the sixteenth century that accurate measurements were made of the amount of declination in Europe. Robert Norman, a compass-maker in Limehouse, found that the compass pointed $11^{\circ} 15'$ to the east of the true north. Borough, Comptroller of the Royal Navy, in 1580 found it to be $11^{\circ} 19'$. The dip of the needle was discovered also by Norman in 1576; and the same fact was independently observed in 1544 by Hartmann, of Nuremberg. Norman constructed a dipping needle, by the aid of which he ascertained the angle of dip at London to be $71^{\circ} 50'$. Another isolated fact was discovered in 1590 by a surgeon of Rimini, named Julius Cæsar, namely, that a vertical bar of iron used as a support on the top of the tower of the church of St. Augustine, had acquired magnetic properties. In 1558 John Baptista Porta, the reputed inventor of the magic lantern, published a work on natural magic, the seventh chapter of which is devoted to the magnet, and to the tricks which may be played by means of it. Porta added a little to previous knowledge. He speaks (I quote, however, from the subsequent edition of 1651) of the two poles of the loadstone, which he sometimes speaks of as the boreal and austral poles, and sometimes as the arctic and antarctic poles of the stone. He gave a method of finding the position of the poles on the stone. He was also aware that a loadstone when divided into two parts becomes two complete loadstones. He mentions that the magnetism produced in a piece of iron by rubbing the end of it with the north pole of a loadstone is diminished by subsequently rubbing the same end with the south pole. He states that the only way of destroying the magnetism of a magnet is by heating it with fire. He also combated a fable handed

down from Plutarch and Ptolemy that garlic rubbed over a magnet destroys its power, unless, according to Ruelius, it be restored by anointing it with goat's blood. Another fable of Marbodeus, that a magnet is powerless in the presence of a diamond, is also refuted by Porta. The latest work on magnetism, prior to the appearance of Gilbert's treatise, was a small pamphlet which appeared in 1597, entitled "The Seaman's Supply," by William Barlowe, which gave for the use of navigators many facts about the declination of the compass at different sea-ports, and about the amount of the dip at different parts of the earth.

All these earlier publications in magnetic subjects consisted, as will be noticed in the announcement of isolated facts and properties rather than in any systematic investigation or consistent explanation. The significance of the facts was not seen; and they were in many cases mixed up with exaggeration and myth. The only explanations or hypotheses which had been advanced as to the cause of the tendency of the magnet or magnetised needle to point geographically north and south were wild in the extreme. Gilbert himself enumerates sundry of them in order to show how empty and ridiculous they were. Serapio Mauritanus and others reported that in the Indies there were magnetic mountains which would attract the ships as they sail by and pull the iron nails out of them. Paracelsus and Cardan considered that the magnet was governed by some virtue proceeding from the constellation of the Great Bear; and after the discovery that the magnet did not point truly northward, Cardan suggested that the star in the tip of the tail of the Great Bear was itself a magnet. Bessard declared that the compass pointed not toward the pole of the earth, but to the pole of the zodiac. Olaus Magnus and after him Maurolycus declared that there was a magnetic island or loadstone rock in the north sea toward which the compass turned its point. Plancius even showed its position upon a chart of the globe.

Such was the state of the science when "De Magnete" appeared. The full title of the book, as it appears on the frontispiece of the folio edition of 1600 is: *Guilielmi Gilberti Colcestrensis, medici Londinensis, de magnete, magneticisque corporibus, et de magno magnete tellure: Physiologia nova, plurimis et argumentis, et experimentis demonstrata. Londini. Excudebat Petrus Short. Anno M.D.C.*

The volume opens with a glossary of terms and a table of contents. The work is divided into six books, each book being subdivided into numerous short chapters.

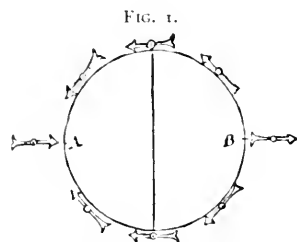
The first chapter of Book I. is devoted to a review of the older writers and their various opinions and vanities, which he scornfully dismisses by remarking that only plebeian philosophers delight themselves in such nonsense, and names the following as the men who have really added to magnetic knowledge: Thomas Hariot, Robert Hues, Edward Wright, Abraham Kendall, William Borough, William Barlowe, and Robert Norman—all Englishmen.

In the second chapter he enters upon a learned discussion as to the etymology of the word magnet, the origin of its discovery in prehistoric times, and the localities whence the loadstone is procured. In the third chapter begins the experimental method. The proposition that a magnet possesses certain parts, or poles, distinguished by their natural power is established by experiment; a loadstone ground down on a lapidary's wheel to a spherical shape being the form preferred, as being geometrically the most perfect and as being fittest for experiments as resembling the globe of the earth. Such a globular loadstone Gilbert called a "Terrella." To the pole pointing southwards Gilbert assigned the name "boreal" on account of the law of attraction between opposite kinds of poles, arguing that the polarity of the pole which pointed southwards must be a pole of the opposite kind. This led to further experiments on loadstones, which were cut into two parts, the parts being floated on water in little vessels. Subsequent chapters deal with the attraction of the loadstone for iron, and with the properties of iron as contrasted with those of other metals; many a passing hit at the absurdities of astrologists and alchemists being interposed. He then shows that iron which has not been touched by any loadstone can nevertheless act magnetically on other iron. To show this a light piece of iron wire is thrust through a small ball of cork and set to float, and toward it is brought the lower end of a long iron rod held above it. The one turns toward the other. Another experimental discovery is that a long iron rod, delicately hung by a special silk thread, will turn, even though not previously magnetised by contact with any magnet, and place itself in the direction of the compass. In chapters fourteen and fifteen is interpolated a description of the alleged medicinal powers of the magnet, beginning with its use, as prescribed by Dioscorides and Galen, to drive away melancholy, and ending with Paracelsus who recommended poultices containing powdered magnets. Short shrift would modern magnetopathic quacks have got, with their magnetic belts and rings, at the hands of the outspoken doctor. After a short

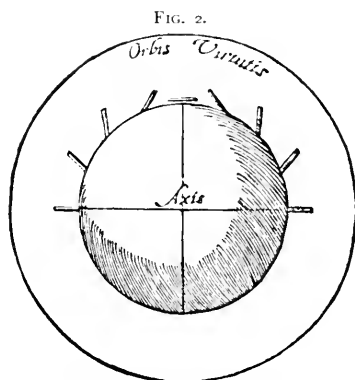
discussion of the differences between magnets of loadstone and masses of iron the first book is brought to a close with a remarkable chapter which gives the key-note to the rest of the work. Its title advances the proposition that the terrestrial globe is magnetic, and is a magnet. "Our new and unheard-of opinion concerning the earth" is his way of emphasizing his discovery that the earth is itself also a great magnet—a big loadstone: for it was by this hypothesis that he proposed to explain the puzzling facts of the several variations of the compass needle. It has poles, he says, not mathematical points but natural terminals, and between them lies an equator, not a mathematical circle but a natural separation between the two polar regions. The whole of the remainder of the work is devoted to sustaining this remarkable generalisation.

Book II. of the volume, the longest of all the six sections, deals with magnetic motions and forces. Almost immediately, however, he introduces a digression upon the attractions which can be set up by rubbed amber and other electric bodies, a digression which though itself of immense importance has little to do with the development of his theme. We will deal separately with this interpolated chapter, merely observing here that he comes to the conclusion that electric actions are comparable with cohesion whilst magnetic actions are comparable with gravity. In his opinion the globe of the earth is collected together and coheres electrically, though it is directed and turned about magnetically. This obscure saying becomes more intelligible by the light of later passages. The next chapters of Book II. are occupied with a discussion of the opinions of philosophers about the nature of magnets and the origin of magnetic attractions, followed by Gilbert's own views thereon and an account of his experiments on the effects, upon the attractive power, of varying the external shape of the loadstone. Here again we meet with his spherical loadstones, specially constructed for these observations. He points out that iron chips and small magnets arrange themselves in particular directions, dipping towards the magnetic poles of the terrella, as the dipping needle does towards the poles of the earth. He conceived the magnetic power as extending within a certain limited region external to the stone; and he indicates in his simple woodcuts with external curved lines the orbits of the magnetic virtue. In one woodcut, here reproduced in reduced facsimile, (Fig. 1), compass needles are shown pointing variously over various regions of the terrella. In another, (Fig. 2), the terrella is shown enclosed within a

certain orbit of magnetic virtue, as by a surrounding atmosphere. In further experiments loadstones were cut into two parts, the parts being floated on water in little vessels to observe their mutual attractions and repulsions. All experiments which Gilbert considered as being original he claimed as his own by affixing an asterisk, large or small according to the importance of the matter, in the margin of the text. He suggest mapping out the lines of magnetic virtue upon the surface of his terrella as the parallels of latitude. The tropics, the arctic circles



GILBERT'S SPHERICAL LOADSTONE,
OR TERRELLA.



THE TERRELLA AND ITS SURROUNDING FIELD
OF ACTION.

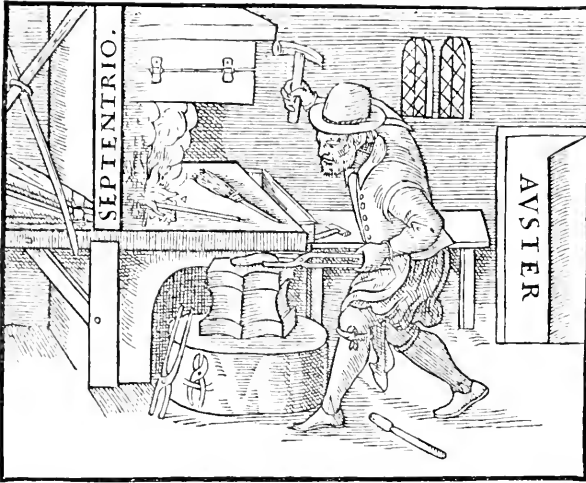
and the meridians are marked out upon a geographical chart of terrestrial globe. The fact that a magnet of elongated shape—a magnetic rod—is more powerful than one of spherical or cubical or any other shape of equal weight (the horseshoe shape not being discovered until many years later) is announced. The screening effect of a sheet of thin iron, and the failure of other metals to screen off magnetic action, are noted. Then comes a series of studies on the effect of capping loadstones with armatures of iron, and on the strengthening of the power of loadstones. Chapter xxxii. of Book II. is a notable one, containing a number of magnetic aphorisms, each tersely summing up some result of experiment or observation. In it the principle of equality of action and reaction is illustrated by the experiment of floating a magnet in a little skiff and showing that it attracts itself to a piece of iron, just as the iron, if placed in the skiff, will be attracted to the magnet, thus furnishing an illustration of the principle of action and reaction. Several experiments are also described illustrative of the mutual repulsions of similar poles, north repelling north and south

south. Most of these experiments were original with Gilbert, and are indicated as such by him, by the placing of an asterisk opposite the account of them in the margin of the book. These experiments and aphorisms are continued in Chapter xxxiii., which deals mainly with the swiftness of the magnetic motions, and he states that the speed of the motion is proportional (inversely) to the distance. He also showed that the magnetic forces between two distant magnets could be conducted from one to the other by interposing a rod of iron; the magnetic virtue being transmitted through iron much better than through air. At the end of this chapter he describes the method of obtaining magnetic figures by sprinkling iron filings upon a card laid over a magnet; and remarks on the movements of the tufts of filings when the magnet beneath is moved. Chapter xxxv. contains a most characteristic diatribe against certain earlier authors, Cardan, Peter Peregrinus and John Taysnier, who had pretended that a perpetual motion machine might be made by means of a magnet; and ends by exclaiming: Would that the gods might send to perdition all such false, misleading and crooked labours by which the minds of studious men are warped!

Book III. is mainly occupied with the directive action of the compass and of loadstones, and of the property of polarity—or verticity—in general. Chapter i. describes further experiments with the terrella made to illustrate observations made on the compass in distant lands which had been communicated to Gilbert by Francis Drake—experiments which fully confirmed his theories, and the results of which are summed up by saying that all magnetic bodies behave toward the globe of the earth precisely as other magnets behave toward the terrella, the laws of their action being alike. In the following chapters further experiments with loadstones and needles are described, relating chiefly to the results of touching one with the other. Amongst other matters which helped him to this conclusion was his discovery that if a rod of iron is hammered whilst lying in a north-and-south position it becomes magnetized by the influence of the earth's magnetism. This observation is illustrated by a quaint woodcut, which is reproduced on a smaller scale in Fig. 3.

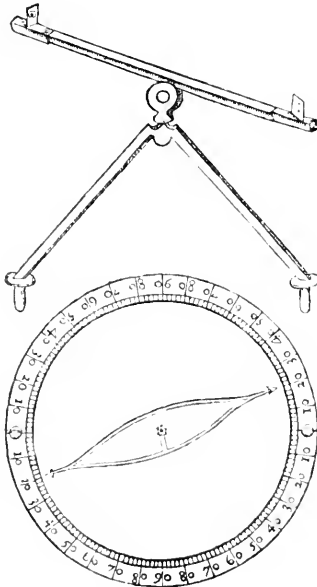
Books IV. and V. go into some geographical and astronomical matters; being intended chiefly as a contribution to the nautical applications of his studies. He describes sundry instruments, one of them, for ascertaining the variation of the compass in different

FIG. 3.



PROCESS OF MAGNETIZING IRON BY HAMMERING WHILE IT LIES IN A NORTH-AND-SOUTH POSITION.

FIG. 4.

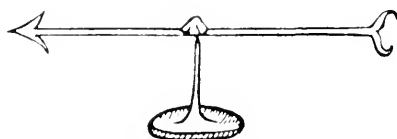


GILBERT'S COMPASS FOR OBSERVING THE VARIATION

regions, being that shown in the accompanying reduced woodcut. Several others are depicted in his book. He particularly discusses the effects of masses of iron ore in mountains and continents in producing local perturbations or variations of the compass ; a matter which has quite lately received fresh attention recently from the magnetic surveys of Professors Rücker and Thorpe, in which they have measured the perturbing effects of mountain-chains such as the Malvern Hills, and have even been led to discover the existence of underground mountains, one of which, for example, is in the neighbourhood of Reading. Book VI. is of a more speculative character, dealing with magnetic motions and cosmical systems : the main point of interest in it being its frank acceptance of the astronomical doctrines of Copernicus.

These contributions to purely magnetic knowledge were of great importance ; but far transcending them in interest is a short digression interpolated in the Second Book. This is the famous chapter on Electricity which laid the foundation of that science. Prior to his time the only known electrical facts were two isolated observa-

FIG. 5.



GILBERT'S ELECTROSCOPE, OR VERSORIUM.

tions of prehistoric date. The mineral amber, or *electron*, then of great rarity and regarded as a gem, was known to acquire, when rubbed, the magical property of attracting straws and other light objects. A similar property had been recognised to exist in jet. Amber was a substance about which there was something uncanny. It was clear like glass, when of good quality, but was often found to contain flies and other insects enclosed within itself—"shining," says Gilbert, "in eternal sepulchres." Much had the ancients, including Theophrastus and Pliny, written about it and the magical properties which it exhibited after being rubbed. This peculiar phenomenon was submitted to examination by Gilbert with an industry and experimental sagacity thoroughly characteristic of the man. He devised for facilitating the observation of feeble attractions, a simple instrument, consisting of a light, stiff arm of metal, resembling in shape, a compass needle, pivoted like a compass upon

a pin. This apparatus, termed by him a *versorium*, constituted the electroscope, by the aid of which he disproved the idea that the alleged magical property was possessed only by amber or by jet. He poured out the vials of his wrath upon the empty-headed and inert philosophers who merely copy from one another and invent high-sounding Greek words wherewith to cloak their ignorance. "For not only do amber and jet, as they say, draw light bodies, but diamond, sapphire, carbuncle, cat's-eye, opal, amethyst, vincentina and bristolla (an English gem or spar), beryl and rock crystal do the same." And he went on enumerating a host of other substances possessing similar powers, following up the true gems with false gems made from paste, glass of antimony, slags, belemnites, sulphur, mastic, hard wax, sealing wax variously coloured, resin and arsenic, and also, but less powerfully and only in dry weather, rock salt, obsidian, and rock alum. All these substances, because they resembled amber, he termed *electrics*; whilst he gave the name of *anelectrics* to another class of substances which showed no such power, and which included the following: Emerald, agate, cornelian, pearls, jasper, alabaster, porphyry, coral, marble, flint, haematite, emery, bone, ivory, ebony and other hard woods, cedar, gold, copper, iron, and the other metals, and, lastly, the loadstone. The substance which above all others possesses the magnetic property of attracting iron shows no trace of electric action when rubbed in the hand. From the terms assigned by Gilbert, the word *electricitas*—electricity—came into use to denote the unseen agent operating in these actions. Gilbert further showed that the power of attraction exercised by the electric when rubbed was not limited to mere straws or chaff, but that all metals and woods, and even stones and earths were attracted. He even found that liquids, oil and water were drawn by the electric force. He ascertained that moisture exercises a prejudicial effect on electrical experiments. He observed that electrical effects can be screened off, and in a way that magnetic effects cannot, by the interposition of a sheet of metal, or even by a piece of paper. He even ascertained the screening effect of a ring of flames. His observations stop short all too soon, leaving the infant science truly in a state of infancy. Nevertheless he was the pioneer whose first steps showed the path to be latter trodden by Robert Boyle, by Francis Hauksbee, by Sir Isaac Newton, and by Benjamin Franklin: and therefore is beyond dispute the father of electric science.

It remains to be told how Gilbert's work was received. The book, which he published in Latin, was followed by two editions, also unfortunately both in Latin, published in Germany. No English edition has ever been published. Strange to say it fell somewhat flat. The world was hardly prepared to accept a sober treatise, based on simple facts, in place of the wild and speculative treatises which had hitherto passed as philosophic. Men knew that Gilbert had travelled abroad, and it was known that he had made researches with the magnet; but they were expecting him to write such a treatise as might have been produced by Thomas Aquinas, who was capable of discussing how many angels could dance on the point of a needle. Scaliger, in one of his epistles (*ad Casaubon*, 1604), speaks of a certain Englishman who three years previously had brought out a book on the magnet, which was nothing worthy of the expectation which it had excited. Bacon, whom so many revere as the founder of the inductive science, calmly appropriated and reproduced as his own in his "Opuscula Philosophica," whole paragraphs, almost verbatim, from the "De Magnete," but he did not say who discovered the truths set forth; and when he mentioned Gilbert, sneered at him, in his "De Augmentis," as the man who had made a whole philosophy out of the observations of a loadstone; and, in another place, he refers to "De Magnete" as a "painfull and experimentall work." In another place, in the "Novum Organon," he accuses Gilbert of having created so many fables about the electric operation, which, he adds, is nothing else than the appetite of the body excited by gentle friction! Others there were indeed who better appreciated the magnitude of Gilbert's work. Galileo, as we have seen, spoke of him as of enviable greatness. Kepler warmly welcomed the new doctrine of the earth's magnetism, and devoted a long chapter in his Treatise on Astronomy to the exposition of Gilbert's views. Barlowe, the learned Archdeacon of Salisbury, whose "Magneticall Aduertisements" was published in 1618, speaks of "De Magnete" as "the very true fountaine of all magneticall knowledge." Dr. Marke Ridley, who in 1613 published "A Short Treatise of Magneticall Bodies and Motions," speaks of Gilbert's labours as "the greatest and best in Magneticall Philosophie." Sir Kenelm Digby classed Gilbert along with Harvey, the discoverer of the circulation of the blood, as men by whose means our nation may claim, even in this latter age, a crown for solid philosophical learning.

Gilbert further laid the foundations of future scientific progress by founding a sort of society, or college, which met monthly at his house in Peter's Hill, Knightrider Street, for the discussion of philosophical subjects, and which, though it fell into abeyance at his death, was afterwards revived by Sir Christopher Wren and others, and received the patronage of King Charles II., and was called the Royal Society in honour of its pious founder.

He did not live to add, as he purposed, an appendix of six or eight sheets to "De Magnete"; no such addition appearing in either of the German editions published at Stettin in 1628 and 1633 respectively. He left behind him, however, the manuscript of another work of lesser merit, which was posthumously published in 1651 by the famous printing-house of Elzevir, entitled "De mundo nostro sublunari Philosophia novo." It is chiefly a meteorological and cosmical treatise, remarkable indeed for one speculative point, namely, a suggestion that the reason why the moon always presents the same face towards the earth is because the moon, like the earth, is magnetic.

His fame as physician and physicist won him the favour of Queen Elizabeth, by whom, in February, 1601, he was appointed chief physician. He even received from her, as has been mentioned, an annual pension; and was continued as chief physician to James I., an honour which he only enjoyed for seven months, as he died on November 30th, 1603.

The partial oblivion into which Gilbert's fame has been allowed to fall is due probably mainly to the loss of all personal relics of him. With the exception of a single doubtful inscription, "*ex dono auctoris*," in a single copy of "De Magnete," not a line of his handwriting is known to exist,² unless his hand wrote the signature "*Ye President and Societie*" at the end of a petition, preserved amongst the manuscripts in the British Museum, addressed by the Royal College of Physicians in 1596 to the Lords of the Privy Council, complaining of the exactions of the Lord Mayor and Aldermen of London. It is pretty certain that the MS. copy of "De Mundo Nostro," in Latin, in the British Museum, is not in the author's handwriting; for in the Elzevir print there is a note which states that the author's original manuscript was partly in English. It is sad to relate that the manuscripts, maps, letters, magnets and minerals,

² Two other specimens, believed to be in Gilbert's handwriting, have been recently unearthed. S.P.T., April, 1891.

which he bequeathed to the Royal College of Physicians, all perished in the Great Fire in 1666. Almost equally sad is it that his portrait, painted in oils, which he himself presented to the Schools' Gallery of Oxford, has disappeared. It is believed to have been destroyed as rubbish forty years ago. Only a steel engraving, made in 1796, which differs from the original picture in several details, remains to witness to the scholarly features of the great doctor. The engraving is reproduced in the plate (frontispiece to the volume), which accompanies this paper.

His residence in Colchester still stands, and his tomb in the church of Holy Trinity still proclaims over his ashes the virtues which he practised whilst living.³ But his memorial remains in his magnetic and electrical discoveries. His reputation is enshrined in the science which he founded—"shining in an eternal sepulchre."

NOTES ON THE RECENT PROLONGED FROST, 1890-91.

By JOHN C. THRESH, D.Sc., M.B., F.R., Met.Soc., etc.

[Read March 21st, 1891.]

THE following brief notes upon the recent prolonged frost are based upon the daily observations taken at the Climatological Station, Chelmsford, which is in my charge.

For the last few days in November and the first two days in December the mean temperature was below freezing point and about five inches of snow fell. From the 3rd to the 9th December the mean daily temperature was above 32° F. and all the snow rapidly disappeared. The prolonged frost set in on the 10th, when the mean temperature fell below freezing point and remained constantly below until January 13th, that is, for a period of thirty-three days. On the latter date the temperature rose to 33·9 and remained over 32° until the 16th. It then fell and remained low until the 20th, when it again rose and the thaw set in. With this slight intermission, therefore, the frost lasted forty-one days, or one day only short of six weeks.

The coldest day was December 22nd. On this day the minimum temperature was 4·3, the maximum 30·5. At 9 a.m. the thermometer stood at 7·9. The mean temperature for the day was only 17·4. The subjoined chart is interesting as showing at a glance the minimum temperature and the mean daily temperature throughout the whole period of frost.

Snow fell on eleven days. The heaviest fall was on December 18th, when a depth of three inches was registered. The snow attained its greatest depth on the 30th, where there was between five and six inches on the ground. On January 20th rain fell (·27 in.) the temperature rose and the snow disappeared. The total

³ The best drawing and description of the tomb, with its numerous coats of arms, and some account of Gilbert's family, will be found in Chancellor's "Ancient Sepulchral Monuments of Essex," pp. 202-6, pl. lxxvii.—1. D.

fall of snow from December 10th to January 10th inclusive corresponded to '81 in. of rain.

During the whole period there was fortunately but little wind. A force of '3° was the maximum registered, and that on one occasion only, and most of the time easterly winds prevailed.

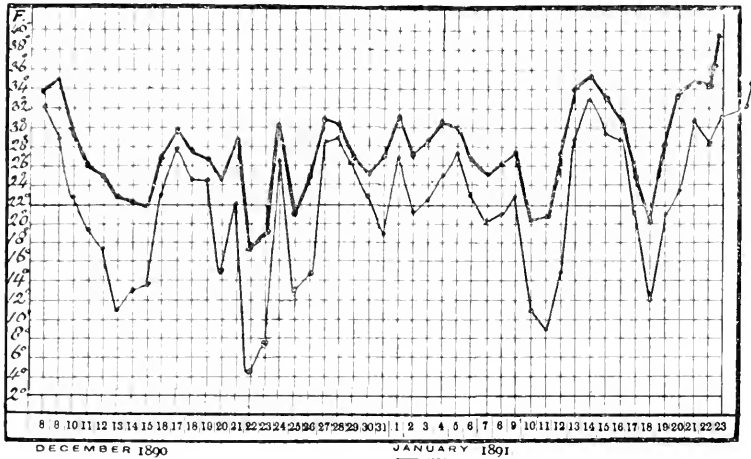


CHART SHOWING MEAN TEMPERATURE AND MINIMUM TEMPERATURE EACH DAY DURING PROLONGED FROST OF WINTER OF 1890-91.

Thick (upper) line Mean Temperature for day; thin (lower) line Minimum Temperature for day.

As for some weeks there was only a thin covering of snow on the ground, the effect of the continued cold will probably have proved very disastrous to vegetation. Some of our members who are interested in agriculture will probably have something to say on this point.

*The effect of the prolonged frost on water mains:—*No observations were taken of the earth temperature at varying depths, though such a series would be very interesting. What that temperature was, however, can be judged from its effect upon the Chelmsford water mains.

The water in the more superficial mains was frozen before Christmas, and before the break up of the frost the mains at a depth of two feet had become affected. This of course caused great inconvenience in many parts of the town, and it was some time after the thaw had set in that the ice in such mains melted. When this occurred the havoc wrought by the expansion of the water in the act of freezing became apparent. The mains had been fractured in most diverse ways and to varying extents and water was rushing to waste at numbers of places.

The moral of this experience is that water mains should be laid at a greater depth than is frequently the case. The slight additional first cost of adopting such a course is as nothing compared with the great inconvenience, annoyance and damage wrought by a single severe frost when the pipes are too superficially bedded.

NOTES ON THE PROLONGED FROST, 1890-91.

By J. FRENCH (Felstead).

[Read February 28th, 1891.]

A FROST of eight weeks' duration is a novelty with the present generation and gives rise to phenomena correspondingly unusual and worthy of remark.

It affects more or less (by deprivation of food) the balance of animal life, and its effect on the disintegration of soils and rocks invites observation, inasmuch as the ordinary work of several winters seems to have been carried out in as many weeks.

We have no means of judging the extent to which animal life is affected, but provided observations were reasonably multiplied we might infer the directions in which changes would take place. In the case of birds, especially, the disturbing influence of man becomes apparent, and this to an extent proportionate with his civilization. Thus it cannot be doubted that in England the kindly feeling towards the feathered race compares favourably with that obtaining in 1814, the year of the last prolonged frost. Man has distributed immense quantities of food to the birds during the last two months and herein lies one disturbing element. Those birds which are shy get little or none of this bounty: those, on the other hand, usually frequenting the haunts of men have been fed, perhaps sufficiently, and may suffer no diminution of numbers. Sparrows and starlings are notable instances. All attempts that I have seen made to feed the shyer members, of which rooks, thrushes, blackbirds and finches may be taken as examples, have met with indifferent success. Although these, with me, have all put in an appearance daily, I cannot but think that very few of the early comers have survived. Many thrushes dead of starvation have been picked up on the very ground where the starling has flourished, and it must be noted that suitable food has been supplied. I am also credibly informed that after the frost of 1814 many hundreds of starved rooks were removed from Sheepcotes Wood at Little Waltham, which was then, as it is now, the winter home of all the rooks of the district. We should have, therefore, as an ultimate result of this eight weeks' frost an excess of starlings and sparrows and a diminution in the numbers of many other species.

Connected with that observation of the dead rooks in 1814, I was informed that that winter told heavily on hares and rabbits, many of the trees in that wood being denuded of bark to the height at which these animals could graze. Certain it is also that rats and weasels had vacated the wood at the time or the dead rooks would not have remained unmolested. I cannot hear, however, upon enquiry, that hares or rabbits have suffered very much this winter.

A curious phenomenon in relation to some pond fish has been here observed. It was noticed that upon breaking the ice in certain ponds the fish came to the hole and remained there with their mouths protruding, giving the idea of vitiated water under the ice. The explanation seems to be that at the outset, in consequence of the state of the springs, the ponds were low. The increase of the ice also further diminished the quantity of available water and thus the water remaining really became vitiated. It would be curious to follow up the possible result to the pond fauna of a frost sufficient to congeal all the water. Death, almost certainly, and the first stage of fossilisation, probably, would ensue, and this brings us to notice the geological effects of a prolonged frost.

In the case of the dead fish, when the thaw set in the surface of the ground would be the first disturbed and that possibly to such an extent as to bring a layer of earth over the pond ice, which would eventually sink and entomb the dead organisms. Similar denudation attending the break up of the frost can now be observed at the bottoms of fields which have a slight inclination. The result is a layer of brick-earth deposited, similar to that following a heavy rain, only very much greater in quantity; as we have before observed, the work of seasons is here done in a few weeks.

One other possible case of fossilisation is presented by the dead rooks in the wood. Suppose, instead of carting away those rooks to manure the field, as was actually done, they had been allowed to remain. Their desiccated carcasses would have held out but little temptation to the returning rodents and carnivores of the summer. When the autumn arrived they would have received a covering of leaves and so easily have passed to the first stage of preservation. The present speculative position of the conditions under which organisms are entombed is my apology for venturing upon these suppositions.

The rapid work of the frost in disintegration has been forcibly brought to notice in the following instance. Some Boulder-clay of a very chalky character had been thrown out last autumn. Ordinarily the lumps of chalk would have wasted very slowly under exposure from year to year. Now, the appearance of the heaps is that of a mass of white slimy clay, the lumps of chalk having quite disappeared. As bearing upon the work of decalcification the instance is instructive. That work must now proceed there with greatly accelerated velocity.

Of the effect of the frost in splitting rocks we have also one instance. A pavement in this village (Felstead) is laid with flags of an indurated sandstone. Some two or three of these flags are broken by the frost, not into laminae, but quite through the substance splitting the flag. The whole pavement, too, is disturbed.

As to the penetrating character of the frost in different soils accounts vary greatly. Some pipes were found choked with ice at a distance of more than two feet under ground. Yet there was no good evidence of the frost having penetrated the soil to that depth. In compact soil and closely pressed gravel there is good evidence of a penetration of frost of one foot and some cases are quoted much in excess.

In passing over some stubble fields a few days after the thaw, I found many small weeds, notably Cul-weed and Pimpernel, looking green and vigorous. Beneath their roots there was still a frozen pan of ice and this proves that at one time the plants were completely frozen. It is not easy to see how they emerged from that state unharmed. Problems affecting the natural transport of plants, not well understood, might perhaps be helped to a solution by noticing their behaviour under prolonged frosts.

The varied phenomena attending this great frost serve as an object-lesson to illustrate the changes brought about by the severity of early post-Glacial times. Assuming the frosts more severe and prolonged, and the thaws to be of rare occurrence, our deaths and migrations of plants and animals would be proportionately increased, and the erosion accompanying one of those rare thaws would be so tremendous as to seem perfectly incredible to ordinary readers; nevertheless traces of all such changes are legacies remaining with Essex folk to this day.

P.S.—Since writing the above I observe a letter in "Nature," of January 29th, by Professor T. G. Bonney, referring to the destruction of fish by the frost in Regent's Park Canal. He also asks whether "such a cause may have acted in the geological history of the globe." In Nordjenskiöld's "Arctic Voyage" there is

an account of finding dead fish under some such circumstance but not having the volume at hand I can only quote from memory. Another writer also suggests polluted water as giving rise to a phenomenon which he observed similar to that I have noted.

Prof. Bonney has contributed an article in "Nature" on "Temperature in the Glacial Epoch." His concluding words are: "We seem, however, fairly warranted in concluding that, whatever may have been the cause, a lowering of [mean] temperature amounting to 18°, if only the other conditions either remained constant or became more favourable to the accumulation of snow and ice, would suffice to give us back the Glacial Epoch." Taking two-thirds of those eighteen degrees as representing a Post-Glacial condition of mean temperature we should probably arrive at the stage where only one summer in a number of years was sufficient to effectually break up the frost. This would bring us to a time of greatest erosion of which vestiges are left as above stated. It does not seem much to ask a decrease of twelve degrees only, yet on the other hand we must not forget that no amount of occasional cold snaps could materially alter the mean temperature. Physical changes of some permanency are required. We should rather lean on such a theory as that of Dr. Croll, in which he treats primarily of astronomical changes which, though small, are known to have actually occurred, and secondarily, adducing other agencies which might reasonably be thought to have operated, produces in the aggregate a result more than required by Prof. Bonney's figures.

Wildfowl in Essex—I saw to-day, at Mr. Pettitt's, the following birds in the flesh, all captured in the neighbourhood: One Whooper (*Cygnus musicus*), one Mute Swan (*C. olor*), partly in immature plumage, and possibly an escape; one Canada Goose, this also may be an escape; one Pink-footed Goose (*Anser brachyrhynchus*); one Bean Goose (*Anser segetum*), the second example Mr. Pettitt has had this year; one Common Bittern (*Botaurus stellaris*), being the third specimen this winter, including the two previously recorded; and several female Smews (*Mergus albellus*). The almost Arctic season is doubtless the cause of the appearance of these interesting visitors, which we rarely see in ordinary winters. (See also E. N., vol. iv., p. 211).—HENRY LAVER, F.L.S., Colchester, January 10th, 1891.

Aceras anthropophora, Br (Green Man Orchis).—A specimen of this plant was sent to me last June by Mr. Edwin E. Turner; he found it near Lord Rayleigh's park, at Terling. This is an interesting "find," as the plant has been recorded only three times in Essex: once at Belchamp St. Paul, by Ray; once at Ballingdon in 1715, by Dale, and lastly in 1835 at Shoebury Common, by Edward Foster. We may congratulate ourselves in learning that this scarce orchis still occurs in our county.—J. C. SHENSTONE, Colchester, February 20th, 1891.

Pied Flycatcher near Harwich.—Mr. F. Kerry writes thus to the "Zoologist" for March: "On 12th May, 1890, two Pied Flycatchers (*Muscicapa atricapilla*) were seen in a garden at Dovercourt; and the male was shot by a boy scaring birds. This is the first instance that I know of its having occurred in this neighbourhood. I have only once before seen this species in the eastern counties; this was a solitary bird, some years since, at Northrepps, near Cromer, in Norfolk." In the same number of the "Zoologist" (vol. xv., 3rd ser., p. 115) Mr. Kerry has some interesting ornithological notes from Harwich.

THE LOCAL (ESSEX) MUSEUM, LABORATORY, AND LIBRARY.

Wednesday, March 18th, 1891.

A PUBLIC Meeting, convened on behalf of their respective Societies by Mr. W. Cole, *Hon. Sec. to the Essex Field Club*, and Mr. Edmund Durrant, *Hon. Sec. to the Essex and Chelmsford Museum*, was held in the Grand Jury Room of the Shire Hall, Chelmsford, on Wednesday evening, March 18th, 1891, at seven o'clock, Mr. W. J. Beadel, M.P., in the chair. There was a large and representative attendance, not only from Chelmsford and its neighbourhood, but also from other parts of the county and from London; the attendance would have been larger, had not a Town Council and other meetings, and the lamented sudden death of Mr. Alderman Grey, prevented many from being present.

The Chairman, in opening the proceedings, said that they had met to lay the foundation of something which he trusted would be highly beneficial, not only to themselves, but more particularly to those who succeeded them. The Essex Field Club and the Chelmsford Museum had arranged a scheme which, no doubt, would result in great good to the county at large. (Applause). No man was more proud of his county than he was of his. (Applause). He frequently had the opportunity of hearing Essex abused, but he had the satisfaction of telling those who abused it that the abuse was simply the result of absolute ignorance. (Laughter). The step they were about to take would, he believed, dispel many of the illusions which had existed with regard to the county. Those who had prepared the scheme before them had taken very considerable pains to arrive at something which would be for the benefit of the community at large, and it would be a satisfaction to them to feel that the inauguration had taken place that night, and that they had been sowing seed on good ground, where it would fructify and would bring forth great benefit to the people of the county. (Applause).

Mr. W. Cole (*Hon. Sec.*), announced that the following had agreed to act as Trustees of the proposed Museum, under the conditions imposed by the scheme: Lord Brooke, M.P., Sir T. Fowell Buxton, Bart., Mr. G. P. Hope, the Archdeacon of Essex, Professor Meldola, F.R.S., Lord Rayleigh, F.R.S., and Mr. W. M. Tufnell. The bankers would be Messrs. Sparrow, Tufnell, and Co., Chelmsford, and the National Bank, London.

The Secretary also read a number of letters from prominent men who had taken an interest in the scheme, but who, from various causes, were unable to be present at the meeting, including: Prof. G. S. Boulger, Mr. James Britten, F.L.S., Sir T. Fowell Buxton, Bart., Mr. Horace Fulton, M.P., Mr. E. B. Knobel (*Secretary to the Royal Astronomical Society*), Sir John Lubbock, Bart., M.P., F.R.S., Colonel Makins, M.P., Mr. R. McLachlan, F.R.S., Prof. Meldola, F.R.S., Mr. H. B. Monckton, F.G.S., Mr. Hillebrand Ramsden, F.L.S., Right Hon. Lord Rayleigh, F.R.S., Right Hon. Lord Reay, Sir Henry Roscoe, M.P., F.R.S., Mr. J. Round, M.P., Sir H. Selwin-Ibbetson, Bart., M.P., Dr. Henry Woodward, F.R.S., &c., &c. Sir John Lubbock wrote: "I sincerely trust that the Essex County Council will devote the sum receivable from the Wine and Spirit Duties to Technical Instruction in accordance with the Act of Parliament, for it seems clear that we must improve our system of education in this respect if we are to hold our own in the future.

This is quite as true (if not more so) in agriculture as in manufactures." Lord Reay (late Governor of Bombay) wrote: "To my great regret I cannot be present on Wednesday, as I have promised to attend another meeting at that hour. The scheme for technical instruction has evidently been drawn up with great knowledge and care. I should have been prepared to support, warmly, its main features. It will fructify elementary education, and enhance its value and appreciation in rural districts, which stand more in need of technical instruction than the manufacturing districts, because agricultural pursuits open a wider field of observation than the supervision of even the most intricate machinery. I wish all success to your undertaking."

Mr. Ed. Fitch (*President of the Essex Field Club*), read the scheme for the amalgamation of the Essex and Chelmsford Museum with the Essex Field Club, and for the establishment of a Local (Essex) Museum Laboratory and Library, which had been agreed to by the two bodies (the scheme is fully set out in the last volume of the *ESSEX NATURALIST*, vol. iv., pp. 236-241).

[In the circular calling the meeting the following summary was given of the scheme, and of the advantages to be derived from such an institution as that proposed to be founded: "It is proposed, under an agreement for the amalgamation of the two above-named Societies, to establish in Chelmsford (chosen not only as the County Town, but also as being a central position in Essex) a Public (Free) Museum, to illustrate the natural productions, the geology and physiography, and the industries and manufactures of Essex, together with an *Educational Series* of specimens and preparations, which may be employed for teaching purposes. The Museum will also contain a Library of books, maps, Parliamentary papers, pictures, &c., treating of the natural history, geology, topography, history, and industries of Essex, as well as a general library of books, necessary for the study of the before-mentioned subjects.

"It is submitted that the Museum, Laboratories, and Library at Chelmsford will be of great utility, not only to Naturalists and Students of Science, but also to the inhabitants of the county at large, to Farmers, Gardeners, Fishermen, &c., and to Members of the County Council, County Officers and others, desirous of obtaining accurate information about Essex, its natural productions and industries, and also as affording facilities for any special technical investigations in the subjects above-mentioned.

"The benefit to be derived from the establishment of local museums as educational agencies is being very widely recognised; the British Association for the Advancement of Science appointed a committee to consider the subject, valuable reports being issued in 1887 and 1888. In 1889 Prof. Flower chose Museums as a principal theme of his Presidential Address to the Association, and in speaking of the value of Local Museums referred especially to that 'numerous class, and one which it may be hoped will year by year bear a greater relative proportion to the general population of the country, who, without having the time, the opportunities, or the abilities to make a profound study of any branch of science, yet take a general interest in its progress, and wish to possess some knowledge of the world around them. . . . For such persons museums may be, when well organised and arranged, of benefit to a degree that at present can scarcely be realised.'

"Of the *scientific value* of local museums nothing need be said—their importance is fully recognised by all competent to judge. Mr. F. T. Mott, Secretary of the British Association Committee on Provincial Museums, has well said: 'Every provincial museum which undertakes to do its proper work for the nation at large must set itself to collect and record every natural fact in every branch of science within the area of its own special district. It must waste no energy upon anything outside of this district, but within it everything must be done as completely and rapidly as possible. *The museum must be a scientific monograph of the district, illustrated by actual specimens of the natural and artificial products of that district. . . .* If every district in the kingdom were thus worked up, many scientific problems which are now insoluble would become plain, and the *local museums are the institutions most capable of accomplishing this object.*' The Essex Field Club, with its large body of expert naturalists and its *serial publications*, is quite capable on carrying on such a work.]"

Mr. F. Chancellor, J.P., moved the first resolution, as follows:—

"That, in the opinion of this meeting, the proposals put forward by the Joint Committee of the Essex Field Club and the Essex and Chelmsford Museum for the establishment of a Local Museum, Laboratory, and Library, is worthy of the support of the county, and this meeting pledges itself to do all in its power to promote the same."

In the course of his remarks Mr. Chancellor mentioned that the present Chelmsford Museum was founded more than fifty years ago, and although, like most local museums belonging to a former age, it contained a good deal of what scientific men would call rubbish, it also contained many things of value and

interest to the town and county at large. The object of the scheme was to increase the usefulness of the Museum by making it truly representative of the county, and to enlarge it so as to become of educational value. The middle classes must seriously take up the question of technical education, if they wished to hold their own. The establishment of the Museum on right lines would confer a very great benefit upon Chelmsford, as well as upon the county generally; and he should be mistaken in, and ashamed of his brother townsmen if they allowed this scheme to slip through their hands, and the Institution to be located somewhere else. It was simply a question as to whether they would raise sufficient money for the building, and if they did not raise it, some other district would get the Institution. If they established the Institution it was almost impossible that the County Council could allow it to exist without providing money for its maintenance. (Applause.) Mr. Chancellor proceeded to mention the names of a number of gentlemen who had apologised to him for their absence, and said that Admiral Luard had promised a donation of £5 5s. (Hear, hear.)

The Ven. Archdeacon of Essex seconded the resolution, and commended the scheme to the approval of the meeting, because it had been thoroughly worked out by men who well understood what they were doing. (Hear, hear.)

Prof. W. H. Flower, C.B., F.R.S. (Director of the British Museum of Natural History), then gave an able address on the "Educational Value of Museums," a subject which, as above mentioned, formed the principal theme of his Presidential Address to the British Association in 1889. Alluding to the scheme before the meeting, he spoke highly of the claims and capabilities of the Essex Field Club to undertake such a task; he had followed the operations of the Club almost from the beginning, and the energy and persistence in one line of work and observation, as evidenced in the publications of the Club, placed it, in his opinion, in the very front ranks of similar institutions. He had had an opportunity of reading and considering the scheme before it was adopted, and now that it was in print he might say that he considered it was as good a scheme as could be devised to meet the special circumstances of the case. It was well abreast of the modern views of the objects and functions of local museums, and contained all the elements of success, having been drawn up by a body of men who were very much in earnest, and he did not think that any fault could be honestly found with the plans that had been put before the inhabitants of Essex. If they succeeded in establishing this Institution it would certainly soon become the centre of great educational advantages, and they would be setting an example for other counties in England to follow. (Applause.) Under Mr. Chancellor's guidance he had been enabled to pay a hasty visit to the old museum in Chelmsford that afternoon, and it seemed to contain many things that would form a nucleus of a collection, more especially in the way of Roman and Saxon remains. These remains should always be carefully and jealously guarded. Prof. Flower insisted most strongly on the necessity of a museum being well arranged, and said that an ill-arranged museum was like the letters of the alphabet thrown about indiscriminately, meaning nothing at all. A well-arranged museum, on the other hand, was like those same letters properly arranged in words of counsel and instruction. But almost everything depended upon the curator—but in most museums he was the last thought of. The Professor was almost inclined to advise, "Get your curator and build the museum around him." Unpaid labour of the kind could never be depended upon; voluntary aid would be most useful in particular departments, but the controlling hand of a permanent curator was in his opinion an absolute necessity if the plans set before them were to be usefully and efficiently carried out. A

museum was like a living organism, it required continued and constant care, but this fact was not sufficiently appreciated by those having the charge of such institutions.

Mr. F. W. Rudler, F.G.S. [Curator of the Geological Museum, Jermyn Street and author of the paper on Natural History Museums printed in the last volume of the E. N. vol. iv. pp. 242-251], in the course of a telling speech, said that the scheme was well worthy of support by reason of its comprehensive character. They must not suppose that the Museum, and its attached educational departments, would benefit only a few with scientific or antiquarian tastes. Some people would say that agriculture and other Essex industries being at such a low ebb rendered the formation of such an institution difficult from a financial point of view, but he would reply that a time of depression (from which he was glad to fancy we were now emerging) was the time above all others when it was worth while, when indeed it was absolutely necessary, to see what aid science, as applied to human industries, could give to agriculture and other employments. Such an institution as that they were advocating would benefit not the few only, but the whole county, and would in time to come be looked upon as of great public utility. He was almost ashamed to say that this was his first visit to Chelmsford, but directly he got into the town he was very much struck with the light of modern days which it possessed. He hoped that the townsfolk's adoption of the beautiful and useful electric lighting might be taken as an earnest of their wish to keep abreast of the latest scientific applications. (Applause.)

Mr. T. V. Holmes, F.G.S. (*President of the Geologists' Association*) strongly supported the resolution, and spoke of the practical value of a knowledge of geology in many branches of industry.

Dr. J. C. Thresh, D.Sc., F.R.Met.S., &c., said the scheme for carrying technical education into the rural districts was a bold one, and a very good one. Essex should be proud of having an opportunity of being the pioneer county in taking technical education into the country districts. Although he had not been long in the county he had learned something of the demand which existed for technical education.

Dr. H. Laver, F.L.S., F.S.A., of Colchester, said it had often been his pleasure to try to upset the stupid notion that Essex was the marshy and unhealthy county it was sometimes represented to be. (Applause.) He should very much like to have seen the proposed Museum established at Colchester, but as that could not be he would do his best to help it forward at Chelmsford. (Hear, hear.) The county had in the past done as much towards making the history of England as any other county, and it was now going to be the pioneer in another movement which would spread light throughout the kingdom. (Hear, hear.) Other counties were bound to follow the example of Essex.

Mr. F. W. Rogers (Head-master of the Chelmsford Grammar School) said he cordially supported the scheme. He was sure that, if properly managed, the local Museum would be a very great help to education. (Hear, hear.)

Mr. J. C. Shenstone, F.R.M.S., of Colchester, also supported the resolution, remarking that, although he should have liked the Museum in his own town, it could not be denied that Chelmsford was the centre of the county, and therefore had superior claims to Colchester as being the home of the Museum.

The resolution was carried unanimously.

Mr. Walter Crouch, F.Z.S., moved—

“That a Subscription List be at once opened for raising a Fund for the building and fitting of the Museum, &c., and for the endowment of the same.”

He said that a very considerable sum of money would be required to place the Institution on a firm footing, and to keep it going, but with the energy of the Club, and the generous appreciation of the inhabitants of the county and of Chelmsford, he had every hope of success.

Mr. F. Marriage, in seconding the resolution, said that if technical education could be taken into the villages it would be worth all the money they could raise. Subscriptions to such an institution as that proposed should be regarded as investments, and a well-to-do man who invested £50, or a comparatively poor man who invested £10, would, through the work of such an institution, reap advantages for himself or confer them upon others, which might fairly be looked upon as worth far more than merely getting a miserable five per cent. for the money.

Mr. A. C. Freeman, of Maldon, supported the motion, and said he had been requested by the Mayor of that "plucky and fightable little town" to state that he would be glad to help the movement in every way he could, not only because he believed in it, but because the president of the Field Club, Mr. Fitch, was one of the most respected and beloved inhabitants of the borough. (Applause.)

This motion was also unanimously carried.

On the motion of Mr. Fitch, seconded by Professor Flower, a vote of thanks was passed to Mr. Beadel for presiding, and with a few words from that gentleman a very successful and enthusiastic meeting came to an end.

[The members and friends of the two Institutions took tea together at the "Saracen's Head" before the meeting, and several of the members and visitors were most hospitably received by local members.]

Sea-gulls in London.—During the past Arctic winter one of the sights of London was the large number of gulls flying over the Thames and settling on the blocks of ice. Near Battersea some hundreds were seen, and Mr. F. J. Chopin, the Superintendent of Battersea Park, wrote as follows to the "Standard," under date December 8th: "It has occurred to me that it might be interesting to some of the readers of your paper to mention the unusual arrival of a large number of sea-gulls during the last few days to the lake in this park. It has been usual in past winters for one or two to visit the lake, but this morning I myself counted one hundred and fifty swimming in one drove, and quite another fifty were flying round. I am inclined to think that their appearance in such numbers is a sign that more severe weather is not far distant."

Otters and Kingfishers in the Chelmer.—On February 28th a female Otter with two young ones was taken alive in the Chelmer at Camsix Farm, Felstead. The mother has since escaped, and the young ones have been returned to the hole in the tree from which they were taken, in the hope that she may find and feed them. The reaches of the Chelmer are here exceedingly secluded, and it is not improbable that others may remain long unobserved in the neighbourhood. As an instance of the seclusion I may mention that last summer my boys found a Kingfisher's nest with five young birds. These young birds were very handsome and perfectly clean in their plumage, in a nest and surroundings very disgusting. Their great beauty, apart from any considerations of humanity, was a sufficient appeal to us to allow them to retain their liberty, although, I may add, they were all caught and handled, and much resented that treatment.—J. FRENCH, Felstead, March, 1891.

THE LEPIDOPTERA OF ESSEX.

PART I.—BUTTERFLIES.

By EDWARD A. FITCH, F.L.S., F.E.S., etc.

[Read December 2nd, 1890.]

OF the sixty-five British butterflies, fifty-five have been known to occur within our borders—a larger number than I can find recorded for any other county. Mr. Porritt's Yorkshire list of Lepidoptera includes forty-eight species of Diurni, and the Rev. E. N. Bloomfield is now able to catalogue fifty-four species, and three doubtful records, for Suffolk. Mr. Cockerell gives forty-one species for Middlesex, several of which are certainly doubtful records. Hence our district may be looked upon as rich in species, and the individuals in many cases are fairly numerous. With regard to the completeness of this catalogue it is only necessary to observe that it contains notes of all the species that have been recorded, as far as a tolerably exhaustive survey of our general entomological literature enables me to judge. No MSS. or "Marked Lists" have been asked for, or used in its compilation; there is always so much difficulty in authenticating captures, and in getting notes of precise localities. With the aid of our Club and the *ESSEX NATURALIST*, it is to be hoped that many local lists may yet be forthcoming, similar to those we have already published by the Rev. G. H. Raynor (*Trans. E.F.C.* iii. 30-47) and Mr. Howard Vaughan (*E.N.* iii. 123-140.). These local lists are interesting and helpful, and act as a stimulus to others to endeavour to make additions to the records in their own immediate localities. Several such lists are already promised, and the publication of the present general list for the whole county will in no way make them less useful.

My catalogue cannot be considered as complete; we know there are yet many unexplored spots in Essex, and there are few localities that have been at all exhaustively worked (*cf.* my remarks, *E.N.* iii. 98-99.) Only this year a new butterfly has been added to the British list, and it was first found in Essex (F. W. Hawes, *Ent.* xxiii. 3). *Hesperia lincola* has been an overlooked species, and thought to be only a variety of the common *H. thaumas*. Mr. Hawes took his specimens in what is now but the remnant of an old locality, Hartley Wood, a spot that has been well worked for at least a century (*see* Miss

Jermyn's "Vade Mecum"). The new butterfly is fairly common and generally distributed in our county, and is a startling instance of what may still remain to be done even among our scanty, much studied, and much collected butterflies. I have but little information from the characteristic country to the north and west of Saffron Walden—the north-west corner of our county—which Mr. Christy has aptly termed "the chalky uplands." It is a district in which many local species, peculiar to chalk soil, may be expected to occur.

I have to thank Mr. W. H. Harwood, Rev. G. H. Raynor, and Mr. B. G. Cole, for some help with regard to the respective localities in which they have collected.

The plan of the paper is self-evident; it is simply intended to gather together the *published* records of the Essex Lepidoptera; a few unpublished records are occasionally added, but exceptionally, and for a special purpose. Now that a summary of the printed records is furnished, it should be easy for our lepidopterists to add to them from their own observations, and the Editor of the ESSEX NATURALIST will be very glad to have local lists, or observations on single species, for publication, so that we may get to know the extent of our native riches. Upon the completion of the Catalogue of the Lepidoptera of Essex I shall hope to say something about the comparative distribution of the species, noting those believed to have become extinct, and the relative richness of our lepidopterous fauna as compared with that of other counties.

I ought, perhaps, to say that the nomenclature and arrangement followed is that of Mr. R. South's "Entomologist" List, being a recent (1884) adaptation of Standinger and Wocke's valuable Catalogue. The headings of families, etc., are omitted. The abbreviations used in making the references will be readily understood by most entomologists, but for the benefit of those taking up the study, a full list is appended.

RHOPALOCERA—BUTTERFLIES.

Papilio machaon, L. Swallow-tail.

Geographical distribution—Europe, North Africa, Asia to Himalaya, and perhaps Japan, Western North America. Generally distributed and frequenting woods, open fields and gardens; but in Britain now supposed to be confined to fens of Cambridgeshire, Hunts, and Norfolk, where it is rapidly disappearing.

Larva—Bright green, with deep black rings, which are spotted with red. *Food*—Common and hog's fennel, wild carrot, and other umbelliferæ. *Imago*—May to August—hibernates as pupa.

Early in the century, doubtless, fairly common in several localities in the county, and it has lingered until quite recently, even if it be now extinct in Essex. Ray, who gives a good description of the larva found near Montpellier on fennel, and in Sussex on *Pimpinella saxifraga*, says, "and I have observed this in Sussex and Essex, counties of England" (*H.I.* 110). Stephens says, "It has sometimes been captured close to London, in Epping Forest, at Stepney, and near Peckham; and it was formerly abundant at Westerham, in Kent" (*J.B.E. Haust.* i. 8). Newman says, "When at school at Tottenham I have found these beautiful caterpillars feeding on rue" (*Y.E.* 4), and again, "I have repeatedly found the caterpillar feeding on rue in a garden in the occupation of some friends of the name of Förster, on Tottenham Green; this was probably fifty years ago" (*B.B.*, 153).¹

In C. Parsons' MS. entomological journal I find, "1826, July 31, *Papilio machaon*, 11, at 'Trotter's.'" At first I thought this referred to eleven specimens, but in a MS. list of insects left by Parsons I find "11 *P. machaon*," so it is probably only a reference number. In a box of Parsons' insects now in the Southend Institute, there are four *P. machaon*, one only with a label "Sutton Broad, Norfolk, 3rd June, 1841"; the other three are most probably Essex specimens. "Trotters" is in North Shoebury parish, less than three miles from Shoeburyness or Southend. C. O. Rogers captured one, and pursued another, in a marshy place near Southend, on August 24th, 1858 (*E.H.I.* iv. 179). Our member, Mr. F. H. Varley, found five pupæ between Southend and Shoebury (not Tilbury, as printed in *Proc. E.F.C.* ii. lxxvix.) in October, 1868. Two of the three specimens bred from these pupæ are in the Club collection. Fennel (with many other Umbelliferae) is still very common on the cliffs between Southend and Shoebury, and the locality seems a natural one for this interesting butterfly. W. S. Coleman, in his "British Butterflies" (p. 66) says that it has occurred singly at Southend, doubtless referring to Mr. Rogers' capture.

One of Rev. J. W. Mills' pupils took one specimen at Tillingham in 1877 (*Ent.* x. 191), and Mr. Mills was quite of opinion that *machaon* used to occur in his neighbourhood, as an old parishioner

¹ I believe that we found a larva of *P. machaon* in our then favourite collecting ground, the lane near Temple Mills, Leyton, in 1850; but being then ignorant of the distinguished character of our beautiful caterpillar, and not knowing the food, we failed to rear it. The once rural lane, along which the "Wood-lady" (*E. cardamines*) used to flit in early summer, and where a morning's walk would furnish forth abundance of the beautiful common objects of the country, is now, alas, the blackened track to the necessary, but ghastly and stinking, parish dust-yard. — W. COLLE.

of his (a female who was considerably interested in entomology), who saw the specimen after capture, was certain she had seen others many years ago, but not lately. Since Mr. Mills has left this neighbourhood I have come into possession of two specimens, also taken at Tillingham by Miss Hance, at least fifty years ago (referred to, *E.N.* ii. 242). Mr. Raynor records a specimen caught at Maldon by Mr. Gutteridge, in August, 1872 (*Ent.* vi. 223). Dr. Gutteridge has confirmed this to me, and there is no evidence of its introduction artificially.

Cornelius Walford, then of Witham, saw a specimen on Tiptree Heath in 1838 (*E.L.J.* 27).

Mr. Harwood has known it to occur several times at Walton-on-Naze, on the authority of Thomas Catchpole, and D. B. Brightwell (caught by one of his pupils). A very likely locality, as it is the only station for *Peucedanum officinale* in Essex, which has been known there from Ray's time to the present; it is also curious that *P. palustre*, still the favourite food-plant of this species in the Fens, was recorded as an Essex plant in the "Flora" only from Epping Forest, by John Ray formerly of Epping. Between the years 1848 and 1850 Mr. H. Doubleday turned out a number of *P. machaon* in parts of Epping Forest, apparently an old locality for this butterfly, but it did not again establish itself (*Proc. E.F.C.* ii. lxxx).²

The Rev. H. H. Crewe says, "The family of a clergyman residing near Ipswich told me they had taken *machaon* on the banks of the [Essex and Suffolk] Stour" (*B.B.* 153). W. Gaze records three specimens taken near Haverhill, by different collectors in 1841 (*Ent.* i. 307), and writes later: "On enquiry I found it has several times been taken in that place" (*Ent.* i. 340). In 1867, '68 or '69, my cousins, Herbert and Arthur Fitch, caught three specimens for me at Clare Priory, where they were at school; two in one year, and one in another, and I have no doubt whatever but that they were residents, and should not be at all surprised to learn that *machaon* still lingers around the sources of the Stour on the Essex and Suffolk border.

Mr. W. R. Jeffrey records it from Saffron Walden, but adds, 'Supposed to have been brought to the neighbourhood in the

² Mr. Maynard, Curator of the Saffron Walden Museum, writes: "Some years since an unsuccessful attempt was made to naturalise *P. machaon* in this neighbourhood by the late Mr. G. S. Gibson and Mr. W. M. Tuke, who procured a large quantity of caterpillars from Wicken Fen, Cambridgeshire. These were placed in a field of carrots, upon the tops of which they fed and seemed at first likely to do well, until they were found out by the birds, who soon made short work of the colony, and not one specimen was ever seen in the imago state." It is interesting to note that many of the old records indicate that *P. machaon* was formerly a garden insect in England (as it is still on the Continent) although now confined with us to the Fen districts. — Ed.

chrysalis state" (*B.B.* 152). In the abridged "Catalogue of the Saffron Walden Museum" (1845), we read, "This species has occasionally been seen near Waken, having probably been brought on sedges in the chrysalis state" (*l.c.* 49).

[*Parnassius apollo*, L.—a reputed British butterfly—is said to have been taken at Epping, about 1847 or 1848, by a son of Geo. Bax Holmes, a schoolfellow of H. and E. Doubleday (*Ent.* vi. 39). This must be an error.]

[*Aporia cratergi*, L. Black-veined White. This species, now verging on extinction in Britain, used to be common near London; Samouelle says "Woods near London" (*Useful Compendium*, 236). Stephens took it at Coombe Wood, and Haworth at Little Chelsea (*Z.* v. 1616). The only Essex record I find is one at Wanstead (*Ent.* xii. 163). This is very doubtful.]

Pieris rapæ, L. Small White.

Geographical Distribution—Europe, Asia, Africa north. Introduced into Canada and rapidly spreading in North America. Throughout Britain—our commonest butterfly.

Larva—Dull green, thin dorsal and lateral yellow lines, yellow dots on sides. *Food*—Cabbages, horse-radish, mignonette, &c.; often destructive in gardens. *Imago*—April to October, especially abundant in May and August; hibernates as pupa.

Common in every garden throughout the county.

Pieris brassicæ, L. Large White.

Geographical Distribution—Europe (except polar regions), Asia to Himalaya, North Africa. Throughout Britain.

Larva—Bluish-green with yellow stripes. *Food*—Various cruciferæ, especially cabbages, turnips and other garden produce; often very destructive. *Imago*—April to September; hibernates as pupa.

Too common everywhere.

Pieris napi, L. Green-veined White.

Geographical Distribution—Europe, Asia, North America. Throughout Britain.

Larva—Dull green, paler on sides, spiracles black in yellow ring. *Food*—Various cruciferæ, as horse-radish, watercress, wintercress, hesperis, &c. Mr. Harwood has found it on sea-rocket. *Imago*—April to August; hibernates as pupa.

Very common, but not so exclusively a garden or town insect as the two preceding species.

Pieris daplidice, L. Bath White or Green Chequered White.

Geographical Distribution—Europe (except polar regions), Asia to Himalaya and China, North Africa. In Britain confined to South and East England, where it is very rare and uncertain.

Larva—Greyish-green with yellow stripes on back and sides. *Food*—Various cruciferae and resedaceae, especially wild mignonette. *Imago*—May and August, but the May brood almost, if not entirely, absent in England; hibernates as pupa.

Very rare, always occurring singly; partial to lucerne fields. Probably an immigrant from the Continent.

One by Mr. Norman Halls, near Dilbridge Hall, Colchester, on Aug. 12th, 1857 (*W. H. Harwood*; *E.W.I.* ii. 182, *B.B.* 159). One by Dr. Maclean, near Berechurch, many years ago (*Harwood*). One male, Epping Forest, by Mr. Walter Nash, 1866 (*A. Cottam*; *E.M.M.* vii. 109). One female, near Southend, Aug., 1870 (*D. T. Button*; *Ent.* v. 221). One female, Southend, Aug. 11th, 1876 (*V.E.L. Young*; *E.M.M.* xiii. 108).

Colias edusa, F. Clouded Yellow.

Geographical Distribution—Throughout palæartic region, except extreme north, reaching Azores and Syria. Uncertain in its appearance in Britain. North American species scarcely distinguishable.

Larva—Deep green, narrow white stripe on sides with pink spots. *Food*—Various species of *Trifolium*, *Medicago*, and *Lotus*, especially white clover and lucerne. *Imago*—June to October; hibernates as imago or larva (see *Entom.* xi. 60, 139).

Notwithstanding some uncertainty I believe that this errant species hibernates as a larva. Although Mr. Buckler knew that its congener *C. hyale* hibernated as a larva, he wrote in 1877, "I strongly incline to the belief that by far the greater number of those I saw on the wing at this time (June 12th) must have passed the exceptionally mild winter in the pupa state" (*Larvæ*, p. 12). In the latter half of October of that—the *Edusa*—year, Mr. Buckler had eggs, larvæ just hatched, full-fed larvæ, pupæ and imagos.

Common in some seasons, in others not seen; generally distributed. Abundant in 1877 (see *Ent.* xi. 49-61), rare since.

"In a field sown with flax not far from the town of Bocking, in Essex" (*Ray*; *H.I.* 113). Epping (*S.M.* i. 17). A few specimens, Sept., 1839, Epping (*H. Doubleday*; *in litt.*). One, Epping, 1885 (*G. V. Elstowe*; *Ent.* xviii. 204). Common, Walthamstow, 1877, last noticed Oct. 5th (*B. Cooper*; *Ent.* xi. 55). Common in Maldon district, 1875 (*Fitch*; *Ent.* viii. 221). Not common, Hazeleigh, 1875 (*G. H. Raynor*; *Ent.* viii. 300). Abundant and bred at Maldon, June 6th to Dec. 12th, 1877 (*Fitch*; *Ent.* x. 189, 210; xi. 58). One, Maldon, Sept. 26th, 1879 (*Fitch*; *Ent.* xii. 283). One, Maldon, Sept. 26th, 1881 (*Fitch*; *Ent.* xiv. 296). One, Maldon, Sept., 1883 (*Fitch*; *Ent.* xvi. 259). Hazeleigh, Maldon, Sept., 1884 (*Raynor*; *Ent.* xvii. 251). Hazeleigh, Warley, Sept., 1885 (*Raynor*; *Ent.* xviii. 315). One, Maldon, Oct. 4th, 1886

(*Fitch* ; *Ent.* xix. 278). One, Maldon, Sept. 10th, 1889 (*Fitch* ; *E.N.* iii. 122). One, Little Cornard, autumn, 1836 (*W. D. King* ; *F.S.J., Dec.*, 1838). One, male, Kedington, 1835 (*W. Gaze* ; *Ent.* i. 278 ; *Z.* iii. 803). Three near Sudbury, Aug. 20th-Sept. 7th, 1843 (*Gaze* ; *Z.* ii. 485). Two, Sudbury and Foxearth ; three, Great Cornard ; eight, near Sudbury, 1844 (*Gaze* ; *Z.* iii. 803). Several near Chelmsford, 1844 (*A. Greenwood* ; *Z.* iii. 803). Two, Walton-on-Naze, 1844 (*J. Taylor* ; *Z.* iii. 1198). Walton-on-Naze, 1875 (*Harwood* ; *Ent.* viii. 198). One, Walton-on-Naze, Aug. 29th, 1889 (*B. G. Cole* ; *E.N.* iii. 93). Common at Clacton to Sept. 28th, 1877 (*H. Miller, jun.* ; *Ent.* xi. 56). One female, Clacton, Sept. 9th, 1881 (*Harwood* ; *Ent.* xiv. 232). Wrabness, Oct. 24th, 1877 ; abundant near Harwich, 1877 (*F. Kerry* ; *Ent.* x. 286 ; xi. 55). One male, Harwich, Aug. 18th, 1878 (*Kerry* ; *Ent.* xi. 269). Six, Colchester, 1857 (*Harwood* ; *E.W.I.* ii. 195). Colchester, June, 1858 (*Harwood* ; *E.W.I.* iv. 107). Chingford, June 6th, 1877 (*R. L. Rolph* ; *Ent.* x. 189). Loughton and Chingford, upwards of forty seen on one day ; Hackney Marshes, several, 1877 (*T. Eedle* ; *Ent.* x. 189). Lea Bridge, June 17th, 1877 (*G. Pearson* ; *Ent.* x. 189). Abundant, Woodford Bridge, 1877 (*W. Cole* ; *E.N.* ii. 170). Two males, Wanstead Flats, Sept., 1884 (*J. A. Cooper* ; *Ent.* xvii. 251). One, Chingford, Aug., 1886 (*W. Cole* ; *E.N.* ii. 170). One male, Woodford Green, Sept. 7th, 1888 (*W. S. Argent* ; *E.N.* ii. 170). One male, Chalk End, Roxwell, Sept. 22nd, 1882 ; a pair near Writtle, Oct. 1st, 1882 (*R. W. Christy* ; *T.E.F.C.* iii. lxxxvi ; *Ent.* xvi. 41). Grays, 1858 (*Button* ; *E.W.I.* iv. 183). Clamp Field, Little Wakering, Sept. 1st, 1826 ; Little Thorpe [South Shoebury], Oct. 13th, 1826 (*C. Parsons, MS. Journal*). Five, Southend, Sept., 1861 (*H. Vaughan* ; *E.W.I.* x. 202). "Common in some seasons," Leigh (*Vaughan* ; *E.N.* iii. 125). Four, Rainham, Aug. 20th, 1886 (*G. A. Lewcock* ; *Ent.* xx. 40). Several, south-east Essex, Aug. and Sept., 1889 (*J. T. Carrington* ; *Ent.* xx. 256). One, Hole Haven, Canvey, Sept. 4th, 1889 (*B. G. Cole* ; *E.N.* iii. 93). Saffron Walden (*Cat. S.W.M.* 49). Two, Newport, Oct. 6th, 1886 (*Waldegrave* ; *Ent.* xx. 64). Felsted (*Rep. F.S.N.H.S.* ii. 44).

The white variety of female (*Helice*, Haw.) was taken in many localities in the county in 1877 : it was so common that Mr. H. A. Cole took sixteen in one day at Woodford Bridge. It has been recorded from :—

One, Colchester, Aug. 24th, 1858 (*Harwood* ; *E.W.I.* iv. 194).
One, Walthamstow, Sept. 15th, 1877 (*B. Cooper* ; *Ent.* xi. 55).

One, Hackney Marshes, 1877 (*T. Eedle*; *Ent.* x. 189). Twenty, Woodford Bridge, 1877 (*W. Cole*; *E.N.* ii. 170). One, Lea Bridge, Sept. 17th, 1883 (*G. F. Brabon*; *Ent.* xvi. 259). One, Hazeleigh, 1877 (*Raynor*; *T.E.F.C.* iii. 37). One, by Mr. Howlett, at Shenfield, in 1878 (*Raynor*).

Stephens figured *Colias chrysotheme*, Esp. (*I.B.E. Haust.* i. 12, pl. ii. fig. 1) and writes: "The male from which the accompanying figure was taken was captured in company with several other specimens by H. Sims, Esq., in September, 1811, either in the county of Norfolk, or near Epping, in Essex" (see also *Westwood and Humphreys*, *B.B.* 17, pl. iii. figs. 1-3). Cf. my remarks about the small males of the third brood obtained in 1877 (*Ent.* xi. 52, 53), and see woodcut. *C. chrysotheme* is a South-east European species and occurs throughout North America from California and Texas to the northern and mountainous districts. Mr. H. J. Elwes says that its distribution "is quite unparalleled by that of any other species." (*T.E.S.L.* 1884, 16.)

See figure of a curious and interesting aberration of *C. edusa* taken near Colchester in August, 1877 (*Ent.* xi. *pl.* and *p.* 52).

Colias hyale, L. Pale Clouded Yellow.

Geographical Distribution—Throughout palearctic region, except extreme north, to Japan, and South Africa. Extending its range northwards in Britain, fitful in appearance.

Larva—Dark green with narrow yellowish-white lateral stripe. *Food*—Various species of trifolium. *Imago*—July to September; hibernates as larva.

In some years not rare, but more often quite absent; generally distributed.

"Of this rare British species I have seen very few specimens, and, until the last season, only three recent captures had come to my knowledge. The first of these was found in August, 1811, at Wrentham, in Suffolk, by the very ingenious and able artist to whose accurate pencil I am indebted for the figures with which this work is embellished [C. M. Curtis], and is in his brother's collection; the second specimen was taken about eight years ago in Epping Forest, in June, and the third subsequently, near Brighton; but last season many specimens were captured near the last-named place by a person residing in that town, &c." (*Stephens*; *I.B.E. Haust.* i. 14). Epping Forest (*Westwood and Humphreys*, *B.B.* 16). Epping, occasionally (*S.M.* i. 17). Forty-three. Epping, Aug., 1842; twenty-one in one day: "I have never

seen it in this neighbourhood before" (*H. Doubleday*; *Ent.* i. 389). Numerous in 1842, common in 1843, Epping (*H. Doubleday*; *Z.* ii. 398). Occurred in numbers in Aug., 1844 [? should be 1842], Epping, Loughton (*J. English*; *E.N.* i. 111). Three, Snaresbrook, Aug. 21st, 1842 (*W. Courtney*; *Ent.* i. 388). One, near "Wake Arms," Epping Forest, 1868 (*W. J. Argent*). Forty-one, St. Osyth, Aug., 1842 (*A. Lambert*; *Ent.* i. 389). Colchester, but rare (*Harwood*; *B.B.* 142). Thirty-six, Aug., 1857, Colchester (*Harwood*; *E.W.I.* ii. 195). Twelve, Aug. 15th, 1868, Colchester (*Harwood*; *Ent.* iv. 146; *E.M.M.* iii. 106). Six eggs sent by Mr. Harwood, of Colchester, Sept. 16th, 1875 (*Buckler, Larvæ* 16). Two, Great Yeldham, Aug. 1842 (*W. D. King*; *Ent.* i. 416). Five, Lower Southend. Aug. 12th and 13th, 1842 (*A. Greenwood*; *Ent.* i. 416). One, Springfield, Sept. 7th, 1842 (*Greenwood*; *Ent.* i. 416). Fifty, Southend, 1868 (*J. Russell*; *Ent.* iv. 160). Common in some seasons, Leigh (*Vaughan*; *E.N.* iii. 125). One, Leigh, Sept. 11th, 1889 (*B. G. Cole*; *E.N.* iii. 93). Felsted (*Rep. F.S.N.H.S.* ii. 44). One, Witham, Sept. 24th, 1868 (*W. D. Cansdale*; *Ent.* iv. 160). Several, Witham, 1875 (*Cansdale*; *Ent.* viii. 221). St. Lawrence, 1875 (*J. W. Mills*; *Ent.* viii. 276). Seventy in 1875, Woodham Mortimer, Hazeleigh (*Raynor*; *Ent.* viii. 300). Common, Maldon, &c., 1875 (*Fitch*; *Ent.* viii. 221). Five or six, Maldon, June 10th, 1876 (*Fitch*; *Ent.* ix. 202). A few, St. Lawrence, Maldon (*Mills*; *Fitch*; *Ent.* x. 191). One, Maldon; one, Hazeleigh, Aug. 29th, 1889 (*Fitch*; *E.N.* iii. 122). One, Warley, Sept., 1885 (*Raynor*; *Ent.* xviii. 315). Saffron Walden (*W. R. Jeffrey*; *B.B.* 142).

***Euchloe cardamines*, L. Orange Tip.**

Geographical Distribution—Europe (except polar regions), Asia, North and West. Throughout Britain.

Larva—Dull green, white stripe at sides. *Food*—Pods and flower-stems of various *Cruciferae*, especially charlock, bittercress or cuckoo-flower, garden rocket and *Alhtria*. *Imago*—April to June; hibernates as pupa. A second autumnal brood is very rare, but not unknown (see *Ent.* ii. 293; xix. 247; xx. 63, 135).

Plentiful throughout the county.

Dr. C. de Gavère (*Tijdschrift* x. 185) says of this species, "It is, perhaps, from an agricultural point of view, the only truly useful lepidopterous insect. I always find the larva upon charlock or wild radish, eating especially the flowers, and so preventing the dissemination of these troublesome plants." Its larva is certainly useful in

limiting the spread of charlock, our great pest on the Essex clays, as it is particularly partial to the seed-pods of this plant, and more especially so when growing by the roadside. Mr. Doubleday writes, "I believe that the cuckoo-flower (*Cardamine pratensis*) is the one on which the eggs are most frequently deposited, but the greater part of the larvæ must perish in this neighbourhood, because the fields are mowed before the larvæ are full-grown. I have very often seen the larvæ on the seed-pods of *Erysimum alliaria* and have several times found the pupæ on the dead stems of this plant in winter. I think it is the principal food of *E. cardamines* at Epping." (*Z.* xiv. 5146.)

Leucophasia sinapis, L. Wood White.

Geographical Distribution—Europe, North and East Asia (except polar regions). Local in England and Ireland, absent from Scotland.

Larva—Green, with darker stripe on back and yellow stripe on sides. *Food*—Various vetches and trefoils. *Imago*—May and August; hibernates as pupa.

Much rarer now than formerly in woods; of weak flight.

Stour and Hartley Woods [Wrabness and St. Osyth] and Bromley Thickets (*L. Jermyn*; *V.M.* 65). One, Donyland Heath, by William Tillaney; one, Markshall Woods, near Coggeshall, by Henry Lawrence (*Harwood*). Kedington and Haverhill, 1833-5 (*W. Gaze*; *Ent.* i. 278). Litley Wood, Debden (*Joseph Clarke*), Saffron Walden (*Cat. S.W.M.* 49). One in 1835, Epping; not seen previously for five years (*E. Doubleday*; *Ent. Mag.* iii. 284). Plentiful near Epping in 1839 (*J. English*; *E.N.* i. 110). Epping, common (*S.M.* i. 20). Probably now gone from the Forest district, although it is said that Mr. P. F. Copland saw it in Ongar Park Woods in 1888. Hainault Forest ("Lover of Nature"; *K.O.J.* ii. 110). Rare, Sudbury, two specimens taken (*W. D. King?*; *F.S.J.* Dec., 1838). Felsted (*Rep. F.S.N.H.S.* ii. 44). Rather scarce, Witham (*E. H. Burnell*; *M.N.H.* (2) i. 601). Trotters [North Shoebury], "my father," May 20th, 1827 (*C. Parsons*; *M.S. Journal*).

Gonopteryx rhamni, L. Brimstone.

Geographical Distribution—Europe, Asia (except polar regions) and North Africa. Very rare and local in Scotland and Ireland.

Larva—Dull apple-green, covered with minute black papillæ, each carrying a short, pale bristle, white stripe at sides. *Food*—Buckthorn. *Imago*—July till May; hibernating.

Common throughout the county, but more so where its normal food-plant (buckthorn) grows. The bright male is especially noticeable, and welcome in early spring, generally the first species seen. Dr. Maclean found eggs deposited on the buds and terminal shoots of *Rhamnus frangula*, in the woods near Colchester, end of April, 1856 (*J. Curtis : Proc. E.S.L. May 5th, 1856*).

Argynnis selene, Schiff. Small Pearl-bordered Fritillary.

Geographical Distribution—Europe, except extreme south; Asia, north and west. Absent from Ireland.

Larva—Smoky pink, dark-brown line and double row of black and orange spots on back, pale pinkish-red stripe at sides; short ochreous spines, anterior pair reminding one of snail's horns. *Food*—Dog violet. *Imago*—June [? August]; hibernates as larva.

In open places in woods. Common in Epping Forest and in many other restricted localities throughout the county.

Argynnis euphrosyne, L. Pearl-bordered Fritillary.

Geographical Distribution—Europe, North and West Asia. Absent from Ireland.

Larva—Black, greyish-white stripe on sides; spines short, on back yellow with black tips, rest black. *Food*—Dog violet. Mr. Harwood found one on primrose. *Imago*—May and June [? August]; hibernates as larva.

Common in open places in woods, more so than the last species (*A. selene*) and earlier in appearance; generally distributed. Abounds in Epping Forest and in most large woods in the county. Interesting aberrations both of this and the last species sometimes occur.

Argynnis latona, L. Queen of Spain Fritillary.

Geographical Distribution Throughout palearctic region, except extreme north. Confined to south and east in England and Ireland, always uncertain and rare.

Larva—Blackish-grey, whitish stripe on back, brownish-yellow lines on sides; spines short, brick-red. *Food*—Heartsease, violet, sainfoin, and alkanet. *Imago*—May to October, mostly in the autumn in Britain; hibernates as larva.

Very rare and uncertain. Probably an immigrant from the Continent. Six British specimens only known previous to 1818, common in that year, according to Haworth: August and September, 1818, near Colchester (*Stephens ; J.B.E. Haust*). Colchester (*Curtis ; B.E. : S.M. i. 43*). Five, Colchester, 1857 (*Harwood ; E.W.I.*

ii. 182). One, Colchester, Aug., 1858 (*Harwood*; *E.W.I.* iv. 194). One, Colchester, end of Sept., 1865 (*Harwood*; *P.E.S.L.* 2nd Oct., 1865). One, Colchester Aug. 15th, 1868 (*Harwood*; *E.M.M.* v. 106; *Ent.* iv. 146). Another, Colchester, Sept., 1868 (*Harwood*; *E.M.M.* v. 131; *Ent.* iv. 161). "I have taken four in different years in the neighbourhood of Colchester, and have seen three others taken, two of them by one of my brothers; Mr. W. Harrington and Mr. Robert Halls have each taken single specimens; others have been taken at Berechurch by the late Dr. Maclean and Mr. Lawrence Black" [should be Brock] (*Harwood*; *B.B.* 34). One, St. Osyth, Sept. 14th, 1881 (*Harwood*; *Ent.* xiv. 232). One, Braintree, Sept. 19th, 1865 (*B. Holland*; *Ent.* ii. 311). Three, Southend, 1868 (*J. Russell*; *Ent.* iv. 160). One, Rainham, Oct., 1870 (*F. Venables*; *Ent.* v. 212). Near Sudbury (*Gazette*; *Z.* xx. 7971). "Said to have been once taken on the Newton Road, Sudbury" (*W. D. King*?; *F.S.J. Dec.*, 1838).

This rare species has also been taken at Stoke-by-Nayland (*Jermyn*; *V.M.* 67) and Felixstowe (*Ent.* vi. 192), just over the Suffolk border.

Argynnis aglaia, L. Dark-green Fritillary.

Geographical Distribution—Europe, North, West, and East Asia. Common on the Continent, but local in Britain.

Larva—Greyish-back, double yellow line on back, orange-red spots on sides; spines black. *Food*—Dog violet. *Imago*—June to August; hibernates as larva.

Rare; on commons, heaths, and rough hill-sides. Local and apparently disappearing from the county.

Lexden Heath, Birch Wood, near Dedham, Bromley Thickets, Wrabness Cliff (*Jermyn*; *V.M.* 67). Southend (*Harwood*; *B.B.* 28) [doubtful?]. Sudbury (*J. Grubb*; *B.B.* 29). I once saw a large Fritillary at Colne Point, St. Osyth, which I believe was this species; it *might* have been *A. lathonia* (*Fitch*). Woods near Bergholt, over fifty years ago (*H. Doubleday, in letter to W. H. Harwood*).

Argynnis adippe, L. High-brown Fritillary.

Geographical Distribution—Europe (except polar regions), Asia (probably to China and Japan). Absent from Scotland and Ireland.

Larva—Reddish-ochreous, interrupted whitish lines on back, velvety-black transverse streaks along sides; spines rusty brown. *Food*—Violet and heartsease. *Imago*—July; hibernates as larva. From Buckler's "Larvæ" this seems doubtful; he had eggs laid Aug. 25th, 1877; hatched, March, 1878; and again eggs laid Aug. 7th, 1882; hatched Feb. 14th, 1883.

Not common, but probably generally distributed in our larger woods. Apparently rarer now than formerly.

Hartley and Hamlet's Wood and Bromley Thickets (*Jermyn*; *V.M.* 67). Great Bromley (*E. Alston*; *E.W.I.* ii. 143, 151). Colchester, St. Osyth, has been more scarce during the last two or three years than formerly (*Harwood*; *B.B.* 32). Still common in Colchester district (*Harwood*). Rare, Epping (*E. Doubleday*; *Ent. Mag.* iii. 285). Used to occur in quantity, Hainault Forest (*English*; *Proc. E.F.C.* iv. xxxiii.) Common, Epping, in 1844, "but I have not seen one now for many years" (*English*; *E.N.* i. 110). Epping (*S.M.* i. 42). Near "Wake Arms," Epping Forest (*A. J. Rose*; *Ent.* xvi. 151). Not uncommon, Brentwood (*Raynor*). Felstead (*Rep. F.S.V.H.S.* ii. 44). Eastwood, not common. "I have often seen *A. adippe* in the cottage gardens near the wood at Hadleigh" (*Vaughan*; *E.N.* iii. 126). Sparingly in Parson's Wood, near Woodham Mortimer Church (*Raynor*, *T.E.F.C.* iii. 37). Hazeleigh Hall Wood, in August, on thistles, not common (*Fitch*). Not common, Witham (*E. H. Burnell*, *M.N.H.*(2). i. 601). Sudbury (*H. D. King*; *B.B.* 33). Abundant in large wood, Essex, and one var., *cleodoxa* (*Button*; *Ent.* v. 221). "Essex" (*Stephens*).

Argynnis paphia, L. Silver-washed Fritillary.

Geographical Distribution—Europe, Asia, except extreme north. Throughout Britain.

Larva—Blackish-brown, broad yellow streak on back, bordered with black spots; spines long, reddish-ochreous, with black tips. *Food*—Violet, wild raspberry. *Imago*—July and August: hibernates as larva.

Formerly abundant in most of our larger woods, now rare and local.

"Whether seen on the wing and shooting through a gleam of sunshine in the recesses of a wood, or settled upon a lofty purple-headed thistle [or bramble spray], and alternately erecting and expanding its silvered wings, this is certainly one of our finest and most attractive butterflies" (*H. D. King?*; *F.S.J.*, Dec., 1838). Lexden and Stour Woods, Bromley Thickets, Hamlets Wood, Hutton's Grove, Beaumont (*Jermyn*; *V.M.* 67). Great Bromley (*Alston*; *E.W.I.* ii. 143). Formerly common in Highwoods, Colchester, now very scarce; still common at Donyland and St. Osyth (*Harwood*). "Usually one of our commonest species" (*H. Doubleday*; *Ent.* i. 374). Larvæ first met with in 1838 (*H. Doubleday*, *in litt.*). Epping

(*E. Doubleday*; *Ent. Mag.* iii. 157). It has almost, if not quite, disappeared from Epping Forest now; the only specimen Mr. B. G. Cole has seen there was a worn male in Bury Wood, Sewardstone, in 1874. Garden at Park Place, Leyton, in 1868 (*R. Meldola*). Hazeleigh Wood, rare (*Raynor*; *T.E.F.C.* iii. 37). Mr. E. Stuart and Rev. J. W. Mills' pupils used to take it sparingly in Mundon Furze, doubtless it still occurs there (*Fitch*). Woods at Warley, not common (*Raynor*). Very common in some seasons, as 1837, near Witham (*E. H. Burnell*; *M.N.H.* (2) i. 601). Very rare at Messing (*Harwood*; *Proc. E.F.C.* iii. xxvii). Felsted (*Rep. F.S.N.H.S.* ii. 44). Sudbury (*W. D. King?* *F.S.J.* Dec. 1838). Eastwood, not common (*Vaughan*; *E.N.* iii. 126).

[The dark variety of the female (*Valesina*, Esp.), now almost confined to New Forest, Hampshire, is traditionally said to have been found many years ago in Lark's Wood, Chingford, a likely locality enough.—*W. Cole*.]

Melitæa aurinia, Rott. Greasy Fritillary.

Geographical Distribution—Europe (except polar regions), North and West Asia, North Africa. Throughout Britain.

Larva—Velvety black, white specks on back and sides; spines black. *Food*—Blue scabious, also plantain, speedwell, foxglove, and honeysuckle. *Imago*—May and June [August?]; hibernates as larva.

Rare and very local, in damp meadows.

Ongar woods, High Beach (*H. Doubleday*; *Ent.* i. 356). Ongar Park and High Beach in 1839, "but never seen in after years" (*English*; *E.N.* i. 110). Four, Epping Forest, 1857 (*R. Tyssen*; *E.W.I.* ii. 115). Epping, has occurred commonly (*S.M.* i. 48). Near Epping (*E. Doubleday*; *B.B.* 42). Used to occur at Wanstead Flats, but has latterly disappeared (*Carrington*; *Ent.* xii. 163). Kedington and Haverhill, 1833-35 (*Gaze*; *Ent.* i. 278). About Colchester, but not nearly so common as formerly (*Harwood*; *B.B.* 42). [This record is an error, as Mr. Harwood assures me he has never seen it in the county]. Saffron Walden (*Jeffrey*; *B.B.* 42; *Cat. S.W.M.* 49).

Melitæa athalia, Rott. Heath Fritillary.

Geographical Distribution—Europe, North and West Asia, possibly to Corea and Japan. In Britain confined to South England and Ireland, local.

Larva—Black dotted with white; spines ochreous, white on sides. *Food*—Flan-tain, wood sage and speedwell. Mr. Harwood found it on cow-wheat (*Melampyrum*), probably its general food-plant, and foxglove. *Imago*—May to August; hibernates as larva.

Rare and very local, frequenting heathy spots in woods.

Benjamin Wilkes found the larvæ "feeding on common heath" in Tottenham Wood, about the middle of May, 1745 (*Eng. M. and B.* p. 58 pl. cxii.) Hartley Wood [St. Osyth], (*Jermyn; V.M.* 65). Near St. Osyth, July 1845 (*J. W. Douglas; Z.* iii. 1089). "Woods bordering road from Colchester to Ipswich" (Δ (*E. Doubleday*); *Ent. Mag.* iv. 231). Colchester (*E. Doubleday; B.B.* 48). Common but very local, Colchester, 1867 (*Harwood; E.M.M.* iv. 162). "Now restricted to one wood" [Dedham Birch Wood] (*Harwood; B.B.* 48). Dark varieties from Colchester (*Harwood; Proc. E.S.L.*, 7th March, 1870). Formerly Highwoods, Colchester, very rare, and twice in field close to town (*Harwood*). "I may here mention that an attempt was made by Mr. Harwood to establish a colony of *M. athalia* in a wood about fifteen miles from one of its haunts in Essex, where its food plant (*Melampyrum pratense*) abounded: but though the insect fairly established itself for a few seasons, from some cause or other, after changing its habitat from one clearing to another in the wood, it disappeared, and has not since been seen in that locality as far as I am aware" (*G. J. Grapes; Ent.* xix. 177). Ongar Park and High Beach in 1839, "but never seen in after years" (*English; E.N.* i. 110). Epping, has occurred (*S.M.* i. 47). One, Epping Forest (*R. Tyssen; E.H.I.* ii. 115). Series from Essex exhibited (*R. South; P.S.L.E.S.* 1885, 34). Two, Witham, June, 1837 (*E. H. Burnell, M.N.H.* (2) i. 601).

Vanessa c-album, L. Comma.

Geographical Distribution—Europe, Asia (except polar regions). Local in England and Ireland, rare in South and East England, absent from Scotland. Close ally in North America.

Larva—Grey-brown, red patch on back of anterior segments, broad white stripe on back of posterior; spines brown and white, red on sides. *Food*—Hop, currant, elm, sloe, and nettle. *Imago*—September to June—hibernating.

Very rare, if not now extinct in the county, like the hop industry.

"Many years since it used to occur in profusion at Epping; I cannot give any date, but it was when I was a mere child—I should judge about 1817 or 1818. Two or three of the specimens taken

then were in existence not many years back. Since those times I have never met with the insect here" (*E. Doubleday*; *Ent. Mag.* iii. 285; *B.B.* 51). This species has disappeared from many places where it was formerly common. All the old writers record it as being "abundant near London," and many entomologists now living can remember, when they were young, such was the case (*S.M.* i. 40). One, Eastlands Wood, near Maldon (*E. H. Burnell*; *M.N.H.* (2) i. 602). One, Mundon, near Maldon, by R. E. Stuart, in 1871 (*Raynor*; *Ent.* vi. 264). I have seen this specimen this year. Colchester, two or three, but it is a great rarity (*Harwood*; *B.B.* 51). Dr. Laver has one taken by W. Tillaney, at Colchester. Saffron Walden (*Jeffrey*; *B.B.* 51). Mr. H. A. Cole and myself believe that we saw a specimen in Takeley Forest on October 10th, 1890.

Vanessa polychloros, L. Large Tortoiseshell.

Geographical Distribution—Europe. North and West Asia (except far north). Doubtful native of Scotland, absent from Ireland.

Larva—Brown, yellow stripe on back, divided by black line, and sides; spines ochreous. *Food*—Elm, cherry, willow, osier, aspen. *Imago*—July to June; hibernating.

Fairly common, and generally distributed throughout the county.

See Mr. White's paper on a specimen of *V. polychloros*, bred with a brood of *V. urticae*, feeding upon nettle (*T.E.F.C.* ii. 1-7). [This was probably an error of observation, the larva being really *V. polychloros*.—Ed.]. Mr. J. A. Tawell, of Earl's Colne, bred *V. polychloros* from nettle-feeding larvæ in 1871 (*Ent.* vi. 88). Some of these specimens are still in the Entomological Club Collection. Mr. Raynor found *V. urticae*, *in cop.* with *V. polychloros* at Hazeleigh in the beginning of August, 1872 (*Ent.* vi. 221).

Common in the Maldon district, but I have never found the larvæ feeding on anything but elm, generally on stubs. "A brood of the caterpillars fed upon a cherry-tree this year in a garden in this town [Sudbury]; after stripping the end of one branch, they were observed to migrate in a body to the extremity of another, preferring the young leaves to those which had been longer expanded" (*W. D. King?*; *E.S.J.*, Dec., 1838). Larvæ feeding on a low branch of a cherry-tree in a garden at Brentwood, July 10th, 1888 (*Raynor*; *Ent.* xxi. 255). Very common round Colchester in 1860, the caterpillars feeding on elm, willow, and osier, now rare (*Harwood*; *B.B.* 57). This

year [1695], I found several larvæ eating the leaves of the common broad and round-leaved willow (*Ray : H.I.* 118).

***Vanessa urticæ*, L.** Small Tortoiseshell.

Geographical Distribution—Europe, North and West Asia, local forms in East Asia. Throughout Britain. One of the most widely distributed and commonest species.

Larva—Variable yellowish-grey, black line on back, broad brown stripe and yellow line on sides; spines black or yellow, with black tips. *Food*—Nettle. *Imago*—June to June; hibernating.

Particularly abundant throughout the county. In June bright, newly emerged, and tattered, hibernated individuals are frequently to be seen together—a great contrast.

Westwood figures a specimen with a supplemental hind wing, abnormally small, but with the usual markings and coloration, fixed to the base of the hind wing (*Butterflies of Great Britain*, pl. vii. fig. 1, and *T.E.S.L.* 1879, pl. vi. figs. 2, 2a). This monstrous specimen was caught flying near Epping by Mr. H. Doubleday (*Stephens ; I.B.E. Haust.* i. 148), and was sent to Stephens by Mr. Samuel Hanson, on March 3rd, 1828. It is now in the Stephensian Collection in the National Museum at South Kensington.

***Vanessa io*, L.** Peacock.

Geographical Distribution—Throughout palæarctic region, except extreme north and south. Throughout Britain.

Larva—Black, with minute white dots; spines, black. *Food*—Nettle; feeds exposed, generally gregarious. *Imago*—August to June; hibernating.

Common everywhere, but apparently less so in Essex now than formerly.

***Vanessa antiopa*, L.** Camberwell Beauty.

Geographical Distribution—Palæarctic region, North and Central America. Throughout Britain, but rare and uncertain.

Larva—Black, with grey pubescence, row of light-red spots on back through which passes thin black line; spines black. *Food*—Willow, birch, nettle. *Imago*—August to June; hibernating.

Rare and uncertain. Comparatively common in 1872, fairly so in 1880, very rare since.

“The fine species figured . . . is rendered rare and remarkable in this country by its periodical appearance, the cause of which has hitherto never been ascertained: the most probable conjecture

is (as Mr. Haworth has observed) that 'their eggs in this climate, like the seeds of some vegetables, may occasionally lie dormant for several seasons, and not hatch, until some extraordinary but undiscovered coincidences awaken them into active life.' Until four or five years since *V. antiopa* had not been seen for nearly forty years, when it was exceedingly abundant in different parts of the kingdom. In the year 1819 a few were taken in Suffolk, and Mr. Samouelle captured one the following spring that had lived through the winter, since which period it has not been seen. It has received its English name from having been first observed at Camberwell, whither it might have been attracted by willows, upon which the larvæ feed, and are full grown the beginning of July," &c. (*Curtis; B.E.* 96). Insect migration was then but imperfectly understood (see my last presidential address, *E.N.* iv. 7). Lewin says, "In March, 1790, a number of these insects were flying and soaring about for the space of twelve or fourteen days; and then, as if with one consent, they migrated from us and were no more seen."

Little Oakley (*Jermyn; V.M.* 69). One, Little Oakley Rectory, Aug. 18th, 1857 (*H. T. Stainton; E.W.I.* iii. 13). Twelve, Colchester, 1872 (*Harwood; E.M.M.* ix. 137). Two, Roman Hill, Colchester, Sept. 2nd, 1872 (*H. Aggio; F.* xl. 249). Dr. Laver has a specimen taken at Middlewick, Colchester, by William Tillaney, Aug. 29th, 1880. Two, Halstead, Sept. 2nd, 1872 (*S. R. Bentall; Ent.* vi. 216). One, Clavering, Aug. 31st, 1880 (*W. G. Nash; Ent.* xiii. 239). One, Saffron Walden, Sept., 1846 (*G. S. Gibson; Z.* iv. 1507). Three, Witham, Aug. 23rd-Sept. 5th, 1872 (*Cansdale; Ent.* vi. 215; *F.* xl. 214). One, Great Braxted, 1837 (*C. Walford; E.L.J.* 27). One, Maldon, Sept. 13th, 1872 (*Raynor; Ent.* vi. 216). I have one from Maldon, taken many years ago by Miss Hance (see *E.N.* ii. 242). Several, Mundon, 1872 (*Raynor; Ent.* vi. 216, 264). Two, Latchingdon, 1872 (*Chelmsford Chronicle; Ent.* vi. 216). One, Cold Norton, 1879 (*Raynor; T.E.F.C.* iii. 38). Several, Burnham, 1872 (*Raynor; Ent.* vi. 216). One, Burnham, 1872 (*Fitch; E.N.* ii. 83). One, Bradwell-on-Sea, Sept. 2nd, 1872 (*J. W. Mills; Ent.* vi. 215). One, Canewdon, July, 25th, 1873 (*Fitch; Ent.* vi. 457). One, Hockley, Aug. 24th, 1872 (*Fitch; Ent.* vi. 193). One, Southend, Aug. 28th, 1872 (*E. J. Higgins; E.M.M.* ix. 109). One, Southend, 1872 (*C. S. Barnes; F.* xl. 249). One, Chelmsford, Aug. 26th, 1857 (*J. Flatman, E.W.I.* ii. 182). One, Brentwood, Sept. 2nd, 1872 (*E. F. Growse; Ent.* vi.

216). One seen by Mr. R. G. Williment in Weald Lane, Brentwood, on Aug. 19th, 1880 (*Raynor*). One, Havering-atte-Bower, April 14th, 1873 (*E. Pemberton-Barnes : F.* xli. 378. *E. Newman : Ent.* vi. 410). One, Havering-atte-Bower, Sept. 9th, 1886 (*W. H. Pemberton-Barnes : Ent.* xix. 248). One, Epping, Sept., 1835 (*F. Lockey ; Ent. Mag.* iii. 415). Common, Epping, 1836 (Δ *E. Doubleday ; Ent. Mag.* iv. 231). Two, Epping, Sept. 12th, 1846 (*H. Doubleday ; Z.* iv. 1504). Epping, occasionally (*S.M.* i. 39). One, Epping Lower Forest (*English ; Buxton's E.F.* 100). Three, Chingford, Sept. 6th, 1877 (*W. Downing : Ent.* x. 252). One, Ilford, Aug. 27th, 1880 (*G. Watkins ; Ent.* xiii. 277 ; exhibited, *T.E.F.C.* i. lxi). One, Woodford Bridge, 1877 (*W. J. Argent*). One, Walthamstow, Sept. 2nd, 1872 (*W. Downing ; Ent.* vi. 216). One, Walthamstow, May 24th, 1888 (*W. Downing : Ent.* xxi. 155 ; *J. A. Cooper ; Ent.* xxi. 184 ; *W. J. Argent, E.N.* ii. 72). One, Leytonstone, Sept. 4th, 1889 (*G. C. Frindell : Ent.* xxii. 257). One, Lea Bridge Marshes, Aug. 27th, 1876 (*H. Ashpole : Ent.* ix. 229).

Vanessa atalanta, L. Red Admiral.

Geographical Distribution—Europe, Asia Minor, North Africa, North America. Throughout Britain.

Larva—Greenish-grey, and yellow to black (variable) often with pale freckles, pale yellow stripe on sides ; spines yellow, reddish-brown, or black. *Food*—Nettle, spinning leaves together. *Imago*—August to June ; hibernating.

Apparently by no means so common in the county now as formerly, though generally distributed. This butterfly has been taken by night at "light" and at "sugar," and I have several times noticed it flying round trees in my wood (Hazeleigh) at dusk together with the red-underwing moth (*C. nupta*), which it then much resembles. Particularly partial to fallen fruit, especially plums.

Vanessa cardui, L. Painted Lady.

Geographical Distribution—Cosmopolitan, except, perhaps, polar regions and South America. Throughout Britain to Orkney and Shetland, but somewhat uncertain.

Larva—Dark grey with yellow spots, yellow stripes on back and sides ; spines yellow or grey. Mallow-feeding specimens hairy. *Food*—Thistle, especially *C. arvensis*, nettle, and common mallow ; spinning leaves together or under a web. *Imago*—July to July ; hibernating. One of Buckler's hairy mallow-feeders pupated 13th Oct., 1868 ; emerged February 7th, 1869 (*Larvæ*, p. 53). Apparently a conspicuous exception to the constancy of hibernation, but doubtless induced by the unnatural conditions of a warm room.

Uncertain and irregular in appearance, but generally distributed. Some years, as 1879, abundant, in others quite absent. [Very common at Woodford Bridge in 1877, and occurs in most years, more or less abundantly, in the Forest districts.—*H. Cole*.] Ray says, "Occurs with us frequently enough round Braintree and elsewhere" (*III.* 422 *recte* 122). Mr. Cole has in his cabinet a very beautiful aberration of this butterfly, taken in his garden at Buckhurst Hill, on June 11th, 1879. A similar specimen is figured by Newman (*B. B.* 64) from Mr. Ingall's Collection.

Limenitis sibylla, L. White Admiral.

Geographical Distribution—Central Europe, Spain, and South Russia, England.

Larva—Green, with yellowish blotches, two rows of spines on back—reddish at tips with black branches, brown at base—white streak on side; head, red-brown. *Food*—Honeysuckle; preferably those plants climbing oak-trunks. *Imago*—June and July; hibernates as larva.

Rare, every year becoming more so; in woods.

"The graceful elegance displayed by this charming species when sailing on the wing is greater perhaps than can be found in any other we have in Britain. There was an old Aurelian of London, so highly delighted at the inimitable flight of Camilla, that, long after he was unable to pursue her, he used to go to the woods, and sit down on a stile, for the sole purpose of feasting his eyes with her fascinating evolutions" (*Hazworth: Lep. Brit.* i. 30).

"In its beautiful flight, when it skims aloft, it rivals the Purple Emperor, which it strongly resembles in appearance. It seems, however (unlike the latter), to avoid the sunbeams, for it frequents the glades of woods, where it rapidly insinuates itself by the most beautiful evolutions and placid flight through the tall underwood on each side the glades, appearing and disappearing like so many little fairies" (*Rev. Revett Sheppard, of Wrabness, I. M.* 121).

"For the first time in my life I saw this beautiful butterfly near Colchester last July [1836], and its elegant appearance when on the wing will not soon be effaced from my mind. It is vain to try to describe it" (*Edward Doubleday: Ent. Mag.* iv. 231).

"*L. sibylla* is only found when the 'slop,' or underwood is high, and a considerable clearance in a small wood means sometimes the all but total extermination of the species in that particular wood; but colonists from neighbouring woods soon restore the balance, so

soon as favourable conditions again obtain, but when there is no neighbouring wood, the balance may never be restored. In very hot seasons local butterflies become to some extent migratory; such was the case with *L. sibylla* last July, and I should not be surprised if, this year, specimens are met with in woods where none have been previously seen. Mr. Laver saw a specimen in the town here [Colchester] last year [1881] two miles from any known locality" (*Harwood; Proc. E.F.C.* iii. xxvii).

Captured by Mr. Morton, in Essex, not far from the town of Tollesbury, and brought to me on July 11th, 1695 (*Ray; H.I.* 127). Hartley Wood [St. Osyth] (*Jermyn; I.M.* 69). Woods between Walton-on-Naze and Brightlingsea, "but seems to be gradually disappearing" (*A. Lambert and J. W. Douglas; Ent.* i. 384). St. Osyth, July, 1845 (*Douglas; Z.* iii. 1089). St. Osyth (*Harwood; B.B.* 70). Common, woods bordering road from Colchester to Ipswich, July, 1836 (Δ *E. Doubleday; Ent. Mag.* iv. 231). Not rare, Colchester, 1867 (*Harwood; E.M.M.* iv. 162). Colchester (*S.M.* i. 34). History of hibernation discovered by Dr. Maclean of Colchester (*Newman; Z.* xix. 7565). Great Bromley (*E. Alston; E.W.I.* ii. 143). One, near Park Hall, Epping, 1836 (Δ *E. Doubleday; Ent. Mag.* iv. 231). Epping (*S.M.* i. 34). Saffron Walden (*Jeffrey; B.B.* 70). One, Debden How Wood (*Joseph Clarke*). The dark variety figured in Newman's *B.B.* 67 has occurred in Essex (*S. Stevens; Proc. E.S.L. Sept. 5th*, 1853, 127) at Colchester (*W. T. Bree; M.V.H.* v. 667). Mr. Ingall also possesses a similar specimen from the same neighbourhood (*Westwood and Humphreys; B.B.* 61.)

Apatura iris, L. Purple Emperor.

Geographical Distribution—Central and South-west Europe, rare in Asia Minor, China (doubtful), England, south of Humber.

Larva—Green with yellowish spots, yellow or pinkish stripes at sides in front and oblique yellow stripes in middle; horns bluish-green in front with brownish-red tips. *Food*—Sallow, aspen, poplar. *Imago*—June and July; hibernates as larva.

Rare and local; restricted to oak woods; of lofty and noble flight. More often seen than caught. Like *I. Atalanta* this fine butterfly has been taken both at light and sugar.

The larva appears to have been first discovered in Essex (and in England) by Mr. Drury. Moses Harris, in his "Aurelian: or Natural History of English Insects, namely, Moths and Butterflies" (1766), gives in plate iii. two figures of the caterpillar, and remarks upon

them as follows: "On the 26th of May, in the year 1758, Mr. Drury, an ingenious Aurelian, in searching for caterpillars, beat four off willow, near Brentwood, in Essex, which in their shape and motion differed from any hitherto discovered, being furnished with two horns of the same hard substance as their heads, resembling the telescopes of a snail, and in their progressive motion seemed rather to glide along, like that animal, than crawl, as most caterpillars do." After carefully describing the larvæ, he expresses his gratitude to his "generous and worthy friend, Mr. Drury, for the discovery of the caterpillar of one of the most beautiful flies in the universe, and which had hitherto eluded the search of the most skilful and industrious aurelians."

"The Purple Emperor of the British oaks is not undeservedly the greatest favourite of our English aurelians." (*Haworth; Lep. Brit.* i. 19 [1803]). He gives an entertaining description of its habits (*reprinted: V. M.* 117-119; *B.B.* 74-5). Haworth says: "In three days I took myself twenty-three (nine of them in one day), but never took a female at all" (*Lep. Brit.* i. 20).

"*Apatura iris* was common in Hartley Wood and Riddles Wood; between eighty and one hundred were seen performing their graceful and rapid evolutions about the tops of the oaks and aspens, gliding among the foliage, and not returning to any particular tree, as Haworth has stated to be its habit. From the frequency with which they visited the aspens, and their greater inclination to settle on them, we are inclined to think that the larvæ feed on those trees as well as on the broad-leaved willows. There was not a wet spot to be found in the woods, or we should have tried the method of capture mentioned by Mr. Hewitson (*Ent.* 324): only four were taken" (*J. W. Douglas, Ent.* i. 384).

Caught in July, 1695, near Heveningham [Hedingham] Castle, in Essex, by Mr. Courtman (*Ray; H. I.* 127). Hedingham and Blackmore End (*Genj. Allen; M.S.*). Larva on willow, Brentwood, May 26th, 1758 (*D. Drury*). Great and Little Stour Woods, Wrabness and Ramsey (*Jermyn; V.M.* 69). Woods bordering road from Colchester to Ipswich (*Δ E. Doubleday; Ent. Mag.* iv. 231). Hartley Wood, St. Osyth; Riddles Wood, between Walton-on-Naze and Brightlingsea, July 1842 (*A. Lambert and J. W. Douglas; Ent.* i. 384). Woods round Colchester and wood on Mersea Island (*H. Doubleday; Z.* iv. 1399). Eggs from Dr. Maclean, Colchester, July 16th, 1861 (*Newman; Z.* xix. 7820). Egg from Harwood, Colchester,

July 31st, 1875 (*W. Buckler; E.M.M.* xiii. 3; *Larvæ* 45). "Formerly common in the High Woods, Colchester, but I have not seen a specimen since 1860, and it has disappeared from all the other woods where it formerly occurred in the vicinity of Colchester. The last specimen taken here was flying round a moderator lamp in the evening in the town itself. [$\frac{2}{\bar{2}}$ in Dr. Laver's Collection.] It still occurs at Coggeshall and in Stour Wood, near Ramsey." (*Harwood B.B.* 76). Has re-appeared in most of the larger woods in the Colchester district, but is scarce (*Harwood*). Some seasons not very scarce, Witham (*E. H. Burnell; M.N.H.* (2) i. 602). Two, Sudbury, 1838 (*W. D. King?; F.S.J., Dec., 1838*). Occasionally, near Halstead, larva on willow, pupated June 15th, 1875 (*S. R. Bentall; Ent.* viii. 182.) Kedington and Haverhill, 1833-5 (*W. Gaze; Ent.* i. 278). Very rare, Old Hall Wood [Steeple Bumpstead] (*W. Gaze; B.B.* 77). Saffron Walden (*Jeffrey; B.B.* 76). Occasionally, Saffron Walden (*Cat. S.H.M.* 49). Twice seen near Walden (*J. Clarke*). "The late Mr. Joshua Clarke has told me that he formerly took this beautiful butterfly in the woods near Debden, Essex. We have four English caught ones in our 'Old Collection'³ that I believe he presented to the Museum, and if so, they may be from the above-named locality." (*G. N. Maynard, in litt.*). Rickling, near Stanstead, Aug. 11th, 1879 (*J. Carter; F.* liv. 287). Two, Brentwood, July 1st, 1882 (*W. J. V. Vandenbergh; Ent.* xv. 187). Two, captured five or six years ago in woods around Thoby Priory by the sons of Major Arkwright; also two in 1890 (*Raynor*). It was formerly not uncommon in Epping Forest, though it is evidently very local. . . . It is also found in several parts of Essex and Suffolk (*Stephens; I.B.E. Haust* i. 51). Very rare, Epping, 1835 (*E. Doubleday; Ent. Mag.*, iii. 285). Epping, has occurred commonly (*S.M.* i. 35). Now rare in Epping Forest, Mr. B. G. Cole has seen two of late years, one in Bury Wood, Sewardstone, the other towards Epping. [I have several times *seen* the butterfly in the forest.—*W. Cole.*]

³ In explanation of the words "Old Collection" which occur in connection with records from Saffron Walden, Mr. Maynard, the Curator of the Museum, writes as follows: "The words 'Old Collection' you ask me about, allude to the collection of Lepidoptera that I found in the Museum here ten years ago, when I first took charge of it; how long they had previously been there I cannot say; but probably many of them from the commencement of the collection (1834), over fifty years. At the time I allude to I found none of them labelled as to locality of capture, &c.; but for my own convenience, to distinguish them when they came into the general collection, since got together from various parts of the country, many from Mr. James Backhouse, of York, I had them labelled 'Old Collection.' Mr. Joseph Clarke, our oldest Trustee, and the only person now living who can give any *positive* information about their locality of capture, &c., him I have interrogated, and he says, 'Many of them were taken in the neighbourhood of Saffron Walden, or this part of the county of Essex,' some of which he speaks more positively about in this respect than others."—*Ed.*

LIST OF PUBLICATIONS—*continued.*

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[List continued on page 3 of wrapper.]

Melanargia galatea, L. Marbled White.

Geographical Distribution—Central and South Europe (except Spain), Armenia. Very local in England, absent from Scotland and Ireland.

Larva.—Green or buff (variable), darker stripes on back and sides, faint reddish line along black spiracles; head pinkish-brown. *Food*—Various grasses, especially cocksfoot. *Imago*—July; hibernates as larva.

Very local; it has disappeared from many of its old localities and is rapidly becoming rare in others; flight feeble and short. Said to be extinct in Suffolk and Yorkshire.

“It is most frequent with us round Braintree in Essex; I first observed it flying this year [1690] in the month of June, about the feast of St. John Baptist, particularly in marshy and wet places” (*Rar.*, *H. I.* 116). This species is figured twice in Benj. Allen’s MS. book. Felstead (*Rep. F.S.N.H.S.*, ii. 44). Mersey Island, Stour and Hartley Woods (*Jermyn; V.M.* 71). In great plenty, Hartley Wood, St. Osyth (“*Mac*”; *F.* xii. 430). Three or four on the railway banks near Lexden; it has disappeared from Hartley Wood, St. Osyth, where it was formerly common (*Hartwood; B.B.* 79). One, Colchester, 1859 (*Hartwood; E.W.I.* vii. 28). One, Hazeleigh, some years since (*Raynor; T.E.F.C.* iii. 38). Common along the coast and on the slopes near Hadleigh Castle (*Vaughan; E.N.* iii. 126). I captured one on Hadleigh Castle slopes at our field meeting, July 13th, 1889 (*Fitch; E.N.* iii. 284). I have found it fairly common in Canvey and at South Benfleet and Thundersley, 1872-4. In profusion on Laindon Hills (*H. Corder; N.H.J.* ii. 132.) Epping (*E. Doubleday; B.B.* 79) Epping, common (*S.M.* i. 26). High Beach, nearly disappeared from woods east of Epping, 1835 (*E. Doubleday; Ent. Mag.* iii. 150). Hog Hill, Hainault Forest, much scarcer now than formerly, July, 1857 (*W. Gates; E.W.I.* ii. 71). Used to occur, Hainault Forest (*English; Proc. E.F.C.* iv. xxxiii.).

Pararge egeria, L. Speckled Wood.

Geographical Distribution—Central, South and South-west Europe, N. Africa, Syria. Throughout Britain.

Larva—Dull green with greenish-yellow stripes, head green. *Food*—Grasses, especially cocksfoot. *Imago*—April, July and August, hibernates as larva? or pupa? (see *Entom.* xii. 3, 57). On April 23rd, 1873, Mr. Buckler received from Rev. John Hellins three larvae that he had brought through hibernation, having reared them from the eggs, one pupated on May 2nd and emerged on June 4th (*Larvæ*, p. 27). Snellen says “Some examples hibernated as pupæ, others as larvae.” Rev. J. Greene several times met with the pupa in winter when pupa-digging.

Common in most woods in the county and in shady lanes and about hedgerows on their outskirts; generally distributed, but not everywhere, mostly local. Quite absent now in Colchester district where it was formerly common. Mr. Harwood has not seen one for about ten years. [Still very common in Monks Wood, Epping Forest, *B. G. Cole.*]

Pararge megæra, L. Wall.

Geographical Distribution—Europe (except polar regions), North Africa, Asia Minor, Armenia. Throughout Britain.

Larva—Apple-green, dark-green stripe on back, two paler green stripes on sides; head bright green. *Food*—Grasses. *Imago*—May and June, August and September; hibernates as larva? or pupa? (see *Entom.* xii. 3, 57; *Larvæ*, p. 165.)

Abundant; flying along every hedge in the county in the summer.

Satyrus semele, L. Grayling.

Geographical Distribution—Europe (except polar regions), North Africa and West Asia. Throughout Britain, but local.

Larva—Light brown or drab, dark olive-brown stripe on back, three brown stripes on side edged with white; head brown. *Food*—Grasses, especially *Triticum* and *Aira*. *Imago*—July; hibernates as larva.

Very rare and local; on dry hill-sides, but generally confined to chalk or limestone soils.

Lexden Heath (*Jermyn*, *V.M.* 71), probably now extinct in this locality as Mr. Harwood has only taken two or three stragglers near Colchester; he has taken several at Birch Wood, Dedham. Common on Tophill Heath (*E. H. Burnell*; *M.N.H.* [2] i. 602). [This is probably a misprint for Tiptree Heath, where it is now extinct.] Felsted (*Rep. F.S.N.H.S.* ii. 44). It should, and probably does, occur in the extreme north-western corner of the county, on the chalky uplands of the Saffron Walden district, but I find no records. Mr. G. N. Maynard writes, "There are several *S. semele* in the 'old collection,' Saffron Walden Museum, which I believe were taken in this neighbourhood."

Epinephele janira, L. Meadow Brown.

Geographical Distribution—Europe (except polar regions), North Africa, West Asia. Throughout Britain, our commonest butterfly next to *P. rapæ*.

Larva—Green, darker line on back, pale yellowish stripe along spiracles; head green, anal points pink. *Food*—Grasses. *Imago*—June and July; hibernates as larva.

Very abundant in all meadows, as everywhere.

Epinephele tithonus, L. Large Heath.

Geographical Distribution—Europe, except North-east, Asia Minor, Armenia. Throughout Britain.

Larva—Greenish-grey or ochreous freckled brown (variable), darker line on back, light grey lines on sides; head pale brown. *Food*—Grasses, especially couch or twitch (*Triticum*). *Imago*—July to September; hibernates as larva.

Abundant everywhere in the county.

Epinephele hyperanthus, L. Ringlet.

Geographical Distribution—North and Central Europe, North and West Asia, probably to Japan (except polar regions). Throughout Britain.

Larva—Reddish- or greenish-grey, darker line on back, two yellowish-white lines on sides; head pale brown. *Food*—Grasses. *Imago*—June and July; hibernates as larva.

This very lazy-flying woodland butterfly is common but local throughout the county. [Extremely abundant in the Forest, near Walthamstow, in the wet summer of 1860; if I recollect rightly, many of the specimens were without the eye-like spots on the underside of the wings.—*W. Cole.*]

Cœnonympha pamphilus, L. Small Heath.

Geographical Distribution—Palearctic region, except extreme north. Throughout Britain.

Larva—Bright green, darker line edged with paler on back and sides; head green, anal points pink. *Food*—Grasses, especially matgrass (*Nardus stricta*). *Imago*—May to October; hibernates as larva.

Very common everywhere throughout the summer.

Thecla betulæ, L. Brown Hairstreak.

Geographical Distribution—Central Europe (extending to Scandinavia) and Central Asia to the Amur. In Britain absent from Scotland.

Larva—Apple-green, four yellow lines on back and sides, two rows of oblique yellow streaks; head brown. There is a brown variety. *Food*—Blackthorn, rarely plum. *Imago*—July to September; hibernates as ovum.

Rare in woods, generally flying high among trees, but sometimes settled on flowers or bramble blossom.

Larvæ on sloe, Epping Forest (*W. H. Tugwell*; *E.W.I.* iv. 125). Larvæ swarming at Loughton (*Argent*; *Ent.* v. 43). Larvæ very common, Epping (*Eedle*; *Ent.* xiv. 181). Chingford (*W. H. Wright*; *Ent.* xviii. 88). Epping (*S.M.* i. 52). Larvæ very abundant in Epping Forest, especially about Loughton and High Beach (*Argent*; *B.B.* 113), [and still common, 1890.—*B. G. C.*]. Larvæ on blackthorn, Fairmead [Loughton] (*English*; *Buxton's E.F.* 100). I have found it there commonly.

Four females, Witham, Sept., 1837, for the first time (*Burnell : M.N.H.* [2] i. 602). Rare, generally in larval state, Hazeleigh, Mundon (*Raynor : T.E.F.C.* iii. 38). Mundon Furze (*Raynor : Ent.* vi. 264). Rev. J. W. Mills, E. Stuart and myself have seen it there in some numbers. Colchester (*Harwood ; E.W.I.* vii. 28). Formerly in Highwoods and fields thereabouts, and Langham Lodge Wood; not taken recently (*Harwood*). Kedington and Haverhill, 1833-5 (*Gaze : Ent.* i. 278).

Thecla w-album, Knoch. Black Hairstreak.

Geographical Distribution—Europe, Central and South (except Spain and Portugal), extending to Scandinavia, North, West and Central Asia. England.

Larva—Light green or reddish-brown (variable), yellowish or dingy brown stripe on back, two oblique ill-defined yellow lines on side of each segment; head black. *Food*—Wych elm (*Ulmus montana*). *Imago*—July and August; hibernates as ovum.

Rare and very local, seems to occur commonly in some seasons.

“This species is usually esteemed a scarce insect in the neighbourhood of London, and previously to the last season I never saw it alive; but the boundless profusion with which the hedges, for miles, in the vicinity of Ripley were enlivened by the myriads that hovered over every flower and bramble-blossom last July (1826) exceeded anything of the kind I have ever witnessed. Some notion of their numbers may be formed, when I mention that I captured, without moving from the spot, nearly 200 specimens in less than half-an-hour, as they successively approached the bramble-bush where I had taken up my position” (*Stephens : I.B.E. Haust* i. 45 note, 77). “For eighteen years I possessed four bleached specimens only of *T. W-album*, having vainly endeavoured to procure others; when in 1827, as elsewhere recorded, I saw the insect at Ripley not by dozens only, but literally by scores of thousands!!! and, although I frequented the same locality for thirteen years subsequently, sometimes in the season for a month together, I have not since seen a single specimen there” (*Stephens ; Z.* v. 1616). Very rare, Epping (*E. Doubleday : Ent. Mag.* iii. 285). Epping (*S.M.* i. 53). Very abundant in Maldon district, extending from Danbury to St. Lawrence. Imago on bramble flowers, larvæ prefer wych elm (*Raynor : T.E.F.C.* iii. 38). I have seen it commonly at Hazeleigh and North Fambridge. Several, Fambridge Hall Wood, 14th July, 1887 (*Fitch : E.N.* i. 139). Common at lime flowers, St. Lawrence) July 14th 1874, thirty taken in one day (*Mills : Ent.* vii. 174). Frequent on bramble hedge, Writtle (*H. Corder, N.H.J.* iv. 102.)

Rather plentifully this year [1837] and in 1832 at Witham, but in none of the intervening seasons (*Burnell: M.V.H.* [2] i. 602). Childeritch and Thorndon Park; East Horndon (*Raynor*). Bergholt Woods, near Colchester (*Harwood: B.B.* 109). Generally distributed from Colchester to Halstead, but not in Tendring Hundred (*Harwood*). Ramsey and Wrabness (*Jermyn: V.M.* 73). Near Sudbury (Δ [*E. Doubleday*] *Ent. Mag.* iv. 235). A considerable number in a wood near Sudbury, in 1836, hovering amongst the brambles, not seen since (*W. D. King? : F.S.J., Dec.*, 1838). Kedington and Haverhill, 1833 5 (*Gaze: Ent.* i. 278). Saffron Walden (*Cat. S.W.M.* 49).

Thecla quercus, L. Purple Hairstreak.

Geographical Distribution—Europe, except extreme north and south, Asia Minor. Throughout Britain.

Larva—Reddish- or greenish-brown, dark brown line edged with yellowish on back, two rows of oblique black stripes; head brown. *Food*—Oak, rarely sallow. *Imago*—July and August; hibernates as ovum.

Common in most woods; flying about oak-trees, and is especially partial to ash stubs, frequently settling on the leaves; in dull weather it rests under the leaves.

[Larvæ frequently beaten in great numbers from oaks in the Forest near Chingford.—*W. Cole.*]

Thecla rubi, L. Green Hairstreak.

Geographical Distribution—Europe, North Africa, North and West Asia to Persia. Close ally in North America. Throughout Britain.

Larva—Yellow-green, pale olive-green stripe edged with yellow on back, thick yellow oblique streak on sides edged with deep green, yellow stripe along sides; head brown. *Food*—Broom, furze and bramble. *Imago*—May and June, rarely August; hibernates as pupa.

Not common, but generally distributed.

[*Polyommatus hippothoë*, L. (= *chryseis*, W.L.). Scarce Copper. "An insect of great rarity, especially the female, arising, most probably, from its locality being unknown; notwithstanding it occurs within twenty-one miles of the metropolis, I believe in the vicinity of Epping, whence Dr. Leach received fine and recent specimens for several successive seasons, and from whom I obtained those which are contained in my cabinet. The insect has also been taken in Ashdown Forest. It appears in August and September" (*Steph; I.B.E. Hawt.* i. 80-81). "Mr. Stephens informs me that Dr. Leach received fine and recent specimens from the vicinity of Epping for several successive seasons previous to the termination of the war in 1815. I believe, however, they were obtained from a dealer, who persisted in keeping the precise locality secret" (*Westwood and Humphreys, B.B.* 95). "Formerly taken near Epping" (*S.M.* i. 56). "I was positively assured that *L. chryseis* and *virgaurea* were taken in the fens of the Isle of Ely. Had I not believed them to

be British I would never have given what I did for them. I got all I could, and was much pleased with the opportunity of equally dividing them with you" (*H. Doubleday in litt. to T. C. Heysham*, March 22nd, 1836). This is all the information I can find about this beautiful species, which is certainly now extinct, if ever it was an inhabitant of our county, or even country].

[*Polyommatus dispar*, Haw. Large Copper. This equally beautiful species probably never occurred in a state of nature but in the Cambridgeshire and Huntingdonshire fens; it has long been extinct. The following information of its introduction into Essex is, however, interesting, and deserves notice here:—

"Mr. Doubleday formerly had a colony of these beautiful insects in his garden at Epping, and the water-dock on which they used to feed is still living" (*E. Newman; Y.E.* 13; *B.B.* 115). Edward Newman described the larva and pupa of this butterfly (*Ent.* ii. 90), and says, "My acquaintance with the larva and pupa was made, very many years ago, in Mr. Doubleday's garden at Epping, where the very plant of *Rumex hydrolapathum* on which the larvæ fed is still in existence." From Sawtry, on June 6th, 1841, H. Doubleday writes, "In Hoim Fen, on the edge of Whittlesea Mere, I got about eighty caterpillars of the lovely *Lycæna dispar*." In his next he says, "I hope to have some good specimens of *L. dispar*, as I sent Edward about 120 caterpillars." On Nov. 20th, 1841, he writes, "Becker, of Wiesbaden, is now in London. He was very anxious to get a number of *dispar*, and I gave him sixty specimens." For some reminiscences of this butterfly see *Entom.* xvi. 129.]

Polyommatus phlœas, L. Small Copper.

Geographical Distribution—Europe, Asia to Himalaya and Japan, North Africa, North America. Throughout Britain.

Larva—Apple-green, with a rose-pink stripe on back and sides (sometimes indistinct), spiracles flesh-colour, head dingy-green or pale brown. *Food*—Dock, especially sorrel-dock. *Imago*—April to October; hibernates as larva.

Generally distributed and common throughout the county, but by no means so abundant as was the case only a few years ago. In Mr. Cole's cabinet is a $\frac{2}{4}$ specimen in which the copper-coloured bands on the hind wings are reduced to a few dashes; this specimen was taken by Mr. H. A. Cole, on the roadside between the "Wake Arms" and Epping, June 3rd, 1872. Mr. Dale had a similar specimen. (*B.B.* 115).

Lycæna ægon, Schiff. Silver-studded Blue.

Geographical Distribution—Europe, North and West Asia to Persia, and perhaps Japan. Throughout Britain.

Larva—Bright yellow-green, blackish-brown stripe edged with whitish on back, small brown plate on second segment, greenish-yellow lines at sides, whitish line along lateral ridge; head black. *Food*—Common bird's-foot (*Ornithopus perpusillus*). *Imago*—July; hibernates as ovum.

Local, and in this county apparently almost confined to one locality in Epping Forest.

Swarms in certain spots by the side of our [Epping] Forest (*H. Doubleday*; *Ent.* iii. 36). Epping, abundant (*S.M.* i. 61). Very common on a piece of dry ground along the side of the road near High Beach (*Argent*; *B.B.* 121). On rushes at the back of the "King's Oak" (*English*; *Buxton's E.F.* 100). Still very common in this locality, opposite High Beach Church (*B. G. Cole*). Gynandromorphous specimen from Loughton, June, 1868 (*W. Cole*; *Proc. E.F.C.* i. xi.) Sudbury (*W. D. King*; *B.B.* 121).

Lycæna astrarche, Bgstr. Brown Argus.

Geographical Distribution—Europe, except extreme north, Asia to Himalaya, North Africa. England and Scotland, but absent from Ireland.

Larva—Pale green, pink stripe on back, broad purplish-pink stripe on sides; head black. *Food*—Rock-rose (*Helianthemum*) and *Erodium*. *Imago*—May, June, and August; hibernates as larva.

Not rare, but local.

High Beach, Epping (*E. Doubleday*; *Ent. Mag.* iii. 150). In plenty within one mile of Epping (*E. Doubleday*, *Ent. Mag.* iii. 285). Epping (*S.M.* i. 62). Common in one wood, Great Warley (*Raynor*). Felsted (*Rep. F.S.N.H.S.* ii. 44). Scarce, Witham (*Burnell*; *M.N.H.* (2) i. 602). Sometimes common, but local, Hazeleigh (*Raynor*; *T.E.F.C.* iii. 38). I have also taken it commonly at Purleigh, and on Osey. Very scarce in Colchester district, Mr. Harwood has not taken twenty. One, Hadleigh Castle, 1860 (*Vaughan*; *E.N.* iii. 126). Southchurch Wick, July 28th, 1826 (*C. Parsons*; *M.S. Journal*). Lawn of the Parsonage and Cliffs, Wrabness (*Jermyn*; *V.M.* 75). One near Wood Hall, Sudbury (*W. D. King?*; *F.S.J.*, Dec., 1838). Haverhill and Kedington (*Gaze*; *Ent.* i. 278).

Lycæna icarus, Rott. Common Blue.

Geographical Distribution—Europe, North and West Asia to Himalaya, North Africa. Throughout Britain.

Larva—Green or olive, darker stripe on back bordered by paler, light green stripe on sides, three pale oblique stripes on each segment; head black. *Food*—Restharrow, bird's-foot trefoil, and other papilionaceæ. *Imago*—May to September; hibernates as larva.

Abundant everywhere, except in towns [and often not uncommon there, being brought in with farm produce. I have seen several specimens in Mark Lane, London, and it is often almost abundant in Covent Garden.—*W. Cole*].

Lycæna bellargus, Rott. Clifden Blue.

Geographical Distribution—Central and South Europe, extending northward to Scandinavia, West Asia, North Africa. In Britain absent from Scotland and Ireland.

Larva—Deep full green covered with black specks bearing black bristles, two yellow stripes on back and yellow stripe at sides; head dark brown. *Food*—*Hippocrepis*, bird's-foot trefoil (*Lotus*), &c. *Imago*—May and June; hibernates as larva.

Mr. Joseph Clarke informs me that this species has certainly been caught once or twice in the Saffron Walden district. I can find no published record.

Lycæna corydon, F. Chalk-hill Blue.

Geographical Distribution—Central and South Europe, West Asia. England, not Scotland or Ireland.

Larva—Light bright green covered with black specks bearing light brown bristles, two yellow stripes on back and yellow stripe at sides; head dark brown. *Food*—Various papilionaceæ, especially *Hippocrepis*, bird's-foot trefoil, kidney vetch and trefoil. *Imago*—June to August; hibernates as larva.

Almost exclusively confined to chalky soils, consequently rare and very local in Essex.

Also recently observed by Mr. Dale near the town of Newport in Essex (*Ray*; *H.I.* 131). Saffron Walden (*Jeffrey*; *B.B.* 132; *Cat. S.H.M.* 50). Six, Saffron Walden (*Clarke*). I have never taken this myself, but was told that a pair had been caught in a garden at Sudbury (*W. D. King?*; *F.S.J.*, Dec., 1838). Colchester, 1859 (*Harwood*; *E.W.I.* vii. 28). Very rare, Colchester, one or two on the railway banks only. About a dozen in High Woods, Colchester [1870]; not seen before or since (*Harwood*; *B.B.* 132). Several, Epping Forest, 1859 and previously (*J. W. Downing*; *E.W.I.* vii. 51). About 1859 it appeared in an open part of Epping Forest and a year or two afterwards was common in several localities in the neighbourhood—some of them five or six miles apart. It was plentiful near Loughton and in clover-fields at Epping (*H. Doubleday*; *E.M.M.* iii. 91). Observed here and there through the Forest, 1866 (*E. Newman*; *B.B.* 132). One, Loughton, July 29th, 1885 (*E. B. Bishop*; *Ent.* xviii. 242). One male, between Leigh and Southend; "It was probably a railway excursionist from Purfleet" (*Vaughan*; *E.N.* iii. 126). I have no record of it from the Grays district, but it doubtless occurs there. Rev. G. H. Raynor writes: "Stray specimens have been taken at Childerditch, probably stragglers from Grays where the species occurs regularly."

Lycæna argiolus, L. Azure Blue.

Geographical Distribution—Europe and Asia (except polar regions), North Africa. Closely allied species in Himalaya and North America. In Britain absent from Scotland.

Larva—Dark greenish-grey or bright yellowish-green (variable), dark green dorsal line; head purplish-brown. Some varieties marked with crimson on back and sides. *Food*—Flowers of holly, ivy rarely, buckthorn or dogwood. *Imago*—April and May. July and August; hibernates as pupa.

Fairly common and generally distributed throughout the county, the spring brood being much the more abundant. [Very common in the holly thickets in Epping Forest and in the neighbouring gardens. The first time I saw the butterfly was on May 1st, 1862, flitting in great numbers around the ivy-clad tower of old Chingford Church.—*B. G. Cole.*]

Lycæna semiargus, Rott. Mazarine Blue.

Geographical Distribution—Europe, North and West Asia to Amur. Local and almost extinct in England; does not occur in Scotland or Ireland.

Mr. Joseph Clarke writes me that this rare, if not now extinct, species in Britain, has been taken in the Saffron Walden district—a likely locality. In a further communication he tells me there are two specimens in the Museum “old collection,” [Mr. Maynard says five]. It was reported, doubtless erroneously, from Epping Forest, August 31st, 1860 (*W. Banks*; *Z.* xviii. 7249).

Lycæna minima, Fues. Small Blue.

Geographical Distribution—Europe, except extreme north and south; North and West Asia to Amur. Throughout Britain.

Larva—Pinkish-brown, flesh-colour or chocolate, darker line on back, dark brown oblique dash on each segment, whitish stripe at side; head black. Mr. Hellins' description differs greatly from that of several Continental entomologists; probably the larva is very variable. *Food*—Flowers and seeds of vetches, especially kidney vetch (*Anthyllis vulneraria*). *Imago*—June; hibernates as larva.

Newman says this species appears in his Essex list (*B.B.* 135) but does not give locality. Morris says, “near Amesbury and Hainhault Forest” (*Hist. B.B.* 138.) Mr. Joseph Clarke writes me, “I caught one only against the milestone on the Debden road, a mile south of Walden; but there are eight others in the Museum ‘old collection,’ all caught, I believe, in this district of Essex.”

Nemeobius lucina, L. Duke of Burgundy.

Geographical Distribution—Central and West Europe, from South Sweden to Balkans. In Britain, England and South-west Scotland, not Ireland.

Larva—Reddish-brown, row of black triangular marks on back, two blackish-

brown lines on side, pale cream-brown line below spiracles; head brown. *Food*—Primrose, cowslip. *Imago*—May and June; hibernates as pupa.

Rare and very local, especially so considering how common is its food-plant; always in or on the borders of woods.

Bromley Thickets and Hartley Wood [St. Osyth] (*Jermyn*: *V.M.* 65). Hartley Wood, St. Osyth (*Harwood*: *E.M.M.* iv. 162; *B.B.* 104). Still occurs in several of the larger woods in Tendring Hundred (*Harwood*). Gaynes Park and Ongar Park Woods, near Epping, 1839-41. "It held its own fairly well for three years, and then suddenly vanished, never to appear again within my knowledge" (*English*; *E.N.* i. 110). Epping (*S.M.* i. 49). Woodham Ferris Hall Wood, common but local (*Raynor*: *T.E.F.C.* iii. 38). Eastwood, not common (*Vaughan*; *E.N.* iii. 126). Used formerly to be taken near Saffron Walden; there are fifteen specimens in the "old collection" (*G. N. Maynard*).

Syrichthus malvæ, L. Grizzled Skipper.

Geographical Distribution—Europe, North and West Asia. In Britain doubtfully absent from Ireland.

Larva—Ochreous-green, pinkish on back of anterior segments, five faint lines; head dark purplish-brown. *Food*—Barren wild strawberry, wild raspberry and bramble. *Imago*—May, August (rarely); hibernates as pupa.

Common throughout the county, but local, and, from its buzzing, Noctua-like flight, not easily seen or captured.

Nisoniades tages, L. Dingy Skipper.

Geographical Distribution—Europe, North and West Asia (except polar regions). Throughout Britain.

Larva—Yellowish-green, darker line on back, pale streak below small red spiracles; head purplish-brown. *Food*—Bird's-foot trefoil. *Imago*—May, August; hibernates as larva.

Not common, and local. It is very inconspicuous, and difficult to see or capture. Only a single specimen from Colchester district, captured near Langham Lodge Wood by Tillaney, thirty years ago; Mr. Harwood has never seen this species alive.

[*N. tages* is not uncommon in some seasons in Epping Forest; Prof. Meldola found it somewhat abundantly north of Monk's Wood in June, 1889. We again saw it in some numbers in 1890.—*W. Cole*].

Hesperia thaumas, Hufn. Small Skipper.

Geographical Distribution—Central and South Europe to Scandinavia, West Asia, North Africa, North America. In Britain absent from Scotland.

Larva—Light green, darker stripe on back, two paler stripes on side; head,

deep green. *Food*—*Holcus*, brome and other grasses, in spun-together leaves. *Imago*—July; hibernates as larva.

Common throughout, especially in the marshes. Newman says (*B.B.* 175): "In Essex it occurs in open swampy places that are covered with rushes." [Very common in the "rushy plains" in Monk's Wood, Epping Forest. — *B. G. Cole.*]

Hesperia lineola, Ochs. Narrow-lined Skipper.

Geographical Distribution—Europe, North and West Asia (except polar regions), North Africa.

Larva—Bright green, five yellow lines on back and sides; head reddish. *Food*—Grasses. *Imago*—July; hibernates as larva.

Mr. Hawes brought this forward as a British species in the "Entomologist" for January, 1890, upon the strength of three males taken in July, 1888, "in one of the eastern counties," really in Hartley Wood, St. Osyth. It has since occurred in several counties and commonly in Essex, but is local, though widely distributed; hitherto overlooked.

South-east Essex, in 1889 (*Carrington*; *Ent.* xxiii. 4, 72). Frequent in Essex, 1885-8 (*A. J. Spiller*; *Ent.* xxiii. 56). On marshes near Benfleet and Shoeburyness (*F. G. Whittle*; *Ent.* xxiii. 57, 99) Mr. Bloomfield exhibited two specimens taken in Essex in 1888 at South London Entomological Society, Feb. 27th, 1890 (*Ent.* xxiii. 142). Numerous specimens, Leigh, July 25th, 1890 (*South*; *Ent.* xxiii. 264, 296). Southend, in 1882 (*Bouttell*; *Ent.* xxiii. 296). Pale variety from Shoeburyness (*Nussey*; *Ent.* xxiii. 296). Long series on the marshes at Leigh (*Tugwell*; *Ent.* xxiii. 320). St. Osyth, common; single specimen near Chappel (*Harwood*). Bures (*V. Gerrard*).

Hesperia sylvanus, Esp. Large Skipper.

Geographical Distribution—Europe, except extreme north, North and West Asia to the Amur, and perhaps to Japan. Close ally in North America. Throughout Britain.

Larva—Pale bluish-green, indistinct darker line on back, paler line above feet; head, crimson-brown. *Food*—Hairy woodrush, couch, cocksfoot and other grasses, in rolled-up blades. *Imago*—May, June and August; hibernates as larva.

Common and generally distributed in the uplands and woodlands; more common than the Small Skipper.

Hesperia comma, L. Silver-spotted Skipper.

Geographical Distribution—Europe, Asia. Close ally in North America, England.

Larva—Olive-green, two white spots on tenth and eleventh segments; head black. *Food*—Birds'-foot, bird's-foot trefoil, and other leguminous plants.
Imago—July, August; hibernates as ovum.

Apparently very rare and local.

Three, Danbury, 2nd August, 1884 (*Fitch*; *E.N.* ii. 239).
 Saffron Walden (*Cat. S.W.M.* 50). Mr. Joseph Clarke writes: "There are five specimens in the 'old collection,' all caught in this neighbourhood."

LIST OF ABBREVIATIONS OF TITLES OF WORKS CITED.

- B.B.* Newman's British Butterflies (1871).
B.B. Humphreys and Westwood, British Butterflies (1848).
Buxton's E. F. E. N. Buxton's Epping Forest (3rd ed. 1890).
Cat. S.W.M. Abridged Catalogue of the Saffron Walden Museum (1845).
E.A. Entomologists' Annual (1855-74).
E.M.M. Entomologists' Monthly Magazine (1864-91).
E.N. Essex Naturalist (1887-91).
Eng. M. and B. Wilkes, English Moths and Butterflies (1747-60).
Ent. Entomologist (1840-42, 1864-91).
Ent. Mag. Entomological Magazine (1833-38).
E.R. Entomologists' Record (1890-91).
E.W.I. Entomologists' Weekly Intelligencer (1856-61).
F. Field (1853-91).
F.S.J. Fulcher's Sudbury Journal (1838).
Hist. B.B. Morris' History of British Butterflies (1860).
H.I. Ray's Historia Insectorum (1710).
I.B.E. Haust. Stephens' Illustrations of British Entomology, Haustellata (1827-35).
K.O.J. Kidd's Own Journal (1852-54).
Larvæ. Buckler's Larvæ of British Butterflies and Moths (1885-88).
Lep. Brit. Haworth's Lepidoptera Britannica (1803-29).
M.N.H. Magazine of Natural History, Charlesworth's 2nd Series (1837-40).
N.H.J. Natural History Journal (1877-91).
Proc. E.F.C. Proceedings Essex Field Club (1880-84).
Proc. E.S.L. Proceedings Entomological Society of London (1833-91).
P.S.L.E.S. Proceedings South London Entomological Society (1873-87).
Rep. F.S.N.H.S. Report of the Felsted School Natural History Society (1877-90).
S.G. Science Gossip (1865-91).
S.M. Stainton's Manual of Butterflies and Moths (1857-59).
T.E.F.C. Transactions Essex Field Club (1880-86).
T.E.S.L. Transactions Entomological Society of London (1834-91).
Tijdschrift. Tijdschrift voor Entomologie (1858-91).
V.M. Miss Jermy's Butterfly Collector's Va de Mecum (1827).
Y.E. Young England—Newman's Butterfly Number.
Z. Zoologist (1843-91).

CORRESPONDENCE.

BOULDER-CLAY IN ESSEX.

SIR,—Referring to the paper "On the Boulder-clay in Essex" (*ESSEX NATURALIST*, vol. iv. pp. 199-201), will Mr. Monckton, or any other geologist, adduce a single particle of evidence of the passage of anything resembling an ice-sheet over any part of the area between Thames and Humber?

There are hundreds, if not thousands, of sections amply disproving this hypothetical agency, and demonstrating the deposition of the Boulder-clay in a berg-covered sea as clearly as that of the subjacent gravels and sands in one less charged with clayey detritus.

"An ounce of fact is worth a ton of theory," and the forcing of evidence into harmony with conclusions drawn from observations in other and entirely different regions has in this matter, as in others, led to the promulgation of the most contradictory ideas.

The ice-sheet which has scored the hardest rocks of the Northern mountains, under the impulse of a scarcely perceptible gradient, must be supposed in East Anglia to have glided over hills of fine sand without disturbing a grain of their surface! Believe it who can!—Yours,

W. H. DALTON.

Derby Road, Woodford.

SIR,—In reply to Mr. Dalton I should say it is unlikely that an ice-sheet would move over hills of fine sand without disturbing a grain of their surface, and I should think it improbable that any one holds such a view. There is, however, evidence to show that an ice-sheet may travel over a country without effecting any great alteration of the surface. (See Clement Reid, "Geology of Holderness" [1885], p. 42.)

So far as Essex is concerned, we know that, whatever the precise process may have been, the surface of the ground over which the ice passed was to a large extent destroyed, and the materials of the older beds re-arranged. The Glacial-drift of Essex consists mainly of local material, chalk, clay, sand, and pebbles, with a small proportion of foreign material intermingled, and that seems to me the great difficulty which those who contend for the marine origin of this drift have to meet. Thus, on the south-west of the road half-way between Ingatstone and Frierning, there was last summer a pit in gravel composed of:—

- (a). Pebbles of flint, forming the bulk of the gravel and clearly derived for the most part from the pebble beds, remains of which still cap the high ground at Frierning Church close at hand.
- (b). Subangular flints, many.
- (c). Quartz pebbles and a block of white quartz, 5 by 3½ inches. These must have been brought by ice from a distance.
- (d). Two large blocks of sand-stone or quartzite.

Here we find a gravel on the side of a hill mainly formed of materials derived from the top of the hill. It does not look to me like a marine bed; it is not the least like an old sea-beach with nothing like a sea cliff. I might give many more instances in support of my opinion that the Boulder-clay and Glacial-

gravels were not formed under the sea. I have failed to find evidence of the presence of the sea in Essex in glacial times, and it seems a pity that Mr. Dalton does not mention one of the hundreds or thousands of sections which in his opinion prove the deposition of the Boulder-clay and the subjacent sands and gravels in the sea. I know that two marine shells were found in gravel near Thaxted ("Memoirs of the Geological Survey, Sheet 47" [1878], pp. 33, 42), and that many have been found in Norfolk, but the presence of marine shells is not conclusive proof of submergence (A. Geikie, "Text Book of Geology" [1885], p. 897), and a doubt has been expressed whether these shells are contemporaneous with the beds in which they are found (H. B. Woodward, "Geology of England and Wales" [1887] p. 504).

In answer to Mr. Dalton's request for evidence of the passage of an ice-sheet over part of the area between the Thames and the Humber I would refer to the remarks of Mr. Skerthly in the "Great Ice Age," by James Geikie (1877), pp. 354-362, and to Clement Reid, "Geology of Cromer," (1882), p. 114, and H. B. Woodward, on the "Glacial Drifts in Norfolk" Proc. Geol. Assoc. vol. ix. p. 122 (1885).—I an, etc.,

HORACE W. MONCKTON.

3 Pump Court, Temple.

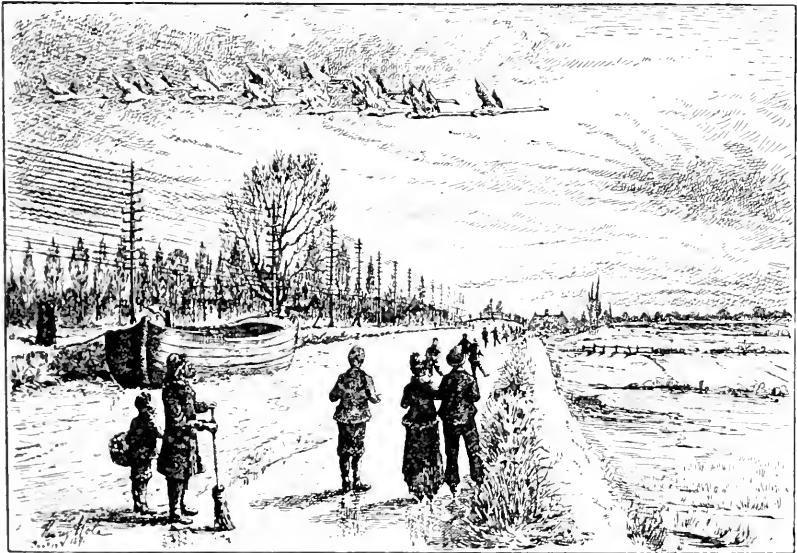
NOTES, ORIGINAL AND SELECTED.

Wild Swans inland in Essex.—For upwards of a month the "Sedgy Lea" has been a solid highway for thousands of skaters and pedestrians. A good long-distance skater might travel from Limehouse to Hertford, if he were oblivious to rough ice and did not object taking to the towpath frequently in order to pass the locks and clusters of ice-bound barges. On Monday afternoon, January 19th, about four o'clock, a striking phenomenon was witnessed by myself and several other persons near Pigott's Lock, Edmonton. Suddenly, coming from the east, appeared a flock of Wild Swans, which, with necks outstretched and shrill clamour, flew low over the river, going west. It was a pretty sight, the rays of the setting sun gleaming on their pure white plumage. Wild Swans (these were probably "Whoopers," *Cygnus musicus*) are not uncommon, I believe, on the Essex coast in severe winters, but it needs an Arctic climate, like that of the last weeks, to induce a flock to venture so far inland.—HENRY A. COLE, Buckhurst Hill. [Under the title "Visitors from the North-West," a correspondent ("E. B., Wakes Colne Rectory"), wrote as follows to the "Essex Standard" on January 21st: "About four o'clock on Tuesday afternoon, whilst walking on Wakes Green, I observed a remarkable flight of birds, travelling at a great height and a rapid pace, in a south-easterly direction. On they came, all from the north-west, glowing at that time with the ruddy fires of the setting sun, battalion after battalion, forming a wide and sweeping semicircle. They had in every case an advanced guard, and these also acted as a rearguard to the battalion in front, thus keeping all the battalions in touch with each other. They did not make a perfect semicircle, as the leaders formed a sort of wedge in front, clearing a course, as it were, and showing the way to those behind them. Whence came they? We can hardly reply, in the language of Longfellow, in 'Evangeline'—

"' Birds of passage sailed through the leaden air, from the ice-bound
Desolate Northern bays, to the shores of tropical islands.'

Whither were they wending their way? What birds were they? Perhaps some of your readers can answer these questions." These were clearly not swans; we shall be glad to hear from any ornithological reader on the subject.—[ED.]

The Immigration of Bustards during the Past Winter.—In the "Zoologist" for March, Mr. Harting gives some interesting particulars of the recent visitation of Bustards, which recalls that of 1879-80 (during which a Bustard was shot in Essex, see Trans. E.F.C. i. 59), when seven or eight specimens were recorded in the "Zoologist." Details of the occurrence of seven birds in different parts of England during the past winter are given by Mr. Harting, including the one shot at Tillingham, in Essex, already noticed in the ESSEX NATURALIST (vol. iv. p. 214.) He refers to the curious fact that, although Bustards formerly bred in England, it is not during the breeding season that they now visit us; they come as winter guests; why, it is not easy to guess.



FLOCK OF WILD SWANS PASSING OVER THE LEA, JAN. 19TH.—Drawn by H. A. COLE.

Grey Phalarope at Stratford.—Mr. Arthur F. Gates, of Marsh Gate Lane, Stratford, records in the "Zoologist" for March that a specimen of *Phalaropus fulicarius* was shot on the marshes near Stratford on November 8th, 1890.

Supposed Occurrence of the Sand Lizard at Woodford: a Correction.—The specimen exhibited by Mr. Oldham at the meeting of the Club, on November 8th last (E.N. vol. iv. p. 225), as a Sand Lizard (*Lacerta agilis*), has been submitted by Dr. Laver to Mr. Boulanger of the British Museum, who writes that it "is a South European species, *L. muralis*, possibly from Italy." The lizard must have escaped from some vivarium or fern-case in Woodford, and the supposed record of *L. agilis* must be struck out.

Land and Freshwater Shells of the Roding Valley.—I have found *Helix caperata*, which Mr. Crouch records from the chalk at Grays, on the ridge of Chalky Boulder-clay which divides the Roding from the Cripsey Brook. *Helix rufescens* and *H. ericetorum*, both common on chalk lands, I have also found on the Chalky Boulder-clay near Fyfield, and in the neighbourhood of Ongar. I have had most successful hunts after water shells in old pits dug in the Boulder-clay for chalk, and now full of water. One afternoon I collected an abundance of *Valvata cristata*, *Planorbis nitidus*, *P. nautilius*, *P. carinatus* and *Ancylus lacustris* from these old pits, all of which shells I was very pleased to meet with.—HORACE W. MONCKTON, F.G.S., Pump Court, Temple, March 16th, 1891.

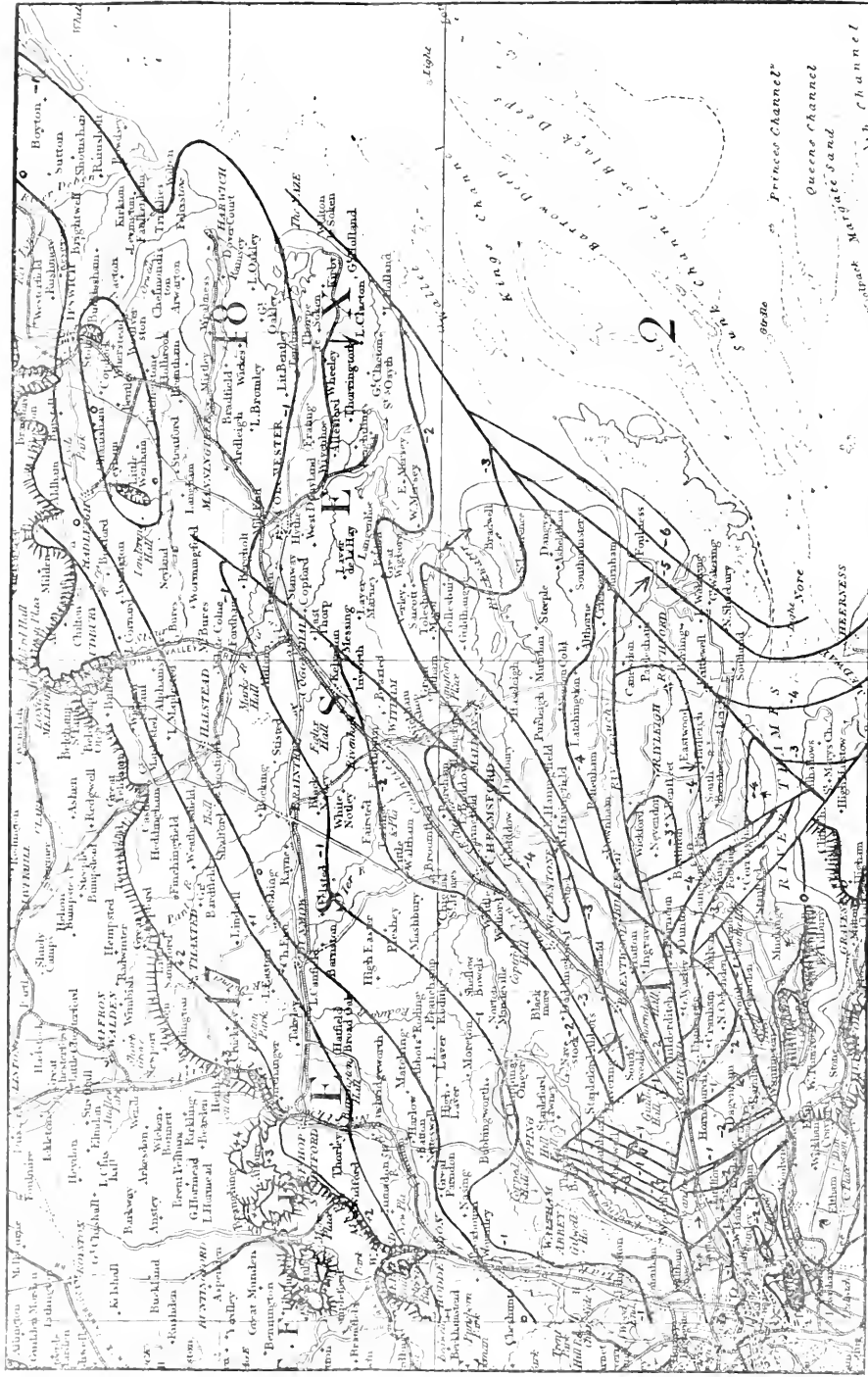
Primula elatior, Jacq.—In the April number of the "Journal of Botany," our member, Prof. C. C. Babington, F.R.S., makes the following observations on this peculiarly Essex species, which are interesting in connection with Mr. Christy's and Mr. French's papers: "I have a plant of this (*P. elatior*), growing in a pot, and also one of *P. vulgaris*; this caused me to notice the development of the young leaves. I found a most marked difference between them when very young. Those of *P. elatior* are *transversely plicate*, so strongly as to show no connecting veins between the ridges; in *P. vulgaris* the leaves are conspicuously *reticulate-rugose* from the very first. As the leaves increase in size this difference becomes much less apparent, and does not attract attention. Unfortunately I have not a root of *P. veris* to examine on this point."

Exceptionally Small Rainfall of the Last Eight Months.—Our member, Mr. F. Chancellor, J.P., writes advising economy with respect to the use of water this summer, owing to the meagre rainfall during the past winter. He says: "With every care it will, I am afraid, be difficult to avert a water famine in some districts during the coming summer and autumn. The following is a table of the rainfall for the corresponding eight months of the ten previous years. This will show that I am not unnecessarily drawing attention to the matter:—

From Sept., 1880, to April, 1881, inclusive ...	...	...	...	19'88
" 1881 " 1882 " ...	...	...	...	15'64
" 1882 " 1883 " ...	...	...	...	20'93
" 1883 " 1884 " ...	...	...	...	14'69
" 1884 " 1885 " ...	...	...	...	14'18
" 1885 " 1886 " ...	...	...	...	15'94
" 1886 " 1887 " ...	...	...	...	12'43
" 1887 " 1888 " ...	...	...	...	15'40
" 1888 " 1889 " ...	...	...	...	13'43
" 1889 " 1890 " ...	...	...	...	15'16

10)157'68

Average for ten years 15'76
 From Sept., 1890, to April, 1891, inclusive 8'28
 or very little more than half the average of the last ten years."



MAP OF THE SUB-TERTIARY CONTOUR OF THE CHALK IN ESSEX.

By W. H. DALTON, F.G.S.

SCALE 10 MILES TO 1 INCH



CHALK OUTCROPS: THE POINTS TOWARD THE CHALK AREA.

Altitudes above, or depths below, Ordnance Datum, in hundreds of feet, ciphers omitted.

(The position of the names of important places has necessitated reproduction of the map beyond the sheet-line to which Mr. Dalton has extended the Chalk contour-lines on the western side of the county.—[11].)

THE UNDULATIONS OF THE CHALK IN ESSEX.

By W. H. DALTON, F.G.S., *late of H.M. Geological Survey.*

[*Read May 17th, 1893.*]

WITH MAP, PLATE III

AS the surface of the greater part of Essex consists of clay, the water-supply is almost everywhere derived from wells, and a considerable proportion of these have been carried down to the Chalk, and derive their value from the copious stores of water yielded by that formation. There are, of course, hundreds of shallow wells in the gravel areas, and a great many artesian borings that go no further than the sands in or under the London Clay. But the water in gravel is always liable to contamination by infiltration of impurities from the surface, whilst the yield from the Tertiary beds, besides being often charged with an objectionable amount of mineral matter in solution,¹ is very apt to be diminished, if not altogether stopped, by the influx of sand carried up by the water into the bore-hole. In fact, the utility of any such wells is but a question of time, and in view of their cost, it is often found that the larger primary expenditure is eventually the more economical procedure. Accordingly, scarcely a month passes but we hear of some new boring being made, or an old one deepened, to the Chalk.

This being the case, it becomes not infrequently a matter of much importance to know the depth at which the Chalk lies from point to point, so as to estimate the approximate cost of getting water from that source in spots hitherto supplied from higher beds.

If the surface of Chalk were a uniform plane the determination of its position with regard to sea-level of any desired point would be one of the most simple geometrical problems—scarcely more than a rule-of-three calculation, but the case is very much otherwise. Instead of a plane we have an elaborately-puckered surface, which I have tried to illustrate by the accompanying map, a reproduction, with geological additions, of a part of the index of the old Ordnance Survey. The scale is ten miles to an inch. Photography does not admit correction of names misspelt in the original. The curved lines with figures annexed indicate approximately where the surface

¹ See Dr. J. C. Thresh's Report on the Water Supplies of the Chelmsford and Maldon Rural Sanitary Districts, 8vo, *Chelmsford* [1891].

of the Chalk occurs, one, two, three, or more, hundred feet above or below the sea-level, the ciphers being omitted for the sake of distinctness, and the *plus* and *minus* signs respectively indicating height above and depth below the Ordnance Datum. The *zero*, of course, implies that the Chalk at or near that line is just at sea-level. The straighter lines are faults whose existence is imperceptible on the surface of homogeneous clay, even where not concealed by drift, but which are sufficiently established by their effect on the Chalk contour-lines.

The Chalk outcrops from beneath the Tertiary sands along lines running from Sudbury to Bishop's Stortford, and from East Tilbury to near Wennington. To the north and south respectively of these lines of outcrop occur isolated patches of the Tertiary beds, only the more important of which can be shown on so small a map.

The Chalk is not everywhere at the surface in the spaces denuded of their original Tertiary covering, for Glacial and Post-Glacial drifts mask both Tertiary and Cretaceous areas, and much of the ground that is shown as Chalk in the map consists of these gravels and clays, extending to depths of sometimes more than 100 feet.

I have considered it impracticable to attempt to make out any undulations in the Chalk beyond the Tertiary boundary, for the simple reason that where the eroding forces of the Glacial sea laid bare the Chalk, they dealt with it as erratically as with the Tertiary beds, cutting it into deep and shallow, at the will of the changing currents. Instead, therefore, of an undulating plane whose position may be calculated with a fair approximation to accuracy, as is the case under the Tertiary area, we cannot safely pronounce on the position of the Chalk under the Drift fifty yards beyond where it is seen, or proved by boring. Mr. Whitaker has shown us² how in the Cam valley, between flanks of Chalk, the alluvium, barely 300 yards wide, conceals a drift-filled fissure of great depth, showing that calculations from exposures in such an area are liable to be completely erroneous. When East Anglia becomes the scene of numerous collieries, perhaps we shall learn from the undulations of the under-surface of the Chalk that which we cannot gather from the open surface, which was lost in the Glacial period. Accordingly I have left that region untouched, and dealt only with the area where the Glacial erosion has not succeeded in reaching the Chalk.

² ESSEX NAT. vol. iii pp. 140-142, 1889; Quart. Journ. Geol. Soc. vol. xlv. pp. 333-340 [1890].

It will be seen that about Ware, at Bishop's Stortford, Sudbury, and Ipswich, the Chalk boundary is very sinuous, whilst between those points it forms curves for the most part broad and smooth.

That is simply due to our knowledge at the points mentioned, and our ignorance as to the intervals. We do not know what sinuosities are present under the pall of drift, and we can only carry the hypothetical line between sections that prove the absence of Tertiary beds to the north, and their presence to the south. Lately a well sunk northward of the boundary assumed in the Geological Survey map at Little Sampford proved the further extension of the Tertiaries. Such corrections (or their converse, the reduction of the hypothetical area of Tertiary beds) are most welcome and useful. The general strike is E.N.E. from Ware to Sudbury, and thence E. to Bramford. Beyond the limits of the map, it runs N.E. to Saxmundham, and N. to Yarmouth.

The base of the Chalk is approximately parallel to this line, and so is the the great faulted undulation of Tiptree Heath, which I described several years ago.³

That important flexure has quite recently been again proved at Messing, and its course through Suffolk is traceable at Shelly, Ipswich, Woodbridge, and Lowestoft. Along Tiptree ridge it is a faulted anticlinal for several miles. From Wickham Bishop it is traceable with less distinctness by Danbury to the south-west, its effects being complicated by a series of obliquely-transverse flexures and fractures in a manner defying verbal description. The parallel fault from Walton to Prittlewell, the anticlinal of Mersea and Burnham, and the bold flexure at Royston (where the Chalk dips at 40° to N.N.W.) point to some general agency affecting a wide area, and in like manner the east and west fractures from Greenwich to Erith, and Walthamstow to Burnham, are probably of the same age and origin as the parallel anticlinals of the Stour estuary (not shown by the contours), and that in which Bentley occurs (as indicated by the zero-line.)

The lines of flexure and fault of N.W.-S.E. trend are less regular, of shorter continuance and variable direction, and appear to be the result of transverse strains at the time of the later of the previously-mentioned movements in a district weakened by the earlier series. It seems probable, for instance, that the triangular bit of country between Chigwell, Havering and Romford was crushed into its present structure of anticline and syncline by pressure from the

³ Trans. Essex Field Club, vol. ii, pp. 15-18, 1881.

north-west acting obliquely to the earlier fracture between Walthamstow and Romford, so that, whilst a deep trough was formed from Wickham Bishop to Havering, a transverse fracture was produced at the latter place. The ground to the south-west of this, being forced into the angle, yielded along a line passing through Chigwell, and there produced a faulted synclinal of much greater importance than the slight depression passing southward from Havering. Between these synclines the Chalk rises in Hainault Forest to the sea-level, whilst to east, west and south it is from two to three hundred feet lower.

In like manner the shallow depression between Horndon-on-the-Hill and S. Ockendon becomes a sharp and deep fold between Rainham and Dagenham, is unrecognisable near Barking, but re-appears with its normal east and west trend from East Ham to Canning Town. Probably the synclinal of Benfleet is part of the same fold, though obliterated at Fobbing and Vange by predominant pressure oblique to the original flexuring.

I do not think it necessary to describe in words the course of the several contours, as the map supersedes any verbal account, and the rest of the county calls for no special notice. Altogether the Essex Chalk shows a range of elevation of about 1200 feet from its greatest depression at Fowlness, over 600 feet below the sea-level, to the 600 feet above sea which, but for denudation, it would exceed in the north-western corner of the county.

I believe one is expected to conclude a summary of facts such as the foregoing with a little theorising as to the causes of the phenomena described. I would suggest for the N.E.-S.W. folds, a slipping of the Chalk and Tertiary beds towards the line of main depression of the London Basin, probably over the surface of the Gault, but pinching up some of it into the folds. This slipping could only occur after great erosion of the upper beds. The limits of the Boulder-clay indicate a great bank or land-area as existing in South Essex late in the Glacial period; over, at any rate, the Essex half of the Thames valley. What was then a hill-range above the level of the Glacial sea is now South Essex, with the Thames, Crouch and Blackwater estuaries, proving enormous denudation (or differential subsidence) in early Post-glacial times. Such reduction in thickness of the Tertiary deposits might, I venture to suggest, result in a series of undulations in the Chalk by gravitation, without invoking Messrs. Vulcan & Co., the agents generally credited with all such

disturbances. The presence of Glacial gravel on the crest of the Tiptree ridge points to its elevation *during* the Glacial period.

I have referred to the possibility in the future of collieries being worked in Essex, but, though the undulations I have endeavoured to portray necessarily affect the subjacent beds, this is not a suitable occasion to discuss the question of the constitution of the ancient basis upon which the Secondary rocks of S.E. England repose. I will only say here that I hold Mr. Godwin Austen's views on the subject to have been *à priori* untenable, and to have been disproved by every successive boring that has reached the Palæozoic rocks in the south-east counties; and that, but for the glamour of possible wealth in concealed coal, his speculations would have received but little notice.

Few things can be clearer than that the Boulonnais and the Warwickshire coal-fields, with their N.W. strike in common, are better *criteria* for the general trend of the older rocks under Essex than the Somersetshire and Belgian coal-fields, which are so much more remote. That Coal-Measures exist, with a N.W.-S.E. strike, under a great part of eastern England I have held as certain for more than a dozen years, whilst every now and then proofs have been discovered of older rocks to the westward in Hertfordshire, Middlesex and Surrey. Harwich, with its Carboniferous rock of uncertain horizon, and Dover, with its unquestioned Coal-Measures, are as yet the only Carboniferous localities—and they lie between the North France and Midland English coal-fields. I hope to live to see many a colliery at work in Essex, but it must be in regions outside of the great depressions I have traced, for these may be due to the deep-seated causes, carrying down the Coal-Measures as well as the upper strata.

THE GREAT FROST OF 1890-91.

IN a paper read before the Royal Meteorological Society on February 18th, Mr. C. Harding gave some details of the late prolonged frost, which are interesting as supplementing the papers of Dr. Thresh and Mr. French in the last number of the *ESSEX NATURALIST*. The paper dealt with the whole period of the frost from November 25th to January 22nd, and it was shown that over nearly the whole of the south-east of England the mean temperature for the fifty-nine days was more than 2 deg. below freezing point, while at seaside stations on the coast of Kent, Sussex, and Hampshire, the mean was only 32 deg.

In the extreme north of Scotland, as well as in the west of Ireland, the mean was 10 deg. higher than in the south-east of England. In the southern Midlands, and in parts of the south of England, the mean temperature for the fifty-nine days was more than 10 deg. below the average, but in the north of England the deficiency did not amount to 5 deg., and in the extreme north of Scotland it was less than 1 deg.

The lowest authentic reading was 0.6 deg. at Stokesay, in Shropshire, but almost equally low temperatures occurred at other periods of the frost. At many places in the south and south-west of England, as well as in parts of Scotland and Ireland, the greatest cold throughout the period occurred at the end of November; and at Waddon, in Surrey, the thermometer fell to 1 deg., a reading quite unprecedented at the close of the autumn. At Addington Hills, near Croydon, the thermometer was below the freezing point each night, with one exception; and there were only two exceptions at Cambridge and Reading; while in the Shetlands there were only nine nights with frost, although at Biarritz frost occurred on thirty-one nights, and at Rome on six nights. At many places in England the frost was continuous night and day for twenty-five days, but at coast stations in the north of Scotland it in no case lasted throughout the twenty-four hours. On the coast of Sussex the temperature of the sea was about 14 deg. higher than the air throughout December, but on the Yorkshire coast it was only 6 deg. warmer, and in the Shetlands and on parts of the Irish coast it was only 3 deg. warmer.

The Thames water off Deptford, at 2 ft. below the surface, was continuously below 34 deg. from December 23rd to January 23rd, a period of thirty-two days, while the river was blocked with ice the greater part of the time. In Regent's Park skating continued uninterruptedly for forty-three days, where the ice attained a thickness of over 9 in. The frost did not penetrate to the depth of 2 ft. below the surface of the ground in any part of England, but in many places, especially in the south and east, the ground was frozen for several days at the depth of 1 ft. and at 6 in. for upwards of a month. In the neighbourhood of London the cold was more prolonged than in any previous frost during the last century, the next longest spell being 52 days in the winter of 1794-5, while in 1838 frost last lasted for fifty days, and in 1788-9 for forty-nine days. At Greenwich the mean was 9.5 deg. below the average, and in some parts it was more than 10 deg. below, while in the extreme north of Scotland it was approximately in agreement with average conditions. Mr. Harding also mentioned the singular fact that on only one day—January 13th—was the mean daily temperature at Greenwich in excess of the average daily mean for sixty years. The frost throughout was remarkable on account of the absence of any high temperatures. Nearly all the prolonged frosts of the last century, said Mr. Harding, were followed by a fairly dry spring and summer, but the accompanying weather was by no means always hot.

Mr. Harding explained the great difference between the temperatures of Scotland and Ireland and that of England by the fact that during the whole period there was a large area of high barometric readings over Europe which maintained its own limits. The incoming disturbances from the Atlantic could not make headway into Europe, but skirted to the westward of our islands, their centres keeping well out into the Atlantic. Consequently our westward coasts felt the warming influence of these disturbances, although the weather remained comparatively quiet. England, especially as to the eastern parts, was not at all affected by these disturbances.

PROLONGED FROSTS OF THE LAST 100 YEARS FROM OBSERVATIONS MADE IN LONDON AND ITS VICINITY.

DATE.	Days Duration.	Mean Maximum.	Mean Minimum.	Mean of Maximum and Minimum.	Absolute Minimum.	DAYS.					Absolute Maxi- mum.
						With Min- imum Temp. 20 deg.	Of continu- ous Frost.	With Daily Mean 32 deg. or below.	With Maxi- mum Temp. 32 deg. or below.	With Maxi- mum Temp. 40 deg. or above.	
* 1788-9, Nov. 26 to Jan. 13	49	Deg. 31'3	Deg. 27'5	Deg. 29'4	Deg. 17'5	4	12	33	30	3	Deg. 46
1794-5, Dec. 11 to Feb. 7	52	31'9	25'3	28'0	7	11	12	35	23	3	46
1813-4, Dec. 26 to Feb. 5	42	33'0	21'5	27'3	8	16	11	32	20	5	41
1838, Jan. 5 to Feb. 23	50	32'9	24'9	28'9	-4'0	9	13	31	19	5	50
1855, Jan. 10 to Feb. 25	47	34'8	24'5	29'7	11'1	12	4	31	15	7	48
1860-1, Dec. 15 to Jan. 19	36	34'9	24'8	29'9	8'0	8	3	26	9	4	47
1879, Nov. 14 to Dec. 27	44	37'2	24'7	31'0	13'7	4	2	22	6	12	55
1881, Jan. 7 to 26	20	31'8	22'1	27'0	12'7	10	9	14	12	1	41
1890-1, Nov. 25 to Jan. 22	59	33'5	25'0	29'3	12'0	10	10	41	27	9	44

* The frost of 1788-9 has been included, as it occurred but little more than 100 years ago. The temperatures, however, are not from self-registering thermometers, but the observations used as the maximum were made at 2 p.m., and those for the minimum at 8 a.m. each day. The observations for all other periods, are from self-registering thermometers.

ON THE RANGE OF THE PRIMROSE (*PRIMULA VULGARIS*) AND THE BARDFIELD OXLIP (*P. ELATIOR*) IN NORTH-WESTERN ESSEX.

By J. FRENCH ; with remarks by MILLER CHRISTY, F.L.S.

[Read March 21st, 1891.]

THERE is a singularity affecting the distribution of these two species in the above-named locality which is worthy of note. The primrose grows very rarely, if at all, in the region occupied by the Bardfield Oxlip, and the southern limit, at least of the latter species, is very sharply defined.

The northern limit of the primrose and the southern limit of the Bardfield Oxlip can be traced at least twelve miles, the same line appearing to define both areas. This line runs nearly due east and west and lies a little to the north of the high road (the old Roman road) from Braintree to Bishop's Stortford. Perhaps it is in no case more than three miles to the north of that road throughout the whole of the distance from Braintree to Takeley, some sixteen miles. These two closely allied species have no debatable borderland that I am aware of throughout that line ; for both species are scarce, if not altogether absent, in places along the margin of either area. It is very general to have to step over some three miles for the change from flora to flora. The cowslip (*P. veris*) is common to both areas, and seems to be equally distributed in both.

In the case of the Bardfield Oxlip and primrose, the growth of one species is not really inimical to the growth of the other ; for both species grow side by side in cottage-gardens. These cottage-garden plants also show that variations in soil have not influenced the distribution of the Bardfield Oxlip, for it flourishes equally well in bog, in alluvial and upland clays, in woods, and in garden soil. At Great Bardfield, the oxlip principally affects wet meadows by the river-side and is perhaps driven there also as to a fastness. The primrose, too, will suffer a large variety of soil without abating its vigour.

Both species ripen their seeds readily in gardens ; but they do not appear to do so to the same extent when growing wild. I think scarcely one per cent. of primrose blooms develop seed in a state of nature. This would seem to point to the absence of fertilising

LIST OF PUBLICATIONS—*continued.*

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.

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[JUNE, 1891.

The Essex Naturalist:

BEING THE
JOURNAL
OF THE
ESSEX FIELD CLUB.

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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COMMUNICATIONS and ADVERTISEMENTS should be addressed to:—
The Editor of "THE ESSEX NATURALIST,"
7, Knighton Villas, Buckhurst Hill, Essex.

Attention is called to MUSEUM APPEAL on pages 3 and 4 of Wrapper.

THE LOCAL (ESSEX) MUSEUM, LIBRARY, AND LABORATORY.

THE attention of Members of the Essex Field Club, and of all those interested in the practical study of Natural Science, and its applications in industries, and as a means of general education, is earnestly called to the Statement and APPEAL FOR FUNDS for the establishment of the Museum now being circulated by the Council.

The scheme has long been under consideration, and it has been fully explained at meetings of the Club and in the ESSEX NATURALIST. Its principal features are as follows:—

With the object of establishing at Chelmsford (chosen as being the County Town, and also as a central position in Essex) a Local and Educational Museum, the club has agreed to amalgamate with the Essex and Chelmsford Museum, under the title of “The Essex Field Club,” conditionally on the sum necessary for founding the new Museum being raised. The main objects in view are:—

- (a) The formation of authentic collections to illustrate the Geology, Mineralogy, Botany, Zoology, Ethnology, Prehistoric Archaeology and Technology, &c., of ESSEX and the adjacent sea and rivers, together with an educational series of specimens and preparations to be employed for illustrative and teaching purposes. Specimens that are not of Essex origin will be admitted so far only as they serve to demonstrate the structure and relationship of the local types.
- (b) The formation of a Local and Scientific Library, to include (in addition to standard scientific works), topographical, antiquarian, and other books, manuscripts, maps, parliamentary and official papers, pictures, prints, &c., which in any way relate to the county of Essex.
- (c) The establishment of a Laboratory and Class-rooms, with fittings, apparatus, and instruments suitable for the preparation of specimens for the Museum, and for the practical study and teaching (either in the Museum or in selected local stations throughout the county) of the subjects named in paragraph (a), and for promoting their practical application in Agriculture, Forestry, Arboriculture, Gardening, Fisheries, Manufactures, Industries, and general education. The laboratory, class-rooms, instruments, &c., will be under the control of the Council, who may permit students, investigators, and others to use them, and may also lend instruments and preparations out of the Museum buildings for purposes in furtherance of the above objects.

[Continued on page 3 of Wrapper.

agents; but it should also be remembered that both plants have enemies in birds. Sparrows, in particular, will feed on the ovules of primroses as soon as they are developed and will destroy an incredible number of blooms. Still, after all these allowances, there is a fair proportion of seed ripened; it is not, therefore, to the lack of seed that paucity of plants can be traced.

Taking into account the limited range of the Bardfield Oxlip in Britain, it can hardly be regarded as an aggressive species. At one place along the southern limit we have mentioned the area extends as a tongue into the northern area of the primrose. This is at Boxted Wood, a little south of Great Saling. In the neighbourhood of the wood the primrose grows very sparingly, but within the wood its place is monopolised by the oxlips, and they can there be counted literally by thousands. The explanation here is obvious that the wood should be regarded as an outlier of the oxlip area which has not succumbed to agricultural interference.

The primrose cannot be regarded otherwise than as a diminishing quantity in North-western Essex, which is partly due, as with the Bardfield Oxlip, to agricultural and other influences, but more particularly, as it would seem, to the want of agents for the dissemination of the seeds. This is the only rational explanation for the narrow border to which we have adverted as being nearly destitute of both species. Primroses are common enough south of that border.

Why the primrose should be so exceedingly rare or absent in the area inhabited by the oxlip, is not easy to say. Darwin says that its range on the Continent "differs somewhat from that of the cowslip and primrose, and it inhabits some districts where neither of these species live." Although, as we have observed, the presence of one plant is not directly inimical to the other, there is doubtless some indirect manner in which *Primula elatior* injures *P. vulgaris*.

Darwin made many experiments on the cross-fertilisation of these two species and of *Primula veris*, all nearly allied (see "Different Forms of Flowers in Plants of the same Species"). Unfortunately these experiments do not help us to a solution; but incidentally Darwin touches upon a problem which may be placed alongside of our difficulty. In treating of the Common Oxlip, which is a hybrid between *P. veris* and *P. vulgaris*, and is in nowise to be confounded with the Bardfield Oxlip, he mentions the singularity of this hybrid being frequently found in some districts and rarely in others, and

thinks it is to be accounted for by the presence or absence of a moth which visits alike the primrose and the cowslip. Whether or no there has been a troublesome moth at work in the area of the Bardfield Oxlip I am afraid it would be useless to enquire. It does not seem possible that insects could hybridise and annihilate a species; yet what other solution is forthcoming?

The broad teaching of Darwin's book is that hybridisation in these members of the genus *Primula* is sometimes common, and that the conditions under which this takes place in nature are not often known. The organs of reproduction in forms recently differentiated appear, in our ignorance, to act capriciously.

Whatever may have been the cause, the fact of the local extinction of the primrose dates from a time long past, for there are large areas now destitute of both species. A melancholy interest lies in defining these areas, and more particularly in marking the boundary of *P. elatior* and watching its gradual extinction. Its original boundary perhaps extended beyond the limit now marked by the absence of the primrose. It still extends far into Suffolk and into Cambridgeshire, but is otherwise unknown in the British Isles.

A more satisfactory task is that of watching its behaviour both in a wild state and under cultivation, and comparing its changes with those of nearly allied species. The changes those species undergo may be roughly tabulated as follows:—

Primrose. *P. vulgaris.*

In a wild state.—Pedicels vary in length; blooms change slightly in colour; corolla (rarely) becomes foliaceous.

Under cultivation.—In addition to the above changes floral envelopes increase in number, and flower eventually becomes double, or produces "hose-in-hose." Blooms vary greatly in colour.

Cowslip. *P. veris.*

In a wild state.—Scape and pedicels vary in their respective lengths, and blooms vary in size to such a degree that the plant simulates, and is often mistaken for, the oxlip.

Under cultivation.—In addition to the above changes flowers alter greatly in colour and finally produce the polyanthus.

Common Oxlip (a hybrid between *P. veris* and *P. vulgaris.*)

Under cultivation.—Plants become robust and corolla sometimes changes in colour.

Bardfield Oxlip. *P. elatior*.

In a wild state.—Single flowers sometimes produce stamens and pistil of equal length.

Under cultivation.—Scarcely perceptible changes occur (?).

Observations on the Bardfield Oxlip are few, but all the evidence I can collect goes to show that it is by far the most stable form of the three species. Darwin knew of some plants kept twenty-five years under cultivation and they varied but slightly. I have a plant in my garden which has kept pure for nine years, whilst its companion cowslips and primroses have gone through changes incalculable.

The authority for the statement that single flowers sometimes produce stamens and pistil of equal length is Darwin's book; a case was supplied to him in which, out of 894 wild plants, sixteen had "equal styles." This he considered to be very remarkable as occurring in the wild state. The same authority says also that hybrids from *P. elatior* are rare.

If the stability of the species be confirmed, and the occasional variations of the filaments' length be regarded as a case of atavism, should we not be justified in claiming a higher antiquity for the Bardfield Oxlip than can be accorded to either the cowslip or the primrose?

[I have been kindly afforded by the Editor an opportunity of perusing the above interesting paper. Few who compare Mr. French's remarks on the distribution of *Primula elatior* and *P. veris* in North-west Essex with the observations contained in my paper "On the Species of the Genus *Primula* in Essex" (Trans. E. F. Club, vol. iii. pp. 148-211) could avoid coming to the conclusion that Mr. French had borrowed largely from my observations: but he has satisfactorily shown that at the time he wrote he had no knowledge of the existence of my paper. His remarks come, therefore, to have a definite value, as corroborating my own statements upon a very interesting point in the distribution in Britain of *Primula elatior*, to which far too little attention has been given. Mr. French's statements on this point are, I believe, accurate. His theory as to the cause of the peculiarity of distribution of this species is, however, questionable. It is difficult to believe that it is due to the existence or absence of any particular fertilising insect, and it would be very difficult to prove this, if it were the case. At the same time I am

bound to confess that the distribution of the species has not yet been satisfactorily accounted for on any other supposition. Further, Mr. French's arguments on behalf of the antiquity of *P. elatior* as a species on account of its non-variability are rather weakened by facts brought forward in my own paper proving its variability within certain limits.

I take this opportunity of stating that, since the appearance of my paper, I have been collecting information as to the exact distribution of *P. elatior* in Britain, and I shall welcome any facts bearing upon the point. Beside the very sharply-defined area which the species occupies in Essex, as shown in my paper, it also extends over large portions of Cambridgeshire and Suffolk, and there is at least one locality within the boundaries of Norfolk. I believe, also, that it crosses the Essex border into Hertfordshire in the vicinity of Stanstead Montfitchet, although this is not stated in the recently-published "Flora of Hertfordshire." There also are localities in Bedfordshire I believe.

MILLER CHRISTY.]

ON A FEMALE SPECIMEN OF THE COMMON RORQUAL (*BALÆNOPTERA MUSCULUS*), CAPTURED NEAR BURNHAM.

By WALTER CROUCH, F.Z.S.

[Read February 28th, 1891.]

With Plate IV.

ALTHOUGH the Whale which was stranded in the River Crouch, on the 12th February, belongs to a species which has occurred more frequently on the British coast than any other of the Baleen Whales, yet it is one worthy of record, not only as an Essex specimen, but as exhibiting a very marked and curious asymmetry of epidermal colour.

The animal appears to have entered the river on the early morning flood-tide, and was first seen by Isaac Courtman, a Burnham dredgerman, who, when proceeding to his work, found it floundering and blowing in the shallow water by Holliwell Point, on the north shore of the river near the oyster layings, about four miles east of Burnham. Nearly opposite this spot on the south side, by Fowlness Island, the specimen of Rudolph's Rorqual was taken in November,

1883, which was described by Prof. Flower in Proc. Zool. Soc. (Nov., 1883), and Trans. E. F. Club (vol. iv. p. 113).

The alarm was given, and in half-an-hour about thirty men were at work trying to secure the animal with ropes, and soon afterwards Inspector Rome of the Burnham Oyster Company and Mr. John Auger appeared on the scene with a gun, and many shots were fired, to which at length it succumbed, lying close under the sea wall.

The tide was then flowing in, and it was taken in tow by the smacks "Plover" and "Teazer," and subsequently by the steamer "Jumbo," which brought the carcass safely to Burnham, where a crowd had assembled to witness its arrival. It was soon seized on behalf of the Crown by Mr. J. Finch, H.M. Customs officer and receiver, and was put up to auction, being knocked down for £17 10s. to Mr. J. S. Prior, of Southminster, and Messrs. John Hawkins and Henry Cook, of Burnham. Later in the day it was claimed by the solicitors of Sir Henry Mildmay, Lord of the Manor, and owner of the royalty of the river, who had on the previous occasion successfully established his right by a Chancery injunction.

Attempts were then made to raise it on to the quay by a crane, but this was found impossible, and on the next day (Friday) fresh efforts were made to raise it on to a slip by means of a capstan and tackle, which were also unsuccessful, the task of raising the carcass being a more formidable undertaking than the buyers had anticipated. Meanwhile a flutter of excitement was caused in the Dengie Hundred by the news, and the advertisement of Mr. Prior announcing the exhibition at the Malting Yard, and cheap trains at single fares. Many hundreds of people came down on Friday and Saturday, but had to go away disappointed. Subsequently 1,300 paid for admission.

I went down to Burnham on Saturday, and was surprised to find the whale lying in the shallow water, held by chains, covered over with tarpaulins, and floated by a number of empty casks. Later in the afternoon, as the tide came in, it was slowly hauled up on a specially prepared slip, at the back of the post-office, but the tackle broke several times, giving me, however, an opportunity of examining the head and baleen, and identifying the species to which it belonged. Later on it was well hauled up, the tail only resting on the mud, and with the aid of Mr. John Rogers, jun., of Burnham, I was able to

have a good inspection and take some measurements. A few days later Mr. E. A. Fitch, who had examined and identified it on the Friday, made further measurements and notes, and I am indebted to him for thus enabling me to prepare a measured drawing of this Rorqual in illustration of these notes. The original scale is $\frac{1}{4}$ -inch = 1 foot; and as the drawing has been reduced one-half in length, the scale of the accompanying illustration is $\frac{1}{8}$ inch = 1 foot.

Two photographs were taken by Mr. A. H. Willott, of Maldon, showing the dead whale on the side of the sea wall, but in these the animal is very much foreshortened.

The following are the chief measurements:—

	ft.	in.
Extreme length	46	6 $\frac{1}{2}$
Girth at base of pectoral fin, estimated	20	0
Median slit of flukes	0	5 $\frac{1}{2}$
End of ditto, to anterior base of dorsal fin	14	3
Base of dorsal fin to blow-holes	23	10
Blow-holes to end of upper jaw	7	4
" " lower jaw	8	5
Middle of eye to end of upper jaw	8	6
" " lower jaw	9	5
Tail flukes, each	6	0
" Width at A in illustration	0	21
Dorsal fin, basal line	0	26 $\frac{1}{2}$
" height from back	0	15
" " to point of fin	0	11 $\frac{1}{2}$
Pectoral fin, greatest length	5	0
" greatest width	0	13
Blow-holes, length of furrows, each	0	13 $\frac{1}{2}$
Eyelids	0	3 $\frac{3}{4}$
Diameter of eyeball	0	4 $\frac{1}{4}$
Baleen, longest (without bristles, about 2 in.)	0	22
" greatest width at attachment to maxilla	0	9
" length of whole row, each side	8	6

The general colour of the upper portion, the dorsal fin, the band of the lower jaw on the left side and the sides of this Rorqual were blackish-slate; and the under part white nearly to the tail. The underside of the pectoral fins and flukes were white, showing also a margin of white on the upper surface.

The baleen, the blades of which numbered about 350 on each side, are delicate slate-colour, mottled with lighter streaks, with the exception of about two feet (part of the row measuring 8ft. 6in.) in front on the right side which are whitish or drab-white.

It is a well-known fact that the colour of the skin of whales

becomes much darker after death, but in this specimen I have observed a feature which is worth recording with regard to the baleen; that the delicate slate colour of the blades which I have, became much darker after it had been cut off and become dry.

Some interesting particulars as to the great variability and sizes of the Common Rorqual are given by Mr. Cocks in *Zool.*, 1887, pp. 215-18,¹ and 1888, pp. 205-6, also *Zool.* 1884, p. 456, where he says, "The extremely thin, elongated, or seemingly-emaciated appearance of this species is very noticeable, the posterior portion of the back is almost sharp-edged, quite deserving the English name, Razorback." This ill-conditioned peculiarity was very apparent in the Burnham specimen.

One of the most interesting features in connection with this species is undoubtedly the asymmetry in colour on the two sides of the head, which, although unnoticed or unrecorded till of late years, appears to be a constant character, and of specific importance.

This was first noticed by Prof. G. O. Sars of Christiania University in descriptions of *B. musculus* which appeared in "Forhand: Videns: Selsk: Christiania," 1878, and again in 1880. In the latter year he figures a specimen taken in Varangerfjord Finmark, measuring about 68 ft. Engl., showing on the *left* side the upper jaw and the band of the lower jaw slate-black, whilst on the *right* side, about half of the upper jaw, a portion of the baleen, and the lower jaw band and throat are white, the difference in colour being very clear and distinct when viewed looking down upon the top of the head.

This want of symmetry has since been noticed in several specimens;² and in a photograph sent me (with some details) of a female stranded at Sea View, Isle of Wight, in September, 1888, which was no doubt of this species, though never absolutely identified, the same difference in colour is clearly shown.

In 1884, Prof. G. A. Guldberg, Conservator of the Zootomical Museum of the University of Christiania, writing "on the existence of a fourth species of *Balenopectera*" (*borealis*) (Bullet. Acad. Roy.

¹ On page 215, a note by one of the whalers, Captain Sørensen, is inserted, mentioning a kind of Rorqual called the Herring Whale (*sildhval*), met with during the herring fishing on the western and southern coasts of Norway. He says it is most like the Common Rorqual, but is smaller, 50 to 55 feet, with the dorsal fin somewhat higher and more pointed, and yields less oil. He suggests this may be the southern form. From the description, so far as it goes, it seems probable that the Burnham Whale belonged to this variety.

² Notably by Prof. Pouchet in 1884, one with the right side white (*Comptes rend. Acad. Sc. Paris*, Fev. 1885); by A. H. Cocks, 1884, a male at Vardø, 64½ ft. long, the left side black and the right side white (*Zool. Ap.* 1885, p. 138); and by the same author, a male 71 ft. at Vardø, left upper and lower lip jet black, right lips enamel or milk-white (*Zool.* 1885, p. 269).

Belge, Avril, 1884, p. 365) mentions that the asymmetry noted by Prof. Sars in *B. musculus* does not exist in *B. borealis*, and adds in a note, "Cette couleur blanche, semi-latérale, que M. le Professeur G. O. Sars a déjà décrite, n'est pas exclusivement attachée à un côté spécial, mais elle varie d'après les observations que j'ai faites." I am not aware of his having published any fuller information on this interesting point.

In 1886, Prof. M. G. Pouchet of the Paris Museum, in a very interesting memoir "De L'Asymétrie de la Face chez les Cétodontes,"³ dealing chiefly with the osteological differences in toothed whales, mentions the asymmetry of colour in *B. musculus* recorded by Sars and Guldberg as a kind of pleuronectism, and adds :—

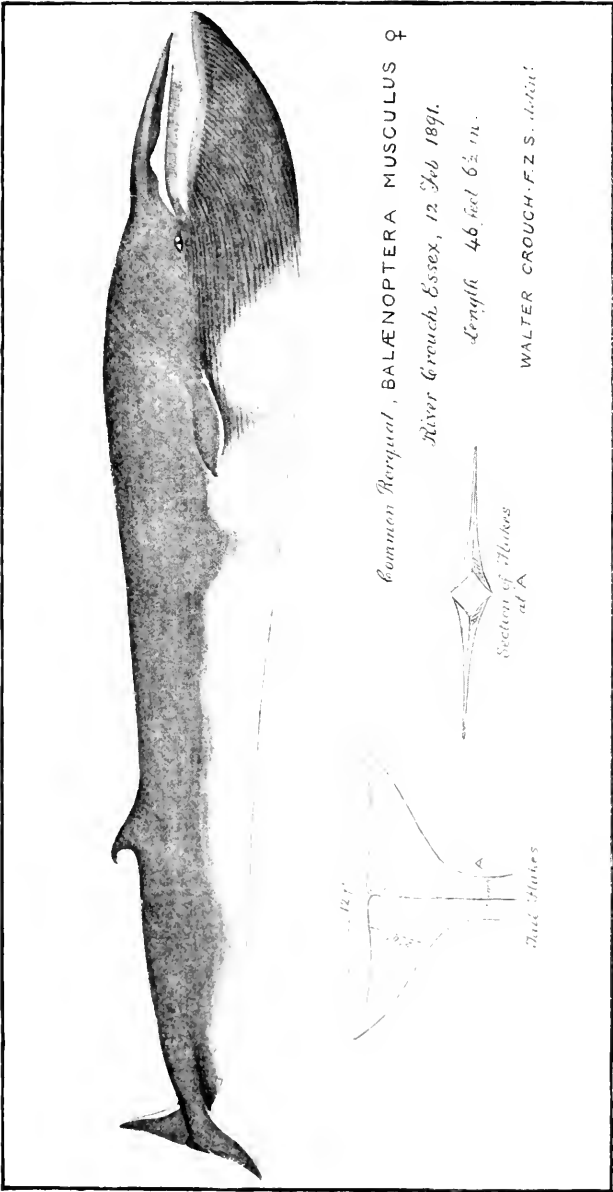
Si cette décoloration existe toujours du côté droit comme semble l'indiquer Sars, elle constituerait pour les Balénides une sorte de caractère *abdominal*, de même que la deviation de l'évent des Cétodontes donne chez eux au côté gauche une sorte de caractère dorsal. Un lien physiologique semblerait en ce cas relier les deux particularités anatomiques, qui l'une et l'autre accuseraient une tendance au pleuronectisme du même côté."

In the Burnham specimen, not only is the asymmetry well marked, but a curious deviation obtained. On the *right* side, as may be seen in the illustration, a portion of the upper maxilla varying from 1 to 7 inches, about 2ft. of the baleen, and a curved margin varying from 5½ inches on the band of the lower jaw, being white, whilst below this the throat is black, which colour extends in an oblique line to the base of the pectoral flipper.

Why this species should exhibit such a remarkable feature, which appears to be common also to both sexes ; and of what particular use it can be to the animal is not known, nor does it seem possible at present to advance any likely reason for the peculiarity.

In conclusion, I may mention that the flesh was used for manurial purposes at Southminster, that the bones are now being prepared by Mr. E. Gerrard, of Camden Town, for the owners, and the skeleton will probably be articulated for exhibition at Burnham.

³ Prof. Pouchet very kindly sent me a copy of this rare Memoir, which he was deputed to write and publish by the Nat. Hist. Mus. of Paris, in honour of the professorial jubilee of the veteran cetologist, Van Beneden, Professor of the University of Louvain, whose works on the osteology of living and fossil cetacea, and other writings, are so well known to naturalists.



Common Porpoise, BALÆNOPTERA MUSCULUS ♀

River Crouch, Essex, 12 Feb 1891.

Length 46 incl 6½ in.

WALTER CROUCH, F.Z.S. (Linn.)



THE ESSEX FIELD CLUB.

MEETING IN HIGHAM PARK, EPPING FOREST, AND 123RD ORDINARY MEETING.

Saturday, March 21st, 1891.

A FIELD MEETING was held this afternoon (previous to the Ordinary Meeting in the evening) to allow of an inspection of the portion of Higham Park, near Walthamstow and Woodford, recently added to the Forest.

The members assembled at Hale End Station about three o'clock, and walked through the pretty village to the "Driftway," as the green lane connecting two portions of the Forest is called. The fence which formerly shut off the woodland and lake of Higham Park having been recently removed, the whole becomes an integral part of the forest, the average width of the belt of land being 150 yards.

Mr. E. N. Buxton (Verderer) was to have led the party, but a letter from him was read expressing regret for his unavoidable absence. Mr. Andrew Johnston (Chairman of the Essex County Council) kindly acted as *cicerone*, and gave some account of how the purchase of the woodland and lake came about. Mr. Johnston said that he had the pleasure on the 17th of May last, at a meeting in the Forest, of making the first public announcement to the Club of the project Mr. Buxton entertained about this addition to Epping Forest, a project which he thought they would all say had been most satisfactorily accomplished. He thought they would all agree with him that to Mr. Buxton belonged the credit of having, with indomitable resolution, carried the scheme through.

[The proceedings in connection with this important acquisition were alluded to in the last volume of the *ESSEX NATURALIST* (vol. iv. pp. 127 and 230) and the matter forms the subject of a separate article in the present number.]

At the entrance to the Driftway, Mr. Johnston pointed out the ugly elbow of land belonging to the Walthamstow Charity Trustees, which abutted into the green lane, and would considerably mar its beauty. If about half an acre of this land could be acquired, it would be possible to make a nice bend, and Mr. Buxton hoped eventually to be able to make this improvement.

Mr. W. Cole read, from the "Rolls of the Court of Attachments of the Royal Forest of Waltham," several references to the enclosure of the "Sale," showing that the land recently thrown out was in a sense a restoration, it having originally been part of the Forest of Waltham (*vide* the article in the present number).

The lake and woodland having been inspected and much admired as a charming and useful addition to the Forest, the party walked by Chingford Lane, skirting "Hatch Plain" and the "Lops" to Woodford Green, where, at the kind invitation of Mr. Johnston, a halt was made at the "Wilfrid Lawson" Temperance Hotel for refreshment. Then the ramble was continued through the very pretty forest-land to the west of Woodford, over "Rushy Plain" and by "Gilbert Slade" in search of the usual "high tea," which was served at the "Eagle Hotel," Snarebrook.

In the evening the 123rd Ordinary (and Special) Meeting was held in the Drummond Room, Wanstead, Mr. E. A. Fitch, President, in the chair.

The following were elected members of the Club: Messrs. S. T. Taylor, M.B., Thomas Tyrer, F.C.S., F.I.C., and Frederick West, C.C.

By order of the Council, the Meeting was made SPECIAL, and Mr. W. Cole, on behalf of Prof. Meldola, moved the following resolution :—

“ That Sir Henry Enfield Roscoe, D.C.L., F.R.S., M.P., &c., sometime Professor in Owen’s College, Manchester, be elected an honorary member of the Essex Field Club in consideration of the services rendered to the Club in connection with the Technical Instruction Scheme.”

This proposal was carried unanimously.



HIGHAM PARK, EPPING FOREST. A WOODLAND PATH.

Mr. Snell exhibited a specimen of the carnivorous slug, *Testacella scutulium*, of which a number of specimens had been found in his garden at Buckhurst Hill.

Mr. C. B. Sworder exhibited a small collection of Mollusca from the neighbourhood of Epping.

Some photographs were then thrown upon the screen by Mr. Wire, consisting principally of views taken by himself during the last year's field meetings, views of the Higham Park from drawings by Mr. H. A. Cole, and some copies of old prints of Essex localities, &c.

The President then called upon Mr. Walter Crouch, F.Z.S., to speak on the main exhibits of the evening, consisting of a goodly number of specimens from his collection, which he had selected in illustration of the characteristic species of a few important groups of invertebrate life, and showing as far as possible the Foreign, British and fossil forms. The shells of the Mollusca were arranged in seven large cases, with larger specimens and fossils on the tables; and to aid in the demonstration, a series of diagrams, painted by himself, were hung on the walls.

The five classes into which the Mollusca are now divided were then hastily reviewed.

The varied forms of Cephalopoda, including the Pearly Nautilus with its fossil allies the Ammonites—the Cuttle Fish, Squids—one of which, the common *Loligo*, was shown in spirit—and fossil Belemnites, &c.—the Octopus, and the Argonaut with the delicate fragile “shell” secreted by the female, which is but a “cradle” for the protection of the young fry, were duly noted. The largest of this group, of which a diagram was shown, is the *Architeuthis*, which has often been known to measure sixty feet from end of the body to tip of the long grasping arms.

The small glassy shells of the Pteropoda or “butterflies of the sea,” were then described—those “winged” forms floating always *on* or just *below* the surface of the ocean. The northern species—some of which are shell-less—provide food for the huge Greenland Whale. One of the larger species, a fine specimen over 2½ inches in length (*Cymbulia peronii* from the Mediterranean Sea, a form which has no shell), was exhibited, well preserved in spirit. Many of this class exhibit phosphorescence at night.

Then the small division of Scaphopoda, mud and sand dwellers, of which the little “elephant's tusk” shell, so commonly cast up on the British coast, is a well-known example.

The extensive class of Gastropoda next claimed attention, from the small land shells and slugs to the large and brightly-coloured tropical marine species; and the growth of the shell from the “capsule,” in which the eggs are laid, up to the fully grown shell of nearly two feet in length, was shown by specimens of a large *Fusus probosciferus* from Dampier's Archipelago.

Special notice was called to the wonderful variety, in shape, colour, and beautiful patterns, which exists, especially in tropical shells. The spiny shells of *Murex*, the brilliant colouring of *Volutes*, *Cones*, *Mitras*, &c., the enamel of Cowries, Olives, and Poached-egg shells, the curious “keyhole” limpets, the shells used for cameo cutting, the frail glassy shell of *Carinaria*, and such aberrant forms as *Chiton*, &c.

A large *Triton variegatus* was shown, and the mode in which it had been used as a trumpet by some dusky native of the Eastern Archipelago to strike terror into the hearts of his enemies; and also a drawing of the same shell with a finely carved Maori mouthpiece, now in the Chelmsford Museum.

The last class, Pelecypoda, was then described, the shells of which consist of two valves united by a ligament, and generally having a number of inter-locking

"teeth." The common cockle, scallop, oyster, and fresh water swan-mussel being familiar examples. Tropical species occur of larger size, and a sketch of the huge *Trilacna* shell from the Moluccas was shown with a young native baby taking his bath therein. A pair of these shells have been found to weigh nearly 4 cwt., and the "dainty" mollusc will provide a "square meal" for twenty men.

Amongst these bivalves were mentioned the thorny forms of *Spondylus* and cockles, the pearly *Trigonia*, the Ark shells, the brilliant scallops or *Pectens*, the window, hammer, and pearl oysters, the boring forms of *Pholas* and *Lithodomus*, and the strange *Brechites*, those dwellers in sand, who commence life in a little pearly bivalve, developing subsequently a calcareous tube with a "watering-pot" top. The beautiful colours of the animal of *Lima*, with its numerous "processes" or filaments, were shown by the aid of a large drawing.

Mr. Crouch then touched briefly upon the polyps which form the stony corals and build up reefs, the Madrepores, *Galaxea*, Brain-coral, &c., and the brightly-tinted delicate growths of the Stylaster and Alcyonoid corals (which were exhibited in two cases), such as the organ-pipe, red coral, and the sea fans or *Gorgonias*, of which he shewed some fine and large specimens from Torres Straits and the Bahamas, and a large specimen of the branching "black coral" *Antipathes*, from the Mediterranean Sea.

A short description of the typical forms of sea urchins, star fish, and the rare "sea lilies" (Crinoids) brought home by the "Challenger Expedition, 1873-76" then followed, illustrated by a number of striking typical specimens.

A brief note on Sponges was then given, and some large and rare examples, chiefly from the Bahamas, were shown; one case containing some beautiful siliceous sponges, *Hyalonema sieboldii* or glass rope sponge; *Euplectella aspergillum*, or "Venus' flower-basket" and some lowlier forms from the English seas, such as *Grantia*, *Chalina*, and the boring *Clione*.

The following papers were read:—"Notes on the Recent Prolonged Frost," by J. C. Thresh, D.Sc., M.B. (*ante*, p. 64); "Vital Statistics of the County of Essex," by Dr. Thresh (*ante*, p. 47); "On the Range of the Primrose and the Bardfield Oxlip in North-Western Essex," by Mr. J. French (*ante*, p. 120). The latter paper was read for the author by Mr. Miller Christy, who also made some remarks upon the subject, and referred to his paper on the "Genus *Primula* in Essex," in the "Transactions" of the Club.

A short discussion on Mr. French's paper ensued, in which Mr. Fitch, Mr. Christy, Rev. H. C. Howell, and others took part. Mr. Fitch mentioned that Mr. G. Alan Lowndes, in a letter dated May 1st, 1889, stated that the true Oxlip grew in great profusion in the Park Wood, near Barrington Hall, Hatfield Broad Oak, and Mr. Lowndes confirmed this by sending specimens. Mr. Fitch also stated that he had found *Primula elatior* abundantly in Cobbler's Grove, between Stoke and Hundon, and that it was common in a pasture called "Wellum," in front of Boyton End House, Stoke-by-Clare. These observations extend the distribution of *P. elatior* N. and S. of the lines marked on Mr. Christy's map in Trans. E.F.C., iii. p. 174.

Votes of thanks were passed to the exhibitors and the authors of papers, and the meeting terminated.

CORRESPONDENCE.

BOULDER-CLAY IN ESSEX.

SIR,—Mr. Monckton regards it as improbable that anyone holds that an ice-sheet can traverse hills of fine sand without denuding them. But this absurdity is essential to his assertion of an East Anglian ice-sheet, for the bedding of the Boulder-clay is conformable to that of the finely-stratified sands on which it often rests. That the Glacial Drift of Essex consists largely (I quite deny the "mainly") of local material is further evidence against the said ice-sheet, and how a well-stratified gravel, such as is exhibited by the pit Mr. Monckton refers to, can be regarded as anything like a moraine, or due in any way to continuous ice, passes my imagination. If Mr. Monckton goes to sections in Essex with a mind prejudiced by accounts of the northern drifts (which *were* produced by confluent ice) as indicating conditions prevalent throughout West Europe, he cannot expect to see evidence of marine action. Fossil evidence may be dispensed with (in the Thaxted case, the shells indicate Crag, in place or nearly so). Stratification, seen in every exposure worth calling a section, settles the question against ice as forming the East Anglian drifts, though their material, chiefly of Lincolnshire and Midland origin, indicates flotation by ice from those regions, in which there is ample evidence of the action of coast ice as a powerful engine of erosion, when Essex was mainly if not wholly submerged.

Of the authors quoted, no one who knows anything of the first values his contributions to the literature of the subject, and I wholly dissent from the conclusions drawn from the facts recorded by the others.

W. H. DALTON.

Derby Road, S. Woodford.

SIR,—With reference to the letters of Messrs. Dalton and Monckton on the above subject in the last number of the ESSEX NATURALIST (*ante*, p. 109), may I be permitted to submit some original observations, which although limited to a small area, are probably typical of much to be found over the northern half of Essex.

In the railway cutting, between Braintree and Bulford stations, the Boulder-Clay lies immediately on gravel and sands of "Westleton" age. The line of division is very sharply drawn. There is no disturbance of the gravel or sand traceable on the minutest examination, neither has either deposit entered by means of a "tongue" or otherwise into the domain of the other. The inference is that the deposition of Boulder-Clay came about there by a quiet process, and not under the pressure and abrasion of land-ice.

At Blewitt's pit, one mile N.E. of Stebbing village, where similar deposits occur, the line of division is again sharply marked, and there is also the complete absence of any disturbance of the underlying bed. In the railway cutting, one mile west of Dunmow Station, the same beds with the same phenomenon are conspicuous, and in Professor Prestwich's paper on the "Westleton Beds" (*Quart. Journ. Geol. Soc.* vol. xlvi.), quoting from a previous paper of Mr. Woodward's, he says "the line between the undoubted pebbly gravels and the overlying Glacial Drift is generally sharply defined."

Where the Boulder-Clay rests on "Middle Glacial Gravel," the transition is much less abrupt, and it is often difficult to say where the one formation leaves

off and the other begins, but in an examination of Mid-Glacial Gravel extending over some years, I have never come across striated stones, whilst these are very common in the Boulder-Clay, a circumstance also implying the absence of an abrading ice-sheet.

In Mr. S. V. Wood's paper on "The Newer Pliocene Period in England," (Quart. Journ. Geol. Soc. vol. xxxvi, 1880), he gives several illustrations of the quiet deposition of Boulder-Clay on Mid-Glacial Gravel, and on pages 486 and 487 of the volume cited the following passage is to be found: "There can, I think, be no question that these instances show that by some means the moraine of which the clay is composed was introduced tranquilly over a sea-bottom in which sand and gravel had up to this time been accumulating."

J. FRENCH.

Felstead, June 13th, 1891.

NOTES—ORIGINAL AND SELECTED.

Badger at Asheldham.—While rabbit shooting the other day over the Asheldham Hall estate, Mr. J. T. Gale and party unearthed a fine badger. It is many years since a badger was caught in the Dengie Hundred.—"Essex County Chronicle," May 29th, 1891.

Another Rorqual in the Crouch River—On the morning of the 7th April, the men on board the "Jumbo" (s.) saw a whale, which they said was about fifty feet in length, almost at the same spot where the one was captured in February, near the mouth of the Roach. Some men at work in that river had heard it blowing during the night. It was subsequently seen distinctly by several persons on the sands at the mouth of the Crouch, and is said to have been stranded, but when the tide returned it made a successful departure from this almost inaccessible position.—E. A. FITCH, Maldon.

A Swallow's "pendent bed and procreant cradle."—In the "Essex Herald" for June 9th, it is stated that a pair of swallows have built their nest on the knot of a rope carried from one rafter to another in a workshop in the village of Blackmore. The nest hangs in mid air.

Homing Instinct of *Hyla arborea*, L.—Our member, Mr. E. N. Buxton, writes as follows to the "Zoologist" for June:—"Two and a-half years ago I put a small green frog (*Hyla arborea*) that my daughter brought from the South of France, into my conservatory here ('Knighton,' Buckhurst Hill). In the following spring he began to croak, and, contriving to make his escape, found his way to the pond where his strident voice awoke the echoes every summer evening. He always remained about the same spot, which was about three hundred yards from the conservatory. Now comes the extraordinary part of his history. When the winter came on, he found his way back to the conservatory. This performance he repeated last year, and now again he has found his voice. That so small a creature should remember where he had been comfortable in winter, and find his way back to the conservatory across an open lawn, seems to me very extraordinary."

Sea Lamprey in the Colne.—I saw lately a very fine specimen, weighing about four pounds, of the Sea Lamprey (*Petromyzon marinus*) which had been

captured in the Colne, at the Hythe in this town. In many English rivers the capture of a specimen of this fish would not be remarkable; but here, from its rarity, it may be worth a notice. It was brought to me by its captor to name, as he said he could find no one at the Hythe who knew anything of this strange fish—a sufficient proof that it is very uncommon in this district.—HENRY LAVER, F.L.S., Colchester.

A Voracious Eel.—On Saturday, May 23rd, a large eel was caught just outside the locks at Heybridge Basin by Alfred Clarke. When opened it had no less than nine perch and a rat in its stomach. The eel itself weighed about two-and-a-half pounds.—JOHN BASHAM, Maldon.

Coleophora vibicigerella in Essex.—Mr. G. W. Bird reports in the "Entomological Monthly Magazine" for June, the re-occurrence of this insect. "A friend and myself journeyed down to the Essex Salt-marshes on April 27th, with the particular intention of looking for hibernated larvæ of *Geometra smaragdaria*. In this, however, we were not successful, but, oddly enough, the very first plant of *Artemisia* examined produced the *Coleophora*, and about a dozen more were found within a few yards. The insect is exceedingly local, as Mr. Elisha has previously observed, for further careful search during the day proved fruitless. . . . On the Continent this species is reported to be attached to *Artemisia campestris*; possibly a careful search among that plant might produce *Coleophora vibicigerella* more plentifully than we have it at present from *A. maritima*."

Essex Earthworms.—An Appeal.—The Rev. Hilderic Friend, F.L.S., who has lately so successfully studied those neglected, but exceedingly interesting animals, the Earthworms (*Terricolæ*) and allied groups, has kindly promised his valuable aid in identifying our Essex species. Mr. Friend writes:—"I have now worked at the worms of Devonshire, Sussex, Notts, Yorkshire, Cumberland, and Westmoreland, S. Scotland, and other parts of the kingdom, and shall be delighted to add Essex to my list. I have found out some curious facts by this embracing method, and if I can get a few more counties worked up in time, I propose submitting a report to the British Association this year. Of course, I must have material. So far as I am aware, there is no record of Essex worms in existence. If you know of any references I shall be glad to incorporate them in such papers as I might be able to submit to you. Let me indicate where worms may be sought:—

- "(1.) In cultivated ground, gardens, fields, &c. The species found here have usually been 'lumped' under the aggregate term *Lumbricus terrestris*. They need careful revision.
- "(2.) In heaps of vegetable mould, old manure, refuse, compost, quitch, and rubbish heaps. 'Brandlings' (*L. olivus*, Hoff.), 'Gilt-tail' worms, &c., are found here.
- "(3.) In woods, damp spots under trees, and by hedgerows generally—these are all good hunting grounds.
- "(4.) Especially by streams and brooks and all kinds of water, fresh or stagnant, running or still, the stones, tufts of grass, each to a depth of ten or twelve inches, should be examined. In the roots of grass, the 'Square-tail worm' (*Allurus tetradrus*, Eisen) is mostly found.
- "(5.) Under droppings, stones, logs, decaying trees, in fields and neglected places, &c.

¹ "Put the worms alive and uninjured into a tin box. Wash some soft moss,

squeeze it pretty dry, and fill the tin box *lightly* with it, putting in enough to keep the worms from being shaken about on a journey through the post, &c.

"My sister the other day—never having collected worms before—went out and got me *ten species*, within a mile or two of Bovey Tracey. What might not your Field Club accomplish, if a dozen members from different parts of the county would take up the work?"

We hope to publish shortly an introductory paper on the study of the Oligochæta, by Mr. Friend. Meanwhile we trust that members will assist in the attempt to work out the Essex species. Mr. Friend says: "I shall be glad to receive as many boxes (packed as above) from your members as they like to send. I cannot return them, however, unless postage is enclosed. In the end I could let the Museum have a set duly labelled, if proper bottles were provided." Address—Rev. Hilderic Friend, F.L.S., "The Grove," Idle, Bradford, Yorkshire.—ED.

Parasitic Vorticellæ.—On Tuesday, March 31st, I went fishing for small objects in the ponds on that part of the forest at the back of Forest House. The chief takings were numbers of *Daphnia* and *Cyclops*, but almost all were covered with a species of the Bell-Animalcule (*Vorticellæ*). So thick did these congregate on the surface of their hosts that swimming was quite impeded, and by no means could the parasites be shaken off.—ALFRED P. WIRE, Leytonstone,

Uncommon Plants at Felstead.—In the interesting "Report of the Felstead School Natural History Society for 1890," just issued, are the following notes on the plants of the district:—During 1890, several notable additions have been made to our local flora, chiefly by the exertions of Mr. W. Moore, of Mileh Hill, Felstead; to him and to Mr. J. French, who is responsible for two of the plants below, our thanks are greatly due. The new plants added are:—*Viburnum lantana*, *Hesperis matronalis* (casual in a field of *Trifolium incarnatum*), *Apium inundatum*, *Valerianella olitoria*, *Carex axillaris*, *C. panicea*, *Festuca myurus*, *Dianthus* (?) *armeria*. The following of our rarer plants have been found in fresh places:—*Onithogalum umbellatum*, *Carex pseudocyperus*, *Genista tinctoria*, *Ophrys muscifera*, *O. apifera*, *Carlina vulgaris*, *Campanula glomerata*, *Melampyrum arvense*, *Polygonum bistorta*, *Nyctotia nidus-avis*, *Faris quadrifolia*, *Potamogeton lucens*, *Scirpus sylvaticus*, *Ranunculus parviflorus*, *Saxifraga tridactylites*, *Echium vulgare*."

Cooke's "Illustrations of British Fungi."—We called attention to the completion of this fine work last year (E. N., iv. p. 224). It was emphatically a labour of love with Dr. Cooke, and we are very sorry to hear that he has not only received no reward for ten years' persistent work, but he is a very considerable loser by the publication, owing to the small number of subscribers. Fifty sets, in parts, still remain, and it is suggested, if subscribers can be obtained, that they should be issued at the rate of two parts monthly, at the original subscription price of 5s. per part, thus ensuring its complete issue in three years, and enabling Dr. Cooke to recoup part of his actual pecuniary loss. The work consists of 1,200 plates (in eight volumes) drawn and coloured by Dr. Cooke, representing 1,400 species of the gill-bearing fungi, or Agaricini, the greater number never having been figured before. At the subscription price it is the cheapest work of the kind ever issued. To complete the Hymenomycetes there yet remain the species of *Boletus*, *Polyporus*, *Hydnum*, the *Thelephorei*, *Tremella*, and *Clavaria*, and Dr. Cooke is willing to issue these plates in four volumes, if a sufficient

number of subscribers can be obtained to shield him from severe loss. We sincerely hope that many of our readers will become subscribers to these works.

Essex Water Supply.—Dr. Thresh has issued in pamphlet form a very interesting and valuable "Report on the Water Supplies of the various villages and hamlets in the Chelmsford and Maldon Rural Sanitary Districts" (Chelmsford, 1891), which includes details of analyses of over four hundred samples of water. The pamphlet contains matter not only of value to the sanitarian, but also to geologists and physiographers. In view of the growing importance of a good water supply in Essex, the following passage is alarming: "Several deep wells, which formerly yielded an abundance of water, at the present time only furnish a limited supply, and in others which once overflowed the water does not now rise to the surface. Dr. Downes, writing to me in reference to these deep wells, says, 'I have told the Essex people that they are drawing upon capital in regard to their wells—drawing from the lower Tertiaries. I think so, because—1, the gathering surface at the outcrop is small, and to the north steeply graded; 2, the number of bored wells has greatly increased; 3, the level of the water is falling.'"

MORE EPPING FOREST.

IN the *ESSEX NATURALIST* for 1889 (vol. iii. pp. 57-60) we had the satisfaction of recording the inclusion of Oak Hill enclosure into the "green lands" of the map of Epping Forest, and now it is our pleasant task to chronicle a yet more important addition to this grand open space. On Saturday, June 6th, 1891, a strip of about 30 acres in extent, part of Higham Park, Walthamstow, was ceremoniously made free land, and many of those who have taken an active interest in the forest had the pleasure in joining in the hearty cheers which greeted H.R.H. the Ranger's announcement—"I now declare this newly acquired land and water to be part and parcel of Epping Forest, and to be dedicated to the use and enjoyment of the public for ever."

Seldom has an important public improvement been carried out with greater rapidity and success than this last addition to our great Essex woodland. It was only on May 17th, 1890, at a meeting of the Essex Field Club, held under the shade of the trees at Ambresbury Banks, that Mr. Andrew Johnston made the first public announcement of the proposals of Mr. E. N. Buxton and Sir T. Fowell Buxton with regard to this matter, and by the middle of December in the same year the matter had been practically settled. We may refer our readers to Mr. Johnston's speech on the occasion alluded

to, printed in the *ESSEX NATURALIST* (vol. iv. p. 127). A meeting was called at the "Wilfrid Lawson" on Thursday evening, June 5th, 1890, "to take the necessary steps to secure a portion of Higham Park, including the ornamental water, as an addition to the Forest.'



THE CHING BROOK IN HIGHAM PARK.

The chair was taken by Mr. A. Johnston, and he and Mr. E. N. Buxton explained the main principles and advantages of the scheme. As the open lands then existed, the wayfarer travelling from Ching-

ford Hatch to Walthamstow, and striving to keep within the bounds of the forest, had to traverse a narrow strip of land, known as the "Driftway" or "Sale." This way skirted Higham Park, and was partly margined by the the Ching Brook. Mr. Buxton's proposal was to extend this avenue to an average width of 150 yards, by acquiring the timbered wilderness of the western side of the park, and also the fine lake, so as to secure some water views, a kind of scenery sadly lacking in the forest. The whole quantity of land proposed to be acquired was estimated at $27\frac{1}{2}$ acres. An independent valuation of £6,000 had been made, for which sum Mr. Courtney Warner was willing to part with so much of his park. If £3,000 could be raised locally, Mr. Buxton was hopeful that an equal sum would be contributed by the Corporation of London from the Capital Fund under the Epping Forest Act, 1878. Towards the local contribution Mr. Buxton, Sir T. Fowell Buxton and a relative, generously offered £1,800. A resolution in favour of the scheme, proposed by Mr. W. Cole, and seconded by Mr. Batey, was unanimously carried. A Local Committee, with Mr. Buxton as chairman, and Mr. W. Cole as hon. secretary, was also formed, to make the proposal widely known, and to solicit subscriptions towards the funds required. At public meetings called by the Local Boards of Walthamstow and Woodford grants from the rates of £500 and £250 respectively were voted, and in response to the request of a deputation which waited upon the Common Council on the 25th of September, the Corporation resolved to grant the £3,000 required. The Drapers' Company contributed £210, Mr. Warner £100, the Commoners' Compensation Fund £100, and the balance was made up by smaller contributions.

The quantity of land proposed to be acquired under the original scheme was, as above stated, $27\frac{1}{2}$ acres. During the course of the negotiations carried on by the City Solicitor, this was increased by three acres, and the exact measurement of the land and water added to the forest is 30 a. 2 r. 39 p. The shady avenues, and the lake with its tributary stream, the Ching, are exceedingly picturesque, and the whole forms a most valuable addition to the open lands of the forest. The evidences of human handiwork proper to a park combine charmingly with the natural luxuriance of a piece of primitive woodland, the tract having been at one time forest land, or was at least land subject to the forestal rights of the king. This is evident from the following facts :—



THE LAKE IN HIGHAM PARK, LOOKING NORTH FROM THE BRIDGE OVER THE CHING.

Henry H. C. 1870

In the "Rolls of the Court of Attachments"¹ there are several entries of leave having been given from time to time to cut the wood in the "Sale." For instance, in the records of a Court held on November 19th, 1720, it was

"Ordered that Wm. Row, Esq^r., have leave to fell a Grove called the Sale in Walthamstow Walk at 3 severall falls, it appearing to be of full growth cont. 80 acres."

And on the 3rd July, 1786, is recorded the following protest against the attempted enclosure of this wood:—

"At this Court Sir James Tydney Long Bart. Lord Warden presented two letters the one wrote by Himself to Governor Hornby owner of the Wood called the Sale in the Forest of Waltham concerning His beginning to enclose the same & Govr. Hornby's ansr. to the same; which being read to the Court, The Court are of opinion that it is necessary for the preservation of the Forest that the Wood call'd the Sale cannot lawfully be enclosed."

And again on 30th July, 1787, "Bamber Gascoyne, John Conyer, and Eliab Harvey, Esq^rs. Verdurors," report:

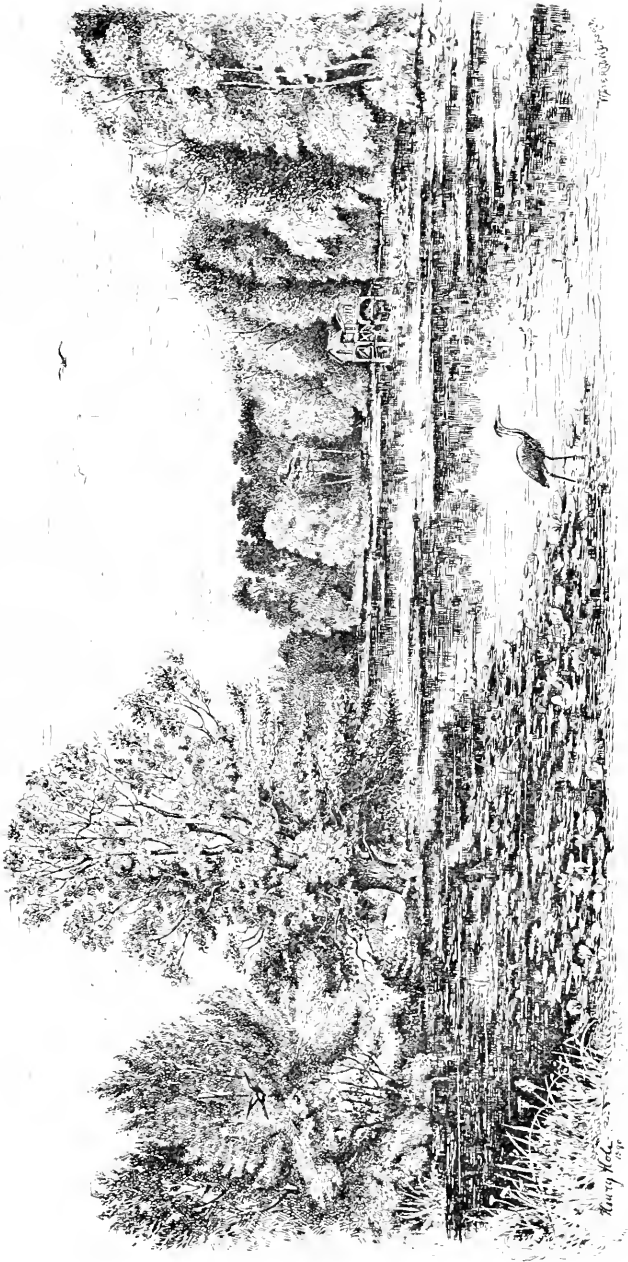
"We have viewed the Wood called the Sale in the Parish of Walthamstow and part of the said Forest of Waltham at the request of William Hornby Esq^r Proprietor of the said Wood called the Sale. And we do declare that if the said Wood is inclosed by Pale as now begun and intended to be carried on by the said William Hornby Esq^r that the same will be injurious to the rights of the Forest and the Ruin and Destruction of the Red and Fallow Deer of the s^d Forest² and thereby that part of the Forest called the Walthamstow Walk will be as disafforested and we do not think that the present Proprietor or those from whom he claims has or had any Right by Pale to inclose the same. And we do also present that there anciently were one or more Roads and Ridings through the said Wood called the Sale which have lately been and are still shut up and that the same ought to be opened."

Action seems to have been taken at this Court to abate the enclosure, for it is recorded:—"Note the Pailing taken down and the communication betⁿ the Wood called the Sale and the other part of the Forest opened." In spite of these presentments, "Wm. Hornby Esq^r" persevered in his attempts to enclose the Sale, and on 19th May, 1788, there is another record:—

"John Laver Underkeeper of Walthamstow Walk presents William Hornby

¹ "The Rolls of the Court of Attachment of the Royal Forest of Waltham in the County of Essex, from the 31st October, 1713, to the 6th December, 1843," printed by order of the Epping Forest Commissioners, 1783. The Court of Attachments, anciently the Woodmote, whatever may have been its original nature and jurisdiction, was held under the Charter of the Forest, which directed that the foresters and verderers should meet every forty days to see the attachments of the forest, both for "greenhue and hunting" by presentments of the foresters. There are no early records of this Court in the Forest of Waltham, although they appear to have been duly kept. There are a few of the time of Elizabeth in the British Museum. In the reigns of James I. and Elizabeth the Court was held at Chigwell, and in 1713 and afterwards its sittings were always "apud le King's Head in Chigwell."

² Licences to enclose lands on the forest were only granted, as a general rule, on the understanding that the ditch or hedge should be low enough to allow a doe with her fawn easily to surmount it, certainly not more than about four feet high.



HIGHAM PARK LAKE, EPPING FOREST, LOOKING SOUTH.

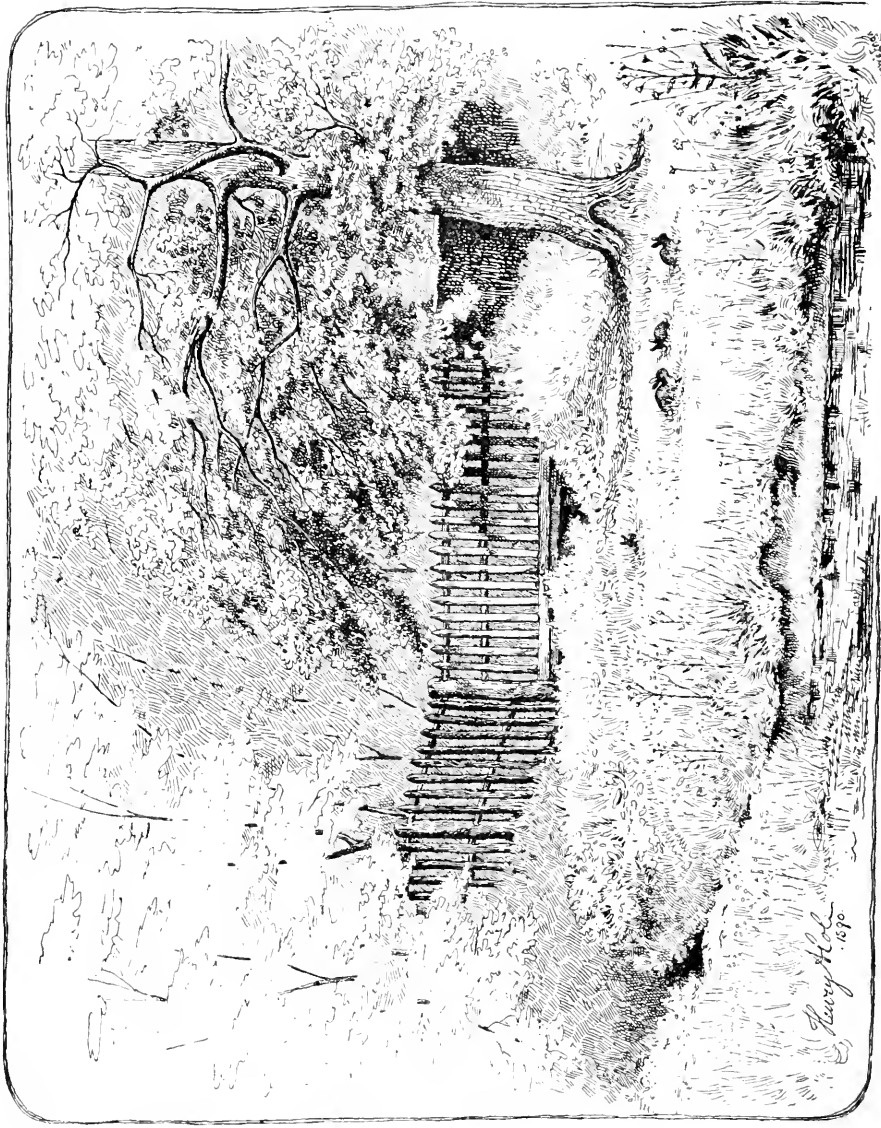
Esq. for inclosing and stubbing up part of the Sale adjoining to his Fields also for securing or making up the remainder of the fence round the cover called the Sale so as to prevent the Deer passing the said cover."

Notwithstanding the efforts of the verderers to enforce the law and prevent these encroachments on the open forest, money or Court influence appears to have prevailed, and at a Court held on July 24th, 1797, a licence was entered on the Rolls to permit John Harman, of Higham, in the parish of Walthamstow, to enclose the Sale, but not so as to prevent the deer leaping over the fences, and with no rights of building on the enclosed lands. The record is interesting, because it shows that the lake forming part of the recent purchase is in reality the Ching stream, artificially widened out, and also that the acquired land is, in a sense, a restoration, it having been formerly land under forestal rights. The record also determines the date of the formation of the "Driftway":

The Licence gives power to John Harman, as Lord of the Manor of Higham Hills or Higham Benstead, "to enclose and continue enclosed a piece of Ground at the North Corner of the said Wood called Little Sale Wood containing about sixty yards and no more one way and fifty yards and no more the other way lying adjoining to and at the Head of a piece of Water made by the said John Harman by widening an Old Brooke at or on the West side of his Lands called Hill Mead and Flatt Mead for the purpose of planting only . . . (provided that no Cottage or other Erection or Building was erected or built thereon or any part thereof). And to make put or place down a Ditch or other sunken Fence in the long slip of Ground situate on the West side of the said piece of Water such Ditch or sunken Fence to run parallel and coextensive with the said piece of Water on the West or outward side thereof leaving a passage on the outside of such fence One Hundred feet in width at the least for the Deer and all persons having right thereto to pass and repass through the said long slip of land. . . (Provided that such last mentioned Fence was not made or constructed so as to hinder his Majesty's Deer from passing and repassing to and from the said piece of Water and to the said lands adjoining thereto called the Hill Mead and Flat Mead on the East side thereof in such manner as they were before the granting the said Licence by Law entitled to do but no farther or otherwise or was in any other manner to the hindrance or prejudice of such Deer)." The Licence contained other clauses sanctioning further enclosures, but always providing that "his Majesty's Vert and Venison of the said Forest received no prejudice by the said enclosures." [To the Licence there were attached plans showing the extent of the enclosures; it would be very interesting to examine these, if now in existence].

The Rolls contain no further reference to the Sale, and we cannot therefore tell when the Lord of the Manor assumed full rights over the property, but it must have been some time between 1848 and the sittings of the Epping Forest Commission.

The dedication of the land and water by the Duke of Connaught (as Ranger of the forest), was made the occasion of a festival by the



Henry Holt
1870

THE CHINESE BRIDGE, BEARING THE NAME OF THE GREAT WALL OF CHINA.

THE LOCAL (ESSEX) MUSEUM—*Continued.*

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.

The property of the Club will be placed under the care of the following 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.

Copies of APPEAL and pamphlet of papers relating to the proposal may be had from the *Hon. Secretaries*, Mr. W. COLE, Buckhurst Hill, Essex, and Mr. E. DURRANT, 90, High Street, Chelmsford, who will be glad to give further information to enquirers.

SUBSCRIPTIONS either to the CAPITAL FUND, or promises of annual donations to the MAINTENANCE FUND, may be sent to Messrs. Sparrow, Tufnell & Co., Bankers, Chelmsford, or to the National Bank, Old Broad Street, London, or to the Treasurer of the Club, Mr. A. Lockyer, Mornington Lodge, Wanstead, Essex.

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BEING THE
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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
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Attention is called to MUSEUM APPEAL on pages 2 and 3 of Wrapper.

THE LOCAL (ESSEX) MUSEUM, LIBRARY, AND LABORATORY.

THE attention of Members of the Essex Field Club, and of all those interested in the practical study of Natural Science, and its applications in industries, and as a means of general education, is earnestly called to the Statement and APPEAL FOR FUNDS for the establishment of the Museum now being circulated by the Council.

The scheme has long been under consideration, and it has been fully explained at meetings of the Club and in the ESSEX NATURALIST. Its principal features are as follows:—

With the object of establishing at Chelmsford (chosen as being the County Town, and also as a central position in Essex) a Local and Educational Museum, the club has agreed to amalgamate with the Essex and Chelmsford Museum, under the title of “The Essex Field Club,” conditionally on the sum necessary for founding the new Museum being raised. The main objects in view are:—

- (a) The formation of authentic collections to illustrate the Geology, Mineralogy, Botany, Zoology, Ethnology, Pre-historic Archæology and Technology, &c., of ESSEX and the adjacent sea and rivers, together with an educational series of specimens and preparations to be employed for illustrative and teaching purposes. Specimens that are not of Essex origin will be admitted so far only as they serve to demonstrate the structure and relationship of the local types.
- (b) The formation of a Local and Scientific Library, to include (in addition to standard scientific works), topographical, antiquarian, and other books, manuscripts, maps, parliamentary and official papers, pictures, prints, &c., which in any way relate to the county of Essex.
- (c) The establishment of a Laboratory and Class-rooms, with fittings, apparatus, and instruments suitable for the preparation of specimens for the Museum, and for the practical study and teaching (either in the Museum or in selected local stations throughout the county) of the subjects named in paragraph (a), and for promoting their practical application in Agriculture, Forestry, Arboriculture, Gardening, Fisheries, Manufactures, Industries, and general education. The laboratory, class-rooms, instruments, &c., will be under the control of the Council, who may permit students, investigators, and others to use them, and may also lend instruments and preparations out of the Museum buildings for purposes in furtherance of the above objects.

[Continued on page 3 of Wrapper.

Epping Forest Committee of the Corporation of London on June 6th, as before mentioned. The ceremony took place in a marquee by the western side of the lake, and many of the company were afterwards entertained at luncheon at the Royal Forest Hotel. The speakers all testified to the value and beauty of the acquisition, and to its importance as connecting two parts of the forest before almost severed. The thanks of all true foresters are again due in the highest degree to the two verderers who have so often shown their real interest in the forest in a practical way. There are many other desirable additions which might be made to the forest, and we hope that the example of the Buxton family will be largely followed by those able to thus benefit present and future generations.

We print a few views of Higham Park, from original drawings, by Mr. H. A. Cole, which were prepared for publication in the newspapers during the negotiations, in order to aid the movement by demonstrating the beauty of the proposed acquisition. Other sketches by Mr. Cole will be found in the "Illustrated Sporting and Dramatic News" for July 21st, 1890.

A DAY ON THE CROUCH RIVER.

By EDWARD A. FITCH, F.L.S., F.E.S.

[Read February 25th, 1891.]

AFTER the meeting at Upminster last year, Mr. Crouch returned with me to Maldon. Early on the Monday morning (July 28th) we proceeded to Burnham, a dull threatening morning breaking out into a finer and warmer day than it promised.

Close by the railway station on the grass of both sides of the approach we found *Helix virgata* abundant, large and well marked varieties occurred and one prettily variegated. We so began a good day's work.

At Burnham we went on board Mr. John Roger's yacht "Fame," he and his son being with us, and we had a most pleasant day, the trawl and one dredge being kept constantly at work. These brought up some most interesting material and I have thought that a short account of our finds, as far as we were able to recognise them, might be interesting to our members.

To commence with the Crustacea. We found one *Nymphon*

gracile crawling over a large mass of "ross" (*Serpule*). This interesting and extraordinary looking little Sea-spider forms the subject of chapter xxvii. of Gosse's "Tenby." With his usual felicity of expression, Mr. Gosse refers to it as "Mr. Nobody," and comparing its tiny cephalothorax with its eight long, many-jointed, strongly-hooked, sprawling legs, it certainly seems to have no body. Another of these curious Pycnogonids occurred in a male specimen of *Pycnogonum littorale*. A much more compact looking creature than *Nymphon* and with its four eyes on a swelling on the first segment. According to Prof. E. Forbes, this is a true whale-louse. Do coming events cast their shadows, or their parasites, before them?

Several specimens of the roughly triangular-shaped *Pisa tetraodon* were brought up, all so covered with mud, in their short hairs, in which Algæ and Zoophytes were growing, that they had almost lost their individuality. Indeed, when pointed out to our two practical dredgemen, they declared they had never seen this crab before, although I have no reason to believe but that it is fairly common. They knew the Common, Spider and Flying-crab well. Specimens of all were obtained. *Carcinus mœnas* (the Common Shore Crab) was, of course, in great abundance: this pest appears to increase as the eels decrease. The Spider-crab (*Hyas araneus*) was not common, but very variable in size and general appearance. Possibly some were *H. coarctatus*, but I have no specimens now to examine. Two or three "Flying-crabs," as they are called here (more generally known as "Swimming-crabs," *Portunus depurator*) were captured, all in the trawl. Their presence in the bucket was frequently impressed upon us by a sharp nip on the fingers; these active and pretty but pugnacious little fellows are exceedingly fond of giving one a nip, and they do it effectually.

Many of the pretty little red-brown Pea-crabs (*Pinnotheres pisum*) were found, some hiding amongst the irregular Serpulidæ and others in the *Cliona*-bored shells of oysters and mussels, the former for preference. I only brought home one male and certainly the females were much the more common, these were all well loaded with the bright orange ova, very inconveniently so, I should think. So also were many of the exceedingly abundant *Carcinus mœnas*.

Hermit-crabs, locally "Farmers" (*Eupagurus bernhardus*) were as usual a common inhabitant of the Whelk (*Buccinum*) shells. I found one in a *Natica* shell, which may belong to a different species (*P. lœvis*?). When these creatures are frightened and they have

thoroughly withdrawn themselves with a snap into the shell, it is quite impossible to extract them by force, but a gentle tapping on the apex of the Whelk-shell with the cull-tack or a knife blade will soon cause them to tumble out. When put in a bucket with two or three empty shells, it is interesting to note how speedily they provide themselves with a new house. There are other, but less humane, methods of dislodging the *Pagurus* from its home.

A fine Lobster had been taken in the river the day before our visit, but such grand Crustaceans did not fall to our luck.

A large *Rhizostoma* brought up in the trawl was put into a bucket of clear water, and this was soon filled by dozens of the very active *Hypera latreillii*, shooting about in all directions near the top of the water. Their large, elongate, bright apple-green eyes were especially noticeable. These little Crustacea were parasitic within the pellucid gelatinous substance of the Medusa, especially between the peduncle and the umbrella-like disk. I also found its tick-like larva (figured in Gosse's "Naturalist's Rambles on the Devonshire Coast," pl. xxii. fig. 15). Those I brought home were much larger than his grain of-sand-sized specimens.

Many Shrimps and Sandhoppers, or "Skipjacks," were captured, but I am not sufficiently acquainted with them to attempt to give a list of the species. *Idotea emarginata* was in the greatest abundance, and we took several *Crangon vulgaris* (Common Shrimp) alive. Oysters, mussel-shells and stones were covered with the Acorn Barnacle (*Balanus porcatus*) locally known as "chitters."

Of the Actinaria or Sea-anemones we only found two species. The Beadlet (*Actinia mesembryanthemum*) was abundant, but all of the liver-brown variety. In one of the bottles you will see three Daisies (*Sagartia bellis*).

The day was not hot enough for us to see many of the common jelly-fish (*Aurelia aurita*), near the surface of the water, as was the case in the Blackwater on September 15th, 1888, (ESSEX NAT. ii. 247), when

"Thick as blanc-mange the jelly-fish clung to the sluggish keel."

Many, however, were noticed, and on one or two hauls the trawl was so filled with "blubber" that care had to be exercised to avoid breaking the net, and when the cord was untied the deck was covered with the jelly-like substance. A few of these common jelly-fish were pale purple in colour, far the larger majority being white, but none

were so brilliantly deep purple as I had seen them in the Blackwater in the spring. Several of the larger stinging *Cyanea capillata* were noticed, and the slippery crystal globes of *Cyditpe pomiformis* were not uncommon.

Six species of Echinodermata were found. The Common Sand-star (*Ophioglypha ciliata*) in great abundance, many hundreds in some hauls, the writhing and squirming of so many flexible arms presenting a curious spectacle. The Lesser Sand-star (*O. albida*) also occurred with it, but it was much scarcer. Within certain limits the disks of these two species varied much in colour. The Common Brittle-star *Ophiothrix pentaphyllum*, Penn. (*rosula*, Link), was by no means common, only two or three specimens being noticed. The Five-finger (*Uraster rubens*) was far too abundant in our host's eyes; in one haul of the dredge as many as seventy-five were brought in, all young and violet coloured; they turn orange and red later. One violet coloured fellow might have been *Uraster violacea*, if that species be really distinct from *U. rubens*; it was the only large violet one caught during the day. The "Five-finger" is a great oyster enemy, sucking out the animal and leaving only "a clock" behind. The voracious Sun-star (*Solaster papposa*), was not common, but all were very bright in colour; specimens with eleven, twelve and thirteen rays were brought home. The only Sea-urchin met with was the purple-tipped species (*Echinus miliaris*), and this occurred commonly—again too commonly—from the size of a sixpence to that of a five-shilling piece (Forbes says it attains $1\frac{3}{4}$ inch sometimes).

The "ross" already spoken of consists of the crowded tubes of a *Serpula*, I believe *Filograna implexa*, and all that were noticed as "live," *i.e.*, containing the living worms, was well crushed under foot. *Nephtys* and *Nereis* were common amongst the "rubbish" or "stuff," but the only other Annelid that calls for mention was a living specimen of *Pectinaria belgica*, dredged on the sandy bottom off Hollywell. The smooth, sandy conical tube was a large one, and the beautiful orange comb (branchial cilia) of the enclosed worm, which Gosse says "seems to be made of burnished gold," was soon shown busy at work when the worm was placed in a small bottle of seawater. Mr. Crouch was on the look-out for tubes of *Terebellide* or *Sabella*, as likely to contain minute shells, but none turned up.

Several Polyzoa were noticed, but they were not well known to us. Dead *Lepraliæ* were very common on the shells of oysters, mussels, whelks, the carapaces of the various crabs, and on *Laminaria*

and other seaweeds. Specific determination in this puzzling genus was not attempted. One of the hard *Escharæ* was noticed, and some fine pieces of "Lemon-weed" or "Sea-mat" (*Flustra foliacea* and the more delicate *F. papyracea*), were brought up. These animal colonies being flat and frond-like, are invariably taken for sea-weeds by the *οἱ πολλοί*, but the use of a lens soon dispels this idea and shows the numerous closely-clustered cells, each inhabited by its own Polypide. Gosse calculated that in *F. foliacea* there were 13,440 cells to the square inch. For figure, see his "Tenby," pl. x. Although here called "Lemon-weed," the scent is little like that of a lemon, but more resembles verbena or pine-apple. *Alcyonidium gelatinosum*, somewhat resembling sticks of barley-sugar, occurred, but in nothing like the abundance we found it in the Orwell (E. N. iv. 170). *Membranipora pilosa* was common, matting together several Sea-weeds (*Algæ*) and Sertularians.

The somewhat repulsive looking Ascidiæ or sea-squirts, whose local name need not be given, were in the greatest abundance. They bear considerable resemblance to oriental and ancient wine-skins, whence their scientific name. They were mostly the common *Ascidia virginea* and were of all sizes and forms consistent with the species, and were attached to everything in the shape of a stone or shell, often in bunches. *Molgula oculata* was found sparingly towards the mouth of the river opposite Hollywell, looking like little bullets of sand; they were quite indistinguishable until they were touched. The currant-squitter, *Cynthia (Styela) grossularia*, looking like a small pink or brick-red sea-anemone when closed, was particularly abundant on the shells of the oyster. It is locally termed "pock"; when squeezed these smell much like eucumber. The life-history of these Ascidiæ or Tunicata affords an excellent example of ancestral degeneration; they all have a free-swimming fish-like larva.

Now coming to the Mollusca. We found *Pholas candida*¹ alive, boring into chalk nodules that were dredged up. These had probably been used originally to face the sea-walls, some of the lumps had been completely riddled by this animal. The soft, wet chalk was easily split or cut through with the cull-tack and so the thin and extremely brittle shell could be easily obtained perfect: many living specimens were found. One or two dead and

¹ When at Burnham on 14th February last, Mr. Crouch got a fine living specimen of *Pholas crispata*. Shell $\frac{3}{4}$ inches long by $1\frac{1}{4}$ inches broad. The animal with siphons measured almost exactly six inches.

broken shells of *P. dactylus* occurred as well as those of *Solen marginatus*. *Thracia papyracea* was noticed, but the specimen is now lost. Many living specimens of the pretty little *Nucula nucleus* were found amongst the "stuff" dredged up. *Philine aperta* occurred rather commonly, but was unrecognised at first; it greatly resembled a small piece of cooked fat, or was like the figure of *Lamargus muricatus* in Gosse's "Manual of Marine Zoology" (vol. i., fig. 203). About half a dozen *Dentalium entalis* were brought up in two hauls of the trawl towards the mouth of the river, off the sand. *Chitons* were numerous and Mr. Crouch took many specimens to examine at leisure.

Several living *Trochus cinerarius* were brought up, but only one *Nassa reticulata*; and the small *Pleurotoma rufa* occurred sparingly. A few good specimens of *Natica monilifera* were also collected. We had one haul at the dredge over the "trail" and got as many mussels (*Mytilus edulis*), mostly small, as could be hauled aboard, but nothing else. All day we did not get enough whelks (*Buccinum*) for a "cook," nor did we see a single "Winkle" (*Littorina*). The Whelk-tingles (*Purpura lapillus*) or Dog-whelks were in evidence, but not in the same pretty variety as is the case on a rocky coast, such as at Hastings, Deal, or Devonshire. These carnivorous molluscs, being a great and deadly enemy of the oyster, by boring through the shell into the oyster's heart, were soon crushed by the practical men, as were one or two nests of their yellow horn or urn-like eggs attached to stones. Several sponge-like masses of the egg-capsules of *Buccinum* were brought up. For an interesting paper on these curious objects, see Dr. J. E. Gray. "Mag. Nat. Hist." (2), i., 247. *Ostrea edulis* of course occurred, also two specimens of *Tapes pullastra*, and one dead shell of *Tellina balthica*.

Of the interesting Nudibranchs or "Sea-slugs," four species were recognised. *Doris pilosa* was common, often as many as half-a-dozen were brought up at one haul of the dredge, with two or three pieces of gelatinous spawn resembling a loosely-rolled frill of sandy ribbon. We found three specimens of the curious *Doto coronata*, which we at once christened the "prickly-pear slug," as that fruit was almost exactly represented in miniature by the dorsal papillæ of the slug both in colour as well as form. These papillæ are not only branchiæ or "gill-plumes" as in the fine and beautiful *Dendronotus* and others, but in *Doto* they contain an important part of the digestive system: nearly the whole of the liver is carried on the

slug's back. One brilliant specimen of the bright purple *Eolis coronata*, and another dark reddish-brown species of *Eolis* (either *Eolis concinna*, Alder and Hancock, pl. 24, or a new species) occurred, but these slugs are difficult to preserve, even to make subsequent identification possible. *Doris* can be kept well, *Doto* fairly well, though it loses its bright colours, but attempts to preserve *Eolis* are quite failures. These slugs are handsome and conspicuous objects when separated from their surroundings, but amongst the various living Zoophytes and Algæ their protective resemblance is remarkable and they are by no means easily recognised amongst the varied contents of the dredge or trawl.

Corallines or Zoophytes were, of course, abundant, but we were neither of us specialists enough to recognise many. *Hydractinia echinata* was common on the shells of *Purpura lapillus*, living and beautiful; much interest was shown in two specimens we bottled. The presence of a fine "root" of *Tubularia indivisa* in a jar, with its rich bouquet of delicate, but brilliant, white-plumed scarlet flowers, was also a great surprise to our crew. This *Tubularia* occurred many times in the deeper water near the mouth of the river, as did also a brilliant orange species, almost equally beautiful, but whose name we did not know. Sertularians were abundant, but all we recognised with certainty were, *Sertularia pumila*, *S. abietina*, *S. filicula*, *S. argentea*, and *Hydrallmannia falcata* on *S. pumila*. Among the Escharidæ *Cellularia avicularia* and *Eschara foliacea* appeared to be common.

Of the sponges, several fine pieces of *Chalina oculata* were noticed, and both *Grantia ciliata* and *G. compressa* occurred, attached mostly to the larger Sertularians. The "Crumb-of-bread Sponge" (*Halichondria panicea*) was not uncommon. Oyster shells, bored by *Clione celata*, were seen in thousands.

While we were examining the "rubbish," the crew and the Messrs. Rogers were busy with the oyster spat, of which several were found, varying from the size of a pin's head to that of a shirt-button. Often three or four were found on a shell, thus giving promise of a good fall of spat; a promise which has been fulfilled, for probably there was a larger spat in our Essex rivers last year than in any since 1881, but it came late. I heard of as many as forty being counted on a single shell from the Blackwater this year, varying from the size of a pin's point to a split pea; sixteen and seventeen on a shell were not unusual in 1881. This is rather a shock to Mr. Frank Buck-

land's famous "heat and tranquillity" formula. Let us hope this valuable spat will not be killed in the winter, as was the case in 1880.²

Of fish we found Flounder (one), Plaice (common), Dab (common), Sole (several), Dogfish (one, certainly a young *Galeus vulgaris*), Bullhead (*Agonus cataphractus*, several), Fatherlasher (*Cottus scorpius* and *C. bubalis*, common as usual), and several young Thornbacks (*Raia clavata*). The young Tope had been feeding, apparently freely, on crabs and shrimps. It was differentiated from the picked Dogfish by the fishermen through its rough coat. They showed us how to scrub the decks with the skin, and it certainly did it very well.

On November 8th, I had another day's trawling at Burnham, but which, from a fisherman's point of view—my object then—was not a very satisfactory one. We took one Eel-pout (*Zoarces viviparus*), one of our few viviparous fish. After it had been dead some time, I took from it fifty-five young, all very lively. Four of that little purplish wriggler, the Diminutive Lump-sucker (*Liparis montagui*) and one Sea-Snail (*Liparis vulgaris*), besides the usual, but a poor, catch of "Bull-routs" (local name for the Fatherlashers, *Cottus*), Dabs, Flounders, and Plaice. One Bull-rout contained a Whiting as long as itself, and several contained two crabs, besides sundry shrimps and prawns. I believe they are fully as voracious as they look, and that is saying a good deal.

In my previous notes I ought to have said that during the day (July 28th) we landed on Fowlness for the purpose of inspecting the Shell-bank already referred to in the *ESSEX NATURALIST* (ii. 268, and iii. 39), and found that certainly the bulk of the schram consisted of Cockle-shells, but some few other species were present; all, of course, dead and broken. This Shell-bank, probably an old Sea-beach, may be easily traced from Sales Point, Bradwell, at the mouth of the Blackwater, to Shelford Creek, between Fowlness and New England islands. Besides these places it gives the name to many farms, as Old and New Mountsales (= the shelly mound), the How (= the hole), and to many fields.

Here, on Fowlness, the sea lavender (*Statice*) was in the greatest abundance and just in full bloom—a lovely sight.

I do not think anything further remains so be recorded of a very pleasant and by no means unprofitable day's work.

² Unfortunately this has happened; the destruction of oyster-brood during the late severe weather has been enormous.

THE LEPIDOPTERA OF LEYTON AND NEIGHBOURHOOD; A CONTRIBUTION TO THE COUNTY FAUNA.

By Prof. R. MELDOLA, F.R.S., &c., *Vice-President Entomological Society.*

THE publication of the first instalment of Mr. Fitch's paper (*ante*, pp. 74-108) has induced me to place upon record my own experience as a collector in the above district. Any interest which these records may possess is perhaps more of a personal than of a scientific character, since they relate, for the most part, to a period of about twenty years ago, when, as a novice, I first took up the fascinating pursuit of butterfly and moth collecting with all the enthusiasm of youth. The district referred to in these notes was comprised by the garden attached to No. 8, Park Place, Leyton, with the neighbouring parts of Epping Forest, more especially the glades about "Rushey Plain" and "Gilbert's Slade," although excursions were also frequently made to the more remote parts of the Forest. Commencing in the autumn of the hot and dry season of 1868, the various methods of collecting by netting on the wing, sugaring, searching flowers at night, attracting by light, breeding from larvæ, &c., were carried on without intermission on every favourable day and evening, till we left the locality in 1870. After this, collecting was still carried on in the district, but not so continuously. Fairly complete notes of captures from 1869 to 1874 have been kept, and most of the specimens are still in my collection in as good a state of preservation as when taken off the setting-boards twenty years ago. From these notes and specimens the present list has been drawn up. As the locality at Leyton where these captures were made is now being rapidly covered with buildings, it has appeared to me of sufficient interest to publish the present list, both as a contribution to the County fauna and as a record of the Lepidopterous population of a suburb which was at the time rural, but which is now being gradually absorbed into the metropolis. Fortunately from the naturalists' point of view, however, Leyton still is, and always must be, cut off from London to the north by the Lea valley and the low-lying marsh and meadow lands bordering that river.

In the list now given, it must be understood that, unless specially

stated, the record refers to the garden at Leyton. All the species entered have been taken by myself unless otherwise stated. To make the list as complete as possible, I have included many species which I have never taken in the district myself, but which I have seen others take, or which are known to me on good authority to be inhabitants of the locality. Any omissions will, I hope, be supplied by others who have worked in the same neighbourhood; one of my reasons in publishing the list as it stands being the hope that it will serve as a basis for other collectors to work upon and to enlarge, especially with respect to the smaller moths (Tortrices and Tineina), which, at the period referred to, I did not know enough about to attempt to name.

RHOPALOCERA.

All the commoner species were taken in the garden and neighbourhood, and need only be briefly referred to here:—

Pieridæ. *Gonepteryx rhamni* was fairly common in the autumn and spring; but never so abundant as I have seen it in the southern counties (Kent, Sussex, and Surrey). Of *Colias edusa*, I saw one specimen flying over Leyton Green on October 9th, 1869. *Pieris brassicæ*, *rapæ* and *napi* were always common. *Euchlōe cardamines* was occasionally taken in the garden, but more commonly in the lanes between Walthamstow and Chingford.

Nymphalidæ. *Vanessa cardui* was rare as a garden insect. I did not see more than two or three at Leyton, the only Essex specimens taken between 1868 and 1874 having been captured in the plantations on the Forest near the Wanstead Orphan Asylum. *V. atalanta* was quite common in the garden in 1868 and 1869. I often used to see this butterfly by day on the trunks of trees that had been sugared the preceding night. I remember also being struck by the ease with which it was captured in small glass forcing frames, supported on bricks over plates of beer and sugar, placed about the garden to attract the wasps, which at that time did much damage to the wall-fruit. It was not unusual to find a dozen or more of these handsome butterflies in one small glass frame mixed up with the swarms of wasps, flies, and other insects attracted by the bait. The larva of this species and *V. urticæ* used to occur also on the nettles growing in a narrow lane (now built upon) running along one side of the garden and leading to the marshes. *V. io* was fairly common in the garden. *V. polychloros* was never seen in the garden.

I have taken it in the Forest near Wanstead, and my mother has taken it in the same locality. *V. urticae* was common in the spring and autumn.

With reference to the habits of *Vanessas*, I recollect an observation which caused me the greatest interest at the time. In the small plantations near the Orphan Asylum above mentioned, there were (and still are) many old birch trees with rugged trunks. From wounds in the bark or some other cause, the sap had exuded from several of the trees and had trickled down the trunk in a long dark streak, extending from near the top of the trunk to the roots. This exudation had attracted numbers of *V. io* and *V. atalanta*, and one or two *V. polychloros* were also seen, the butterflies flying round and settling on the dark streak of moist bark. As the insects sat with wings alternately opened and closed, after the manner of their family, they seemed to me, even at that time, to reveal the meaning of the sombre mottling of the under surface of the wings which harmonised so well with the mottled bark, that when they sat motionless with closed wings they were almost invisible, especially when viewed "end on," *i.e.*, in the plane of the closed wings.

The only specimen of *Argynnis paphia* taken at Leyton is the one referred to by Mr. Fitch. It was a somewhat tattered male captured in August, 1868, on the flowers of a patch of thyme growing in the garden. I have records of having seen this species in Epping Forest (near High Beach), on July 31st, 1870, and July 19th, 1872; and my mother has also seen it in the Forest, on at least one occasion near Wanstead. Of the other Fritillaries, *A. selene* has been taken by me some what rarely in the Forest between Monk's Wood and Epping, and *A. euphrosyne* more commonly in the same part of the Forest. I have seen one or both these species in the same locality within recent years, and they appear to be getting commoner.

Satyridæ. *Pararge egeria* was never seen at Leyton, but commonly in the Forest. *P. megera* was occasionally taken in the garden, but more commonly in the Forest. *Epinephele janira* was common in the garden and abundant among the grass of the marshes. *E. tithonus* was only an occasional visitor to the garden, although common enough in the Forest. *E. hyperanthus* never appeared in the garden, but was common in the Forest. *Canyonympha pamphilus* was common everywhere.

Lycænidæ. *Thecla betule* was well known to occur in the neighbourhood of High Beach, where its larva was beaten from the

blackthorn. I have often taken the larva in this way ; but I do not know whether it is still to be found there, as for many years systematic persecution of this species has been carried on by collectors and dealers. Although the larva was fairly common at the period to which these records refer, I only saw the butterfly itself on the wing on one occasion : *viz.*, on September 23rd, 1870, when I for some time watched a female flying over the blackthorn and depositing eggs. The butterfly probably escapes notice owing to its being mistaken for a common Satyrid, which it much resembles on the wing. *Thecla quercus* is the only other Hairstreak that I have taken in the Forest. It was pretty common about the oaks between Monk's Wood and Epping Thicks. *Polyommatus phlæas* was common as a garden and forest insect. *Lycæna argiulus* was also common both in the garden and Forest. The earliest record of the appearance of this butterfly in my notes is April 24th, 1869. *L. icarus* was common in the garden, on the marshes, and in the Forest. *L. ægon* was taken only at one locality : *viz.*, in the reedy swamps near the King's Oak at High Beach. *L. astrarche* was taken occasionally in the garden ; more commonly in the Forest.

Hesperidæ. None of these butterflies were taken at Leyton ; and the only species I have taken in the Forest are *Syrichthus matvæ*, which I saw in considerable numbers in 1889 between Monk's Wood and Epping Thicks, and, in the same part of the Forest, *Hesperia thaumas* was occasionally taken. I have a distinct recollection also of having seen *Nisoniades tages* and *Hesperia sylvanus* in the Forest within the last few years, but these are not recorded in the notes from 1869 to 1874.

One noteworthy fact respecting the butterflies captured in 1869, is the exceptionally small size of some of the specimens. I have now in my collection dwarfed *P. rapæ* and *napi*, *E. cardamines* (taken in lane at Chingford), *V. atlanta* and *V. io* (both taken in the garden). Whether this character was prevalent generally, might perhaps be ascertained by referring to the entomological records of that season.

HETEROCCERA.¹

Zygæna filipendulæ. This species was taken in the meadows about Chingford rather commonly. I believe it still occurs

¹ The sequence and nomenclature of the species of Heterocera adopted by Prof. Meldola is that of Stanton's "Manual of British Butterflies and Moths" (1857). As this book is so well known to entomologists, it is unnecessary to re-arrange the species in accordance with the more modern lists. —ED.

there, and also in other meadows in the Abridge district. I often searched for it among the grass of the marshes about Leyton, but without success.

Smerinthus ocellatus. Several larvæ of this species were taken on *Salix* by Mr. E. B. Poulton and myself, near the Wake Arms in 1887. I have no record of the species from Leyton.

S. populi. Fairly common; taken at light, on the wing, and occasionally at rest on fences.

S. tiliæ. One specimen at rest on fence; "Chestnut Walk."

Sphinx convolvuli. Two specimens seen hovering over a bed of geraniums in September, 1868; one was captured, the other escaped.

Sphinx ligustri. Fairly common on the wing in 1868 and 1869. All my captures were made at the flowers of the honeysuckle growing round the trunk of an apple-tree. I never saw the moth visit any other flowers in the garden.

Chærocampa elpenor. Fairly common in 1868 and 1869; taken on the wing at honeysuckle with the last species.

C. porcellus. One at honeysuckle, June 29th, 1869.

Macroglossa stellatarum. Frequently seen in district; once captured over a scarlet geranium in the garden.

M. fuciformis. Never seen in Leyton garden, but taken somewhat freely in certain seasons at High Beach, over rhododendron, by Mr. H. A. Cole.

M. bombylifformis. Taken at High Beach by Mr. H. A. Cole with the preceding species, but much rarer.

Sesia tipuliformis. Common in the garden on the leaves of currant bushes in early morning, and during bright sunshine on the flowers of syringa.

S. myopiformis. Fairly common on trunk of an apple-tree in early morning, and on flowers of syringa by day.

Hepialus hectus. Common in Forest; never seen in garden.

H. lupulinus. Not common in garden, commoner in Forest; on the wing at dusk, and on fences by day.

H. sylvinus. This species is known to occur along the lanes in the Chingford district. The only record I have is from the neighbourhood of Higham Park, August 9th, 1874.

H. humuli. Fairly common on wing at dusk, many more females than males being captured.

Zeuzera æsculi. Only once taken at Leyton on trunk of apple (or pear) tree in neighbouring garden.²

Cossus ligniperda. One specimen taken on fence in Lea Bridge Road. Larva occasionally found.

Dicranura vinula. Taken only in the larval form on willows about marshes.

Notodonta camelina. Once on wing in garden ; occasionally in the Forest.

Stauropus fagi. I have never taken this species, but it is well known to occur in the northern part of the Forest.

Diloba cœruleocephala. Fairly common in larval form in Forest about High Beach ; not recorded from Leyton.

Pygæra bucephala. Abundant in larval form ; not so common as imago.

Liparis auriflua. Common in garden as larva and imago.

L. salicis. Common on the wing, or at rest on tree trunks and fences. Has become much rarer in the district of late years.

L. monacha. At rest on tree trunks in northern portions of Forest ; not uncommon in some seasons.

Demas coryli. In northern part of Forest ; scarce (larval form).

Orgyia antiqua. Common in garden, but not so abundant as in the London Squares.

Calligenia miniata. Taken on the wing at High Beach ; not common.

Lithosia helvola. One specimen beaten out at High Beach.

L. griseola. Occasionally on the wing in garden, and in the Forest.

L. complanula. On wing in the garden, rare ; more commonly in Forest.

Nola cucullatella. Fairly common in garden ; common in Forest, both as larva and imago.

Arctia caja. Common in larval form, less common as imago.

A. villica. One specimen taken at rest by day on leaf of lilac.

Spilosoma menthastri. Abundant as larva and imago.

S. lubricipeda. Common as larva and imago.

² I find among my notes, that in 1871 this moth was remarkably abundant in the London Squares. In July of that year, scores were to be seen on the trunks of trees in Euston and other Squares, and numbers of detached wings were lying about on the ground at the foot of the trees. Whether these wings indicated that the moths had been eaten by the birds, as appeared the most probable explanation, I was never enabled to ascertain by direct observation. The empty pupa cases from which the moths had emerged were to be seen projecting from the bark in large numbers. See "Land and Water," August 12th, 1871.

S. mendica. Taken occasionally on the wing (female); not taken in Forest.

Euchelia jacobææ. Never seen at Leyton; common in larval form on ragwort about High Beach, much less common as imago.

Bombyx quercus. Never taken in garden; larva fairly common on grassy banks about Chingford and Walthamstow.

B. neustria. Abundant in garden as larva and imago.

Odonestis potatoria. Same remarks apply as under *Bombyx quercus*.

Saturnia carpini. I have never seen this species in the Forest, but its larva is sometimes taken about the heathy parts.

Cilix spinula. Occasionally on wing in garden; more commonly in Forest.

Platypteryx falcataria. Beaten from birch in Forest about Theydon Bois; never taken at Leyton.

P. hamula. Once taken in garden; occurs (somewhat rarely) in Forest.

P. unguicula. Not uncommon among beech at Monk's Wood.

Fumea radiella. Once taken flying in some numbers about a roadside bank near the "Robin Hood."

NOCTUÆ.

Thyatira derasa. At sugar in garden occasionally; commoner in Forest.

T. batis. Not uncommon at sugar in various parts of Forest; not taken in garden at Leyton.

Cymatophora duplaris. Occasionally at sugar in Forest ("Rushey Plain").

Bryophila perla. Taken in profusion on wall by Lea Bridge Station, and also on a wall at Loughton. I have not seen the moth in the Lea Bridge locality of late years.

Acronycta tridens and **psi.** Both species occurred at Leyton; but were not recorded separately, as I was then unable to distinguish them.

A. aceris. Larva occasionally taken on fences throughout district.

A. megacephala. Fairly common as larva and imago.

A. rumicis. A specimen bred from larva feeding on verbena in garden; occasionally at sugar in Forest.

Leucania conigera. At sugar in garden, scarce.

L. lithargyria. Occasionally at sugar in garden ; common in the Forest.

L. comma. Somewhat rare at sugar ; and on the wing.

L. impura. Common at sugar and on the wing, both in garden and Forest.

L. pallens. Very common at sugar and on wing, in garden and Forest.

Nonagria despecta. In Forest, about swampy parts of "Rushey Plain" ; not at Leyton.

N. fulva. Same remarks as under preceding species.

Hydræcia nictitans. Fairly common at sugar and on wing, in garden and Forest.

H. micacea. Occasionally at sugar ; more frequently on flowers at night.

Xylophasia lithoxylea. Common at sugar, and on fences by day.

X. polyodon. Abundant at sugar, at lime blossom, and on the wing.

Dipterygia pinastri.³ Occasionally at sugar in the garden ; fairly common in Forest.

Heliophobus popularis. Occasionally at light.

Luperina tes acea. Common at rest on fences by day, on the wing, and at light.

Mamestra anceps. Once at sugar in Forest ("Rushey Plain"), June 18th, 1870.

M. brassicæ. Abundant at sugar, on fences, and on the wing.

M. persicariæ. Not common at sugar ; larva common on garden dahlia, &c.

Apamea ophiogramma. Once on wing in garden at Wanstead.

A. oculea. Abundant on the wing, at sugar, light, and lime blossom.

Miana strigilis. Common at sugar and on fences, in garden and Forest.

M. fasciuncula. At sugar in garden and Forest ; not common.

M. furuncula. Very common at sugar, and on wing in garden and Forest.

³ I have records of this and many other species having been taken on the leaves of currant bushes and nettles covered with "honey dew" (Aphis secretion). See "Entomologist," vol. 15, p. 393.

Grammesia trilinea. Not uncommon at sugar in Forest ; not taken at Leyton.

Caradrina morpheus. Fairly common in garden and Forest.

C. alsines and **blanda.** Both species occurred somewhat commonly, but were not recorded separately.

C. cubicularis. Common in garden and house.

Rusina tenebrosa. Not common at sugar in garden ; common in Forest.

Agrotis suffusa. Occasionally at sugar in garden and Forest.

A. saucia. Five taken at sugar in garden in September and October, 1869.⁴

A. segetum. Very common at sugar and on wing ; absolutely swarmed in 1869.

A. exclamationis. Common at sugar, at light, and lime blossom.

A. nigricans. Occasionally at sugar in garden ; commoner in Forest.

A. tritici and **aquilina.** Both species occurred, but not commonly. They were not recorded separately as I could not then distinguish them.

A. porphyrea. A fresh specimen taken flying by day over heathy part of Forest near Loughton Camp, July 19th, 1888.

Triphæna ianthina. Occasionally at sugar in garden ; commoner in Forest.

T. fimbria. Two specimens at sugar in garden in 1869 and 1870.

T. orbona. Common at sugar and on the wing.

T. pronuba. Abundant throughout district.

Noctua glareosa. Once at sugar in Forest ("Gilbert's Slade"), September 8th, 1869.

N. augur. Occasionally at sugar in garden ; commoner in Forest.

N. plecta. Fairly common at sugar and on wing, in garden and Forest.

N. c-nigrum. Common at sugar.

N. triangulum. Scarce at sugar in Forest ("Rushey Plain") in July, 1870.

⁴ This species appears to be somewhat capricious in its appearance. 1869 must have been a good season for it, as it swarmed at sugar in a copse near Brighton on September 21st of that year, when, among other things, I captured a specimen of *Leucania vitellina*.

N. festiva. Scarce at sugar in garden ; abundant in Forest.

N. rubi. Occasionally at sugar and on the wing, in garden and Forest.

N. umbrosa. Several at sugar in garden in 1869 and 1870.

N. baja. Very rarely at sugar in garden ; commoner in Forest.

N. xanthographa. Extremely abundant at sugar and on wing.

Tæniocampa gothica. At sallow in woods near Chingford ; fairly common.

T. rubricosa. Same locality as preceding ; scarce.

T. instabilis. Common at sallow throughout district.

T. stabilis. Very common at sallow in woods near Chingford.

T. gracilis. Same locality as preceding ; scarce.

T. cruda. Very common in same locality as preceding.

Orthosia upsilon. Scarce on the wing in garden.

O. lota. Fairly common at sugar in garden.

O. macilenta. Scarce at sugar in garden.

Anchocelis rufina. Scarce at sugar in garden.

A. pistacina. Common at sugar in garden. This species absolutely swarmed in 1869, every patch of sugar attracting them by scores. The moths were sometimes seen still at the sugar by broad daylight in the morning. I have never seen the species in such profusion since.

A. lunosa. Common at sugar with the preceding, but not so abundant.

A. litura. At sugar in garden ; scarce.

Cerastis vaccinii. Fairly common at sugar in the garden in the autumn, and at sallow in the spring (woods near Chingford).

C. spadicea. Not quite so common as preceding ; taken under same conditions.

Scopelosoma satellitia. Occasionally at sugar in garden, and at sallow in the spring. Commoner in the Forest, where the larva can be beaten out in large numbers.

Xanthia citrigo. Occasionally at sugar in garden. A specimen was taken by my mother on a fence at Buckhurst Hill, in 1890.

X. ferruginea. Fairly common at sugar in garden and Forest.

Dicycla oo. Not uncommon in some seasons at sugar in "Rushey Plain"; never seen in garden.

Cosmia trapezina. Very common at sugar in garden and Forest.

C. diffinis. Not uncommon at sugar in garden and Forest.

C. affinis. At sugar in garden and Forest; scarcer than preceding.

Dianthæcia capsincola. Not uncommon over honeysuckle in garden in 1868 and 1869. It used to fly about the flowers with *Sphinx ligustri*, *Cherocampa elpenor*, and *Cucullia umbratica*.

Hecatera serena. Occasionally at sugar in Forest; once or twice on fences near Woodford.

Polia flavicincta. Occasionally at sugar in garden.

Miselia oxyacanthæ. Fairly common at sugar in garden, and in larval form in Forest.

Phlogophora meticulosa. Common at sugar and on wing, in garden and Forest.

Euplexia lucipara. Occasionally at sugar in garden; common in Forest.

Aplecta occulta Two specimens at sugar in "Gilbert's Slade." August 26th, 1869. ("Entomologist," vol. iv., p. 325.)

A. nebulosa. Scarce at sugar in garden; fairly common in Forest.

A. tincta. One specimen on fence near Woodford, June 25th, 1871.

Hadena protea. At sugar in Forest; somewhat rare.

H. dentina. Occasionally at sugar in Forest; more frequently on fences by day.

H. chenopodii. Common at sugar in garden and Forest. I once saw this moth actively on the wing in bright sunshine, flying over flowers of *Epilobium*.

H. oleracea. Common at sugar in garden and Forest.

H. pisi. Larva not uncommon on broom in Forest.

H. genistæ. Occasionally at rest on fences in Woodford district.

Xylocampa lithoriza. Fairly common on fences and tree trunks throughout district.

Cucullia chamomillæ. One specimen taken at rest on the extreme end of a pointed wooden paling in the Lea Bridge Road, April 22nd, 1869. (See Ann. and Mag. Nat. Hist., Feb. 1878, p. 159.)

C. umbratica. Common over honeysuckle in garden.

Heliodes arbuti. Fairly common among grass of wayside strips in lanes between Walthamstow and Chingford. This record refers to 1869 and 1870; I have not seen it there of late years.

Habrostola urticæ. Occasionally on wing in garden; not common.

H. triplasia. Not uncommon on wing in garden.

Plusia chrysitis. Occasionally on wing in garden.

P. festucæ. One specimen over flowers of garden "sweet herbs," in 1868.

P. gamma. Abundant on wing in garden and Forest.

Gonoptera libatrix. Occasionally at sugar in garden and Forest.

Amphipyra pyramidea. Common at sugar in forest; occasionally in garden.

A. tragopogonis. Common at sugar in garden and concealed in house.

Mania typica. Fairly common on wing and at sugar in garden.

M. maura. Common at sugar in garden and concealed in house.

Catocala nupta. Common at sugar in garden, and on fences and walls by day.

GEOMETRÆ.

Urapteryx sambucaria. Common in garden and Forest. I have a record of this species having been double-brooded in 1868, the second brood appearing in September.

Epione apiciaria. I took this species in the Forest district in the neighbourhood of Higham Park in 1874 (August 9th) with the Messrs. Cole. My mother took it in 1890 in a garden at Buckhurst Hill.

Rumia cratægata. Abundant in garden and Forest.

Venilia maculata. Fairly common in Forest; never taken in garden.

Angerona prunaria. Common in Forest; never taken in garden.

Metrocampa margaritata. Common in Forest; occasionally taken in garden.

Eurymene dolabraria. Occasionally at rest on tree trunks in Forest. Always considered a rarity.

Pericallia syringaria. Occasionally on the wing in Forest.

Selenia illunaria. Fairly common in Forest, in both spring and summer forms. Rare in garden.

S. lunaria. Bred from larvæ beaten out near High Beach.

Crocallis elinguaris. Common in Forest and garden.

Ennomos tiliaria. Once at rest on fence in "Chestnut Walk."

E. fuscantaria. Once at light in house.

E. angularia. Fairly common on fences by day and at light.

Himera pennaria. The larva of this species was fairly common in Forest.

Phigalia pilosaria. At rest on tree trunks and in the larval form; not uncommon in Forest.

Biston hirtaria. Although a London insect, this moth was very seldom taken in the garden.

Amphidasis prodromaria. Occasionally on tree trunks and fences. Never taken in garden.

A. betularia. Occasionally on fence in "Chestnut Walk."

Hemerophila abruptaria. Common on fences throughout district.

Boarmia repandata. Fairly common in garden and Forest.

B. rhomboidaria. Common in garden and Forest.

Tephrosia crepuscularia. Occasionally on tree trunks in Forest; never taken in garden.

Pseudoterpnæ cytisaria. Fairly common in Forest in larval and imaginal forms.

Iodis lactearia. Very common in Forest; not uncommon in garden.

Phorodesma bajularia. Not uncommon in Forest; only once taken in garden.

Hemithea thymiaria. Very common in Forest; not uncommon in garden.

Ephyra porata.⁵ Not uncommon in Forest; not taken in garden.

⁵ The species of this genus are seasonally dimorphic. My general experience has been that the spring brood is always somewhat more abundant than the autumnal brood. [See notes on the seasonal dimorphism of *Ephyra*, B. G. Cole, in Proc. Entom. Soc., Lond., 1887; pp. vi. and vii. -Ed.]

E. punctaria. Not uncommon in Forest; not taken in garden.

E. trilinearia. Fairly common among beech woods in Forest.

E. omicronaria. Not uncommon in Forest; not taken in garden.

E. pendularia. Occasionally in Forest; once taken in garden.

Asthena candidata. Abundant in Forest; not so common in garden.

A. sylvata. Rare in Forest.

Acidalia scutulata. Common in Forest; less common in garden.

A. bisetata. Very common in Forest and garden.

A. trigeminata. Occasionally in Forest.

A. osseata. Very common in Forest and garden.

A. incanaria. Abundant in garden and Forest.

A. subsericeata. Occasionally in Forest; flies with *A. candidata*, which it closely resembles on the wing. (See *Ent. Mo. Mag.*, vol. ix., p. 163.)

A. remutata. Very common in Forest; rare in garden.

A. imitaria. Fairly common in Forest; occasionally in garden.

A. aversata. Abundant in garden and Forest, and on fences.

A. inornata. Rare in Forest; never taken in garden.

A. emarginata. Not uncommon in Forest.

Timandra amataria. Occasionally along lanes towards Chingford.

Cabera pusaria. Very common in Forest; occasionally in garden.

C. exanthemaria. Common in Forest; occasionally in garden.

Corycia temerata. Not uncommon in Forest.

C. taminata. Occasionally in Forest.

Aleucis pictaria. Not uncommon over blackthorn blossom in Forest.

Halia w-varia. Swarmed in garden; less common in Forest.

Panagra petraria. Common in heathy parts of Forest.

Numeria pulveraria. I have seen series of this moth from the Forest near High Beach.

Fidonia atomaria. Abundant in heathy parts of Forest.

Abraxas grossulariata. Abundant in garden and Forest. The larva was commonly beaten from blackthorn.

Ligdia adustata. Not uncommon in Forest ; occasionally in garden.

Lomaspilis marginata. Not uncommon in Forest.

Hibernia rupicaprararia. Fairly common along hedges and at light.

H. leucopheararia. Fairly common at rest on tree trunks.

H. aurantiaria. Larva fairly common ; I have never taken the imago in the Forest district.

H. progemmaria. Common along hedges, at light, and in the larval form in the Forest.

H. defoliaria. Very common in larval form in Forest ; imago less common ; generally taken at light.

Anisopteryx æscularia. Common in larval form in Forest, and imago on fences throughout district.

Cheimatobia brumata. Extremely abundant in larval form everywhere ; the imago swarmed in garden.

Oporabia dilutata. Common on fences throughout district.

Larentia didymata. This moth was tolerably common in the Forest, but was never taken in the garden. I have never seen it so abundant in this district as I have in Surrey and in the Midland and Northern Counties. In parts of Lancashire and Yorkshire and the Lake District it is the prevailing species at a certain period of the year.

L. olivata. Occasionally in Forest : not taken in garden.

L. pectinataria. Not uncommon in Forest ; not taken in garden.

Emmelesia affinitata. Occasionally in Forest ; never in garden.

E. alchemillata. Occasionally in Forest ; rarer than preceding.

E. decolorata. I only took the species once in the district, a specimen coming to light at Leyton (May 23rd, 1869).

Eupithecia centaureata. Fairly common in garden and Forest.

E. pygmæata. Once in garden.

E. castigata. Occasionally in garden.

E. denotata. Once or twice in garden.

E. indigata. Occasionally in garden.

E. nanata. In heathy parts of Forest.

E. subnotata. Not uncommon in garden.

E. vulgata. Common in garden and Forest.

E. assimilata. Common in garden.

E. abbreviata. Occasionally in garden.

E. exigua. Occasionally in garden.

E. sobrinata. Occasionally in garden.

E. pumilata. Not uncommon in garden and Forest.

E. rectangulata. Common in garden.

Thera variata. Not uncommon in Forest ; by no means so common as in Surrey and Kent.

Hypsipites elutata. Fairly common in Forest ; but never so common as I have found it in the woods of Surrey and Kent.

Melanthia rubiginata. Not uncommon in Forest. It is one of the first geometers to appear on the wing at dusk.

M. ocellata. Fairly common in Forest ; rare in garden.

Melanippe rivata. Not uncommon in Forest ; never in garden.

M. subtristata. Fairly common in Forest ; never in garden.

M. montanata. Common in Forest ; rare in garden.

M. fluctuata. Abundant throughout district.

Anticlea badiata. Fairly common in Forest.

A. derivata. Not uncommon in Forest.

Coremia propugnata. Occasionally in Forest ; never in garden.

C. ferrugata. Common in Forest ; less common in garden.

C. unidentata. Fairly common in Forest. Neither this nor the preceding are so common as in Surrey.

Camptogramma bilineata. Abundant throughout district.

Scotosia dubitata. Not uncommon in garden.

S. certata. Occasionally in garden.

S. undulata. I have seen this species taken once or twice in the Forest.

Cidaria corylata. Not uncommon in the Forest.

C. russata. Fairly common in the Forest ; but not so abundant as in other parts of the country where the species occurs.

C. suffumata. Not uncommon in Forest.⁶

C. testata. Occasionally in heathy parts of Forest ; a rarity as compared with the abundance of this species in other districts.

⁶ I have no record of *C. prunata* ; the species may occur, however, in the district. Its absence would be remarkable, seeing that it is a common garden insect in Kent, Surrey and Sussex, and in the west of England. In 1888 it was almost the only species on the wing in a garden at Chippenham.

THE LOCAL (ESSEX) MUSEUM—*Continued.*

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.

The property of the Club will be placed under the care of the following 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.

Copies of APPEAL and pamphlet of papers relating to the proposal may be had from the *Hon. Secretaries*, Mr. W. COLE, Buckhurst Hill, Essex, and Mr. E. DURRANT, 90, High Street, Chelmsford, who will be glad to give further information to enquirers.

SUBSCRIPTIONS either to the CAPITAL FUND, or promises of annual donations to the MAINTENANCE FUND, may be sent to Messrs. Sparrow, Tufnell & Co., Bankers, Chelmsford, or to the National Bank, Old Broad Street, London, or to the Treasurer of the Club, Mr. A. Lockyer, Mornington Lodge, Wanstead, Essex.

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[AUGUST, 1891.]

The *Essex Naturalist*:

BEING THE
JOURNAL
OF THE
ESSEX FIELD CLUB.

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

Attention is called to MUSEUM APPEAL on pages 2 and 3 of Wrapper.

THE LOCAL (ESSEX) MUSEUM, LIBRARY, AND LABORATORY.

THE attention of Members of the Essex Field Club, and of all those interested in the practical study of Natural Science, and its applications in industries, and as a means of general education, is earnestly called to the Statement and APPEAL FOR FUNDS for the establishment of the Museum now being circulated by the Council.

The scheme has long been under consideration, and it has been fully explained at meetings of the Club and in the ESSEX NATURALIST. Its principal features are as follows:—

With the object of establishing at Chelmsford (chosen as being the County Town, and also as a central position in Essex) a Local and Educational Museum, the club has agreed to amalgamate with the Essex and Chelmsford Museum, under the title of "The Essex Field Club," conditionally on the sum necessary for founding the new Museum being raised. The main objects in view are:—

- (a) The formation of authentic collections to illustrate the Geology, Mineralogy, Botany, Zoology, Ethnology, Pre-historic Archaeology and Technology, &c., of ESSEX and the adjacent sea and rivers, together with an educational series of specimens and preparations to be employed for illustrative and teaching purposes. Specimens that are not of Essex origin will be admitted so far only as they serve to demonstrate the structure and relationship of the local types.
- (b) The formation of a Local and Scientific Library, to include (in addition to standard scientific works), topographical, antiquarian, and other books, manuscripts, maps, parliamentary and official papers, pictures, prints, &c., which in any way relate to the county of Essex.
- (c) The establishment of a Laboratory and Class-rooms, with fittings, apparatus, and instruments suitable for the preparation of specimens for the Museum, and for the practical study and teaching (either in the Museum or in selected local stations throughout the county) of the subjects named in paragraph (a), and for promoting their practical application in Agriculture, Forestry, Arboriculture, Gardening, Fisheries, Manufactures, Industries, and general education. The laboratory, class-rooms, instruments, &c., will be under the control of the Council, who may permit students, investigators, and others to use them, and may also lend instruments and preparations out of the Museum buildings for purposes in furtherance of the above objects.



FAIRLOP OAK,

Made on the Remains of a Forest where a Fair is held on the first Friday in July

The Wood is 100 Years before the Tree was tapped by Mr. Parnell.
Published according to the Act of Parliament (July 1) 1810.

W. H. Stiles del.

C. fulvata. Not uncommon in Forest.

C. pyraliata. Occasionally in garden and Forest.

C. dotata. Abundant in garden.

Pelurga comitata. Somewhat rare in garden.

Eubolia cervinata. I took this species once or twice in a lane leading from the garden to the marshes.

E. mensuraria. Common in Forest.

E. palumbaria. Common in Forest.

Anaitis plagiata. Occasionally in Forest.

Chesias spartiata. Not uncommon in larval form on broom in the Forest.

Tanagra chærophyllata. My mother has taken this species in the Forest ("Gilberts Slade").

DELTOIDES.⁷

Hypena proboscidalis. Common in garden and Forest.

H. rostralis. Abundant in garden.

Hypenodes albistrigalis. Once or twice at sugar in Forest ("Rushey Plain").

Herminia tarsipennalis. Fairly common in Forest.

H. nemoralis. Occasionally in garden.

PYRALIDES.

Pyralis costalis. Common in garden and Forest.

P. farinalis. Common in garden and about the premises.

P. glaucinalis. Occasionally in garden.

Aglossa pingualis. Common in garden and stables.

A. cuprealis. Once or twice in garden.

Pyrausta purpuralis. Occasionally in heathy parts of Forest.

Endotricha flammealis. Abundant in Forest.

Cataclysta lemnata. Abundant over standing water throughout district.

Paraponyx stratiotata. Occasionally at light and over ponds.

Botys verticalis. Abundant among nettles.

B. fuscalis. Once in Forest.

B. urticalis. Abundant everywhere.

⁷ The species in this and the following tribe are very imperfectly recorded, as I was but little acquainted with them at the time. The list will no doubt be largely added to by others.

- Ebulea sambucalis.** Not uncommon in garden.
Pionea forficalis. Very common in garden.
Scopula olivalis. Common in garden and Forest.
S. prunalis. Common in garden and Forest.
S. ferrugalis. Not uncommon in Forest.
Stenopteryx hybridalis. Common in Forest.

Of the remaining species of this tribe and of the Crambites I have not sufficiently complete records ; nor is my recollection of captures sufficiently distinct to make the list trustworthy. I prefer, therefore, to leave its completion to later collectors better acquainted with the species than I was at the time covered by my notes. I can only add that many species of *Eudorea* were common ; that **Phycis roborella** was occasionally taken on the wing in the Forest, and **Pempelia palumbella** in the same localities, flying over the heathy parts. Of the genus *Crambus*, the beautiful **C. pinetellus** is a noteworthy Forest species. I have also taken **Aphomia sociella** commonly in the Forest ; and once a specimen of **Galleria cerella** at rest by day on a fence, bearing a most remarkable resemblance to a raised splinter of wood.

The list now presented, although confessedly incomplete, will, it is hoped, serve as a basis for the more complete catalogue which in time it will be possible to draw up from the joint observations of all those who have collected in the district.

NOTES—ORIGINAL AND SELECTED.

Bottle-nose Whales in the Thames.—Two male specimens of this whale (*Hyperoodon rostratus*) occurred in the Thames at the end of July—one near the Nore lightship, which was towed into Leigh, and one near the entrance to Barking Creek. Our member, Dr. Murie, has made a careful examination of the Leigh specimen, and has promised to communicate a paper on it to the Club, and Mr. Crouch will append a few remarks on the Barking example.

Short-eared Owls in Essex in May.—Mr. F. Kerry, of Harwich, writes as follows to the "Zoologist" :—"Whilst looking for the nests of some gulls, *Larus ridibundus*, on the bentlings near Walton-on-the-Naze, on Whit-Monday last, I flushed a short-eared owl. It had just killed a black-headed gull, and had commenced to pluck and eat it ; the blood was flowing from the dead bird. Being very fearless, it did not fly more than ten yards at a time ; most probably it was

breeding somewhere near. It was about one mile distant from the spot where I saw short-eared owls in August, 1884, and two miles from where they bred in 1889 (see Zool. 1889, p. 453)."

Captures of Lepidoptera in Essex.—At the meeting of the City of London Entomological Society on May 21st, Mr. Battley exhibited various Lepidoptera from Southend, including *Lycæna argiolus*, *Biston hirtaria*, *Aleucis pictaria* and *Psyche pullella*; and at a meeting of the same Society on June 18th, Mr. Hockett showed a box of insects taken near Epping on May 23rd and June 6th, including *Platypteryx hamula*, *P. lacertula*, *Nola cristialis*, *Corycia tenerata*, *Tephrosia consonaria*, &c. On July 22nd, Mr. Hill exhibited a fine aberration of *Argynnis euphrosyne*, taken by a lad in Epping Forest some years ago. The upper surfaces of the wings were much suffused with black, and the silver spots on the under sides were reduced to mere streaks. On July 16th, Mr. Clark exhibited a series of *Heliodes arbuti* from Epping Forest; Mr. Gates, *Psyche reticella* from Southend, and Dr. Buckell a series of *Ephyra trilinearia* from Epping Forest, which varied considerably in (1) the basal line, which was well marked in some, but scarcely to be traced in others; (2) central line, usually narrower in the females, but in one specimen (female) it was exaggerated into a band; (3) discoidal spot on (a) upper wings, not to be traced in one specimen, well marked in others, and outlined with black in one; (b) hind wings to be traced in all, and often well marked. The position of this spot varied from being imbedded in the median line, to halfway between median and basal lines. Mr. Bayne exhibited *Demas coryli*, *Tephrosia consonaria*, *Emmelesia affinitata* and *Ephyra porata* from Epping. Mr. Battley reported that he had met with *Hesperia lineola* commonly on July 14th between Benfleet and Leigh. He thought that it was more sluggish than *H. lineola*, and it was very easy to detect the difference between these two species when at rest. [We have taken these records from the reports in Mr. Tutt's useful "Entomologists' Record."—ED.]

"Assembling" of Geometer Moths.—The mysterious phenomenon of the attractive influence of a virgin female moth is well known to occur amongst various groups of the Bombycidae, but the records of the "sembling" power are much fewer in other families. It may therefore be worth while to print the following observations:—In mid-June last, having a number of pupæ of *Amphidasis betularia*, the cage containing them was placed at the window of an upper room overlooking my garden at Buckhurst Hill, a great extent of forest and thickly-wooded park land lying beyond. As the female "pepper moths" emerged in the cage an astonishing sight presented itself. For several successive nights numbers of male moths congregated to the spot and flew around the cage and into the room. Scores might have been easily taken, and most of them were in fine condition. When the cage was taken into the garden, a few moths were attracted, but nothing like the swarm around the upper window. My brother and I had previously noticed this "sembling" in two other species of Geometrae. In New Forest, many years ago, we observed numbers of the pretty "emerald moth," *Hemithea strigata*, all males, flying around a small bush, and a careful search revealed a female ensconced therein. On another occasion, in May, 1875, a similar phenomenon was observed in Epping Forest, near Woodford, the species being the common "brimstone moth," *Rumia luteolata*. It is worthy of note that in the "Entomologist" for May, our member, the Rev. G. H. Raynor, records a remarkable instance of "sembling" in the case of *Brepheos parthenias*, a moth

formerly classed with the Noctuæ, but now grouped in a special family. Mr. Raynor's experience was in a wood near Warley, Essex, in April last. Having caught a female *parthenias*, his net was soon a centre of attraction for the males, which continued to come both with the wind and against it. It is very desirable that such cases should be recorded, so that we may get to know how far the habit attains with moths, and indeed among insects generally.—WILLIAM COLE, Buckhurst Hill, August, 1891.

Hippuris vulgaris, L. (Common Marestail).—I found an abundance of this singular plant in the Stour river near Sudbury, last June. As it is comparatively scarce in our county, the occurrence of the plant may be worth a record.—J. C. SHENSTONE, Colchester.

The Highest Land in Essex.—Arising out of a statement as to the height of Danbury in the programme of the Chelmsford to Maldon meeting of the Club, some correspondence on the moot point as to which part of Essex stands highest above Ordnance Datum has appeared in the "County Chronicle." It is very clear that Danbury must hide its diminished crest, and lose the distinction so long assigned to it in the local guide-books of being the "highest point in Essex." We referred the question to our Vice-president, Mr. T. V. Holmes, and he has furnished us with data, taken from the new Ordnance Sheets, which show that the highest land in Essex is in the N.W. corner of the county. The following are a few data :—

Danbury (a mile N. of Little Baddow Road)	332 ft.
Road close to Warley Barracks	378 „
Langdon Hills	378 „
Epping Forest (a few miles N. of Ambresbury Banks)	379 „
Great Chishall	479 „
Between Great Chishall and Langley	485 „

This last spot seems entitled to the honour of being the "highest land in Essex."—ED.

John Constable, R.A., and the Valley of the Stour.—In one of the writings of this delightful nature-artist, he says, "I associate my careless boyhood with all that lies on the banks of the Stour; those scenes made me a painter, and I am grateful." His finest pictures were carefully studied scenes in that neighbourhood, in which he was born, and to which he ever and again returned for freshness and vigour.

An interesting article on "Constable's Country," by Mr. C. L. Burns, has just appeared in the "Magazine of Art" (June, 1891), which is well illustrated by several views; Flatford Lock and Blackwater, the mill at Flatford, where he was born, and Willy Lott's house, the original of his fine picture, "The Valley Farm," are therein depicted. The sketch of East Bergholt church is also of interest to those who know the old edifice with its ruined foundation of a tower, which never was (so it is said) erected; and the peal of bells is housed in the churchyard, under a massive structure of timber, with red tiled roof.

THE ESSEX FIELD CLUB AND THE COUNTY COUNCIL OF ESSEX.

THE outcome of the Club's application for a grant to carry on scientific and technical instruction work in the county (fully set forth in the last vol. (iv.) of the *ESSEX NATURALIST*, pp. 258-262), has been the appointment of a hybrid committee for the purpose of assisting in the endeavour to establish a system of technical instruction in Essex. At the County Council meeting held on July 7th, 1891, the scheme of the Technical Instruction Committee was adopted, which included the following recommendations. It should be stated that by the scheme the extraordinary plan of dividing the major portion of the money received under the Local Taxation Act, 1890, among local authorities, on the basis of 1d. in the £ of the assessment to the county rate of the district concerned, was adopted:—

- (a) That a sum not exceeding £250 be granted to an Organising Joint Committee consisting of six members of this Committee and six members of the Essex Field Club for administration purposes, and the constitution of a centre for the supply of lecturers and teachers, whose services will be paid for by the Urban Authorities or Local Committees engaging them.
- (b) That a sum not exceeding £500 be granted to the same Joint Committee for the purchase of apparatus and diagrams, which are to be the property of the Council, and that a sum not exceeding £100 be granted to the said Committee for the storage and carriage of such apparatus and diagrams.
- (c) That a sum not exceeding £50 be granted to the same Joint Committee, to be expended in lectures under the direction of the Essex Bee-keepers' Association.
- (d) That Local Committees throughout the county, especially in rural districts, be recommended to make application to the said Joint Committee or the Essex Agricultural Society, for aid in lecturers or teachers, obtaining apparatus and materials, the conducting of examinations, and seeking help and guidance generally.

The following are the members of the Organising Joint Committee appointed by the County Council and the Council of the Essex Field Club respectively :—

(*On behalf of the County Council*) Mr. E. N. Buxton, J.P., Mr. E. A. Fitch, F.L.S., Mr. J. H. Burrows, Mr. S. W. Squier, J.P., Mr. F. West and Mr. W. B. Whittingham. (*On behalf of the Club*) Prof. G. S. Boulger, F.L.S., F.G.S., Mr. F. Chancellor, J.P., Prof. R. Meldola, F.R.S., F.C.S., Sir Henry E. Roscoe, M.P., F.R.S., Mr. F. W. Rudler, F.G.S., and Mr. J. C. Shenstone, F.R.M.S. At the first meeting of the Committee held on July 20th, Mr. W. Cole was appointed Secretary. It is too early yet to report any of the work of the Committee, which it is hoped will be of considerable assistance in the very difficult task now undertaken by the County Council.

MONK WOOD, IN LOUGHTON.

A FRAGMENT OF FOREST HISTORY.¹

By W. C. WALLER, M.A.

ALMOST anything connected with Epping Forest seems to come within the catholic embrace of the Essex Field Club, and a note or two concerning Monk Wood, in Loughton, may, perhaps, not be refused a place in the *ESSEX NATURALIST*. It has probably occurred to many a rambler through the woodland to ask himself, as he passed from the stunted growth of pollards which are the legacy of lopping rights, into the great shady wood with its carpet of russet-gold, how it came about that this particular spot fared otherwise than the rest of the Forest. He may have asked a question and been told that "fuel-assignments" used to be made, and that this was the "assignment" of the lords of the manor, who dealt more gently with their woods than people whose notions of primogeniture and inheritance were less well developed. But the history of Monk Wood goes back beyond the comparatively modern days of "assignments" and "lopping rights."

Somewhere about the beginning of the thirteenth century one

¹ *Authorities*: Harl. MS. 4809. D. of Lanc.: Surveys and Depositions; 24 Eliz. D. of Lanc.: Misc. Rec.; xxv. F. 17 a.

part of Loughton was called "Luketon Snarringe,"² as being, or having been, the fee of one Geoffrey de Snarring. He, we may say in passing, was probably an under-tenant of the great Norman barony of de Valoines in Essex, as in Norfolk; from a place in the latter county, now called Snoring, he seems to have derived his name. It appears, however, that he had granted at any rate some portion of his estate to three owners, who held a certain wood in Luketon Snarrynge in common, though their shares were not equal. But at this point it will be well to let two of them, Geoffrey Renitot and Roger Fitz-Ailmar, speak for themselves through the medium of an interpreter, their own words being recorded in monkish Latin:—

"To all the faithful in Christ, Geoffrey de Renitot and Roger Fitz-Ailmer send greeting in the Lord. Be it known unto all men that Ralph de Assartis and we ourselves having measured of our commonwood in the parish of Loughton, fifty-six acres and a-half, and Ralph having demised his share to the Abbot and monks of Stratford,³ we, for our own salvation and that of our [kinsfolk], granted, gave, and by this charter have confirmed, to God and the Church, and to the Canons Regular of the Holy Cross of Waltham, all our part of the aforesaid wood with the land and all the right we had therein, or could have, as in the felling and carrying-away of trees, and in pannage at pannage-time, with everything else by any right pertaining to us, to be had and held by the said church and canons in free, pure, and perpetual alms, free and quit from all secular service or demand from us and our heirs for ever. And it is to be noted that of the aforesaid wood and land, fifty-six acres and a-half by measure, our share was a fourth part in all the advantages mentioned, and others which might casually accrue, to be received in common between the said Ralph de Assartis and ourselves. And we and our heirs will for ever guarantee against all men this part of the wood and land, with the appurtenances thereof, as is aforesaid, to the said church and canons, as our free, pure, and perpetual alms. And for this grant, donation, and the confirmation of this our charter, the aforesaid canons have received us for ever in the prayers and other benefits of their house. These being witnesses, &c."

Not content with this joint declaration of their gift, Geoffrey and Roger proceeded to execute, each of them, separate deeds, couched in much the same terms. The names of four witnesses are appended to the charter of the former, *viz.*, Nicholas de Barton. (Barrington);

² It may have been a small manor. That a hill on the southern border of Monk Wood is still called "Court Hill," is a significant fact.

³ Unfortunately no cartulary of the Abbey of Stratford Langthorne, if it exist, is accessible. That said to be preserved in Trin. Coll., Dublin, is a fragment of three pages only.

William de Bosco, Richard Alcher and Gregory de Thayden. The last is probably identical with the man of that name who was a Verderer in A.D. 1250.

Nor was this the conclusion of the whole matter. Following on the three charters just recited we have two others, from which we learn that both Roger and Geoffrey still had seventeen acres of wood and waste left to them, of which Roger's share was three acres and three-parts of a rood (*rode*), and this they also made over to the canons. The grant made by Geoffrey was subsequently confirmed by Edward, his son. A pleasing unanimity has marked the proceedings up to this point; but the new joint-possessors do not seem to have succeeded in maintaining it. For, on the Thursday next after the Feast of Saint Barnabas the Apostle, in the twenty-fourth year of the reign of King Henry, the son of King John (June 14, A.D. 1240) Henry, Abbot of Waltham, and Hugo, Abbot of Stratford, found it desirable to meet in the mother church of Chelmsford and there to compose certain differences which had arisen over their common wood in Loughton Snarrynge. The result of their meeting is recorded in a charter, by which it is solemnly provided that, when either Abbot wishes to fell any timber, the bailiff of the one shall send for the bailiff of the other, and the two shall, by common consent, fix upon four trees of equal value, of which the Abbot of Stratford shall have first choice as to two, and the Abbot of Waltham take whichever he prefers of the two remaining. Into the other provisions we need not enter here.

So far so good, says a logical reader: we have a wood and we have monks; but there is nothing to show that the wood was called "Monk Wood"; nor even if it were so called, that it was the particular wood which now goes by that name. To meet these objections, which are reasonable enough, we must carry the reader from the thirteenth to the second half of the sixteenth century, when Elizabeth, by the grace of God, was Queen, and, withal, lady of the manor of Loughton, *alias* Lucton.

From a Commission to survey, dated May 20, 1582, we learn that "greate spoyle and waste" was alleged to have been committed in the felling of a parcel called "Moncke Wood," parcel of the Manor of Loughton, lately sold to Robert Wroth, Esq. by Thobie Houghton, surveyor of woods to the Duchy of Lancaster. The three commissioners named were directed to repair to Mouncke Wood, then and there calling before them Robert Wrothe and others. Their

report states that they did so on June 1, and “the same daie at Eppinge, did by the othes of . . . , twelve substanciall and honest men, neare inhabytinge to the said mannor of Loughton, make inquirie of the same, who, uppon viewe as well made by them of the woodes as by seekinge further to understand of the same . . . have made presentment.”

The presentment, or verdict, consists of detailed answers to five articles of enquiry; and as they are brief and to the point, we give them as they stand:—

(i.) **Ūe say** that there is a wood upon the waste soyle of the said mannor called Muncke Wood, containing as it is measured fifty-three acres, sixty-five poles, at twenty-one foote to the pole; whereof there is waste ground in the same that beareth no wood by estimacion fifteen acres; which said wood hath been sold to Mr. Wroth, who felled the same. The nature and kind of the woodd so felled was most oke, beach, hornebeame, and birch. The oaken wood was lopte and some shredde, and the other usual wood was most lopte, saving there was felled by the ground of the said usuall wood to the nombre of 500 younge trees. And as we are certified by our evidence, it hath byn felled in lyke order before at former sales. The said wood at the time of the felling thereof was fifteen years' growthe.

(ii.) **Ūe say** that there was late felled within the said wood eight timbre trees for making of a pownde at Loughton Hall; which is informed to be done by warrant from Mr. Chancellor of the Duchy. Of crabtrees and hawthornes, to the number of 618 trees, and two hollies being vert. And as we are informed moste parte of them were dead in the toppe and felled by carters and beaten down on the fall of the wood.

(iii.) **Ūe say** that Robert Wrothe, Esq., paid for the same wood to the Queen £20. The charges of felling, &c., stood him in £35; and he afterwards sold the said bargaine of wood to Phillip Grenely for £120, giving him one year and a quarter's daie for paiment of £90. And Phillip Grenely saith uppon oath that he got not £20 by the said bargaine.

(iv.) **Ūe say** that the verte felled in Muncke Wood aforesaid was felled by the foresaid Phillip Grenely between the Feast of S. Bartholomew and the Feast of S. Michael last past, after Mr. Wrothe had sold the bargain of woode to him; but whether the doing thereof is to be accounted waste or not, we knowe not.

(v.) **Ūe say** that the said Munckewoodd hath byn three times sold within the mynde of man: that is, one tyme by the Abbot of Stratford, and twice in the Queene's Majestie's tyme that now is.

In witness of this our Verdict we have hereunto sett our handes and scales the xii. June, 24 anno R.

Two points are to be specially noted in the foregoing report. First, the area (fifty-three acres, sixty-five poles) of the wood; and, secondly, the fact that it was sold, presumably before the dissolution of the monastery, by the Abbot of Stratford. A search through one or two *Ministers' Accounts* for proof that Monk Wood was included among the possessions of the "late dissolved monastery of Stratford Langthorne," proved vain; nor does it seem to be numbered, with the manor of Loughton, among those of Waltham Holy Cross. But woods were apparently entered on the rolls only when the proceeds of their sale came into the accounts. Of a great felling which took place in or about A.D. 1488, we have evidence in a Forest Roll (4 Hen. VII.), according to which a certain Christopher Stubbes, of Loughton, was presented for having cut down 100 loads of timber and wood in Monk Wood, called "le King's wast soile", and for the bark of the same received viij. s. The explanation of this would seem to be that the Abbot had sold the wood to Stubbes, without first obtaining a licence to fell.

The evidence, however, seems sufficient to warrant the identification of the Abbots' Wood in Luketon Snarringe with that now known as Monk Wood, in Loughton.

THE ESSEX FIELD CLUB.

FIELD MEETING AT NEWPORT, QUENDON, &C.

Monday, March 30th, 1891.

ON the kind invitation of Lieut.-Col. A. M. Cranmer-Byng a meeting was held in the Newport district, which, notwithstanding the cold and ungenial weather, was a very pleasant gathering, largely attended by members from many parts of the county.

Some members went down to Saffron Walden on the previous Saturday, for the purpose of visiting the museum, and various places of interest in and about the town. All assembled in Newport at half past ten, waiting there until about one o'clock for the later arrivals, and spending the time in viewing this very interesting village.

It was formally a market town (and known as "Newport Pond" from a piece of water at the S. end, now drained), standing on the (Roman) road to Cambridge. It was, in pre-railroad days, a place of considerable bustle and importance. The ancient houses are well worthy of examination, including the "Crown House" (from the crown sculptured over the door), in which according to

tradition, Mistress Nell Gwynne once dwelt. It affords a good example of ornamental raised plaster work, but the date of the building (close to the end of the 17th century) hardly accords with that of the frail beauty of the "Merry Monarch's" court. It was formerly an inn, with the sign of the "Horns," and it is said that Charles II., the Duke of York, and Nell Gwynne used to stop there on their way to Newmarket.¹

There are some fine carved chimneys in the village, also the house known as "Monks Barn" in the main street, a timber framed edifice said to have been used in the latter part of the 14th century by Dominicans who received rents and tithes there. It has a very noteworthy bay-window in the upper story, facing west, underneath which, and forming part of it, is a bold carving out of solid oak, depicting the Coronation of the Blessed Virgin, but this may have been inserted at a later date than that of the house itself. The building, with its "herring-bone" brick nogging and studs, well deserves a careful inspection. The "Coach and Horses," an old hostelry, from which, according to tradition, the Duke of Buckingham and the Earl of Rochester used to post; and many very picturesque cottages and other buildings. In a farm yard are still to be seen vestiges of St. Leonard's Hospital for lepers, dating from "Good King John's" time.

A walk was taken through the village to the grounds of "Shortgroves," a mansion of Queen Anne's days; in the park are some unusually fine timber trees, and Cedars of Lebanon, one of which covers with its branches an area of about eighty yards in diameter. On the roadside towards "Shortgroves" is a very large block of sandstone.

The Vicar, the Rev. G. F. Tamplin, M.A., and Mr. G. E. Pritchett, F.S.A., acted as guides to the church of St. Mary the Virgin, Perpendicular and Decorated, which was carefully restored in 1857 by Mr. Pritchett, but the tower was re-built, because of its dangerous condition. The church is a noble structure, consisting of nave, aisles, transepts, tower porch and chancel. The mouldings and details are good, and at a spot near the pulpit the spectator may see first, second and third pointed work. In the parvise over the S. porch is a remarkably fine oaken chest of unusual size. On the interior of its lid are early painted panels; it is carved and moulded elaborately, and it has many old locks. How the chest was got into the parvise is a mystery, as the staircase is narrow, and the window too small to admit the great box without considerable disturbance of the masonry.

The lectern is of oak and of early type; the pedestal is hollow; the revolving portion for holding the chained Bible can be let up and down to the required height and is secured by a spring let into the woodwork. There is an inscription on brass let into this lectern which reads as follows: "In the year 1535 the first complete translation of the Bible was published, and in 1535 came out the king's command, that a copy thereof should be set up in every church. Then the people long thirsty for the Word rushed to the waters of life and drank freely. Shall we have known more and felt greater mercy and shall we love less." The west tower is very lofty and has four octagonal turrets on its summit. In consequence of its having been shattered by lightning and having a faulty foundation, it became unsafe. It was rebuilt in 1855, re-using the original material and the Barnack free-

¹ Mr. Probert says (in Trans. Essex Arch. Soc., v. (1st ser.) p. 77) that he has seen a play in which the scene was laid at the "Horns" at Newport, the King, Nell Gwynne, &c., figuring as characters in it. He adds, "Tradition says that they used to come with pack-horses by the Great North Road, *via* Rickling, and the lane near Wicken Bonhunt, still called 'London Lane;' then along the ancient road at the foot of Bury Field in Newport; then along the back of the Burywater House and so emerging opposite the Crown House."

stonework so as to reproduce the tower as nearly as possible in its details and dimensions. This tower is very similar to that of Great St. Mary's, Cambridge, and may have been constructed originally by the same builders; it forms a striking feature in the landscape and especially so when seen from Shortgroves Park.

Quitting the church, the ramble was continued along the lanes and across the fields to Quendon Hall. Although there were gleams of bright sunshine the weather was very cold, with a keen north wind blowing, bringing snow storms at intervals. No plants were in blossom, with the exception of a few primroses in sheltered nooks here and there, and of course insects were absent. In the hedges—rows Mr. Crouch and others found a few *Helices*:—*Helix aspersa*, *H. nemoralis*, *H. hortensis*, *H. rufescens* (deep reddish-brown in colour), *H. rotundata*, *H. hispida* and *H. cantiana*. Also *Hyalinia* (*Zonites*) *cellaria*, and some glassy shells of *Vitrina pellucida*.

In the park we were met by our kind host, Col. A. M. Cranmer-Byng, and a very pleasant stroll was taken in the finely wooded domain. The herd of deer was much admired; it was stated to have been maintained in the park for over 200 years. A buck and doe in the herd are pure white. Some of the trees in the park are very fine; two oaks were measured, one was 17 feet 3 inches, and the other 20 feet 2 inches in girth about 3 feet from the ground. Col. Cranmer-Byng pointed out a tumulus in the park, which appears to be well worthy of careful examination, and some very curious depressions or pits, which occasionally make their appearance in the fields without warning, and are consequently dangerous. Some discussion took place as to their nature, whether natural swallow-holes in the chalk, or whether they owe their origin to excavations of the nature of Dene-holes. The hope was expressed that some investigations might be carried out in order to solve the question.

Quendon Hall is of considerable antiquity. Although portions have been pulled down and altered, it still has a striking appearance. The present south front is pretty well known to be the work of Wyatt, but it is not in character with the original design of the mansion. A long and wide gallery on the chamber floor extends the whole length of the hall front, west to east, and the rooms entered from this gallery have glazed double doors of Georgian character. The hall contains much fine oak panelling, old china, and good paintings, including a portrait of Archbishop Cranmer, by Holbein. At the back of the house is a magnificent avenue of limes.

At the mansion the party (a large one) received a most cordial welcome from Colonel and Mrs. Cranmer-Byng and members of the family, who did all in their power to make the visit a pleasant one. Luncheon was served in the fine dining hall, and, although owing to want of time the Ordinary Meeting intended to have been held in the hall was postponed until evening, on the motion of Mr. Fitch, as President, a most hearty vote of thanks was passed to our kind host and hostess by acclamation. Col. Cranmer-Byng replied, and shortly afterwards the party left for a walk to Rickling for the purpose of seeing the very interesting church (All Saints) principally of very early date (parts being supposed to be Saxon) but which is of mixed styles, having experienced many alterations and additions. The Rood-screen is of late "first-pointed" style of very good detail. The pulpit dates from pre-reformation periods; the chancel has a oaken roof, and there is a modern reredos both of fine Flemish work. On the quoins about the chancel and on its priest's south-doorway are incised mediæval scrolls and lettering, also a curious

demi-figure supposed to be a Mediæval caricature. A mural monument in the vestry is dedicated to the memory of Robert Turner who "dyed the second day of February, 1657," it is recorded that "it was the decessed's advise to the Lyoeing that noe man should suffer 110 ounces of blood to be taken from him!" There are also several interesting tombs, including an Easter tomb on the north side, some 12th century painted glass, &c. The whole church and its belongings are well worthy of a visit from ecclesiologists.

The President and many members from Chelmsford, Maldon, &c., had to hasten back to catch *their* last train home, but the remainder of the party lingered on the return to Newport to inspect (under the guidance of the rector, the Rev. A. E. Tollemache, and Mr. Pritchett) the little church of St. Mary (?) Quendon, one of the early "first pointed" churches of Essex, consisting of nave, aisles, chancel and porch. The west wall is of unusual thickness and has one large and lofty lancet window in its centre, very boldly splaved internally. Probably this wall carried a good bell turret; it had one of the most ancient bells known, but, alas, it went to the melting pot when the church was "restored," a good many years ago (1861). A singular feature about this west wall is, that it is not nearly at right angles with the north and south walls, being about 2 feet out of square, so that the north wall is shorter than the south. There is no apparent reason for this departure, as the churchyard is not cramped in any way.

The chancel is a rebuild of late 15th century work. In the north and south angles of the east end are two curious twisted pedestals, which, at some period, doubtless carried two figures, probably representing St. Simon and St. Jude, to whom the church may have been dedicated, but there seems to be some doubt as to this. The original chancel was probably apsidal. On the occasion of the underpinning of the north wall some years ago, the skeleton of a man was found completely covered by the wall; he had probably been buried before the present quadrangular chancel was built.

To the great regret of many members time would not allow of the remainder of the programme being carried out, and the interesting and beautiful village of Clavering, with its fine perpendicular church, the embankments and moat of the demolished Clavingbury Castle, and the little village of Wicken Bonant, were reluctantly left for a future visit to this picturesque district.

On returning to Newport tea was taken at the "Rose and Crown" Inn, but unfortunately the President and many members from Chelmsford, Maldon, &c., had to leave to catch the train.

After tea an Ordinary Meeting (the 124th) was held, Prof. R. Meldola, F.R.S., in the chair.

The following were elected members: Messrs. Leonard Brown, Hugh Cranmer-Byng, W. G. Gimson, M.D., W. F. Kelsey, T. F. Sanderson, F. Kemp-Smith, and Miss Smoothy.

On the motion of Prof. Meldola a very hearty vote of thanks was accorded to all who had contributed to the success of the day's meeting, including Mr. L. Cranmer-Byng, Mr. G. E. Pritchett, the Rev. G. F. Tamplin, the Rev. A. E. Tollemache, and others.

Mr. Walter Crouch exhibited, on behalf of Mr. French, of Felstead, two shells of a distorted form of *Linnæa palustris*, which he had found "in flood débris in a meadow just below the water mill on the Chelmer at Felstead." In these the columellar of the last whorl is widely reflected and gaping, so that the interior of the shell may be seen from the anterior end. They appear to be recent shells,

but such a variety or monstrosity does not seem to have been recorded or described; and Mr. Crouch therefore provisionally named it as *L. palustris*, mons. *aperta*. Mr. Edgar Smith, F.L.S., of the British Museum, (Nat. Hist.) to whom Mr. Crouch had submitted it, wrote "I have had a good hunt for any notice of such a growth of *L. palustris* as you send, and cannot find either figure or description. The peculiar form of the front part of the aperture calls to mind *L. reflexa*, Say, of the United States, the name being suggested by the slightly reflected appearance of the base of the aperture when viewed in profile. Of course your shell is much more reflexed than the American species."

Mr. Edward Charlesworth, F.G.S., then delivered a short lecture on his observations on the formation of flints, illustrating his remarks by a fine series of examples of flints from the chalk pits near Saffron Walden. We understand that Mr. Charlesworth intends publishing a full account of his observations elsewhere, so that we need only refer to the summary of the principal facts upon which he relies already printed in the *ESSEX NATURALIST*, (vol. iii. p. 225).

Prof. Meldola briefly discussed some of the points in Mr. Charlesworth's address, and a vote of thanks to the latter gentleman for his interesting exhibits and remarks brought the meeting to a close. The main party of members left by the Doncaster express train, which the authorities kindly stopped at Newport, but some returned to Saffron Walden, and remained there until Monday.²

² The veteran Essex antiquary, Mr. Joseph Clarke, F.S.A., who accompanied the party in his carriage the major part of the day, had kindly prepared for the meeting the following extracts from the scarce pamphlet "Poor Robin's Perambulation from Saffron Walden to London, performed July 1678," which mentions in the best of doggerel, many of the places visited during the excursion. Mr. Clarke says: "Robert Winstanley ('Poor Robin') was the second son of Henry Winstanley, a stationer of Saffron Walden (who was a man of mark, master of the almshouse, churchwarden, and was buried in the church); his eldest son Henry was the celebrated builder of the first Eddystone lighthouse and was drowned in its fall. Robert was the author of several works of facetious criticism and the originator of the almanac, the name of which is continued down to the present day; in his time it was a skit upon and ridicule of the prognostications of all his contemporaries. After a jolly carouse at the "Rose and Crown" with his friends he went to Audley End (then a considerable village) and to the "Black Swan" (which he ridicules as no such thing). After passing Hendell and Sparrows' End:—

"To Newport-pond my course I next way
lent,

And in at the sign of the Black Bull * went;
Where in a room I had set down,
When in came my old friends kind Mr. Brown,
And Mr. Woomwell, two who love their friend,
With true and hearty love unto the end,
For though they in another Town do live,
They to their neighbour some kind visits give.
'Twas twelve o'clock, Dinner-time did approach,
When men what knives on wheels of Cart or
Coach;

The Cloth was laid, and by the scent o' th' meat
One might perceive there something was to eat,
And so it proved, for from the pot
Came forth a rump of Beef was piping hot;
And from the spit was brought a Loyn of mut-
ton,

Would satisfy the stomach of a glutton;
For like a Loyn of Beef it might been knighted;
To which our Hostess kindly us invited;
Which we accepted of, and to delight her,
Told her none could deny such an inviter;
For she's a Widow of such excellent carriage,
Would make a Man most happy in her Marri-
age,

Being young, fresh, fair, of a most pregnant
wit,
And for a kind good Husband sure most fit.

For having din'd and join'd a pint or two,
Then forwards on my journey I did go,
And first I came into a town call'd Rickling,
Where for to stay awhile I made no stuggling,
But presently in at the King's Head fell,
Where of compounding *Dick* I first heard tell,
To whom if that it please you to resort ye,
He for a Hundred pound will mortgage forty—
Shillings a year, nor do you think I jest,
It's very true, indeed, probatum est.

Or lend him lesser sums, which if you do,
For twenty Shillings he will pay you two,
Not two and twenty Shillings, no such plenty,
I mean he'll pay you two Shillings for twenty;
Pray heed him then, and this shall be your por-
tion
You shall not need fear being su'd for extortion,
From the King's Head I out of doors scarce
went,

But was in Quendon-street incontinent,
Of many a handsome Country-house the
station

It seems to be a little Corporation,
Yet are the houses not so neat as strong,
And doth most to one Gentleman belong,
For nothing on it can you look against,
Unless cause there is ne'er an Ale-house in't.
Good air, brave Woods, and fine rich Meadow-
ground,

* Cole in his MSS calls it the "Red Bull," with painted glass in the windows—Simply the animal may have been altered in its paint. There is a token in the S. Walden Museum, and several have been found, John Runham a bull. Foynie ascribes it to Newport. Sidop, but it belongs to this village, as the Runhams are known to have lived there.

FIELD MEETING IN HAINAULT FOREST DISTRICT AND BARKINGSIDE.
SATURDAY, JUNE 20TH, 1891.

A PLEASANT afternoon excursion was made round the Hainault Forest district, under the direction of Mr. Walter Crouch, F.Z.S., one of the Vice-presidents; and the Rev. W. S. Lach-Szyrma, M.A., the Vicar of Barkingside. Over sixty members were present, the drive commencing at Woodford Station about 2.30, and though the day was warm and fine there was a cool breeze which tempered the heat.

The route taken was by the lower portion of Snakes (Sakes) Lane, and over the River Roding, through Woodford Bridge, passing the lodges and entrance to the new Claybury Lunatic Asylum. On the left hand the view is very pretty over the valley to Woodford Green and Buckhurst Hill. Thence by the new road through a belt of woodland, a remnant of the Forest of Hainault, disafforested in 1851. Attention was called to the extensive Asylum Buildings on the right, now in course of erection, close by Toms Wood, and extending over twenty acres; and to the view on the left towards Grange Hill and Chigwell Row, and across Fairlop Plain (now under cultivation) to the wooded heights of Havering. The view extends southward, over South Essex into Kent, and in front the spire of Ilford Church, with Shooter's Hill as a background. The drive was continued by Toms Wood Hill and Lane, past Fairlop Place, to Fullwell Hatch (named from an old mansion which formerly stood here, owned by Adam Fullwell; in the time of Dorothy Barley, the last Abbess of Barking). Here is the "Old Grey Goose," with its motto, "Live and Let Live," and opposite, the "Old May Pole Inn," where no doubt the May-pole stood, and the May dances took place in the olden days.

The party was here joined by the Vicar of Barkingside and his family, and proceeded to Fairlop Plain, where, close by the site of the famed "Fairlop Oak," blown down in 1820, a paper by Mr. W. Crouch on "Hainault Forest" was read by him from the box-seat of the private carriage of Mr. Green, of Hainault House. This was compiled mainly from parliamentary reports and acts, and other original documents; a contribution towards what the writer regretted was still a much-needed work, viz., a well-digested history of the Forest of Essex. In this, after a slight sketch of the "Forest of Essex" and "Waltham Forest," a more detailed account was given of the portion known as "Hainault Forest," which was mostly crown land; of the old perambulations of 1301 and 1640; of the three Forest Courts; the Verderers for petty offences; the Court of Swainmote for jury trials, and the Court of Justice Seat, held by the Lord Chief Justice in Eyre, till abolished in 1777; and of the various attempts at enclosure and the litigation which culminated in the act for disafforesting, passed August, 1851. The subsequent spoliation, settlement of claims for rights of pasturage, estovers for fuel, vicarial tithes, and poor widows' rights were then described; and a short notice of the ancient Fairlop Oak was given, illustrated by a number of engravings of the famous tree, some from Mr. Crouch's and some from Mr. Furbank's collections. In conclu-

And doth with every sort of Grain abound.
The young men there do bear the Bell away
From all the Towns about at Foot-ball play.
Unto a Farmer's house I went out-right,
Who entertained me like to a Knight:
And though at Newport I had din'd before,
Yet here with him I must eat one bit more,
Some ribs of Pork, new kill'd, broil'd on a Grid-
iron

Of seven ribs, three on each side, and one mid-
iron.
But ere they laid them on they did them Salt,
A Shoving-horn to draw down juice of Malt,
Yet this much of his Beer's strength I do know
'Twould well go down without helps there-
unto; "

sion, Mr. Crouch pointed out that "to enjoy the woodlands yet left we must mount higher up into the belt of the forest by Grange Hill to Crabtree Wood, or a piece by Hog Hill, and there as of old the ladies can

Like Robin Hood, still feel themselves the free,
And draw their beaux beneath the greenwood tree."

Mr. W. Cole added a few remarks on some points in the history of the forest. [Mr. Crouch's and Mr. Cole's notes will be printed in full in a later number of the E.N.].

The accompanying view of Fairlop Oak is from an old print published at the beginning of this century, the block of which has been kindly presented by Mr. Crouch. (See Plate V.)

A slight sketch was also given by Mr. Crouch on the surroundings, especially relating to the Claybury Hall estate (230 ft., O.D.), and the new Middlesex Lunatic Asylum, illustrated by a copy of the architect's (G. T. Hine of Nottingham) designs and ground-plan and some views of the old hall, which will still remain as a prominent feature of the park. The old bridle-path through the great gate across to the side of Toms Wood has since been closed, and a footpath formed further south.

The Vicar discoursed on fairs in general, and "Fairlop Fair" in particular, and the eccentric Mr. Day—"good Day" as he was dubbed—who dined his friends each year on beans and bacon beneath the old oak.

The drive was then continued by Oak Row to Mossford Green, and a visit paid to Gaysham Hall, where Mr. Crouch read some notes on the estate, and some good old panelling, &c., was seen. In 1360 it was the property of Thomas de Sandwich, proveditor of the household to Edward the Black Prince, who held it under the Abbess and Convent of Barking, with about 160 acres of land. It was subsequently owned by Sir William Denham, Clement Sisley (who built Eastbury House), and the Breame family, and was sold in 1609 to Gabriel Wight, in whose family it has been handed down, and formed part of the estates of the Hibbit-White family, but was sold soon after the death, in 1867, of Mr. John Wight-Wight of Blakeley Hall, who died intestate.

Lysons tells us that the old Manor House, which was built of timber and very spacious, was pulled down, but Mr. Crouch doubted this very much, and considered that the present house is really a portion of the old building. Due thanks was rendered to Mr. George Brown and his family for allowing the house to be inspected.

Returning to Trinity Church, Barkingside (built 1840), on Mossford Green, the church was inspected, and a visit was paid to the school-room, where quite an interesting collection of various objects had been arranged. The Vicar exhibited many historical relics, and some rare linguistic books, &c. A useful collection of trade products, raw materials in process of manufacture, minerals, &c., the property of Mrs. Denham, and now employed as a school museum, was also arranged for inspection on the tables.

The beautiful grounds and greenhouses of Great Gearies were then visited, by special invitation of Mrs. Whitbourn, and the choice collections of Cyrtipediums and Orchids were shown and explained by the head gardener, Mr. Douglas, who is himself a member of the Club.

The members then drove to Little Gearies, and were most kindly and hospitably received by Mrs. Edenborough and her family, our member, Mr. Edenborough, being away from home through illness. After tea, most charmingly served on the

THE LOCAL (ESSEX) MUSEUM—*Continued.*

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.

The property of the Club will be placed under the care of the following TRUSTEES:—

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Copies of APPEAL and pamphlet of papers relating to the proposal may be had from the *Hon. Secretaries*, Mr. W. COLE, Buckhurst Hill, Essex, and Mr. E. DURRANT, 90, High Street, Chelmsford, who will be glad to give further information to enquirers.

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The Essex Naturalist:

BEING THE
JOURNAL
OF THE
ESSEX FIELD CLUB.

EDITED BY
WILLIAM COLE,
Honorary Secretary.

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7, Knighton Villas, Buckhurst Hill, Essex.

Attention is called to MUSEUM APPEAL on pages 2 and 3 of Wrapper.

THE LOCAL (ESSEX) MUSEUM, LIBRARY, AND LABORATORY.

THE attention of Members of the Essex Field Club, and of all those interested in the practical study of Natural Science, and its applications in industries, and as a means of general education, is earnestly called to the Statement and APPEAL FOR FUNDS for the establishment of the Museum now being circulated by the Council.

The scheme has long been under consideration, and it has been fully explained at meetings of the Club and in the *ESSEX NATURALIST*. Its principal features are as follows:—

With the object of establishing at Chelmsford (chosen as being the County Town, and also as a central position in Essex) a Local and Educational Museum, the club has agreed to amalgamate with the Essex and Chelmsford Museum, under the title of “The Essex Field Club,” conditionally on the sum necessary for founding the new Museum being raised. The main objects in view are:—

- (a) The formation of authentic collections to illustrate the Geology, Mineralogy, Botany, Zoology, Ethnology, Pre-historic Archæology and Technology, &c., of ESSEX and the adjacent sea and rivers, together with an educational series of specimens and preparations to be employed for illustrative and teaching purposes. Specimens that are not of Essex origin will be admitted so far only as they serve to demonstrate the structure and relationship of the local types.
- (b) The formation of a Local and Scientific Library, to include (in addition to standard scientific works), topographical, antiquarian, and other books, manuscripts, maps, parliamentary and official papers, pictures, prints, &c., which in any way relate to the county of Essex.
- (c) The establishment of a Laboratory and Class-rooms, with fittings, apparatus, and instruments suitable for the preparation of specimens for the Museum, and for the practical study and teaching (either in the Museum or in selected local stations throughout the county) of the subjects named in paragraph (a), and for promoting their practical application in Agriculture, Forestry, Arboriculture, Gardening, Fisheries, Manufactures, Industries, and general education. The laboratory, class-rooms, instruments, &c., will be under the control of the Council, who may permit students, investigators, and others to use them, and may also lend instruments and preparations out of the Museum buildings for purposes in furtherance of the above objects.

[Continued on page 3 of Wrapper.]

lawn under the trees, the members inspected Mr. Edenborough's large collection of old watches and other plate, arranged in the billiard-room.

Then on the lawn an Ordinary Meeting (the 125th) was held, the chair being taken by Prof. Meldola, in the unavoidable absence of the President. The following were elected members of the Club:—Messrs. Thos. Bird, James Round, M.P., D.L., &c., H. S. Tabor and J. Lichlenstein; the Rev. J. G. Hughes, Rev. H. M. Milligan, B.A., and Mrs. Ferry, Mrs. Musselwhite and Miss Maud Musselwhite.

Cordial votes of thanks were accorded to Mrs. Edenborough and to the conductors, Rev. W. S. Lach-Szyrma and Mr. Crouch, for their kind exertions in making the meeting a success, and announcements of meetings, &c., having been made, the meeting closed.

The party then proceeded to Valentines, where they were kindly received by Mrs. Ingleby, assisted by Miss and Mr. Holcombe Ingleby. The house was built by a son-in-law of Archbishop Tillotson, about 1690, who often came here for retirement. The "Bishop's Walk" of yew trees is in the grounds, which consist of some sixteen acres, and are exceedingly beautiful, and the rhododendrons being yet in bloom added to the charm. A very enjoyable ramble was made in the cool evening through the grounds and round the spacious lake. Mrs. Ingleby, who is known so well and deservedly for her good works in this poor district, pointed out some of the chief features of the house and the fine collection of Norse drinking vessels and carved household goods, whilst her son, Mr. Holcombe Ingleby, showed the fine library of the late Dr. Ingleby, his father, who was a well-known Shakesperian scholar and literary man, and also subsequently escorted some of the party round the grounds. Some remarks on the house, and the old vine which formerly existed here, were read by Mr. Lach-Szyrma.

Some notes were also given by Mr. Crouch, with reference to Sir Charles Raymond, Bart., who lived here till the death of his wife in 1778. He also owned the manors of Wyfield and Cranbrook, and built the mansion, Highlands, where he resided till his death in 1788. It was he who built in 1765 the triangular tower on the latter estate, which was then called Raymond's Folly, but now Ilford Castle. He intended it for a Mausoleum for his family, but it was never consecrated, and he was buried in Barking Church, where there is a monument to his memory, erected by his two daughters.

The old Manor House of Wyfield (of which Mr. Crouch exhibited a drawing) was standing in 1800, but soon afterwards pulled down. It is interesting to note that in 1598 it belonged to John Tedcastle, whose fine brass, with effigies of himself and wife, is still in Barking Church; and curiously, with the date of his death *not* inserted in the blank space he left for it.

The members found it difficult to tear themselves away from the place, so pleasing in the cool evening, but at last a start was made, and the programme finished by driving through Beehive to Clay Hall, where a short history of the Manor was given by Mr. Crouch, and the chapel, cellar, and other remains viewed. This important Manor was held by the Abbess of Barking, but was leased for 150 years to the Colte family. It was afterwards held by Sir Christopher Hatton, of the same name, and inheritor of the estates of his more famous cousin (the Lord High Chancellor), who married Mistress Ales Fanshawe, and a quaintly worded love letter of his was read. The date is about 1601, and it begins "Sweete Mrs. Ales." Then, after signing himself, "Yrs, in all harty affection," he drops into rhyme in a postscript:—

“ Thus have I rudely rigde this paper saile,
 Soone maye hee waufed bee with happie gaile ;
 Nor needs it piratts feare, for, though it die,
 Loves endles trafique in this breast doth lie.”

This Hatton-Fanshawe alliance is mentioned, though incorrectly, and with altered surroundings, in the Ingoldsby Legend of “ Bleeding Heart Yard ” :—

“ One Alice Hatton, neé Fanshawe—a name
 Which you'll recognise, reader, at once as the same,
 With that borne by Sir Christopher's erudite dame.”

Here he built a chapel, which was consecrated in 1616, but is now used as a stable. One of the large carved oak cantilevers of the chapel roof, a stone tablet in the granary, with shield of arms, and inscription of a later owner, Sir Thomas Cambell, 1664 (who married Mary, daughter of Viscount Fanshawe), and the chapel with its niches and oval windows were seen by the kind permission of Mr. James Lamb.

We may gain some idea of the grandeur and size of Clay Hall, which was one of the most important estates in this end of Essex, from the MSS. of Smart Lethieullier of Aldersbrook, recording the principal houses near Barking, about 1750. He calls it “ A noble seat finely situated, and commanding a pleasant prospect. No less than thirty rooms were standing within a few years past, and it is now entirely pulled down, and a small farmhouse built in its stead.” It is probable, however, from the inscription on the tablet mentioned above, that the mansion had been added to, or rebuilt, by Sir Thomas Cambell about a century before.

The return drive was made by St. Swithin's Farm and Redbridge, through Wanstead to Snaresbrook Station, thus ending a most interesting and successful meeting.

ON CABINETS OF NATURAL HISTORY SPECIMENS FOR CIRCULATION AMONG THE VILLAGE SCHOOLS OF ESSEX.

By F. W. RUDLER, F.G.S., M.A.I.

Curator of the Museum of Practical Geology; formerly Professor of Natural Science in the University College of Wales.

WHEN the Essex Field Club's scheme for founding a Central Museum and Scientific Institution at Chelmsford shall be accomplished, there is one simple way in which it may readily extend its influence throughout the county, and thus lay claim to wide sympathy and support. This is by establishing a system of lending small collections to schools and rural institutions. A number of small cabinets, cheaply but strongly made, and filled with attractive specimens, well-arranged and clearly-labelled, should be issued from

the central museum, and allowed, under proper restrictions, to circulate on loan among the village schools of Essex.

The means of scientific instruction by object-lessons would thus be carried into remote parts of the county, to the great benefit of those least likely to be able to visit the Central Institution. As Matthew Arnold said, with reference to a different subject, "We must take this instruction to the students, and not hope to bring the students to the instruction."

In Liverpool the circulating system is worked with marked success, but is confined to schools within the boundaries of the city. The scheme originated with the Rev. Henry H. Higgins, who has devoted the best years of his life to the development of the great Natural History Museum which adorns his city. A memorandum, embodying the suggestions, was originally drawn up by Mr. Higgins in 1884, and issued by the Liverpool Museum Committee¹. The scheme was duly accepted, and a few months afterwards Mr. T. J. Moore, the curator, presented a report,² giving details of the construction of the cabinets and the nature of their contents, illustrated by three photographs showing the cabinets laid open for inspection. The work of periodically distributing these collections to the schools, and exchanging them for others, has developed upon Mr. J. Chard, an enthusiastic assistant at the Museum; and at the Liverpool Meeting of the Museums Association last year he read a paper on the progress of the scheme.³

It is satisfactory to note that the scheme has been singularly successful. "That the showing of specimens *does* interest the children is abundantly proved by experience," says Mr. Chard. "The promise to exhibit a cabinet to the children, and give a lesson upon it, never fails to secure a large attendance." Surely there is no reason why the success in Liverpool should not be repeated in Essex. That the children in East Anglia—even the children of agricultural labourers in rural parishes—are capable of appreciating scientific instruction, if properly and agreeably presented, was amply demonstrated years ago by the notorious success of Prof. Henslow's botanical lessons in the national school of Hitcham. "No one," said the professor on one occasion, "who had heard the

¹ "Proposed Circulating Museum for Schools and other Educational Purposes." By the Rev. H. H. Higgins, M.A., Chairman of the Museum Sub-Committee. (Jan. 1884.)

² "Report on the Progress of the Circulating Museum Collections." By Thomas J. Moore, Curator. (June, 1884.)

³ "On Circulating Cabinets for Schools and other Educational Purposes." By John Chard, Assistant in the Liverpool Museum. Report of Proceedings at First Annual General Meeting of the Museums Association, 1890, p. 54.

lamentations uttered [by the children of the village school] upon my announcing, at our last lesson before Easter, the necessity of six weeks' absence at Cambridge duties, could possibly have doubted the great interest the children take in these exercises."⁴

Nor is it only in schools that cabinets of Natural History objects would be valued as useful loans; there is no question that they would also be much prized as attractive objects at village soirées and other social gatherings, where adults would have an opportunity of inspecting them. Their educational value would obviously be much increased if, when on loan at any centre, an intelligent person in the locality would undertake to give a demonstration or lecturette on their contents.

It will probably be found desirable that the number of specimens in any single loan collection should be small (perhaps not more than twenty) but that the objects themselves, though not necessarily expensive, should be large and attractive, so as to impress the observer by appealing to the eye. Above all, they should be accompanied by full, descriptive, and bold labels. The selection, arrangement, and labelling of the collections could only be satisfactorily carried out by scientific assistants, experienced in museum work. The Central County Institution is therefore evidently marked out as the place where the cabinets should be prepared, and whence they should issue. The scheme would tend to gain for the Institution respect and sympathy in all parts of the county, even from those who might never come within its walls; while it would probably be the means of obtaining from remote sources donations of local objects of interest.

But there is no shutting our eyes to the fact that such a scheme would naturally entail some expense. Money, which in this sordid world unfortunately measures all things, will assuredly measure the extent to which extraneous work of this character can be accomplished. The longer the purse, the wider the work. But the cost of procuring, arranging, and distributing a few small cabinets will, after all, be but small. May we not say that it will be utterly insignificant in comparison with the good which it is likely to effect in the schools of the county!

Every village school is verily a "workshop of humanity"—the little place where the teachers are busy in shaping the intellect and character of those who in the course of a very few years will be doing the

⁴ Memoir of the Rev. John Stevens Henslow." By the Rev. Leonard Jenyns, M.A. London, 1862, p. 109.

work of the world. The circulating museum, if properly used, may become an unspeakable boon in educating and edifying the children; in drawing-out their observational faculties and building-up their reasoning powers. If the Essex Field Club's Museum will aid in such a work, every educational realist will admit that it will not be simply benefiting the children and teachers in this or that village—it will be indirectly elevating the entire county.

EPPING FOREST RUBI.

By J. T. POWELL.

PART II.—ADDITIONS AND CORRECTIONS.

TWO more seasons among the Forest brambles have resulted in several additions to the list given in the *ESSEX NATURALIST* for 1889 (Vol. iii., p. 20), as well as some revision of that list.

I have again been greatly indebted to Prof. Babington for his aid in determining difficult forms, and more particularly this year have I been helped by the Rev. W. Moyle Rogers, F.L.S., one of our best botanologists, who has not only named the specimens sent to him through the Watson Botanical Exchange Club, but has in the kindest manner rendered me invaluable personal assistance.

Mr. Rogers refers to *R. rhombifolius*, Weihe, a bramble which occurs abundantly about Walthamstow and Snaresbrook, and which I formerly placed under *R. rhamnifolius*. We have also plenty of the robust *rhamnifolius* of the English authorities. A form near *villicaulis* Mr. Rogers identifies as *R. pyramidalis*, Kalt. This occurs sparingly at and near High Beach. The bramble previously recorded as *R. sertiflorus*, P. J. Müll, is believed by the same authority to be a hybrid, probably *rusticanus* × *pyramidalis*, in which case the name *sertiflorus* must be cancelled. A very distinct form of *macrophyllus* has been named by Prof. Babington, *R. amplificatus*, Lees. This occurs at Leppitt's Hill, Buckhurst Hill, and near High Beach. The professor has also given the name *R. plinthostylus*, Genev., to a bramble from Hawk Wood, Chingford, which I had included under *Koehleri*. *R. sprengelii*, Weihe, recorded in 1886 by Mr. J. G. Baker, I have found to be one of the most widely-spread of the Forest Rubi.

An elegant little bramble, entered in the 1889 list as a small-leaved

form of *radula*, is now referred by Mr. Rogers with some hesitation to *R. echinatus*, Lindl. He says: "Under *R. echinatus*, Lindl., I think. A remarkable and very beautiful variety." In this case the name *radula* will have to be omitted. It illustrates the extreme difficulty of classifying some of the forms of this most perplexing genus to note that this not uncommon bramble has been variously named *radula*, *rosaceus* and *echinatus*. It may ultimately require a name to itself. Another bramble, one of the largest and most showy I have yet collected, is in a similar case. Mr. Moyle Rogers says of it: "This handsome plant seems just intermediate between *R. echinatus*, Lindl., and *R. rosaceus*, W. & N., but with mature stems very different from both." (Watson Club Report).

Another bramble found about Walthamstow has been named *R. emersistylus*, P. J. Müll, by Prof. Babington, who has also referred one of the commonest forms under *hirtus* to *R. saxicolus*, P. J. Müll. Another form of the same group he is disposed to place under *R. kaltenbachii*. I think we have two of the three varieties of *R. corylifolius*, but will await the confirmation of the authorities before recording them.

It will be seen that there is work yet to be done among the Rubi of the forest, and that the list, though growing, is not complete.

The following are the additions:—

- R. rhombifolius**, Weihe.
- R. pyramidalis**, Kalt.
- R. amplificatus**, Lees.
- R. sprengelii**, Weihe.
- R. plinthostylus**, Genev.
- R. emersistylus**, Lees.
- R. saxicolus**, P. J. Müll.

The following two species, given in my former list, should be omitted.

- R. radula**, Weihe., and **R. sertiflorus**, P. J. Müll.

NOTES ON THE GLACIAL FORMATION NEAR CHELMSFORD.

By HORACE W. MONCKTON, F.G.S.

[Read at the Field Meeting on July 11th, 1891.]

THE sections which we shall see this afternoon¹ illustrate very well the Glacial formation of this part of Essex. It consists of—

- (1) The Great Chalky Boulder Clay.
- (2) The Glacial Sands and Gravel.

In Norfolk these sands and gravel are underlain by a second Boulder Clay; but here they rest directly on the London Clay, a marine formation of Eocene age, very much older than the Glacial Period.

The origin of the Boulder Clay has given rise to a great deal of controversy. At one time it was supposed to be due to a series of great waves raised by hurricanes and storms which swept over the continents, carrying mud and stones of all sorts with them; but that theory has long been abandoned, and all geologists now, I think, agree that both the Boulder Clay and the materials of which the accompanying sands and gravel are formed were brought into this part of the country during the Glacial Period or Great Ice Age by the agency of ice. There is, however, a great difference of opinion as to the manner in which the ice did the work of transport. Sir Charles Lyell favoured the view that the Boulder Clay was formed of mud and stones melted out of floating ice when nearly the whole of England north of the Thames and Bristol Channel lay submerged beneath the sea ("Antiquity of Man," 4th ed., 1873, p. 273); but many geologists now attribute the transport of the material of which the Glacial beds are formed to the agency of land-ice, either in the form of a vast sheet which covered a great area, or to more or less local glaciers. The Chalky Boulder Clay is supposed, according to the land-ice theory, to have been pushed or drawn along under the ice, or to have been carried enclosed in the ice and deposited where we now see it when the ice melted; whilst the sands and gravels are supposed to be due to glacial streams or rivers flowing over, through

¹ The sections visited were in the gravel pits at Rainsford End, Writtle Mill, and Rol-stons, all in the neighbourhood of Chelmsford and Writtle. See the account of the Excursion, *post.*

or under the ice, and to floods caused by the melting of greater or lesser portions of the ice.

The materials of which the gravel is composed are—

- (1) Flint pebbles more abundant at Rolstons than at Rainsford End, probably derived for the most part from pre-glacial pebble gravel, such as that which still caps the hill at Writtle Park.
- (2) Sub-angular flints, the brown colour of which shows that they have not been derived directly from the Chalk, but from older gravels.
- (3) Black flints, not much worn or rolled, derived from the Chalk. The nearest point at which the Chalk crops out is twenty-five miles distant. These flints have, therefore, travelled at least twenty-five miles, and must have been carried embedded in ice, for they would have been rolled and water-worn had they been brought all the way by water.
- (4) Pebbles of quartz of a white or pink colour, derived either from older pebble gravels or from the Triassic beds.
- (5) Pebbles of red and white quartzite from the Triassic beds of the north. The nearest point at which these beds now reach the surface is near Leicester, ninety miles N.W., so that these pebbles have been carried at least ninety miles, no doubt by ice. The presence of these pebbles in a gravel proves it to be either Glacial or formed of *débris* from Glacial Gravel.
- (6) Blocks of white quartz and of various old rocks, and fragments of Lias, Oolite, &c., probably nearly all brought by ice from the north.
- (7) Small pieces of chert, originally from the Lower Greensand, but derived at secondhand from older gravels.

The Chalky Boulder Clay is here mainly composed of Chalk, and contains pebbles of chalk, chalk flints, pebbles, and fossils from Oolitic or Liassic strata, the whole having come from the north.

The thickness of the Glacial beds is very variable, and they rest on a very uneven surface of London Clay, Chalk, &c., often filling deep Pre-glacial valleys, as at Littlebury, near Saffron Walden, for instance (see Whitaker on "A Deep Channel of Drift in the Valley of the Cam, Essex," Quart. Journ. Geol. Soc., 1890, p. 333, and ESSEX NAT., vol. iii., pp. 140-142, and vol. iv., p. 117), or banked up against Pre-glacial hills which in places rise above them, as at Writtle Park. There are some patches of gravel and brick-earth in this neighbourhood which are believed to be newer than the Glacial beds, but in none of them, nor, indeed, in any beds newer than the

London Clay and Bagshot Sand, have I been able to discover any trace of marine remains, excepting fossils derived from older formations; nor have I seen any reason to believe that the sea has flowed over this part of Essex either during or since the great Ice Age.

NOTE.—Mr. W. H. Dalton, F.G.S., finds fault with my statement that the “Glacial Drift of Essex consists mainly of local material” (compare *ESSEX NAT.*, vol. v., pp. 109, 133); and I therefore take this opportunity of pointing out that of the above classes of materials, No. 1 may well have come from the Eocene beds, or Pre-glacial gravels of the immediate neighbourhood; Nos. 2 and 3 from the chalk or older gravels of North Essex; and Nos. 4 and 7 from the Pre-glacial pebble gravel (Westleton shingle) of North Essex, leaving only classes 5 and 6, which have, no doubt, come from a distance.—H. W. M., 4 November, 1891.

BRITISH ANNELIDS.

WITH ESPECIAL REFERENCE TO THE EARTHWORMS OF ESSEX.

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

IN these days of detailed research, when every department of natural history is being carefully explored, and every secret process in the development of life investigated, it is curious that so little attention has been paid to our indigenous annulosa, and especially the ubiquitous, easily obtained, and readily studied earthworms. Many naturalists seem to be still under the impression that we have but one species of Earthworm in the British Isles, the life-history of which is so thoroughly well known that nothing more remains to be done in the matter of its study. No delusion could be greater. If we limit ourselves entirely to genuine earthworms, or Lumbrici, we shall find at least a dozen well-worked species; and it is perhaps not too much to prophesy that the number will shortly be raised to a score or more. As yet, some of the most interesting portions of the island (not to say the British Isles) have not been examined even in the most casual way, while even those counties whose worm-fauna has been examined, may yet yield numerous other species or varieties when our researches have been more thorough and extensive.

Let me first claim the reader's indulgence for a moment while I attempt a brief description of the class of animals to which the earthworm belongs. If we admit that every member of the animal kingdom must belong either to the vertebrates or the invertebrates—just as every plant must be a phanerogam or a cryptogam—then we know that worms are invertebrates, because they are boneless. Now the invertebrate animals fall into a number of sub-kingdoms, the names of which I need not detail. One of these divisions, however, must include worms, and to it the name of Annulosa, or Articulata, is applied. The latter term, invented by Cuvier to represent this sub-kingdom of animate nature, is now usually replaced by the former; and the Annulose or articulated animals are again subdivided into smaller groups. One of these bears the name of Annelids, the members of which are normally distinguished by the possession of a jointed body and a double nerve-chain on the ventral or under surface of the body. In addition to the earthworms, there are also included in this class the leeches and freshwater worms on the one hand, and the marine worms on the other.

Not one of these groups is well known. There are numerous freshwater worms in our streams and stagnant waters whose life-history has never been carefully worked out by any British naturalist trained in the new school of biology, while the distribution of the leeches is almost unknown. Some attention has been given of late years by the marine biologist, to the curious and surpassingly interesting annelids found on our shores, but the results of their researches are not in the hands of the public. Under these circumstances it seems eminently desirable that something should be done to put us on a level with our continental and American fellow-workers in this department of science.

While I shall hope eventually to deal with each of the groups included among the annelids, it will be necessary for the present to confine attention entirely to that group which is at once the most widely distributed and the most easily worked—the Earthworms or Oligochaetes. This group of animals may be described as pre-eminently domestic. By this I mean, that, wherever man is found, there will the worms be also; whereas they are almost entirely absent from our broad moorlands and bleak mountains, except where the cattle graze, and the collie seeks up the sheep. Their distribution is very wide. The following hints will afford the collector all the information he needs for starting him in his pursuit, experience

being very quickly acquired by the field-worker after he has made one or two excursions.

1. Gardens and cultivated soil, especially if "fat," will always yield a good supply. The species usually found here has been always termed the earthworm (*Lumbricus terrestris*), but we shall find that this old aggregate term needs revision, and the various species, forms and varieties, rearranging. The worms found in these situations vary immensely in colour, size, shape of hinder extremity, and in other particulars, and a good series should be secured.

2. Lawns, grass plots, pastures, and the paths through the same, are also very productive. In the garden or field digging can be resorted to: not so very frequently on the lawn. Here, however, other methods can be adopted. Those naturalists who do not retire before midnight can carry a bull's-eye on to the lawn before going to rest, and thus secure a good supply. Others prefer to spread an old carpet on the short sward. Nothing, in any place, succeeds better than this. I have taken my heaviest "bags" by the side of a stream where an old piece of sacking has been thrown, while my friends have often told me, when it was too late to benefit by it, what numbers of worms had accumulated under their carpets which had been spread on the grass. The species differ in many cases from those dug from the rich soil.

3. Manure heaps, lumps of compost, decaying leaves, lawn grass in a state of decay, quitch and rubbish mounds on the borders of fields and occupation roads will abundantly repay a careful examination. Here, especially in very old manure and thoroughly rotten vegetable matter, the brandling will lurk, while the angler's gilt-tail, the red worm, and others will abound.

4. Next away to the stream or pond, to any spot in fact where water is found, only let clay and iron be absent. Mineral waters do not seem to be required by worms to keep them in health, and clay is not necessary to keep them cool. So far as my experience goes it is useless to look for worms here, unless there be some unusual factor at work to entice them. In every other case the pond, ditch, stream, gutter, will yield a golden harvest. The stones should be overturned, the tufts of grass pulled up by the roots and carefully examined, and the soil and *débris* dug up to the depth of a foot or so for different species. The curious little square-tail will haunt the grass roots: the turgid worm, the mucous worm, and the green worm will probably be found under the stones, and frequently fine specimens of the ruddy worm will occur as well.

5. Nor should the woodlands be neglected. Under some species of tree no worms seem to thrive, while under others they multiply amazingly. It is as well to begin by the hedgerow where leaves and vegetable mould have accumulated, then work further in towards the denser parts of the copse or forest. Usually the humid spots are the best; but I have often found worms some inches under the soil in

drier places, coiled up in a state of quiescence, and perfectly clean within and without.

6. I need mention only one other favourite habitat. In passing through pasture land it is well to overhaul the dry droppings, the stones or boulders which are large enough to keep the grass from growing, and the decaying timbers, old logs, unbarked trees, and other similar harbourers of uncanny creatures. Here will be found the purple worm, the green worm, the red head, marsh worm, and gilt-tail, with perhaps one or two others.

It will be seen that there are few places where worms may not be sought with some reasonable hope of discovering sufficient to afford one occupation for many days to come. It will perhaps be well to indicate here how worms should be prepared for future use. The process is simple. The collector should carry with him a tin box or two containing a sufficient quantity of soft, damp, clean moss, to fill the receptacle loosely. It would be well for the beginner to have a separate box for each locality, duly numbered or labelled, so that he might have a means of learning what worms were peculiar to certain habitats. After keeping the worms a short time in the moss, to clean and scour, they should be carefully removed one by one, with as little rubbish as possible, and put into an old tumbler half filled with water. When all the worms from the tin are transferred to water, a little common salt should be dropped in if it is intended to preserve them for future use. This causes them to empty their canal of excrement, which would otherwise greatly interfere with section cutting. Let the worms now be transferred to another glass of pure water, leaving the refuse behind. If it is necessary to examine the worms alive, in order to note their colours and other external characteristics before they are changed by the preservative medium, let a little methylated ether be dropped into the water. This quiets without painning them, and soothes any slight irritation caused by the salt. They can now be examined on a plate, sketches or drawings taken, the colours imitated, and the worm transferred to weak spirits. This will kill the creature while it is still in a comatose or unconscious state—for of all things in the world a naturalist must avoid giving even a worm a needless pang—and, finally, it can be placed in strong spirits for permanent preservation.

(To be continued.)

THE GEOLOGY AND SCENERY OF THE CLUB'S VOYAGE FROM MALDON TO CHELMSFORD, AUGUST 8TH, 1891.

By T. V. HOLMES, F.G.S.

[*Read August 8th, 1891.*]

IT is now three years since our very pleasant voyage on the Blackwater estuary, from Maldon to the sea off Mersea, took place. On that occasion we sailed (or were becalmed) on a broad sheet of water having low shores composed of London Clay, gravel or alluvium. During our voyage to-day we are towed along a narrow stream, the banks of which are bright with flowers, through a rich valley, bordered by hills of considerable height. At Maldon we leave behind us the broad tract in southern and south-eastern Essex which is wholly, or almost entirely, free from Glacial Drift, and enter the district in which that formation covers almost the whole of the surface, except that occupied by the valleys of the various rivers and streams. In these valleys the underlying beds appear, that which everywhere exists beneath the Glacial Drift and the Valley Deposits during our course to-day being the London Clay. Indeed, could we prolong our voyage up the Chelmer as far as Dunmow, or ascend the other streams, which, when united with the Chelmer, form the Blackwater, as far as Braintree or Coggeshall, we should still find London Clay in the sides of the river-valleys, and Glacial Drift capping the plateaux between them. In this district the Glacial Drift generally consists of gravel covered by Boulder Clay, as we saw during our excursion to Rainsford's End and Writtle on the 11th of July. Sometimes, however, the gravel is absent, sometimes the Boulder Clay; and more rarely, as in the new railway cutting at Maldon, a little Boulder Clay may be seen underlying the gravel. The full thickness of the London Clay in Essex is perhaps 450 feet, but of course this is only attained where it is capped by the conformable Bagshot Beds. Where it is covered by the highly unconformable Glacial Drift, as between Chelmsford and Maldon, or is exposed at the surface, as between Brentwood and Rayleigh, its thickness is much less. Thus, beneath Valley Gravel, near Maldon railway station, were 130 feet of London Clay, there being 21 feet of gravel. And at Maldon Waterworks the London Clay is said to

be 234 feet thick. On the other hand, at the waterworks at Moulsham, near Chelmsford, the surface beds consisted of $63\frac{1}{2}$ feet of Glacial Drift, which rested upon $86\frac{1}{2}$ feet of London Clay. The river-gravel and alluvium, which occupy the flat ground close to the streams, are the work of the rivers, and are consequently confined to their valleys. Rivers are perpetually tending to change their courses, to eat into the bank on one side and to deposit gravel, sand, or loam on the other. The nature of the material deposited in this way at any given spot depends partly on the force of the current, partly on the nature of the rocks higher up the stream. These valley-beds between Maldon and Chelmsford probably seldom exceed twenty feet in thickness, and average less. They, in all probability, rest everywhere upon the London Clay.

As we leave Maldon, a broad flat of river-gravel appears on the northern bank of the Blackwater between Heybridge and Langford, and a small patch surrounds the railway station. It is slightly higher in level than the alluvium of the marshes. Old river-gravel has always been a favourite site for human habitations, whether towns, villages, or isolated dwellings, while houses on marshes are extremely rare. As we ascend the river, few patches of gravel of any size are seen, while the alluvium of the marshes occupies a belt of ground bordering the stream, and having an average breadth of rather more than half a mile throughout our voyage. It forms excellent pasture land.

As already stated, the higher ground on each side consists of London Clay capped by Glacial Beds, the latter being hereabouts almost wholly gravel. Between Chelmsford and Maldon, on the southern bank, this Glacial Gravel covers a considerable area, and the overlying Boulder Clay is seen only here and there in small patches. Between Little Baddow and Chelmsford this gravel is shown on the map of the Geological Survey (1 N.E.) as coming down to the level of the alluvium on both sides of the stream. Mr. Whitaker, however (*Geology of London*, vol. i., p. 316), is inclined to think that the wash of sand and gravel down the slopes may have proved deceptive. No doubt there is glacial sand and gravel low down on these slopes, where it is depicted as being, but it is not where it was originally deposited. The material belongs to the Glacial Period, but all of it below a certain level has been washed down the hillsides during the ages in which the Chelmer was cutting its way downwards to its present level, and thus forming the valley

which now divides the Glacial gravel of the plateau of Tiptree Heath from that of Danbury.

Beacon Hill, between Wickham Bishop and Great Totham on the right, and Danbury on the left, are noticeable as hills of somewhat unusual height for this part of Essex. At the County Asylum of Wickham Bishop a well of unusual interest was sunk about a dozen years ago. The base of the London Clay was found at a depth of 295 feet from the surface, then the Woolwich and Reading Beds were pierced, and at 343 feet a fault was crossed and the

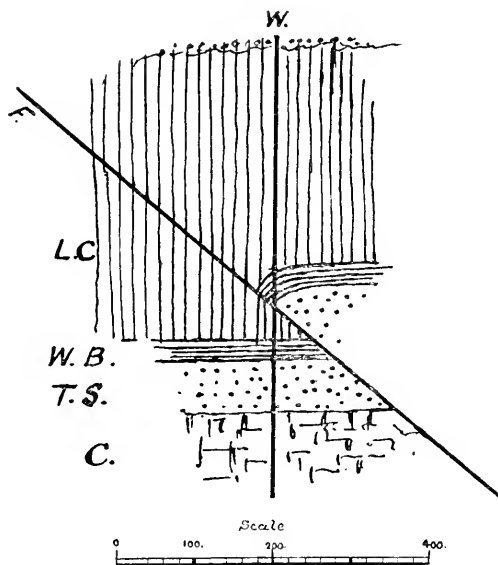


DIAGRAM TO ILLUSTRATE THE EFFECT OF THE FAULT AT THE WICKHAM BISHOP WELL.

W.—Well. F.—Fault. L. C.—London Clay. W. B.—Woolwich Beds. T. S.—Thanet Sand. C.—Chalk.

London Clay again bored through and its base reached at 383 feet. Mr. W. H. Dalton described this well and the fault in our "Transactions" (vol. ii., pp. 15-18, pl. 1), and there gives a diagram showing a reversed fault, or one inclining to the upthrow, and not, as usual, to the downthrow. The late Searles Wood, on the other hand, in his note on the subject in our "Transactions" (vol. iv., June, 1885), prefers to account for the peculiar section in the well by the supposition that there is a very singular S-like fold in the strata.

and thinks a fault unnecessary. For my own part I am inclined to favour Mr. Dalton's explanation as the more probable one; for the Tertiary rocks of Essex afford no evidence of being contorted anywhere, and, on the contrary, appear to be singularly free both from contortions and from faults of any magnitude, such as abound in mountain districts. It is, indeed, almost impossible to imagine the existence of a contortion of this kind in strata so soft and of so late a date as those of Essex. But a reversed fault may exist anywhere, and a small one at Loam Pit Hill, Lewisham, in Woolwich Beds, which I noted there three years ago, is figured in Whitaker's "Geology of London," vol. ii., p. 333. As regards the fault at Wickham Bishop, my reason for giving a diagram to illustrate its effects, instead of referring the reader to Mr. Dalton's section, is that the latter, being without shading, is not so intelligible to the non-geological eye as a shaded drawing; and the increased slope here given to the fault also tends to make the result more obvious.

But the question of most interest for us at this moment is whether the fault in question, or any others known to exist, have had any noticeable influence on the scenery of this district. That faults may have a very powerful influence on the scenery of a locality is evident to all who have studied the geology of a place like Settle, in N.W. Yorkshire, where massive limestones of great thickness have been thrown against beds of a totally different kind. But in Essex, though many faults doubtless exist of which we have no evidence, nothing is known of faults of any great importance, nor is there anything in Essex geology which can be accounted for only by their aid. Besides, the Tertiary rocks, with the Glacial and other drifts, which form the surface of the country are all alike soft, and give no indication of the range of a faulted line such as we get when hard and massive rocks are brought side by side with softer beds. It is obvious, indeed, here in central Essex, that where the London Clay, uncovered by other strata, forms the surface, we have gently undulating country, while a gravel-covered area, whether at a high or low level, has a flattened contour—flatter even than that of the districts covered by Boulder Clay. But if we enquire what explanation can be given of the unusual height of the plateau of Danbury on our left, and of the ridge of Tiptree Heath on our right, what answer can be given? The Wickham Bishop fault does not appear to me to throw any light on the matter. We have no evidence as to the direction in which it ranges, nor does it appear to be of any great size. Nor do we know

of any important fault which points in this direction. The only one, indeed, shown on the Geological Map which may possibly continue to exist in this locality is that which throws down the Chalk on its northern side to a depth of about 40 yards at the Royal Naval College, Greenwich. But even in the case of faults of much greater size, it is in the highest degree rash to prolong them in any direction without evidence of their existence. To illustrate this point I have brought with me a map of a portion of the Yorkshire Coalfield, which gives a fair notion of the average state of things there. It becomes at once evident on glancing at this Yorkshire map that where faults exist others range more or less parallel with them, and are crossed by a second series having an average direction nearly at right angles to that of the first-named group. The evidence afforded by a map like this is of special value on account of the absence of drift, the greater facility of tracing faults at the surface (as compared with Essex), owing to the interstratification of hard and soft beds, and to the information obtainable from colliery plans. Yet it shows how few faults preserve an independent existence for a distance of even six or seven miles, most of them being stopped off by others crossing them in a much shorter distance. And—to return to Essex—we have no evidence of the continued existence of the Greenwich fault north of the Thames, while the distance between Greenwich and Danbury is about thirty miles, in a straight line.

If, however, we turn our attention from faults to those folds in the strata which Mr. Dalton has so thoroughly worked out in his paper on "The Undulations of the Chalk in Essex" (ESSEX NAT., vol. v., pp. 113-117), we may obtain, I think, some explanation of the unusual height of Danbury and Tiptree Heath for this part of Essex. It is well known that where beds are thrown into synclinal folds they are usually better preserved than where they form anticlinal curves. Outlying hills are, therefore, usually found where the strata lie in a trough or basin, and consequently dip towards the centre of the hill, not away from it. Now, if we draw a straight line along the axis of Tiptree Heath, across Danbury, and prolong it in a south-westerly direction, we find that it passes through, or close to, the equally lofty Bagshot outliers of Stock, Billericay and Warley, each attaining a height of more than 300 feet. Beyond Warley we soon reach the broad flat of old river-gravel and alluvium which covers so much ground north of the Thames. But if we prolong our line southward of the Thames we find ourselves at Shooters' Hill (120 feet), the

highest ground in the district between Greenwich and Dartford, which certainly lies in a slight synclinal basin, the Blackheath Pebble Beds at Woolwich dipping slightly under Shooters' Hill and coming up again southward of it at Eltham. It seems, therefore, probable that the Bagshot outliers of Warley, Stock and Billericay, with the heights of Danbury and Tiptree Heath, may owe their preservation in a considerable degree to their position on a long line of synclinal fold.

MOLLUSCA OCCURRING IN THE NEIGHBOURHOOD OF BISHOP'S STORTFORD.

ADDITIONS AND CORRECTIONS.

By EDWIN G. INGOLD.

SINCE my paper on the above was published in the *ESSEX NATURALIST* (vol. iv., pp. 215-217), I have been able to add two species to the list of local Mollusca; and I find it necessary to make corrections in the determination of some species in my collection, at the instance of the referee to the Conchological Society.

The additions to the previous list are:—

Ancylus lacustris, L. River Stort; uncommon.

Helix hortensis, Müll. Hedgerows; common.

The corrections necessary to be made are:—

For *Paludina contecta* read **P. vivipera**, L.

Delete *Zonites alliarius* and *Z. excavatus* (the supposed specimens of the former were a variety of *Z. cellarius*, and the latter a variety of *Helix hispida*).

For *Helix concinna* read **Helix hispida**, L.

For *Pupa umbilicata* read **Pupa marginata**, Drap.

All the remaining species in my list are, I believe, correctly named, and I regret that any mistakes should have occurred.

NOTES—ORIGINAL AND SELECTED.

Late nesting of Rooks at Felstead.—Mr. J. French, writing on October 28th, said:—"Some Rooks of about five or six weeks old have been observed since October 20th in this village (Felstead). Nothing is known of their nest, or whether they are first or second broods. It is believed to be an uncommon

phenomenon." And again Mr. French wrote on Nov. 16th: "A nest of Rooks of about a fortnight old is now perched upon a tall elm tree in the village of Felstead. The nest is evidently an object of much interest to many Rooks, who daily visit it—partly perhaps on account of the untimely season, and partly perhaps on account of the experimental situation of the nest; this, with one exception, being the only nest which has produced young ones on that clump of trees, although experiments have been made annually for more than ten years. Its exposed situation has always proved disastrous to the nest, and I have invariably noticed that the twigs have been completely blown away before sitting commenced. The one exception is the nest which produced the Rooks late in the summer of this year, of which I have sent a notice. It escaped observation until quite recently. The thick foliage as against the bare twigs of March seem to act as a protection, as the great storm of last Wednesday did not affect this nest."

Grey Phalarope and Common Skua at Bradwell-on-Sea.—Mr. R. G. Owen, of Trent College, Nottingham, writes that single specimens of these uncommon birds were sent to him from Bradwell in the last week in October.

Oysters and Mussels in the Crouch in 1891.—"The oyster spat this year has been, contrary to early prognostications, a very poor one. Mussels are found everywhere in great abundance. Were they to confine themselves to their recognised quarters, *viz.*, the mussel banks some miles from the mouth of the river, little cause would be felt for complaint. The oyster layings are, however, infested with the mussels bunched together with rock, shells, and weed, which causes them to gather large quantities of mud in their vicinity. If disregarded this would speedily choke the oysters, and consequently much time has to be spent in lifting them up from the deposit. The oyster, unlike the mussel, has no power to change its position. The latter is capable of erecting itself on edge and going forward with a slow laborious motion. If thrown into a lake separately mussels are sometimes taken in bunches of many together. As an instance of the rapidity with which these animals collect mud, a bushel of mussels was put down upon a clean sandy foreshore, and at the end of two months they were found lying on the surface of two feet of mud. The season for mussels is from July to October."—*Essex County Chronicle*.

A Hunt for "Swallow-tails."—"On Saturday the members of the Felstead School Natural History Society made an excursion to Wicken Fen, Cambridge, which is about the only piece of wild fen of any extent left in England, and almost the only known home of the beautiful swallow-tail butterfly in this country. The party, which numbered between thirty and forty, was conducted by the Rev. E. Gepp, Hon. Sec. of the Society, and accompanied by Mr. J. F. Martin and Mr. F. H. Meggy. The spoils of the day included about twenty specimens of the swallow-tail (*Papilio machaon*), the hog's fennel (*Peucedanum palustre*), on which the caterpillar of the swallow-tail feeds, the marsh fern (*Lastrea thelypteris*), great spearwort (*Ranunculus lingua*), flowering rush (*Butomus umbellatus*), &c. Returning by water to Clay Hithe, full justice was done to a substantial meal prepared there, after which the party entrained, and reached Felstead about seven p.m., immensely pleased with the day's expedition."—*Essex County Chronicle*, July 10th, 1891.

Melampyrum arvense in Essex.—I have received from Mr. Edwin E. Turner a specimen of *Melampyrum arvense*. It was found at Faulkbourne near the Fairstead Road. This is an uncommon plant, only being recorded for two localities in our county.—J. C. SHENSTONE, Colchester.

there is to be considered, not only the possibility of the area being underlain by Coal Measures (an idea first suggested by myself in 1877, and to which recent discoveries give a considerable degree of support), but the probability of the land being ultimately required for the purpose of some public building, if not that for which it was primarily secured. The well sunk by the county authorities proved waterless, because (as I told the engineers soon after they commenced operations) the spot selected is on a line of ancient disturbance of the strata, which are faulted and crushed, so that the same beds are penetrated twice over in the boring. This movement has closed all the water-bearing fissures in the chalk in its immediate vicinity, but has not injured the yielding powers of that rock at short distances away from the line of fault. The direction of this line is precisely determined by the boring at Messrs. Thorn and Swermore's brewery at Messing, confirming the previous hypothesis of the line coinciding with the trend of the hill. At Messing, the crushing has been less severe, and a sufficient supply was obtained. Consequently, a well not far down the hill to the N.W. of the site would yield an ample supply, and the only difference in cost of pumping would be the trifling extra 'duty' arising from friction in an oblique instead of a vertical pipe. If, therefore, it is decided to sell the land, it should be as a magnificent site for a large building, with every natural advantage, water supply included."—[This fault was described by Mr. Dalton in our "Transactions" for 1881 (vol. ii., pp. 15-18), and is referred to by Mr. Holmes in the present number of the E.N. (*ante*, p. 199).—ED.]

Ancient (? British) Pottery at Felstead.—A very ancient piece of pottery has recently been dug from a gravel-pit at North End, near Felstead. It is shaped by hand, and although fragmentary, its form and dimensions can be made out. It is a round dish of about eight inches diameter and four inches in height. The pottery is of coarse earth about three-fourths of an inch in thickness, and has mixed with it an abundance of pounded flint, the particles being rather larger than a pin's head. It has been very imperfectly baked, although it has certainly been subjected to a considerable heat. It is now in possession of Mr. A. Skill, of Felstead.—J. FRENCH.

Luminous Appearance of the Crouch River.—"All who live by, or have sailed on, the sea, are familiar with the luminous appearance of its waves by night. For some time past this natural phenomenon has been more than usually noticeable in the Crouch. In some places the water shines as far as the eye can reach, and at other times only when the waves break against the side of a vessel, or when the oar of a row-boat dashes into the water."—*Essex County Chronicle*, August 14th, 1891.

THE ESSEX FIELD CLUB.

RAMBLE FROM CHELMSFORD TO MALDON.

Saturday, June 27th, 1891.

THE idea of the projectors of this meeting was to explore the country lying between Chelmsford and Maldon, which is of a very varying and picturesque character, and presents great attractions to the botanist. The rendezvous was the "Saracen's Head," Chelmsford, where, at a little after one o'clock, a very large company of members and friends (including students of the botanical class of the

Chelmsford Museum) assembled, the "Directors" being Mr. F. Chancellor, J.P., the President, Mr. E. A. Fitch, F.L.S., and Mr. Edmund Durrant. In breaks and other vehicles the party was driven along the Baddow Road, and so through the fine avenue of old oaks, elms and beeches to the site of "Great Graces," Little Baddow, where Mr. Chancellor described the interesting features of the remaining fragments of this once important manor house, which takes its name from the family of De Gras, the ancient owners. An account of the former possessors and the present condition of the building may be read in Mr. Chancellor's magnificent work, "The Ancient Sepulchral Monuments of Essex," page 64. The fragments still remaining consist of a portion of the south-east wing, and one of the grand old chimney shafts, and inside one of the old square staircases with cut newels and ballusters. It is now a farm house.

The weather was lovely, and the ramble through Blake's Wood to "Old Riffhams" (where Mr. Charles Smoothy hospitably received the party), a structure also anciently a manor house, which was probably originally a wooden structure, and afterwards encased in brickwork. Mr. Smoothy's knowledge of natural history is well known; the greater part of his collection of birds (presented by himself) is on loan at the Chelmsford Museum; but attention was directed to a Honey-Buzzard, specimens of the Long and Short-eared Owls—all local specimens, and a Golden-eyed Duck, and a Swan, shot in company with Mr. Fitch on the Blackwater, and a Danbury Raven killed by mistake for a Carrion Crow. Close by the house in Holly Grove were shown nests of the Kingfisher, Flycatcher and Wren—the last-named without a dome, under an old coat.

The ramble through the Holly Grove was a delightful experience, the abundance of Foxgloves and the pretty White Fumitory (*Corydalis claviculata*) in full bloom being noticeable features; while the abundant flowers of the Yellow Pimpernel (*Lysimachia nummularia*) in the damp rides was a welcome sight. Dr. J. E. Taylor acted as botanical "Conductor," and readily imparted information to non-botanical members on the numerous plants found in the woods. Then over Lingwood Common (from whence a vast panorama of lowland Essex was visible), through "Bell Hell Wood," concerning the origin of the name of which old Holinshed relates a wild legend.

Leaving this wood the party passed up the meadows to Danbury, where, at the ancient and well-known "hostelry called the 'Griffin,' near Baddow" (immortalised in these words in the introduction to "Waverley"), a cup of tea, enjoyable after the long ramble, and more substantial viands, awaited the pedestrians. The "Griffin" is also mentioned several times in Strutt's romance of "Queenhoo Hall."

Danbury is a village of great interest. It has been commonly described in local guide books as the "highest land in Essex"; but this is an error, as parts of Epping Forest exceed it in height, and the highest elevations in Essex are found in the north-west parts of the county (see *ante*, p. 172). The Club visited Danbury on August 13th, 1881 (Proc. E. F. C., vol. ii., liii.), and in the report of the meeting on that occasion much information about the village and church will be found. The Early-English church (St. John the Baptist) stands within the bounds of Danbury Camp, figured in Morant's "Essex," and more accurately by Mr. F. C. J. Spurrell in *ESSEX NATURALIST* (vol. iv., 138). The ancient and interesting features of the church were pointed out by Mr. Chancellor, notably the three cross-legged wooden effigies of Crusaders, presumably the St.

Clere family (*temp.* Edward I.) figured in Chancellor's "Ancient Sepulchral Monuments of Essex," plates 33 and 34. Several members climbed up to the top of the tower to view the fine landscape, extending over a great part of Essex.

On the pleasant greensward in front of the picturesque old church (both in the very centre of the camp) the party then gathered together, augmented by a scattered fringe of curious visitors, to be photographed by Mr. Spalding, and to hear Dr. Taylor deliver one of his delightful scientific "lay sermons." Considerable regret was felt that time did not allow of a more extended treatment of his subject, which was:—

"THE ORIGIN OF OUR NATIVE PLANTS."

For the purpose of illustration, the specimens gathered during the ramble were laid upon the table in front of the lecturer. Many of them were quite "common objects of the country," Horsetails (*Equisetum*), Bracken-fern, *Bryonia*, Black Bryony (*Tamus*), Spurges, *Ranunculi*, *Polygalia*, &c., &c., but they served as texts for the discourse. Where, asked Dr. Taylor, did our common wild flowers come from? It is very certain they did not originate in the British Islands. We have not a single flowering plant which is peculiar to this country. The only original flora of England exists in the fossil state. Our oldest flowering plants are found in the pipeclays of Bournemouth, and they are allied to, if not identical with, the flora which now characterises Australia and New Zealand. But there were some common flowerless plants, such as the horse-tails and brackens, which had a high geological antiquity in this country. In the Upper Old Red sandstones of Kilkenny, in Ireland, which were deposited in a large fresh water lake before the commencement of the Carboniferous epoch, there were found fossil ferns, club mosses (*Lycopodium*), and plants allied to the quillworts (*Isöetes*): and if we rambled around Windermere Lake at the present time we should find in the woods the royal flowering fern, or *Osmunda*, which could hardly be differentiated from the fossil ferns imbedded in the Kilkenny sandstones. There also are found growing miniature groves of the wood horsetail (*Equisetum sylvaticum*), whilst in the shallow waters, where the green meadows border the lake, would be found abundance of living quillworts (*Isöetes*), so that in this respect our famous English lake as regards its flowerless vegetation resembled that which existed in Ireland in Devonian times. Our bracken fern, so abundant on all commons and heaths, and by our hedgerows, could hardly be distinguished from the abundant fossil fern (*Alethoptris*) found in the Coal Measures, and there was hardly any doubt it was its lineal descendant. Bracken ferns identical in all but a trifling particular with our own, were as abundant in the wild bush of Australia as on our English commons. Their wide geographical distribution proved the enormous geological antiquity of these common plants. The bracken was found not only in Australia, but in New Zealand, in all the great Atlantic islands, near the Cape, in the northern parts of the United States, and even near the equator. No fern in all the world was so widely distributed. Dr. Taylor gave his reasons for believing that the ancient terrestrial, flowerless flora of our planet was a modification of aquatic plants; and showed that the sperm cells of mosses, ferns and others were still possessed of aquatic locomotive organs which were very possibly relics of their ancient aquatic mode of life. Turning to the flowering plants, and producing a specimen of the White Bryony, he asked what it was doing here. We had only one species. It belonged to an abundantly represented tropical order of plants—that of the Gourds; and it was as singular to find it in our hedgerows as it would be to find a Chinese family settled in an English village. The same thing might be said of the Black Bryony, which belonged to another tropical order—that of the Yams. Our English Spurges were dwarfed representatives of gigantic tropical relations, such as the indiarubber and gutta-percha trees. Even our common and too-abundant nettles were herbaceous modifications of the family to which they

belonged, which in warm countries grew to the height of forest trees. It might be that these slenderly represented British plants were relics of the ancient tropical flora of Eocene times. Similarly on the tops of our British mountains would be found an abundance of flowering plants met with only in similar situations in Switzerland, but which grew at the sea level in Arctic regions—such as pinks, gentians, saxifrages, and others—and he drew attention to the fact that nearly all our early spring flowers, which appeared before the warmth of the summer, belonged chiefly to Arctic and Alpine orders. There was much reason to believe that these cold-loving plants came over to Great Britain during the Glacial Period, and had remained ever since. The lecturer also showed that in the south of Ireland and Cornwall there were flowering plants which were outliers of the Spanish flora, which had spread thither when the intervening sea bed was dry land. He then turned to the fact of the recent formation of the German Ocean, proving that the depression of its bed had probably taken place since the appearance of man upon the earth. Probably since then also the chalk downs, which formerly stretched right across from Dover in Picardy in France, had been breached through, so as to allow the waters of the German Ocean and the English Channel to form the Straits of Dover. When England and Ireland were a continuous western prolongation of Europe, the common European plants would naturally spread over them. It was in this way that our daisies, buttercups, primroses, cowslips, dandelions, campions, roses, grasses, and other abundant wild flowers came to us. Dr. Taylor also dwelt upon the ups and downs of floral life as related to the great climatic and geographical changes which had taken place in Europe since the Pliocene Period, or the time when the crags of Suffolk and Norfolk had been formed. Our plants, said the doctor, like the great English people, have come here from various directions. Some of the plants that lived in cold climatic conditions adapted themselves to our changed climate by appearing only in the early spring, others by surviving only on mountain heights. "Saxon, Dane, and Norman are we," wrote Tennyson; and the same might indeed be said of our British flowering plants.

Dr. Taylor having been warmly thanked for his interesting lecturette, the ramble was continued along the Rodney Road towards "Cherry-tree Cottage"; then through "Fir-tree" and "Pheasant-house" woods (where a huge nest of the wood ant (*Formica rufa*) was seen), which include a large variety of forest trees, notably some fine beeches; and where the curious Butcher's-broom, the only woody monocotyledonous plant in Britain, is abundant. Then across Woodham Walter Common, covered with oak scrub, and the home of the Lily of the Valley, Buckbean, Wood Pimpernel, many ferns and other interesting plants. The Deptford Pink and Golden Saxifrage have been found there, while the Badger once made the Common its home. Abundant patches of the Sundew (*Drosera rotundifolia*) were found among the *Sphagnum*s on the boggy hill-sides, and two specimens were found, each of which had captured by means of its glutinous tentacled leaves, a poor little blue butterfly (*Lycana xerusa*); one of the insects was already dead, the other was still struggling in the clutches of its relentless captor.¹

But the special train was to leave Maldon at 8.45, and the hasty walk rendered necessary to reach the station in time precluded any extended botanical or other observations; nor could the other items on the programme be carried out—the visit to Woodham Walter Church, and the Hall, interesting as being the last place in England where the Royal Hawks were kept by the Duke of St. Albans, Hereditary Grand Falconer, and Lord of this Manor, being unavoidably

¹ As recorded in our "Journal of Proceedings" (vol. i., p. xxiii.) I have on two occasions in Epping Forest seen, on *Drosera*, butterflies thus entrapped—the species being *Satyrus janira*, an insect measuring two inches across the wings.—W. COLE.

left for another occasion. It was evident to everyone present at the meeting that had time permitted the district so rapidly traversed would have furnished many interesting specimens both to the entomologists and botanists. The New London Road was reached at last, leading the party over Wintersleet Hill to the ancient town of Maldon, already so well explored by the Club—but some missed the train after all!

GEOLOGICAL RAMBLE AROUND CHELMSFORD

(In conjunction with the Geologists' Association).

SATURDAY, JULY 11TH, 1891.

Conductor—HORACE W. MONCKTON, F.G.S.

THE party started from Chelmsford Station soon after 2.30 on Saturday afternoon, and walked along the Roxwell Road to the water tower and reservoir of the Chelmsford Waterworks, which were inspected under the guidance of Mr. Chancellor. The spring, roofed over, from which the water is pumped, attracted considerable notice. A gravel-pit in an adjoining field was then visited. It was found to show a very good section of well-stratified sand and gravel, overlain in two places by patches of Boulder Clay. One of these patches filled a great hollow in the underlying gravel, and the manner in which this hollow had been formed and the clay deposited in it became the subject of a most interesting discussion, in which the Rev. E. Hill, F.G.S., the author of a paper on Boulder Clay, read at the Geological Society on the 24th June last, and Mr. F. C. J. Spurrell, a well-known authority on River Gravels, took part.

A short paper, "Notes on the Glacial Formation near Chelmsford," was here read by Mr. Monckton (see pp. 191-193).

Leaving this pit the party crossed the River Can, and, passing through Admiral's Park, walked to another gravel-pit close to the bridge over the River Wid, at Writtle. Here, again, the section shows Glacial Gravel overlain by a clayey bed, which is probably partly decomposed Boulder Clay, and partly brick-earth of a more recent date. On a heap of gravel in the pit several large blocks of white quartz were seen, and Mr. Thomas Leighton, F.G.S., found a block of mica-schist containing garnets.

The party then passed through the picturesque village of Writtle (noticing the two masses of pudding-stone at the gates of Writtle Brewery), and visited the Rolstons pit, which, not having been worked lately, did not show as good a section as usual. A considerable thickness of White Chalky Boulder Clay was seen to rest on a somewhat uneven floor of Glacial Gravel (see Woodward's "Geology of England and Wales," 2nd edition, 1887, p. 506, fig. 89). The Boulder Clay was found to contain many small concretions of carbonate of lime termed "racc." A few remarks on the formation exhibited in this pit were made by the Rev. Edwin Hill, F.G.S.

After thoroughly examining this section, the members assembled in a group, and were photographed, after which they returned to Chelmsford along the edge of Hylands Park and through Widford. On crossing the Wid, the party composed of members of the Botanical Class of the Chelmsford Museum was overtaken. The class, under the guidance of Mr. E. Durrant and J. E. Taylor, F.L.S., had spent the afternoon in searching for wild flowers on Waterhouse Farm and the back lane to Widford. On their return to Chelmsford, the united party found an

excellent tea provided at the Saracen's Head Hotel. Mr. E. A. Fitch, the President of the Essex Field Club, took the chair, and Mr. T. V. Holmes, Vice-president of both the Essex Field Club and the Geologists' Association, the vice-chair. After tea Mr. Holmes proposed and Mr. Fitch seconded a vote of thanks to Mr. Monckton, which was cordially responded to; and Mr. Monckton having returned thanks, the party broke up—some returning by the 7.50 train to London, whilst others, on the invitation of Mr. Durrant, visited the Church and the Museum.

ON THE OCCURRENCE OF WESTLETON BEDS IN PART OF NORTH-WESTERN ESSEX.

By J. FRENCH; with Remarks by W. H. DALTON, F.G.S.,
and H. W. MONCKTON, F.G.S.

[Read November 7th, 1891.]

FOR some years my attention has been drawn to certain pebbly gravels used for road metal in the neighbourhood of Stebbing. These gravels are so greatly unlike those excavated in my own neighbourhood (Felstead), that I had made enquiries of Road Surveyors and others; but, beyond their remarks that they were obviously sea-shingle, no information could be afforded as to their place in the Drift series. On reading in the *ESSEX NATURALIST* (vol. iv., pp. 100-102) the summary of Prof. Prestwich's article on the Westleton Beds, I gathered that there was some probability of getting light thrown on these pebbly gravels; and through the kindness of Mr. W. H. Dalton, I was put in possession of the original text,¹ together with some hints and warnings from Mr. Dalton, which have proved very useful in conducting my observations.

In addition to Prof. Prestwich's article, I find that Mr. S. V. Wood, junr., had previously described a Drift Gravel as earlier and underlying his "Middle" series at Danbury Hill and Tiptree Heath. The Geological Survey Map and Memoir, illustrating Sheet 47, except in one doubtful case, provisionally group all the gravels underlying the Boulder Clay into one series. It will be the object of the present paper to show that in the area observed the series is sometimes divisible into two parts, and also to substantiate in many particulars Prof. Prestwich's observations and inferences.

The tract of land to which I would direct attention lies between Bulford Station, near Braintree, on the extreme east, and Dunmow High Wood on the extreme west. Its southern border nearly agrees

with the line of railway. The area is bounded to the north-east by the Blackwater as far as Shalford, and a line drawn from that point through Stebbing Mount to Dunmow High Wood completes the northern limit of the area of observation.

Great changes have occurred at Braintree since Prof. Prestwich visited the spot and drew his sections, presumably in 1849. Those sections are now all concealed. New sections have, however, been opened at higher, at the same, and at lower elevations, and these are in the main confirmatory of those he drew. It is to be regretted that the section in Black Notley cutting (of which he has given such an instructive illustration, Plate vii., Fig. 6) is now covered by *talus*, and there is no present equivalent in that neighbourhood; that is to say, no section at Braintree now shows the Westleton Beds overlaid by the Middle Glacial Gravel. They are generally sharply overlaid by Boulder Clay.

The section shown by the Black Notley cutting I have used as a standard of comparison with other beds. These gravels and sand vary greatly in their composition, but not to such an extent as to be mistaken for the Glacial deposits of the district. Moreover, the variations have proved valuable in cases where the section was small and only one particular variety of sand or shingle was exposed. The sand is sometimes ferruginous, sometimes of a rich yellow colour, and in this case contains almost always abundant, though minute, scales of mica. Sometimes it is quite white, like silver sand. It is generally finely comminuted, and, with the pebbly gravel, contains but little clay. The gravel is well described in Prof. Prestwich's paper (*l.c.* p. 133). Generally it is made up about half of Quartz pebbles and half of Flint, *both well rounded*. It has but very few sub-angular flints, and none sharply angular; and only a small proportion of the stones in number are larger than a pullet's egg. Moreover, the pebbles are enclosed in a matrix of yellow or iron-coloured sand, which has but a small admixture of clay. In this respect the gravel differs radically from the Middle Glacial Gravels of the district.

The Middle Glacial Gravels are well developed at Felstead and Great Waltham, and generally just south of the area under consideration; and, however much these gravels may vary in more widely separate localities, they certainly do not, for the few miles in or near the tract under consideration, show a great amount of variation. Cases occur where, as Prof. Prestwich points out, they are hopelessly mixed up with the Westleton series; but sufficient instances remain

where no such mixing occurs, and where the one cannot easily be mistaken for the other. Briefly, they may be described as being made up of angular and rounded rocks, chiefly flint, and the angular often in excess. Besides the flint, there is a motley collection of various hard rocks—Quartz and Quartzite, Sandstone, &c., and some Volcanic (Crystalline). The latter I have never found in Westleton Beds. Prof. Prestwich's distinction of the Glacial Gravel is that of the presence of dark brown ovate pebbles of quartzite out of Triassic beds. This distinction I have not been able to apply, but it is doubtless due to the narrowness of the field, or to imperfect observation.

We will now take the sections in detail :—

From Bulford Station to Braintree Station, the line of rails entirely rests upon Westleton shingle, the embankments filling up the valleys near both stations being made up of Westleton rock derived from Black Notley cutting, which lies intermediate between the two. This cutting is from 20 to 30 feet deep, and the Westleton Beds are, perhaps, of twice that thickness. I infer this from the exposure of London Clay made on the other bank of the small river flowing to the west of the cutting. It is capped with Boulder Clay, which, as before stated, in all visible sections, is sharply divided from the Westleton Beds, and has no intermediate member. The want of this intermediate member (Middle Glacial Gravel) is apparent at Braintree particularly, and more or less in the whole area under observation. In fact, it is partly due to this that we have exposures of Westleton at all. Most of them are made for gravel pits, and these are not workable to a great depth. Therefore, if the upper gravel be Glacial, and this much exceeds 15 feet, we have no knowledge of the underlying bed, as it is rarely pierced, except in the case of wells, which we shall note later.

At Braintree, the Westleton Beds have been very much disturbed on the southern side of the town. The disturbance was most likely due to river erosion in Post-glacial times, either leaving a cliff on the side of the hill, or producing a landslip of some magnitude. The facts are as follow :—In Hunnable's gravel pit, which lies on the slope of the hill at about midway from its summit to the river flat. Mr. Kenworthy obtained clearly-worked flint implements and bones. These were overlaid by 15 feet of undisturbed shingle, palpably Westleton, and this again by 5 feet of Brick-earth. The explanation seems to be that they were covered by *talus* from a cliff;

or that an enormous mass of gravel had slipped over the relics. As, however, the brick-earth is not of a kind agreeing with ordinary rain-wash, but appears to have been formed *in situ*, the latter supposition (unless we refer them to Pre-glacial interment) seems to be the only one admissible.

This section is, I believe, at a greater elevation than any treated of by Prof. Prestwich at Braintree. As a disturbance, therefore, has probably occurred at that elevation in Post-glacial times, should it not rather modify his statement as to the gravels at lower elevations, "round which the glacial beds wrap" (*l.c.* p. 134)—the more so that no true Boulder Clay is found in the valley there?

The Westleton series extends to the summit of the hill, but at places on the top it has a capping of about two feet of Boulder Clay. The total thickness of Westleton Beds there cannot be less than eighty feet, as stated by Prof. Prestwich.

The Boulder Clay, trending in a north-westerly direction, attains a considerable thickness near Panfield Wood, but at a point about a quarter of a mile north of that wood it has thinned out somewhat, and under two or three feet of Chalky Clay the Westleton Shingle appears again. It is here of the ordinary pebbly character and unaccompanied with sand for the first six feet, the depth of the section.

On Clap-bridge Farm, south-west of Braintree (marked erroneously on the one-inch map as "Mill-farm"), at an elevation of about fifty feet from the river, there is an exposure of about four feet of Westleton pebbly gravel. No Boulder Clay exists here now, but a large lump of Lower Tertiary Sandstone lying near the surface gives evidence of its former existence.

In the cutting for the goods-siding at Rayne there is a small section of Westleton Gravel. The gravel-pit marked on the one-inch map south of Rayne station is not free from a suspicion of Glacial admixture.

Passing on to Felstead Station, there is a low cutting there of not more than six feet of fine shingle, undoubtedly of Westleton age. Although not by any means a fine or typical exposure, it is worthy of special notice, because from it have been obtained vegetable remains. This was a piece of wood of about six feet in length, and flattened into a thin lamina by pressure. At some parts it is said to have had the consistence of coal, but other parts clearly showed its woody fibre. I am indebted to the platelayers and

signalman for this information, as, unfortunately, I was too late to see the specimen, which had been destroyed.

There can be no doubt on examination of the place, as to its entombment being contemporary with the laying down of the shingle. This piece of ancient flotsam seems to be our only representative of the Cromer Forest Bed series. In further support of the antiquity of this exposure, I may mention another section shown in a gravel-pit about one-eighth of a mile south of this cutting, and at a less elevation down the valley slope. That gravel-pit is capped in part by Boulder Clay, and the underlying gravel (Glacial) is partly made up of blocks, as it were, of the Westleton shingle derived from the older bed. Cubes, in fact, of this material may be cut out completely and compared with the bed where it occurs *in situ*, and from which, probably, it was originally torn. There is a chalybeate spring rising near this place, and I have thought whether its impurities can in any way be traced to carbonaceous matter lying in the Westleton bed, from which it undoubtedly originates.

Our next section is less than a quarter of a mile west of Dunmow station, and is a small exposure at the foot of the hill on which the windmill stands. This is of Westleton shingle. It would not appear to have any great thickness here, because the London Clay rises nearly to the surface opposite Dunmow station.

Passing to the railway cutting a mile further west near the "High Wood" we have the most instructive section to be found in the area. It occurs at the commencement of the cutting. The gravel there abuts rudely on a boss of bright yellow Westleton sand, which, under the sun's rays, glitters abundantly with scales of mica. The false-bedding of the gravels is abruptly broken off at its junction with the sand, and forms a conspicuous feature. Unfortunately, the Westleton sand passes almost immediately under the *talus*, which exists continuously throughout the cutting. The gravel, with its overlying boulder clay, is very finely developed. There is some doubt as to the true character of this gravel. Inasmuch as it is sharply divided from the Boulder Clay, a character common to the "Westleton" over a wide area (see Prestwich and Woodward), it resembles Westleton gravel, but in its uneven lie and total unconformability to the underlying sand it resembles Glacial gravel. Unfortunately, I could find no loose heaps about to assist me in further determination.

As we shall meet with the underlying micaceous sand again, and

as it seems a characteristic of the Westleton Beds, it is worth while here to ask two questions—(1) Is it derived from the waste say of the Chillesford Clay? (2) Has it ever been known to occur in the Glacial series?

In passing north-east towards Stebbing Downs we pass over a ridge of some elevation, say 250 feet above O.D., and more than two miles across. It is a matter of speculation as to whether the Westleton Beds may not enter largely into the composition of this ridge. Yet again it may be due to a fold in the London Clay. Towards its south-eastern end, at a point one-eighth of a mile west of "Throws" Farm, the Drift is about sixty feet in thickness, and the London Clay two hundred feet. (See letter from Mr. Hasler, *Appendix*.)

The sand-pit at Stebbing Downs, to which I now call attention, has furnished some good evidence as to the Pre-glacial age of the gravel and sand. It is shown as "Sand-pit" in the Geological Map. A nodule of clay containing shells was taken from there a few years ago, and submitted to Prof. Keeping, of Cambridge, who pronounced them to be of "Crag" age. Unfortunately the relic has since been lost.² The exposure there is now very fine, and is as under:—

Post-Glacial drift	8 feet.
Westleton Pebbly gravel	4 "
Finely bedded yellow sand, with mica scales, not bottomed	8 "

A shallow pit, one hundred yards to the north-east of the above pit, shows only Westleton gravel overlaid by dark soil of about one foot.

Westleton gravel appears to underlie the mount and stream at Stebbing Park. A small exposure shows that it extends to the level of the stream. It is not thus shown on the Drift Map, being included in the London Clay.

About a mile to the east of Bran End, near the letter "W" in "White House" (one-inch map), there are two gravel pits known as "Blewitt's." One is in the lane, and the other in the field adjoining. That in the lane is a long semi-circular exposure, showing six feet of Westleton shingle overlaid by two feet of Boulder Clay. The pit in the field shows also six feet of Westleton shingle overlaid by four feet of a purple sandy clay of uncertain age. A depression in the lane at a lower elevation shows bright yellow sand with mica scales.

² This specimen of Crag from the Stebbing pit was described by the Rev. Edward Gepp in a note in our "Journal of Proceedings" for April 26th, 1884 (vol. iv., p. xcvi.).—Ed.

The next section is that of the gravel pit just north of Great Saling Church. This exposure is very fine (see figure), and consists of:—

Brick-earth—Boulder Clay	6 feet.
Middle Glacial gravel	0 ft. to 1 ft.
Westleton shingle	12 ft. (not bottomed)

The peculiarity of the Brick-earth is that the decalcification of the chalky Boulder Clay is incomplete, leaving a nodule of Boulder Clay unchanged about midway in the section. This phenomenon I believe to be rare. The Middle Glacial gravel thins off to the right and left, and at a few feet distance is reduced to an inch in thickness.

It would seem as suggested by Prof. Prestwich that the beds may be still more developed in the Thaxted direction. The most northerly point that I could trace was the pit at Park Hall Farm, Great Bardfield. I saw gravel from this pit which could be at once identified as Westleton, but was unable to visit the spot. Again, I am credibly informed that sands precisely similar to those at Stebbing are developed at Shalford and Wethersfield, that is on both sides of the Blackwater river at that place.

On the other hand, there is but small chance of examining what is perhaps but a remnant of the Westleton beds south of the area I have drawn. The mid-glacial and overlying beds effectually conceal the Westleton where it exists. In the village of Felstead the drift deposits attain a thickness of from forty to fifty feet. Yet it is well known that the lower stratum of gravel varies widely from the mid-glacial type. It is, in fact, Westleton shingle or sand, and is the water-bearing stratum into which wells are sunk. The thickness varies from a few inches to six or ten feet, but I regret that I cannot as yet speak with precision of any well-section. Apart from this general remark, which applies to the neighbourhood around, there does not appear to be a section which can be adduced in further illustration.³

APPENDIX.

[*Letter from Mr. R. Hasler, referred to above (p. 215).*]

Mr. J. French, Felstead.

DEAR SIR,—The well for Jubilee Pump in this village is twenty-eight feet deep, and the soil twenty-five feet down was half white or chalky clay, and the

³ Some post-glacial deposits have been mentioned in the above article, and the question will naturally be asked as to the evidence of their age. As they are all curious I purpose to treat of them specially in another paper.

other half, stiff yellow clay or tile earth, then the lower three feet into drift. My well here is about fifty-eight feet deep, white clay at twenty feet through, yellow about thirty-five feet, and then same as above.

Mr. Richardson's, at the cottages here, late "Flitch of Bacon Inn," is the deep well. As nearly as I can remember it was same as mine TO SAME DEPTH; they came on to the London Clay at about sixty feet, and dug eighty feet in it, and then bored about 120 feet lower, all London Clay; had just decided to give up that day when they came on a thin crust of rock, which, having broken through, there came in upon them a great rush of water.

Yours truly,

LITTLE DUNMOW, *May 20th*, 1891.

ROBERT HASLER.

Notes on the above Letter.

The place of this Artesian Well is about one-eighth of a mile due west of Throws Farm, Little Dunmow.

The thickness of the London Clay mentioned is a near approximation to the truth, because the boring was compared at the time with the Saling Well mentioned in the Survey Memoir, and much surprise was expressed at its much greater thickness. The thickness at Great Saling was 165 feet, with seventy-five feet of drift over it, the surface level being 290, according to Mr. Dalton.—
J. FRENCH.

The level of this spot (Little Dunmow) is 288 (new Ordnance Map, Sheet 222), giving the base of the London Clay at $\times 28$, and the Chalk (by inference) at -16 . This fairly coincides with my map in ESSEX NAT., vol. v., p. 113, being a little south of my zero line, on which the Chalk is at sea level.—W. H. DALTON.

REMARKS BY *Mr. W. H. DALTON, F.G.S., AND Mr. HORACE W. MONCKTON, F.G.S.*

[At the reading of the above paper, Mr. Dalton sent some observations, and Mr. Monckton made a few verbal remarks which may be conveniently printed here:—]

"Although I have not had an opportunity of visiting the sections described by Mr. French, whose paper was shown me by Mr. Cole some months ago, I am quite prepared to accept his correlation of these Essex beds with the typical series at Westleton. In some recent investigations in the Chelmsford district, effecting various corrections of the Geological Survey Maps, I have found two indubitable outliers of the Westleton series: *viz.*, at Writtle Mill and Roxwell Hoe Street, whilst the Middle Glacial Gravels in several places are clearly derived in large part from the denudation of Westleton Beds, which were probably continuous across the county originally. The occurrence of the Lower Boulder Clay in similarly severed patches seems to indicate that the principal denudation was in the Middle Glacial period. Unfortunately the Westleton Beds and the Lower Boulder Clay are now both so fragmentary in Essex, that their mutual relation cannot be seen. There can be no doubt (from the Suffolk and Norfolk series) that the Westleton is the older; but whether the unconformity below the Westleton is more serious than that above it, is not determinable, even in the principal area of development and exposure."—W. H. DALTON.

At the reading of the paper at the meeting on November 7th, Mr. Horace W. Monckton remarked on its value, and on the interest attaching to the section near Dunmow High Wood:—"Prof. Prestwich had endeavoured to trace the

Westleton Beds from Norfolk and Suffolk through Essex, Middlesex, Hertfordshire, etc., into the West of England; but there were several breaks in their continuity, and one of the most serious was that between Broxton, near Braintree, and Coopersale Common, near Epping, a distance of nineteen miles. The sections described by Mr. French served to shorten this distance to about fifteen miles, and were so far very satisfactory. It should be noted that Prof. Prestwich says of the Westleton Beds, that they extend from Braintree, by Withersfield, to Dunmow and Thaxted, but are rarely exposed" (Quart. Journ. Geol. Soc., vol. xlvii., p. 134).

SPOTTED EAGLE (*AQUILA NEVIA*) AT ELMSTEAD AND LEIGH; AN ADDITION TO THE ESSEX FAUNA.

SOME time since I recorded the fact of a Crane having been shot in the parish of Elmstead near Colchester (*see* ESSEX NATURALIST, vol. ii., p. 271), and now I am very pleased to announce the occurrence there of a Spotted Eagle—but with this welcome circumstance, that the bird was not killed, but is alive and apparently healthy. If these captures continue Elmstead will become celebrated in ornithological annals as the harbourage of rare birds. Mr. Pettitt, our local taxidermist, purchased the specimen from a gipsy, who had a few days before bought it of the captor, a farm-labourer of Elmstead. On October 29th, the man had noticed a strange bird, in an apparently exhausted state, alight in a field in which he was working. He immediately gave chase, and after the bird had taken a short flight he came up with it and succeeded in taking it alive and uninjured. The specimen appears to belong to the small race of the species, its size and markings corresponding to Mr. Saunders' description of this variety.—HENRY LAVER, F.L.S., *Colchester*.

It was stated in the local papers that on Thursday, November 3rd, a "Golden Eagle" was shot at Leigh by the Rev. R. Stuart King. Having some doubts as to the species, I wrote to Mr. King, and he informs me that the bird he shot was the Spotted Eagle (*Aquila nevia*). It was first seen on the ground in the Rectory meadow at Leigh, and upon being alarmed by a lad, it flew up and settled on a tree. The lad, thinking it was a goose, fetched Mr. King, who, at once recognising it as an Eagle, procured a gun and shot it. Mr. King describes it as a young bird, the spots being very plainly marked. The measurements were: from tips of wings 5 feet, from beak to tail 2 feet $\frac{1}{2}$ inch. He adds: "The bird was evidently

weak from want of food, and was very light. A gale from the N.E. had been blowing for two days, so I imagine that the bird had been carried out of its course. I find that it had been seen two or three days before I shot it."—W. COLE.

[We, of course, give the names of the species on the authority of Dr. Laver and Mr. King. The Spotted Eagle appears to be one of our rarest birds, only six examples having been previously recorded in Great Britain and Ireland (*viz.*, two near Youghal in 1845; two in Cornwall in 1861; one in Lancashire in 1874; and one, in 1885, in Northumberland). Its distribution is thus summarised by Mr. Saunders:—"It is probable that the specific name generally employed was originally intended for the small form which breeds in the forests of Northern Germany, and becomes numerous in Pomerania and the Baltic provinces of Russia; though rare on the eastern side of the Gulf of Bothnia, and only a straggler to Sweden and Lapland. Southward this can be traced through Poland and the marshy woods to the west of the Dnieper down to Bessarabia, as well as to the Caucasus. A larger form, which slightly intrudes on this area, occupies the forest region to the eastward and southward as far as the steppes; beyond which it extends across Turkestan and Central Asia to Northern China, and to some parts of India, Persia, and Asia Minor. It nests in Turkey, the districts watered by and south of the Danube, and suitable localities in Italy and the islands of the Mediterranean; also, sparingly, in north Africa. In the south of Spain it is not common; but I frequently saw and heard it in the Pyrenees. In France and Belgium it is rare, except on the wooded south-eastern frontier towards Switzerland and Luxemburg. In winter both races migrate entirely from their northern, and partially from their southern, haunts in Europe, numbers ascending the Nile valley to Abyssinia." The late severe storms were doubtless the cause of these distinguished visitors' presence in Essex. Possibly they were blown from their course during migration. It is stated that the Elmstead specimen is a young male, in good plumage, the wings extending nearly six feet from point to point. Its appetite is very keen, it having disposed in three days of a large barn-door fowl, a rabbit, and the entire pluck of a sheep! If Dr. Laver is correct in referring the specimen to the small form, it is probably quite new to the British fauna, as Mr. J. H. Gurney stated that all the British examples he had seen were referable to the larger variety, which, he says, is the *A. clanga* of Pallas. The Elmstead specimen forms the subject of a large engraving in the "Daily Graphic" of November 18th.—ED.]

NOTES ON THE MOLLUSCA OF THE THAMES ESTUARY, WITH A LIST OF SPECIES OBSERVED.

By A. J. JENKINS, *Member of the Conchological Society.*

[*Read November 7th, 1891.*]

IN bringing before the Essex Field Club the following account of the Mollusca inhabiting the Thames Estuary, I am free to acknowledge that the list is by no means complete. When asked by your Secretary some time ago to prepare an account of the various species collected by myself in this locality,¹ I was hopeful that I should be able to increase the number during the past summer. Unfortunately, pressure of work during fine weather, and the heavy rainfall when it was possible to steal away from business, have frustrated these bright hopes; consequently, I have been able to make during 1891 but few additions to the list of species previously observed. My attention has generally been confined during the past two years to the marshes bordering the Thames upon either side of the river. I have collected upon many occasions at Beckton, over the marshes at Rainham, Purfleet, Grays, Thurrock, and Tilbury as far as Low Street Station upon the Tilbury and Southend Railway. I have not yet paid attention to the land shells of the Essex Marshes, but I hope to do so in the future.

Parts of the marshes in Kent and Essex are somewhat inconvenient to travel over, particularly after wet or foggy weather, when the roads are rendered almost impassable by thick tenacious mud, and the coarse grass, reaching to the knee, is saturated with moisture. They are also intersected with numerous wide, deep, and in many cases swift running dykes or drains, frequently involving the necessity of a jump to avoid a *detour* of several miles. These ditches are connected with the Thames in many places by drains and sluices, and the river overflowing occasionally at high tides, the water in them is more or less brackish. On the other hand these ditches are interesting to the naturalist, being the abode of numerous aquatic animals and plants; in many places the dykes literally teem with Mollusca, and with Microscopic Algæ and Infusorian life. And although the pernicious effects of the refuse from manufactories, and particularly of the London Sewage, have done much to annihilate the

¹ At the reading of the paper Mr. Jenkins exhibited a complete series of all the species and varieties mentioned, and also presented an almost perfect series to the museum of the Club. — ED.

animal and plant life of large tracts of marsh land, still we hope that for years to come the shores of the estuary will afford ample scope for collecting and observation. Within recent years the establishment of various chemical, gas, and sewage works and factories has caused several species of Mollusca to retreat some miles lower down the river, and in one case, that of *Hydrobia similis*, will soon have completely exterminated this rare and local form. As far as is at present known, the only remaining British resort for this shell is a small narrow ditch, a few yards only in length, the precise locality of which, to prevent vandalism, it is necessary to keep a secret.

The conversion of the Thames into a gigantic sewer has almost abolished "shrimping" near the mouth of the Thames, at Gravesend, and the shoals of fish are fast retreating seaward. Last year a ditch at Beckton, abounding with *Hydrobia jenkinsi*, and a very peculiar tumid variety of the same shell, was completely poisoned by the deposition of a quantity of chemical ballast. In the "Journal of Conchology," vol. vi., page 141, Mr. J. T. Marshall, in an article on the *Hydrobiæ* and *Assimineæ* from the Thames valley, mentioned the fact, that "for some years *Assiminea grayana* has been migrating down riverwards. Many years ago it was found abundantly in the Greenwich marshes; but when Dr. Jeffreys, in 1868, wanted fresh specimens for the purpose of illustrating his fifth volume, he could find only two specimens, after a most diligent search," assisted by Mr. Marshall; and his recorded habitat in that volume was "banks of the Thames, between Greenwich and a little below Gravesend, making altogether a distance of about twenty miles."

Mr. Marshall mentions that in his interleaved copy of Jeffreys', the following note occurs, written in 1872: "This habitat, which was correct twenty years ago, has undergone some change in the interval. At that time Clark and Barlee found it in myriads between Greenwich and Charlton; but at the present time neither Mr. Jeffreys nor myself can find it there. We have, however, found it in countless thousands at Abbey Wood, and Erith, on the raised banks of the Thames, which now seems its nearest locality to London, so that they appear to have migrated a distance of about ten miles:" and Mr. Marshall adds that "as Mr. Horsley has been searching for this species also at the latter stations without success, it must have migrated further still, if the sewage outfall works of recent years has not altogether exterminated it."

A short time after this was written by Mr. Marshall, the Rev. J.

W. Horsley obtained a number of this species from the river bank at Gravesend; and subsequently we collected together a number of living Assimineæ with *Melampus myosotis* at the Salt Marsh near Purfleet. I have frequently taken dead shells from the same habitat as *Hydrobia similis*, and also below Erith; but I have never found living specimens above Greenhithe and the Purfleet Salt-marshes.

The marshes between Greenwich and Woolwich were for some years the recorded habitat of *Hydrobia similis*; but it has long since disappeared from that locality, together with the original colony of the new *Hydrobia* which I discovered in East Greenwich Marshes in 1883.

It thus appears that in a period of about a quarter of a century, several species have been forced to migrate lower down the river from the causes above mentioned. The same causes will also account for the total extinction of rare or local forms not sufficiently vigorous to reproduce their species quickly, or to adapt themselves to new habits and environment.

The list of Mollusca appended to this paper is the faithful record of two years' work; but, as I have said, it is by no means complete, and I am certain that members of the Essex Field Club in collecting along the Essex Marshes will be able to add to it considerably.

Of shells peculiar to the marshes, eighteen fresh-water species, six brackish-water, and nineteen species of land shells have been recorded; or a total of forty-three species. Adding those collected in the lanes and hedgerows in close proximity brings the number up to fifty-four species, with thirty-two varieties.

It is to be regretted that circumstances have not at present permitted a study of the mouth of the Thames for marine forms; neither has there been time for collecting land shells upon the Essex Marshes. But this last omission is less to be regretted; for, on reading the very interesting account of the "Land and Fresh-water Mollusca of Wanstead and the neighbouring districts of the Becontree Hundred," by Mr. Crouch in vol. iv. of the *ESSEX NATURALIST*, I came to the conclusion that in all probability the Terrestrial Mollusca that are most common upon the Kentish Bank, are also likely to be the prevailing species inhabiting the Essex Marshes.²

I have little to say respecting the land and fresh-water shells of this district; but will take the opportunity of making some remarks

² I was also pleased to find that the pretty little many-whorled shell *Planorbis contortus*, which I had reason to believe was both rare and local, having only taken four shells once in two years, has been recorded by Mr. Crouch as common in quite a number of localities in the Becontree Hundred.

with regard to the brackish-water species, and also a few words of explanation of the difficulties which have arisen, by reason of the discovery of the new *Hydrobia*, which is now generally considered by conchologists as worthy of specific rank.

Our British Hydrobiæ and Assimineæ, which were originally divided by Dr. Jeffreys into two distinct orders, would seem to occupy a somewhat anomalous place in the Molluscan world. They are not all strictly marine in habit, neither can they all endure long immersion in fresh water. To me they appear to form distinctly a connecting link between the fresh-water and the marine Mollusca.

Take the Hydrobiæ for instance, of which family *H. ulvæ* nearest approaches to the purely marine species; whilst *jenkinsi*, by the readiness with which it adapts itself to fresh-water environment (during which it will remain hardy and vigorous for prolonged periods, reproducing its species with remarkable fertility), certainly serves to connect the two groups. *H. similis* also does not object to water that is not in the least brackish; indeed, specimens remained alive in tap water in Aquaria after many months (but I could not succeed in breeding them under artificial conditions). Dr. Jeffreys states in his "British Conchology" that in France they inhabit quite fresh water. Under these circumstances it is rather difficult to properly classify this family. They can scarcely be all designated as fresh-water Mollusca, neither does it seem quite right to include them all with the marine shells; possibly the best way out of the difficulty would be to constitute them an intermediate class.

Hydrobia ventrosa has a persistent habit of floating shell downwards upon the surface of the water after the manner of the fresh-water *Physæ*. *H. jenkinsi* and *H. similis* may occasionally have recourse to the same habit, but not habitually. The two latter species will also crawl about immediately after being placed in a saucer without sufficient water to cover them, and the former will extend its researches over the edge of the dish and even upon the table.

H. ventrosa is very timid if disturbed in this way; it will remain quite dormant for a long time, and it never travels out of the reach of water.

A. grayana, *Melampus myosotis*, and *H. ulvæ* are great wanderers also, and may frequently be collected many yards away from the water, or high and dry upon mud flats, and crawling upon wooden piles some distance from tide mark. In such a situation last summer I collected some thousands of *H. ulvæ* at Lowestoft

by just brushing them into a box from off the piles of a landing stage.

Upon two occasions I have found *Hydrobia jenkinsi* existing with *H. ventrosa* in the same ditches, but generally the Mollusca associated with it have been fresh-water species, viz.: *Bythinia tentaculata*, *B. leachii*, *Planorbis nautilus*, *P. spirobis*, *P. complanatus*, and the ubiquitous *Limnæa peregra*. Once I found a single living *H. similis* with *H. jenkinsi* in a new locality upon Erith Marshes.

I have found *Hydrobia similis* associated with *Limnæa truncatula*: and I think it has at one time been accompanied by *Assimineæ grayana*, as I have taken numerous dead shells of the latter from its habitat.

A. grayana and *Melampus* also seem to inhabit the same waters, and upon one occasion I collected *H. ulvæ* from the same ditch upon Dartford Marshes, in which these two species were abundant. A curious dwarfed variety of *Littorina rudis* occurs in the brackish-water ditches upon West Tilbury Marshes along with *Hydrobia ventrosa*, and the latter species and *H. similis* are also found together.

I believe that *H. jenkinsi* is the most abundant Thames marsh species of the Hydrobiæ, and its habitat extends far beyond the others, occupying many miles of ditches from the commencement of the Plumstead Marshes, near the Arsenal wall, away down to a point midway between Dartford Creek and Greenhithe, and from Beckton nearly to Coldharbour Point, which to me appears to be the full extent of its distribution in Essex. I made my first acquaintance with this interesting Mollusc during the early summer of 1883, when I collected from a muddy ditch upon the marshes near East Greenwich six or eight specimens of a small operculated Mollusc, which did not agree with any British shell with which I was at that time acquainted.

The animal seemed to me to differ entirely from the genus *Bythinia*, and the operculum, in particular, was quite distinct, and seemed to more nearly approach that of the Littorinidæ. I made a drawing of the animal and its shell, and sent off by the post a number of specimens to several conchologists of my acquaintance, and they were unanimous in pronouncing them to be *Hydrobia similis*, Drap.

Another well known conchologist to whom I sent specimens of the same shells from East Greenwich Marshes, also wrote me to the effect that at first suspecting them to be *H. ventrosa* he had sent them

to an authority, who had pronounced them to be undoubtedly *H. similis*.

This appeared to me to be conclusive evidence that the shells were certainly the *Hydrobia similis* of Draparnaud, and from that date until October 4th, 1889, I had no further doubt about them, and during that period I sent out many exchanges of this species to various correspondents.

To Mr. J. T. Marshall, of Torquay, belongs the credit of being the first to positively say that it was not *H. similis*, although also for a time he considered these shells to be Jeffreys' variety *ovata* of *H. ventrosa*.³ These opinions of good conchologists must be my excuse for being so easily misled in respect of this shell. Certainly, if I had thought that there was the least doubt as to its identity, I should have taken care to submit specimens for observation and comparison to some practical conchologist well acquainted with the family. I also regret that many correspondents have at various periods received as an exchange these *Hydrobiae* as authentic *H. similis*. I feel confident that these mistakes originated owing to the great difficulty of obtaining shells of *H. similis*, and also Jeffreys' variety *ovata* of *H. ventrosa*, and I am certain that at that time the real Simon Pure was to be found in the shell cabinets of very few collectors.⁴

As the dispute waxed warm between the advocates of *H. jenkinsi* versus *H. ventrosa*, var. *ovata*, I felt the necessity of procuring living examples of all the species under discussion, and made frequent excursions to the marshes in all sorts of weather. Having supplied Mr. Smith, of the British Museum, with living examples of the three species, I kept a number in Aquaria under my own observation for many months. During this time I had every opportunity of noting their difference in habit and capability of adapting themselves to water which was more fresh or more brackish than that to which they had hitherto been accustomed.

Close examination soon convinced me that Mr. Smith was right

³ This statement may be correct so far as the particular specimens sent to Mr. Marshall by his correspondents as *H. similis* ("Journ. of Conchology," vol. vi., p. 140) were concerned; but it seems to be clear that the credit of positively determining the Essex and Kent specimens as constituting a new species belongs to Mr. E. A. Smith and Mr. Walter Crouch, who came to that conclusion as long ago as February 2nd, 1889. (ESSEX NAT., iv., pp. 212-214.)—ED.

⁴ The first *H. jenkinsi* deposited in the collections at the British Museum were, we believe, the three specimens sent on 29th January, 1885 (with other species of *Hydrobia*) by Mr. W. Allen, of Canning Town, to Mr. Walter Crouch, who, noticing the carinated whorls, concluded at once that they were new. They were taken on February 2nd by Mr. Crouch to the Museum, and Prof. Flowers' acknowledgment, dated March 11th, runs thus: "Three specimens of a species of *Hydrobia*, new to the British fauna, from Beckton, near North Woolwich" (vide E. A. Smith, "Journ. of Conchology," vol. vi., p. 142; ESSEX NAT., vol. iv., pp. 123 and 212; and "Science Gossip," 1891, p. 163). Subsequently Mr. Jenkins sent a series from the Erith Marshes, and Mr. Crouch a set of thirty-six examples from Beckton.—ED.

in his opinion that the new *Hydrobia* was a distinct species, as, putting aside the difference in the form and contour of the shell, the tufts and carination of a large majority of the specimens, &c., the habits and external appearance of the creatures were quite characteristic. Mr. Marshall frankly acknowledged in his "Further Notes on British Hydrobiæ" (Journal of Conchology, vol. vi., p. 224), that having always taken Jeffreys for granted, he "had not examined the animal." I at once sent him living Hydrobiæ for comparison. About this time a correspondent of mine sent me a solitary shell of the true variety *ovata*, Jeffreys, of *H. ventrosa* (which had been authenticated by Mr. Marshall), affording me the opportunity of comparing it with specimens of *H. jenkinsi*, from which it differed considerably.

The examination of the living Hydrobiæ and the discovery of the real variety *ovata* seemed to convince Mr. Marshall, and soon afterwards he subscribed to Mr. Smith's opinion that the Plumstead-Beckton *Hydrobia* was entitled to rank as a new species. From this, I conclude that the variety *ovata* of *H. ventrosa* is exceedingly rare, as otherwise comparison of the two shells would have settled the affair at once. To me it has often been a matter of deep regret that the splendid collection of Dr. Jeffreys, containing his types, was ever allowed to go out of this country.

The carination and little tufts upon many of the shells of *H. jenkinsi* are very peculiar, and form one of the features by which we can readily distinguish them from allied species. An examination with a pocket lens of between two and three thousand shells, from various places, proves that by far the larger proportion show more or less traces of the carination, although but few specimens show these processes in perfection. Amongst the marine and brackish-water shells of the Antipodes there are quite a number of species of *Hydrobia* which are either keeled and tufted, or else possess a number of delicate hair-like processes, running spirally around the body and preceding whorls just upon or above the periphery. Several New Zealand species are strongly keeled, and the shells are either tufted or sericeous. *Potamopyrgos corolla*, Gould, is strongly carinated with a number of very short bristles, proceeding from the keel, and the very beautiful shells of *P. cumingiana*, Fischer, have a number of long silky processes. *P. antipodium*, Gray, appears generally to be eecarinate and without tufts or hairs, although a few tufted specimens may occasionally occur. This species appears most nearly to resemble *H. jenkinsi*, and one variety might easily be

mistaken for it. Professor E. von Marten has also noticed this, although he believes that it differs from *jenkinsi* in other respects.

It seems extremely probable that this new species has been introduced from abroad, particularly as it has not been noticed in any other part of Great Britain. From the fact that none of our other Hydrobiæ seem to have the least tendency to assume the keeled and tufted appearance, surely, if indigenous, it must have been noticed long ago. It seems hardly possible that Dr. Jeffreys, Mr. Marshall, and other conchologists of repute, could have overlooked the species. But, supposing it to be a recent introduction, we are met with the further difficulty that it is almost inconceivable that the *Hydrobia* could have increased to such an extent in a few years. The shells now occupy many miles of ditches upon both sides of the Thames, and from their greater vigour and prolificness they seem likely before long to predominate over our other native species.

The carinated tufted specimens of *H. jenkinsi* are so distinct, and generally they so far exceed the proportion of shells which are not keeled or tufted, that I prefer to consider them as typical of the species; those specimens which are without any trace of either keel or tufts may be called var. *ecarinata*. Besides these two forms, there are to be found existing with the type at Beckton, and several other places, a very short spired, much inflated variety, which I have proposed to name var. *tumida*. Other specimens occur at Beckton and Plumstead which are much more graceful in contour, the spire is long and tapering, and the outer lip very much expanded; if worthy of being considered as a variety, they might be designated var. *gracilis*.

There is every reason to believe that the pretty little shell *H. similis* (or *H. confusa*, Frau., as they prefer to call it at the Natural History Museum at Kensington), will not long continue to be enumerated with the British Hydrobiæ. A recent visit to its habitat resulted in obtaining two dead shells only, and the most diligent search for living specimens was unavailing. It is just possible that a few may still remain in hibernation, as the locality has been known to but a few conchologists, who have done their best to preserve it from extinction.

In searching for this Mollusc some very interesting caddis-worm (Phryganidæ) cases have at times been collected, which have been constructed almost entirely of the young shells of *H. similis* and of *H. ventrosa*; and upon one occasion I came across a caddis-case which had a single shell of the subterranean species *Ceciliooides*

(*Achatina*) *acicula* attached to it. This confirms my idea that this latter species certainly does exist, either upon the marshes or in their immediate neighbourhood, although from its burrowing habits it has hitherto been overlooked.⁵

[It may be useful to append the titles of some papers on *Hydrobia* and allied forms of Mollusca of our Essex marshes, which have recently appeared:—

J. T. Marshall. "On Hydrobiæ and Assimineæ from the Thames Valley."—

"Journ. Conchology," vi. (1889), pp. 140-142.

Ibid. "Further Notes on the British Hydrobiæ," *l.c.*, pp. 224-225.

E. A. Smith. "Notes on British Hydrobiæ, with description of a supposed new species," *l.c.*, pp. 142-145.

Ibid. "A reply to Mr. J. T. Marshall's 'Further Notes on British Hydrobiæ,'" *l.c.*, pp. 244-246.

Ibid. "Note on *Hydrobia jenkinsi*."—"Essex Nat.," vol. iv., pp. 212-213.

A. J. Jenkins. "Distribution and Habits of the British Hydrobiæ."—"Science Gossip," 1890, pp. 103-106.

Ibid. "Note on *H. jenkinsi*."—"Science Gossip," 1891, pp. 184-185.

A. J. Jenkins and L. O. Grocock. "Notes concerning the Distribution of Mollusca in the Thames Estuary," *l.c.*, 1891, pp. 8-10.

Walter Crouch. "Note on *Hydrobia jenkinsi*."—"Essex Nat.," vol. iv., pp. 213-214.

Ibid. "*Hydrobia jenkinsi* in Essex."—"Science Gossip," 1891, pp. 163-164.

J. W. Williams. "The New Hydrobia."—"Science Gossip," 1890, pp. 131-132.—Ed.]

LIST OF SPECIES.

I.—Fresh Water and Land Shells.

ORDER LAMELLIBRANCHIATA.

FAMILY SPHERIIDÆ.

Sphærium corneum, L. Fairly common; Plumstead and Tilbury Marshes.

S. lacustre, Mull. Same localities, and Erith Marshes.

Pisidium fontinale, Drap. Local; Plumstead Marshes.

ORDER PECTINIBRANCHIATA.

FAMILY PALUDINIDÆ.

Bythinia tentaculata, L. Common, and generally distributed.

Var. *albida*, Rim. One specimen from Coldharbour Marsh.

B. leachii, Shepp. Common in same locality as *B. tentaculata*.

⁵ See ESSEX NAT., vol. iv., p. 227, in report of meeting on December 2nd, 1890, when Mr. W. Cole exhibited specimens of *Cacilioides acicula* from a human skull at East Tilbury. These specimens appear to be recent shells, and, therefore, it is probable that *C. acicula* exists on the Essex marshes, although its subterranean habits enable it, as Mr. Jenkins suggests, to escape detection.—Ed.

ORDER *PULMONOBRANCHIATA*.FAMILY *LIMNÆIDÆ*.

Planorbis nautilus, L. Local; abundant between Greenhithe and Darent Creek; also few associated with *Hydrobia jenkinsi*, Plumstead Marshes.

P. spirobis, Mull. Common; and generally distributed.

P. vortex, L. Somewhat more local; Tilbury Marsh.

P. carinatus, Mull. Local; near Abbey Wood.

P. complanatus, L. Common upon the Marshes both sides of the river.

P. corneus, L. Local. Specimens from the Marshes are not generally so fine as those inhabiting the adjacent ponds and ditches.

P. contortus, L. Very local; few from ditch, West Tilbury Marsh.

Physa hypnorum, L. A few shells in ditch upon Plumstead Marshes.

P. fontinalis, Linn. Common; and widely distributed.

Var. *inflata*, Moq. Marsh near Abbey Wood Station.

Var. *oblonga*, Jeff. One specimen; ditto, ditto.

Limnæa peregra, Mull. The commonest fresh water shell upon the Marshes.

Var. *ovata*, Drap. Near Abbey Wood Station.

Var. *acuminata*, Jeff. Ditto, ditto.

Var. *labiosa*, Jeff. Few specimens; Plumstead Marshes.

Var. *scalariforme*, Jeff. Two shells only at Abbey Wood.

L. stagnalis, L. Local; a few at Purfleet; also in pond Shooter's Hill.

Var. *albida*, Jeff. One shell; Coldharbour Marshes, near Purfleet.

L. palustris, Mull. Common; everywhere.

L. truncatula, Mull. Scarce and local; Plumstead and Erith Marshes.

ORDER *PULMONIFERA*.FAMILY *ARIONIDÆ*.

At present I have recorded six species only of slugs from the Marshes and immediate neighbourhood.

Arion ater, L. (Black Slug.) Plumstead Marshes. One specimen kept in captivity attained the length of $8\frac{1}{2}$ inches when

fully extended. The *Arions* are partially carnivorous, and are occasionally guilty of cannibalism.

FAMILY *LIMACIDÆ*.

- Amalia marginata**, L. Common all along Kentish Marshes.
Limax flavus, L. (Cellar Slug.) Sparsely distributed.
L. maximus, L. One specimen from near Abbey Wood.
L. agrestis, L. Very common upon the Marshes.

FAMILY *TESTACELLIDÆ*.

Testacella haliotidea, Drap. A number of specimens have been collected by the Rev. J. W. Horsley, in his garden at Woolwich.

FAMILY *HELICIDÆ*.

Succinea putris, L. Upon reeds at the sides of ditches in the Marshes upon both sides of the river.

S. elegans, Risso. Same habitat as the last. This species differs from the former, being smaller, less robust, with a longer spire, the suture of which is more oblique.

Vitrina pellucida, Mull. Scarce and local; under stones, and among decaying leaves at Bostal Wood.

Zonites (Hyalina) cellarius, Mull. General in the Kentish Marshes.

Z. nitidulus, Drap. A few shells from Belvedere.

Helix aspersa, Mull. Common and general.

Var. *exalbida*, Menke. Few near Dartford.

H. nemoralis, Mull. Very common in Marshes (Kent) from Plumstead to Gravesend.

Var. *albolabiata*, Von Mart. Near Abbey Wood.

Var. *bimarginata*, Moq. Plumstead Marshes.

Var. *libellula*, Risso. (Shell, yellow.) Common; and general.

Var. *rubella*, Moq. (Shell, pink.) Ditto, ditto.

Var. *castanea*, Moq. (Shell, brown.) Belvedere.

Var. *olivacea*, Gassies. (Shell, olive.) Abbey Wood and Cobham.

H. hortensis, Mull. Woolwich, Shooter's Hill, Dartford, and Cobham.

Var. *albina*, Moq. (Shell, whitish.) Woolwich.

Var. *lutea*, Moq. (Shell, yellow.) Common ; with type.

Var. *incarnata*, Moq. (Shell, pink.) Charlton.

Var. *lilacina*, Taylor. Scarce and local ; Shooter's Hill.

Var. *arenicola*, McGill. (Shell, with translucent bands.)
Dartford.

H. arbustorum, L. Very local ; Shooter's Hill Road.

H. cantiana, Mont. Common ; and widely distributed.

Var. *albida*, Taylor. Generally distributed ; with type.

H. rufescens, Penn. Common and general ; a very dark form occurs at Charlton.

H. concinna, Jeff. Common ; Plumstead Marshes, &c.

H. hispida, L. Bostal Wood ; generally distributed.

H. virgata, Da Costa. Common ; Greenwich and Plumstead Marshes.

Var. *alba*, Taylor. Occurs with type.

H. caperata, Mont. Generally distributed.

Var. *ornata*, Picard. With type ; Plumstead Marshes.

H. rotundata, Mull. Common in lane and hedgerows, at Bostal Wood and Belvedere ; not generally found in Marshes.

Var. *alba*, Picard. Two shells at Bostal Wood.

H. pulchella, Mull. Charlton, Plumstead, &c.

Bulimus obscurus, Mull. Charlton and Belvedere.

Pupa umbilicata, Drap. Under stones ; Dartford and Marshes.

Clausilia rugosa, Drap. Bostal.

C. rolphii, Gray. Bostal Wood, and lane Belvedere. This generally rare species, although local, is fairly common in places.

C. laminata, Mont. Bostal and Belvedere.

Cochlicopa lubrica, Mull. Charlton, Bostal, and Plumstead Marshes.

Carychium minimum, Mull. Occurs sparingly, on leaves and under stones, at Bostal Wood.

Cyclostoma elegans, Mull. Very common ; and general in chalk districts from Bostal Wood to Gravesend.

Var. *ochroleuca*. Bostal Wood.

Cyclostoma elegans and *Aeme lineata* are the only two operculate land shells which are found in the British Isles. The first species is very common in chalk districts, and abounds in this neighbourhood. *Aeme lineata* has been recorded for East Kent, but we have never been fortunate enough to obtain specimens from our district.

No doubt, owing to its extreme minuteness, and its habit of hiding among moss, it is frequently overlooked.

II.—Brackish Water Shells (generally classed as Marine) inhabiting the Marshes of the Thames Estuary in Kent and Essex.

ORDER *PECTINIBRANCHIATA.*

FAMILY *LITTORINIDÆ.*

Littorina rudis, Maton. Small brackish water variety; associated with *Hydrobia ventrosa*, and *Assiminea grayana*. Ditches upon East Tilbury Marsh.

Hydrobia ulvæ, Pennant. Grays, Tilbury, Greenhithe, and Gravesend.

H. ventrosa, Montagu. From Erith to below Gravesend, Kent; Coldharbour Point to below Tilbury Fort, Essex.

H. similis, Draparnaud. Erith Marshes; one dead shell at Beckton; two live and one dead shell, marshes near Abbey Wood, 1890.

Var. *candida*, Jeff. Occurs sparingly with type. (A clear pellucid variety.)

H. jenkinsi, Smith. The most abundant shell of this genus upon the Thames Marshes; from the commencement of Plumstead Marshes nearly to Northfleet, in Kent, and from Beckton to Coldharbour Point, Essex.

Var. *carinata*, Jenkins. Shell smooth, without keel or tufts; occurs with type.

Var. *tumida*, Jenkins. Shell much inflated, very short spire; ditch near Beckton.

Var. *gracilis*, Jenkins. Ditches; Rainham and Erith Marshes

ORDER *PULMONOBRANCHIATA.*

FAMILY *ASSIMINIDÆ.*

Assiminea grayana, Leach. Between Coldharbour Point and Purfleet; also from Grays, extending some distance down the river below Tilbury Fort; and in Kent from Greenhithe to below Gravesend; abounding in the canal near the latter place.

FAMILY *CARYCHIIDÆ.*

Melampus myosotis, Drap. Associated with *Assiminea* in the same localities.

THE LOCAL (ESSEX) MUSEUM—*Continued.*

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.

The property of the Club will be placed under the care of the following 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.

Copies of APPEAL and pamphlet of papers relating to the proposal may be had from the *Hon. Secretaries*, Mr. W. COLE, Buckhurst Hill, Essex, and Mr. E. DURRANT, 90, High Street, Chelmsford, who will be glad to give further information to enquirers.

SUBSCRIPTIONS either to the CAPITAL FUND, or promises of annual donations to the MAINTENANCE FUND, may be sent to Messrs. Sparrow, Tufnell & Co., Bankers, Chelmsford, or to the National Bank, Old Broad Street, London, or to the Treasurer of the Club, Mr. A. Lockyer, Mornington Lodge, Wanstead, Essex.

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The Essex Naturalist:

BEING THE
JOURNAL
OF THE
ESSEX FIELD CLUB.

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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COMMUNICATIONS and ADVERTISEMENTS should be addressed:—

The Editor of "THE ESSEX NATURALIST,"

7, Knighton Villas, Buckhurst Hill, Essex.

Attention is called to MUSEUM APPEAL on pages 2 and 3 of Wrapper.

Title and Index to Vol. V. will be issued with the April part.

THE LOCAL (ESSEX) MUSEUM, LIBRARY, AND LABORATORY.

THE attention of Members of the Essex Field Club, and of all those interested in the practical study of Natural Science, and its applications in industries, and as a means of general education, is earnestly called to the Statement and APPEAL FOR FUNDS for the establishment of the Museum now being circulated by the Council.

The scheme has long been under consideration, and it has been fully explained at meetings of the Club and in the *ESSEX NATURALIST*. Its principal features are as follows:—

With the object of establishing at Chelmsford (chosen as being the County Town, and also as a central position in Essex) a Local and Educational Museum, the club has agreed to amalgamate with the Essex and Chelmsford Museum, under the title of “The Essex Field Club,” conditionally on the sum necessary for founding the new Museum being raised. The main objects in view are:—

- (a) The formation of authentic collections to illustrate the Geology, Mineralogy, Botany, Zoology, Ethnology, Pre-historic Archæology and Technology, &c., of ESSEX and the adjacent sea and rivers, together with an educational series of specimens and preparations to be employed for illustrative and teaching purposes. Specimens that are not of Essex origin will be admitted so far only as they serve to demonstrate the structure and relationship of the local types.
- (b) The formation of a Local and Scientific Library, to include (in addition to standard scientific works), topographical, antiquarian, and other books, manuscripts, maps, parliamentary and official papers, pictures, prints, &c., which in any way relate to the county of Essex.
- (c) The establishment of a Laboratory and Class-rooms, with fittings, apparatus, and instruments suitable for the preparation of specimens for the Museum, and for the practical study and teaching (either in the Museum or in selected local stations throughout the county) of the subjects named in paragraph (a), and for promoting their practical application in Agriculture, Forestry, Arboriculture, Gardening, Fisheries, Manufactures, Industries, and general education. The laboratory, class-rooms, instruments, &c., will be under the control of the Council, who may permit students, investigators, and others to use them, and may also lend instruments and preparations out of the Museum buildings for purposes in furtherance of the above objects.

[Continued on page 3 of Wrapper.

NOTES ON THE TEASELS, *DIPSACUS SYLVESTRIS* AND *D. PILOSUS*, AND THEIR NATURAL RELATIONSHIP.

By J. FRENCH.

[Read December 2nd, 1890.]

THE Teasel, *Dipsacus sylvestris*, in its stage of flowering and seed is so familiar that description is quite unnecessary. *Dipsacus pilosus*, with a more modest appearance, is less common, and not nearly so well known. Its heads of flowers are nearly globular, and not half the size of those of its kinsman, and the bloom is white and inconspicuous. The plant, moreover, is nearly destitute of that formidable array of prickles so characteristic of *D. sylvestris*. The curious arrangement of water-cups in the latter plant, which are developed at the axils of the leaves at an early stage of its growth, is absent in *D. pilosus*. In point of foliage and habit the two plants are not greatly unlike.

We will now call attention to the prickly apparatus and cups of *D. sylvestris*. Neither of these appliances are brought into operation until the stems¹ are in process of development. The cups precede the prickles, which latter do not appear on the stem until the fourth or fifth node is reached. The cups, however, cease just before the time of flowering, while the prickles are hardened and multiplied to a much later date.

A very cursory examination will assure us that the cup is the result of a special process, and is not the accidental result of contiguity of leaf bases like *Blackstonia*, *Lonicera*, and others. Long before the leaf attains its full development the puckering at the base is well marked, and a set of vascular vessels specially contributing to the support of the cup make their appearance. The rim of the cup, too, is very entire, and never crenated like the leaf limb. The cups are absolutely water-tight, only losing water by evaporation and rupture.

The arrangement of the prickles is such as to indicate a special design. This design is more pronounced as the plant advances to seed, and in the species known as the "Fuller's Teasel" (*D. fullonum*) it attains its maximum. The points of the prickles are directed downwards, as though to repel a foe creeping upwards. In the "Fuller's

¹ The plants are, it should be recollected, biennial, and in the first year make only radical leaves.

'Teasel" even the tips of the awns of the flowering head have this downward inclination.

It is not easy to say what are the foes so carefully guarded against. That there are, or have been, foes in the case of the cups there can be no doubt; for the most careful observation will not show that the water is in any case absorbed by the plant, or used as nourishment.

Ants have been suggested as possible enemies, but it is hard to see what harm they could do. The prickles in any case are not against them. In the allied species, *D. pilosus*, the cup is represented by a fringe of bristly hairs, which also is no protection against ants. Slugs and snails in both species are guarded against; but far more effectively in *D. sylvestris*, although there is reason to believe that no English species of Mollusca now attack the plants.

It does not seem that the prickly apparatus is directed against the attacks of cattle, as these prickles are rarely hardened enough to cause much inconvenience till the plant has flowered, when the foliage will be dry and tasteless.

It may be that the prickles at an early stage guard against molluscs, and at the last stage assist in dissemination of the seed-heads by attaching themselves to the wool of cattle, &c.

We will now attempt to trace the mutual relationship of the two species.

When we consider that *D. pilosus* has only the rudiments of a prickly system, and a rudimentary form of cup, we infer, either that it is a degenerate form of *D. sylvestris*, or, on the other hand, is more nearly allied to an ancestral form. An examination into the structure and habits of both species will show that the latter alternative must probably be the one accepted.

In plants of the first year it is hardly possible to discriminate the species, both being so much alike. The configuration of the leaf in this early stage is instructive, the limb is reduced to a rudimentary fringe for nearly half the length of the mid-rib, and the leaves may therefore be regarded as petioled. There is a tendency to development of the sheath of the petiole equally in both species. The epidermis is also here equally active, giving rise to occasional prickles, and develops the serrature on the mid-ribs of the leaves of both.

The start in the following spring appears to run for a short time on equal lines, as the radical leaves are much alike; but a difference soon

becomes apparent. *D. sylvestris* goes on with new and vigorous developments; out of the sheath of the petiole is developed the cup, and each pair of leaves is strengthened and rendered rigid by a more perfect system of venation than obtains in *D. pilosus*. The prickly system is afterwards matured with the same vigour, and the whole gives rise to a very robust plant having flowering heads proportionately much larger than its kinsman. There is still usually an excess of vigour expended in different ways, sometimes in producing very long and foliaceous bracteoles, sometimes in bifurcating a leaf or leaves, and sometimes in producing an additional leaf or pair of leaves at one of the upper nodes.

In *D. pilosus* this vigorous growth is pretty well absent throughout. In this species, in place of the cup, there is developed from the sheath of the petiole, which is not greatly expanded, a fringe of bristly hairs, and also some prickles on the earlier nodes of the stem. The cauline leaves, which are the largest of the plant in both species, in *D. pilosus* are peculiar. They have a naked petiole for the most part, but at the base of the leaf-limb some two or three leaflets are generally developed. The leaf, moreover, has a flabby appearance. It is at this stage that the essential weakness of the plant, as compared with *D. sylvestris*, becomes apparent. The flower-stalks are clothed with weak prickles, and, with the flower-heads, attain a size comparable with *D. sylvestris* only when its stem has been cut nearly through so as to allow only two or three bundles of fibres to nourish the plant.

We have adverted to the not infrequent case of bifurcation (or even addition) of a leaf of *D. sylvestris*, which, of course, means that the mid-rib of the leaf separates at a certain point into two equal or unequal portions, and these develop proportional independent leaflets. This must be regarded as the most pronounced stage of a phenomenon which is traceable in both species, but far more frequently in *D. sylvestris*. It seems reasonable to suppose that the plant exercising this function (of variation) most readily should be the newer form.

Closely associated with the fibro-vascular tissue giving rise to these variations are the prickles, and some attention should therefore be directed to their structure and distribution. In the advanced stage of *D. sylvestris* they almost acquire the consistency of spines, whereas in *D. pilosus* they are often represented by hairs. They are all epidermal, and there is no material difference between the hair of

one plant and the spine of the other, as every transition between them can be found. It would seem that in most cases they are nourished directly from the fibrous vessels, no other tissue intervening. For instance, in the serrature of the mid-rib—the most persistent line of prickles in both plants—the epidermis closely invests a bundle of fibres for the whole length of the leaf. It further seems that the vitality of the prickles is dependent on the presence of the growing fibres, and in that respect they may be regarded as secondary appendages. This will perhaps account for their presence on the stem of *D. pilosus* at an early, that is, fast-growing stage.

No functional importance appears to attach to the prickles. We may, however, safely prognosticate their further development in direct proportion to the increase of the vigorous tissue on which they depend. As we have seen that this tissue is such a capricious and increasing quantity, the plant bids fair to become eventually a spiny monster.

Any mention of the leaves of *D. pilosus* would be incomplete without a special reference to the pair of characteristic leaflets, occurring as before noticed at the back of the main limb. Do these still exist as relics of an earlier form? My ignorance of the other members of the genus will not allow me to discuss that question; but I can certainly say that no such appendages ever occur in *D. sylvestris*.

Comparing the two British species, it seems to be correct to say that the one (*sylvestris*) is vigorous and variable, and tends to depart from forms which may have been ancestral. The other (*pilosus*) is much less vigorous, and shows affinity with forms (*Cephalaria* and *Scabious*) which also may have been ancestral.

[At the reading of the above paper, Prof. Boulger communicated the following remarks:—

“I am sorry that I cannot get down to the meeting, as I should have liked to say a few words on Mr. French’s paper on *Dipsacus*. As, however, you have kindly given me an opportunity of seeing the paper, I may briefly state what would have been the substance of my remarks. Generally, I may say that I consider that the chief mistake of the modern students of the new teleology—the followers of Mr. Grant Allen, with whom I must class Mr. French—is that they constantly look for some immediate utility to the possessor in every detail of structure. In so doing, they often, I think, overlook two large classes of structures, which I may term *ancestral* and *indifferent* respectively. The first class, the ancestral, includes: (i.) the

embryonic, those useful to the organism in its early stages; (ii.) the *vestigial*, those useful to its ancestors, but now in process of abortion through the operation of the law of economy of nutrition; and (iii.) the *indifferent ancestral* structures, structures originating in the variation which we call 'spontaneous' of its ancestors; which, being neither directly useful nor extravagantly wasteful of tissue—and therefore likely to become aborted—nor otherwise harmful, are inherited unaltered. The *indifferent* class similarly includes all structures originating in the free play of that 'spontaneous variation' which Mr. Wallace has shown to be so widely varied in its results, which are neither directly useful nor harmful. Darwin showed that structures which I should refer to one or other of these classes, being practically beyond the scope of natural selection, will be extremely variable. Coming to Mr. French's immediate subject, I would remark that he has confined his attention to the two species of *Dipsacus* that happen to be British, whereas there are seventeen or eighteen species of the genus, five or six of which occur on the continent of Europe; and that *D. sylvestris* and *D. pilosus* belong to different sections of the genus, the *Eudipsaci* and the *Trichocephala*, the latter approximating to the genus *Cephalaria*. I should be interested to know whether Mr. French has ever observed the two British species, or others, growing so as to compete with one another."¹
—G. S. BOULGER.]

BRITISH ANNELIDS.

WITH ESPECIAL REFERENCE TO THE EARTHWORMS OF ESSEX.

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

(Continued from page 106.)

ONLY a few words are necessary in order to present a bird's eye view of the different genera of British earthworms. The indigenous species belong entirely to one group, which has been, at the most, divided into four sections, and as one of these divisions is not at present retained (though it may at any time be revived), we have practically only three distinct genera to examine. These are *Lumbricus*, *Allolobophora*, and *Allurus*. The lapsed name is *Dendrobena*, but we will not include it in our present study. *Lumbricus* is distinguished from *Allolobophora* chiefly by the shape of the lip or prostomium. In *Lumbricus* the foremost portion of the body and the first ring form a perfect mortise and tenon, whereas in *Allolobophora* the lip cuts but partially into the first ring. The first ring, which bears no setæ, is usually known as the peristomium. While

¹ This I have not yet seen.—J. FRENCH.

both the foregoing species have their male pore on segment fifteen, it is found on the thirteenth in *Allurus*, and thus they may be readily distinguished. A brief tabular arrangement may present the matter in clearer light, and help to pave the way for a rather more detailed account of the different genera :—

TABULAR VIEW OF BRITISH LUMBRICI.

GENERA.	MALE PORE: SEGMENT.	LIP OR PROSTOMIUM.	GIRDLE OR CLITELLUM.	COLOUR.	SETÆ OR BRISTLES.
<i>Lumbricus</i>	15	Perfect mortise and tenon with peristomium.	Begins on any segment from 25 to 34 and covers about 6.	Usually red-brown, iridescent.	Always in couples.
<i>Allolobophora</i>	15	Partial.	Same as <i>Lumbricus</i> .	Variable. Pink, brown, yellow, green.	Not always in couples.
<i>Allurus</i>	13	Partial.	22 to 27.	Brown and golden.	Four couples one at each angle.

Let us imagine the naturalist going out with a collecting tin lightly filled with damp moss, and securing a dozen specimens of worms from different localities. He wants to know first of all what genera he has procured, and takes them out one by one for examination. With his pocket lens he first examines the head and finds the first ring cut right through by the lip. This points to *Lumbricus*. He next counts the segments from the head to the girdle, and finds upwards of twenty-two. It cannot, therefore, be *Allurus*. It is a dark red or ruddy brown colour, and will therefore not be *Allolobophora*, unless it is an exception, and then the shape of the mortise and tenon is decisive.

Putting this aside as a species of *Lumbricus*, he takes up another. It is a small worm but mature, or possessed of a girdle, and has a happy method of progressing tail foremost; while the tail, instead of being flat round or oval, is sharp-angled, or square. The mortise and tenon is imperfect, so it may be either *Allurus* or *Allolobophora* but the male pore is on the thirteenth and the girdle on the twenty-second segment, so it must be *Allurus*. Now since we have at pre-

sent only one species of *Allurus* (subject to variation, however, as we shall see later on), it will be utterly impossible to confound it with *Allolobophora* when we have once seen and examined it. We are thus narrowed down practically to the two genera *Lumbricus* and *Allolobophora*, and have, as external guides to their distinction, the mode of insertion between lip and peristomium, the colour, and the setæ. Since the latter are variable we may be obliged occasionally to resort to anatomy before we can be absolutely certain about a given species; but I believe that I shall be able to show as we proceed that all the species may be readily distinguished by external characters alone, if only they are mature. I shall endeavour to give such unmistakable clues to the identification of each species by external means as shall render the use of the knife and the microscope unnecessary.

Those who have followed me thus far will have learned which are the leading portions of the body of a worm, and what parts must be particularly observed in order to obtain a clue to their identity. I may add now a few more details which will be helpful, and explain some terms which will be constantly met with in the study of Annelid literature.

Beginning with the front or anterior portion of the body we find that there is no distinct head, while no organs of vision or hearing are anywhere apparent. There is a retractile lip, usually called the prostomium on account of its being in front of and above the mouth (stoma). The first ring, segment, or somite, bears no setæ or bristles, and is called the peristomium, because it surrounds the mouth. Some works include this ring in all calculations relating to the number of segments, but it is usual in England to omit it, and begin to reckon from the first segment which carries bristles. The setæ are organs of locomotion. Along the back, in the groove between each segment, one will be able to discover a series of pores or punctures which look as though a pin had been thrust through the skin. These are the dorsal pores of which an account will be found in "Science Gossip," December, 1891. The male pore, found on segment fifteen, except in the case of *Allurus*, is to be looked for on the lower surface of the body. In some species the opening is seated on a cushion or papilla of very delicate structure, which gives it great prominence; but in other cases only a well-trained eye will detect it. The Greenworm and the Common Earthworm have the most prominent papilla for the male pore, and these should be

studied in order to understand the position and appearance of this important organ.

The girdle, which has been variously called the "clitellum," "cingulum," or "knob," is that swollen portion of the body, usually of a lighter colour, which one observes in adult worms, and which when I was a boy in Sussex was declared by the country folk to represent the place where two portions of a worm had joined up after having been bisected under the gardener's spade! It is usually saddle shaped in our native species, and in the channel which it forms on the under surface of the body we may find a series of pores, and at times a number of beautiful trumpet-shaped bodies which are known as spermatophores, and play an important part in the reproduction of the species. I have found the Greenworm the best species for many of these researches, and as it is to be obtained under stones wherever cattle are kept, or by the side of stagnant water, it will be a convenient subject for the beginner to practise upon.

It is a good plan to have a note-book in which to make entries on the following plan:—

"Species taken at Romford, January, 1892.

"1. A specimen found by the side of a pond where cattle come to water, lying under the stones in a coil, and appearing very sluggish. Dirty green colour with a yellowish girdle about the middle of the body. Length about two inches. The lip only partially bisecting the first ring. Male pores on segment fifteen with prominent, pale papillæ. Girdle commencing on segment twenty-eight, and extending to the thirty-sixth, with three pairs of pores on the under side on segments 31, 33 and 35. Tail curled up, cylindrical or round, tapering off rather abruptly."

"2. A small worm from the roots of grass by the side of the stream. Dull brown, with lighter girdle and square tail. Only an inch long, and unlike the last, very active; chiefly moving tail foremost. Lip partly cutting the peristomium, male pore on segment 13, and girdle extending from the 22nd to the 27th."

These will be the Greenworm and the Square-tail (*Allurus*) respectively, and all the others should be worked up on the same principle.

It remains for me now to describe in successive issues of the *ESSEX NATURALIST* the species of Earthworm which I have already received from Essex, with such others as shall by the courtesy of the reader be submitted to me for identification and registration. I shall

be glad if specimens are sent to me in a tin box with damp moss, and data respecting the habitat, soil, nearness to sea or brackish water, and the like, addressed, "The Grove," Idle, Bradford, Yorkshire.

(*To be continued.*)

THE ESSEX FIELD CLUB.

SECOND JOINT MEETING OF THE CLUB AND THE IPSWICH SCIENTIFIC SOCIETY, AT IPSWICH, AND ON THE ORWELL AND STOUR RIVERS.

Friday and Saturday, July 24th and 25th, 1891.

Directors:—HENRY MILLER, M.Inst.C.E.; Dr. J. E. TAYLOR, F.L.S., F.G.S.; E. A. FITCH, F.L.S.; E. M. HOLMES, F.L.S.; WALTER CROUCH, F.Z.S.; G. H. HEWETSON, and W. COLE, F.E.S.

THE meeting in June last year, for the purpose of dredging in the Estuaries of the Orwell and Stour rivers, having been so successful and pleasant, the Council, with the kind and hospitable co-operation of the Ipswich Scientific Society, arranged to repeat the experiment, with some additional features. A full account of the previous meeting, with lists of the objects of marine zoology and botany found, was printed in the *ESSEX NATURALIST*, vol. iv., pp. 169-173.

Ipswich ("Gipes-wic," A.S. Chronicle, A.D. 993) is a fine example of an English town, containing abundant evidences of antiquity and continuity of history, and many interesting buildings and churches. The building known as "Sparrowes House" is perhaps the most remarkable specimen of ancient domestic architecture to be found in the eastern counties (see "In and About Ancient Ipswich," by Dr. J. E. Taylor). The centre of attraction for the naturalist is, of course, the MUSEUM, in which are local collections of very considerable scientific importance. It was largely promoted by the Rev. W. Kirby, the celebrated entomologist, and by the late Prof. Henslow. It is famous for its collection of fossils from the Red and Coralline Crags of the eastern coasts, which was augmented in 1877 by the late Sir Richard Wallace's gift of the Rev. H. Canham's fine collection, the result of twenty years' labour. There are also excellent botanical and bird collections, shells and crustacea, and a good series of flint implements, principally found in Suffolk by Mr. S. Fenton. Dr. J. E. Taylor is the Curator, and under his able management the Museum has become the centre of scientific activity in Suffolk.

Members of the Club assembled in Ipswich on the Friday afternoon, coming by road and rail. The management of the meeting was again in the hands of the Secretaries of the two Societies, Messrs. G. H. Hewetson and W. Cole, the former most kindly undertaking all the local arrangements. The "East Anglian Daily Times" gave excellent accounts of the two days' meeting, and we cannot do better than repeat the opening words of the reporter:—"Between men engaged in scientific pursuits, whether professionally or as a form of recreation—and the women too, happily enough—there is a kind of freemasonry which places them all upon a common footing of sympathy and good comradeship. No society is more democratic, in the best sense of the word; and in none other are more friendly relationships established without any deference to political or religious

differences. The study of nature, like the poet's 'one touch' of it, makes the whole world kin. It was the underlying, if unexpressed, apprehension of this fact, we think, which left so many pleasant memories of the joint meeting of the Essex Field Club and the Ipswich Scientific Society, and led eventually to a repetition of the programme during the present summer. Members of the now famous Essex Society expressed an earnest wish for another visit to Ipswich, the local Society were delighted with the opportunity of giving them an enthusiastic welcome, and the introduction to a day's outing assumed the form of a social and scientific 'reception' at the Ipswich Museum on the previous evening. Arrangements for this preliminary gathering were made in a spirit of heartiest hospitality by the Committee of the Ipswich Scientific Society. The President for the year (Mr. Henry Miller, jun.), Mr. G. H. Hewetson, Hon. Secretary, and Mr. F. Woolnough, welcomed the company upon their arrival, and were the more active organisers of the proceedings; but they were assisted in various ways by others of their colleagues, including Mr. J. Napier, Mr. E. P. Pidley, Mr. W. Vick, and Mr. F. W. Wilson.

"The visitors at once proceeded to the room occupied by Dr. J. E. Taylor, who acted as guide, philosopher, and friend to all inquirers, and showed the way with pardonable pride around the Museum which he has in great part created, and for which the borough is rightly famed. In the Doctor's room, Mr. W. Vick showed his remarkable collection of photographs of one hundred people over seventy years of age, which make a curious study in character and facial expression, together with many good views of scenery and places of interest in the neighbourhood, which were seen to advantage through two or three graphoscopes. Dr. Taylor exhibited a group of carnivorous plants, Sundews (*Drosera*) and Butterwort (*Pinguicula*), of which he gave an intensely interesting account; and his sanctum was, as usual, full of objects which arrested the attention of the naturalists and geologists."

Dr. Taylor afterwards led the way upstairs into the principal room of the Museum, and proceeded to give, in his inimitable style, a most interesting discourse upon the Essex and Suffolk Red Crag formations, demonstrating each statement by aid of the magnificent collections of Crag fossils which were contained in the cases around. At the close of the address the Mayor of Ipswich proposed a hearty vote of thanks to the demonstrator, which was carried by acclamation. Dr. Taylor replied in a happy speech, complimenting the Essex Field Club upon the high position it had attained among natural history societies.

The remainder of the evening was occupied in examining the collections, and in partaking of the refreshments which were hospitably provided in the Art Classroom. The members of the Essex Field Club present on the Friday evening were not so many as were desired; but those who went down to Ipswich on the Friday were delighted at the kind reception accorded to them by the Council and members of the local Scientific Society.

On the Saturday morning the Conductors and members of both Societies assembled punctually at the landing-stage on the New Cut, and (after being reinforced by the Field Club members who travelled down by the 8.5 a.m. from London) embarked on the Great Eastern Railway steamer, the "Stour," for a day's dredging in the estuaries of the Orwell and Stour rivers.

Whilst awaiting departure alongside the steamer, Mr. Walter Crouch pointed out the numerous borings of a most destructive mollusc, the *Teredo*, which was well in evidence on the landing-stage; and before the start other interesting forms were to be seen on board, alive. These had been taken on the previous day from

the oyster-beds in the river. Of these, two exceedingly fine varieties of the beautiful sea-anemone, *Bunodes (Tealia) crassicornis*, at once attracted attention; and the white and orange-coloured specimens of *Alcyonium digitatum*, or "dead-man's fingers," with their crowd of translucent extended polypes, each with eight feathery tentacles. Crawling on the sides of the glass vessels were two specimens of the Gastropod, *Philine aperta*, whose delicate shells are concealed beneath the mantle lobes; and the little Top-shell, *Trochus cinerarius*, but both of these had been recorded in the previous year's excursion (see ESSEX NATURALIST, vol. iv., p. 171).

On leaving Ipswich, the walls of the quay were observed to be lined with green Algae of a filamentous character, probably (Mr. E. M. Holmes suggested) consisting of species of *Urospora* and *Enteromorpha*, and possibly (in the darker patches) of *Oscillaria*, *Lyngbya* and *Protococcus*, but neither time nor opportunity permitted of their examination.

The weather was rather dull and cold as the "Stour" dropped down the river, under the command of Captain Mills, and it remained so during the greater part of the day.

The reader is referred to the report of the previous dredging meeting on June 14th, 1860, in the ESSEX NATURALIST (vol. iv., pp. 169-173), for much interesting information on the natural history of the estuary of the Stour. The methods of working were the same as on the first visit; but a greater number of large clear-glass bottles and small aquaria having been provided than on the previous occasion, the members were enabled to view the various animals brought up with ease and minuteness. Microscopes and hand lenses were provided for this purpose. Mr. W. Jolly (the lessee of the Orwell Oyster Fishery) again gave permission for dredging in his waters, and rendered most valuable assistance.

The first cast of the dredge was made on the Woolverstone Park side of the river, just beyond the Cat House, and this haul (and subsequent casts both in the Orwell and Stour) brought up an abundance of the POLYZOAN, *Aleyonidium gelatinosum*, or "Barley Sugar," on which were thickly sprinkled young specimens of a mollusc allied to the periwinkle, *Lacuna crassior*, with the epideimis of the shell drawn up into ridges. On the same Polyzoan, and also on the siliceous sponge, *Chalina oculata*, were crowds of the small scarlet and white skeleton CRUSTACEAN, *Caprella linearis*, both male and female. Other Crustaceans observed were *Nymphon gracilis* (in good numbers), *Eupagurus bernhardus* (in *Buccinum* shells), *Hyas araneus*, *Carcinus marnas* (abundant, as usual); of *Pallene brevis* Mr. Fitch recorded one specimen, &c.

Of other POLYZOAN, some specimens of *Bugula avicularia* and *Membranipora pilosa* were noticed investing the algæ; and on dead shells, species of *Eschara* and *Lepralia*.

A few forms of the TUNICATA, or "Sea Squirts," were brought up—*Botryllus*, *Cynthia* and *Ascidium*; among the latter, *A. intestinalis*, with almost transparent gelatinous tunic, which was fairly abundant, and generally attached to dead shells of *Tapes*, &c.

Among the SEA ANEMONES were many free-swimming *Ilyantius scoticus* and specimens of another species that comes nearest to *Edwardsia callimorpha*, and another small sage green species with yellow furrows that seems to come near *Gregoria fenestrata*; it was attached to seaweeds, especially *Laminaria* and *Fucus*.

The MEDUSE (HYDROZOA) included *Aurelia aurita*, and one specimen of *Cydippe pomiformis*; and the division Hydromedusæ was represented by

Hydractinia echinata (on various shells), *Sertularia abietina*, *Hydrallmania fulcata*, and *Thuiaria thuiia*.

The ECHINODERMATA were represented by *S. papposa*, and *Ophiotrix* ("brittle-star").

WORMS. Good specimens of *Sabella penicillus*, in their leathery tubes, were brought up, and in their new abode, in the bottles and aquaria, soon displayed the delicate mottled plumes, as though they sought for admiration.

On an old oyster shell was a tube of *Terbella conchilega*, with its rough exterior composed of broken fragments of shells and stones, but the annelid-builder was no longer within.

On the *Laminaria*, a host of the tiny spiral calcareous tubes (which simulate a true shell) occurred, the shelter of the delicate plumed *Spirorbis nautiloides*.

Many other species of MARINE WORMS of the genera *Phyllodoce*, *Nereis*, *Polydora*, *Nephtys*, &c., were taken, and it is hoped that they may be subsequently worked out.

SPONGES. Some grand specimens of *Grantia compressa* and *G. ciliata* (of the former two very large ones) were brought to the surface, which were pronounced by Dr. Taylor and Mr. Crouch to be the largest they had ever seen. One of these measured 7 inches in length, and 2½ inches in breadth, and is prettily lobed. *Chalinia oculata*, and *Halichondria panicea* ("The Crumb of Bread Sponge") were abundant, as on the previous occasion; and a number of the small but very interesting *Sycon ciliatus*, with its tri-radiate calcareous spicules around the osculae. The largest one taken is barely half-an-inch long.

MOLLUSCA. A larger number were captured than on the previous trip,¹ when only sixteen species were recorded. These (with two exceptions—*Saxicava* and *Eolis*) were again taken, and Mr. Crouch has now been enabled to add twenty-one to the list, making in all thirty-seven species. Of these, nine were in the River Stour, and in the following list Mr. Crouch has detailed these and marked those which had occurred in 1890.

A large specimen (dead) of the northern shell *Fusus norvegicus* was dredged up; but this cannot be taken as indigenous, as they have been brought here at different times with oyster spat from the North Sea, the Dogger Bank, &c.

LIST OF MOLLUSCA OBSERVED IN THE ORWELL AND STOUR ESTUARIES.

(Species marked * occurred also in 1890.)

BIVALVE SHELLS—PELECYPODA.

* <i>Ostrea edulis</i> .	
* <i>Pecten varius</i>	Two dead shells.
* <i>Mytilus edulis</i>	Abundant.
<i>Modiolaria marmorata</i>	Four alive.
<i>Nucula nitida</i>	A few.
* " <i>nucleus</i>	A few.
<i>Lucina borealis</i>	One valve, young.
<i>Cardium exiguum</i>	A quantity.
* " <i>edule</i>	Mostly dead.
* <i>Tapes pullastra</i>	Mostly dead.
" <i>decussatus</i>	Several dead.
<i>Tellina balthica</i> (Stour)	One dead valve.

¹ See ESSEX NAT., vol. iv., p. 171.

<i>Macra solida</i> (Stour) . . .	One dead.
<i>Scrobicularia piperata</i> (Stour) . . .	Several.
" <i>alba</i> (Stour) . . .	One alive.
* <i>Mya arenaria</i> (Stour) . . .	A few dead.
" <i>truncata</i> (Stour) . . .	A quantity of dead shells.
<i>Pholas dactylus</i> . . .	Dead.
" <i>candida</i> . . .	Several dead.
<i>Teredo</i> sp. (?) . . .	Borings only.
* <i>Saxicava rugosa</i> . . .	(Taken 1890 only.)

UNIVALVES—GASTROPODA.

* <i>Chiton cinereus</i> . . .	Two alive.
* <i>Trochus cinerarius</i> . . .	Quantity alive.
<i>Trochus</i> , sp. ? . . .	Two on oyster shell.
<i>Lacuna crassior</i> . . .	Abundant, but <i>small</i> .
* <i>Littorina rudis</i> (Stour) . . .	Common.
" <i>littorea</i> (Stour) . . .	Common.
<i>Rissoa membranacea</i> . . .	A few.
<i>Hydrobia ulvæ</i> (Stour) . . .	Plentiful.
<i>Purpura lapillus</i> . . .	Dead shells.
* <i>Buccinum undatum</i> . . .	Alive, but mostly small.
<i>Murex erinaceus</i> . . .	Several dead shells.
<i>Fusus norvegicus</i> . . .	(From North Sea.)
* <i>Nassa reticulata</i> . . .	A few.
* <i>Philine aperta</i> . . .	Plentiful.

NUDIBRANCHIATA.

<i>Doris filosa</i> . . .	Several specimens, one an inch in length.
* <i>Eolis coronata</i> . . .	(Taken 1890 only.)
Egg ribbons of a <i>Nudibranch</i> also occurred.	

Mr. E. M. Holmes reported that the Marine Algæ dredged up were very few and hardly worthy of record. *Enteromorpha compressa*, *Gracillaria confervoides* and *Antithamnion plumula* were noticed, but even these only in small quantities.

During the afternoon, Dr. Taylor gave an exceedingly interesting address "On the Marine Zoology of the Estuaries of the Orwell and the Stour." Nobody, he said, who merely travelled over the surface of the water would ever dream of the marvellously dense metropolis of marine life which crowded the bottoms of the estuaries. Submarine life was not so abundant in the Stour as in the Orwell, and his explanation of the fact was this—that the bed of the former river was more largely composed of London clay than the Orwell, and that the mud of this clay took a great deal of the oxygen out of the water, leaving but little to support animal life. Dr. Taylor thought that a fairly representative collection of the animals inhabiting the littoral zone, found everywhere between high and low water marks in the British Islands, had been obtained; but that, as these estuaries opened southward, they had perhaps met with some forms of life which would not be found in the firths and lochs of Scotland, while the latter would contain some arctic animals not discoverable in the Suffolk and Essex estuaries. Along the bottom of the Orwell and Stour, adapting themselves to changed climatal conditions, forms of animal life had probably lingered, like those found fossilised in the crags, and, perhaps, had lived there ever since the Crag period.

Dr. Taylor then briefly described the various forms of animal life dredged up during the morning, taking as his texts the numerous specimens in the bottles and jars on the deck. Nearly every conspicuous species mentioned in the above lists was attended to, and many very interesting remarks were made on the details of their structure or life-history.

Dr. Taylor's remarks were highly appreciated by the company; and then Mr. Walter Crouch, upon the invitation of the former, said a few words about the shells, referring more particularly to monster Almond Whelks (*Fusus norvegicus*), which had been brought to the Orwell with oyster spat from the Dogger Bank.

Mr. E. A. Fitch, as President of the Club, proposed a comprehensive vote of thanks. First of all, he said the Essex Field Club felt indebted to the Ipswich people for supporting such a splendid Museum as that over which Dr. Taylor presided. The collection there of fossils illustrating the Red Crag, both of Suffolk and Essex, was, perhaps, one of the best in the country; and the graphic demonstration by the Curator, to which they had listened on the previous night, alone repaid a visit to the town. During the whole of that Excursion, moreover, the Doctor had been always demonstrating and answering the many questions of inquiring friends, and to him their thanks were in the first place due. They had also to most warmly thank the members of the Ipswich Scientific Society for the reception given them, Mr. G. H. Hewetson and Mr. W. Cole for their hard work as Secretaries, and Mr. Frank Woolnough for the excellent manner in which the Excursion had been organised.

Mr. H. Miller, jun., on seconding the motion, said he hoped there would be another joint Excursion next year in some part of Essex, and that Dr. Taylor would again be present with them.

The motion was carried by acclamation, and Dr. Taylor, in reply, said that he was always happy to do what he could to assist naturalist students.

A vote of thanks was also passed to Mr. W. Jolly for his courteous assistance in superintending the dredging operations.

In other ways than those strictly scientific, the Excursion was very much enjoyed. Luncheon and tea were served on board by Mr. James Hardwick, of the "Queen Street Restaurant," and these important arrangements were well carried out under the personal supervision of Mrs. Hardwick. The veteran Captain Mills was anxious to please his visitors, and was most successful in his efforts; and the crew and dredgermen were most helpful in assisting the various efforts of the naturalists.

A short run was taken up the Stour to Parkeston. The Stour is celebrated as certainly the most beautiful of Essex rivers. Constable was born upon its margin, and the charms of its scenery made a deep impression on his mind and works. "I associate," he said, "my careless boyhood with all that lies on the banks of the Stour; these scenes made me a painter, and I am grateful." Unfortunately, the river not being navigable far from its mouth for a vessel like ours, the scenes of Constable's labours were reserved for another visit to the Stour.

At Harwich some of the members were landed, in order to catch an earlier train home, and spent some time in viewing the town, perhaps, historically, the most interesting port in Essex, which was long the chief point of communication between England and Holland. It was a very early settlement; the remains of a camp may still be traced to the south, and Roman relics have been found in and about the town. It had early acquired such maritime importance as to be able, in 1347, to furnish fourteen ships to the fleet of Edward III. The harbour

is of great extent, and forms, united with the bay, a roadstead for large ships of war.

While waiting at Harwich, Mr. E. M. Holmes made some observations on the algæ of the shore there, which will be found recorded in the present number of the ESSEX NATURALIST (see page 263).

A run was also made by the steamer across the harbour to Felixstowe Pier, where nearly an hour's stay was allowed, and where, on the shore, the botanists were much interested in finding *Zostera marina* var. *angustifolia* in flower and in fruit, the furrowed seeds being almost as large as wheat kernels, while the axillary flowers were only to be seen by the slight thickening and by holding the plant up to the light.

The company saw the "Lord of the Isles" leave Harwich and a splendid steamer belonging to the Wilson Line come in, and the journey home was made in glorious weather, with the evening sunlight showing the scenery of the river-side in its loveliest aspect. All were landed at Ipswich before seven o'clock, and the party separated with mutual expressions of a hope that other meetings of a similar kind would be held in future.

EXCURSION FROM MALDON TO CHELMSFORD, ALONG THE BLACKWATER AND CHELMER NAVIGATION RIVER.

Saturday, August 8th, 1891.

Directors—E. A. FITCH, F.L.S., EDMUND DURRANT, WALTER CROUCH, F.Z.S., W. COLE, F.E.S., DR. J. E. TAYLOR, F.L.S., and DR. PEARL.

THE main object of this meeting was to afford opportunities for botanical, entomological and conchological observations along the banks of the Chelmer river, which was rendered navigable in 1797 by the setting up of numerous locks, and making some cuts to avoid bends, &c.

The principal arrangements were in the hands of Messrs. Fitch and Durrant, and they were admirably carried out in every detail. The members and visitors (numbering about eighty) embarked about eleven o'clock from the Maldon siding, close to the railway station, on board the barge "William Davis," which was drawn by a couple of horses, the helmsman being Mr. Lewis Hansell. Our veteran Essex Naturalist, Mr. Joseph Clarke, of Saffron Walden, was on the platform to meet some of the party, and to wish us *bon voyage*. The weather was delightful, and the barge being most comfortably fitted up, and flowers and other natural history objects fairly abundant, the novel "Field Meeting" was thoroughly enjoyed by all privileged to take part in it.

Mr. President Fitch acted as skipper of the craft, and, on starting, read out the humorous "sailing orders" he had prepared, printed copies of which had been posted up on the awning.

A splendid view of Maldon was obtained as the craft passed under the railway bridge, and there were some grand stretches of river scenery, the banks abounding with flowers. Eleven locks had to be ascended, namely—Beeleigh, Ricketts, Hoe Mill, Rushes, Little Baddow Mill, Paper Mill, Stonehams, Cuton, Sandford Mill, Barnes Mill, and the Upper Lock.

On the voyage the parishes of Heybridge, St. Peter's Maldon, Langford, Ulting, Woodham Walter, Hatfield Peverel, Little Baddow, Danbury, Boreham, Sandon, Great Baddow, Springfield, and Chelmsford were touched or traversed. The most noticeable features passed *en route* were Beeleigh Weir and Mill, the Speeney, Sugar Bakers' Hoe (where the old Sugar Mill formerly stood), All

Saints' Church, Ulting, the junction of the river Ter, the Paper Mill, Little Baddow Mill, Sandford Mill, and Barnes Mill, Springfield, and concerning most of these places the "Skipper" had a fund of information to communicate.

The first halt was made at a small eyot, where many river-side plants were gathered in profusion, Dr. Taylor and Dr. Pearl affording information to those unfamiliar with field botany.

At Beeleigh Lock the following paper was read :—

NOTES ON THE HISTORY OF THE CHELMER AND BLACKWATER NAVIGATION.

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

All our Essex rivers rise in the north-western portion of the county. This somewhat peculiar physical feature is due to the outcrop of the chalk in that district. A four-mile radius from Radwinter Church (near Saffron Walden) includes the sources of the Blackwater, the Chelmer, the Stour, the Colne, and the Cam. The Stort is reached in seven miles. With the exception of the Cam, these Essex rivers take a southerly or south-easterly course, and are mostly contained within the county.

The Blackwater rises at Crawney Wood, Debden, and to the north-west of Wimbish Green, joined by two other brooks, or "burns," as it trends round Radwinter Hill. It then flows through the Sampfords (the "Sandy" Ford) and the Bardfields, receiving many smaller tributaries in this district and Wethersfield, and at Shalford (the "Shallow" Ford) is its first mill. Then on past Panfield, which derives its name from the river Pant, to Bocking and Stisted. The high road crosses it at Blackwater, thence to Coggeshall, and by Feering to Kelvedon, where it is crossed by the railway a few yards before the railway station, and by the high road over a single span bridge, with five small arches for flood water, built in 1788. The old seven-arched bridge, now much dilapidated, still remains, situated a short distance to the south-eastward. Morant gives "Easterford" as an alias of Kelvedon, as in John Norden's map (1594), and says "Easterford denotes the more eastern ford, which it is in regard to Rivenhall water, now covered with a bridge, and to that at Wickham mills" (*Hist. of Essex*, ii., 150). The river now turns sharply in a south-westwardly direction, and flows past the Braxteds to Witham meads, the high road running almost parallel with it, where it receives the important affluent known as Pod's Brook, which is fifteen miles in length, and has five mills on its stream. The Blackwater now passes below Wickham Bi. hops, through Langford (the "Long" ford) nearly to Beeleigh Mill, which is on the Chelmer. It then flows parallel with its sister river almost to Fullbridge, when it turns northwards and flows in a semicircle round the Little Marsh and Potman Marsh, joining the common estuary at Heybridge Creek, just at the back of Maldon East Railway Station, a little more than half-way from Fullbridge to the Hythe, Maldon. The tide flows up under the stone bridge (Heybridge High Bridge) to Heybridge Mill. This bridge at the end of the Causeway was doubtless the one solitary bridge over the river when the Chelmer only took the water from Beeleigh Mill, the flood water going into the Blackwater channel; and even to-day in the old leases of the Maldon wharf property it is described as on "the bank of Beeleigh Mill-stream." Fullbridge was then a shallow ford; now the tide rises about seven feet at ordinary tides, and to ten feet at spring tides. The whole river is doubtless a much cleaner cut channel than formerly.

The river Chelmer rises about two miles to the north of Thaxted, less than one mile south-east of the Blackwater, and these rivers almost join about one and a half miles above their common estuary; in fact they interchange their waters here commonly in flood times. Running round Thaxted the Chelmer runs through Tilty, where it receives a rather large but nameless brook on either side. Between Great and Little Easton there is its first mill, and at this point its channel is within a mile of the source of the Roding. Traversing Easton Park, through Church End, Dunmow, the silvery streak approaches almost to Felstead where it receives the Stebbing brook, on which are two mills, through the

Walthams—it is said to flow a distance of five miles through the parish of Great Waltham—between Broomfield and Springfield to Chelmsford.

Here it receives the two important tributaries of the Cann and the Wid. The former rises at High Easter and High Roding, and flows between Margaret Roding and Good Easter to Chignal St. James, a little below which it is joined by the Roxwell Brook, which flows round Fingrith Hall and the High Woods. The latter flows from Doddinghurst and Blackmore, Shenfield, and Herongate, through Buttsbury, Margaretting, Widford, and Writtle. It may be news to some of the travellers on that great Essex highway—the Colchester line of the Great Eastern Railway—that the flood water they so often see out from the Mountnessing Brook, between Brentwood and Ingatestone stations, comes down to Maldon to the same point as the river they cross just below Kelvedon station.

Four miles below Chelmsford this river receives on the left bank the New Hall and Boreham Brook, and a little lower, at Little Baddow, it receives from the other side the Sandon Brook, a considerable stream flowing from Stock and the Hanningfield. The Ter runs from Felstead, within a mile, from the old river and from Rumley Wood, Great Saling, within a mile of Pod's Brook, a tributary of the Blackwater, through Little Leighs, Great Leighs, and Terling, (to which parish it gives its name), under the main line of railway at the Viaduct, near Crix Mill, through Hatfield Peverel, and falls into the Chelmer about half-a-mile above Ulting Church. Between Hoe Mills and Beeleigh Mills it receives a brook running from Little Baddow and Woodham Walter Common. The tide flows up past Beeleigh Abbey to Beeleigh Mill.

There has been and still is considerable confusion about the Blackwater and Chelmer rivers during the last mile of their separate existence. As has been already said, they interchange their waters at many points from a considerable distance above Beeleigh Mill, but their streams are distinct now, if not in times past, and it is the Chelmer that flows under Fullbridge, although in the six-inch Ordnance map this is called the Blackwater, and some years ago a conviction of the justices was made upon an information for an offence committed here upon the river Blackwater, but upon appeal this conviction was quashed on the ground that the river wasn't there at all. Only last year the Maldon borough authorities had the satisfaction of setting both the Board of Trade, the Woods and Forests Office, and the Local Government Board right in this important particular, doubtless caused by the serious error in the Government survey. It is Heybridge Creek, falling into the estuary just east of the railway station, that is the river Blackwater.

In the year 1765 a proposal was made to make the river Chelmer navigable for 30-ton barges from Moulsham Bridge, Chelmsford, to Maldon Bridge, and an Act of Parliament was obtained to that end. In those days, however, company floating was not so readily accomplished as now, and although the capital asked for was but £13,000, sufficient was not subscribed. The details of the survey, by Thomas Yeoman, for this project will be found in the "History of Essex, by a Gentleman," vol. i., pp. 84-102, and in the same volume, at p. 93, we read, "We here give the survey and report, made by the encouragers of this navigation, as also their plan, curiously engraved on copper, and when we come to treat of Maldon we shall then subjoin the survey plan, &c., given by several gentlemen who strongly opposed it, leaving the reader, after a thorough inspection of the whole, to form his own conjectures." I cannot learn that these plans were ever published, and Yeoman's plan is only found in a few copies of the History. In 1762 the cost of land carriage "for coals and all other goods brought by waggons from Maldon to Chelmsford" was 8s. per ton, and it was estimated that the water carriage was to cost 2s., with a toll of 2s. 6d., in all 4s. 6d., a saving of 3s. on every ton of goods so carried to Chelmsford, in addition to a considerable saving of time in transit. It was also estimated that then (1762), "under all the disadvantages of the late war," at least 6,000 tons of coal and 4,000 tons of other goods were imported into Maldon for the use of Chelmsford.

In the year 1793 (33rd George III.) another Act of Parliament was passed "for making and maintaining the Chelmer and Blackwater Navigation." In this Act the proprietors' names are set forth, so in this instance, presumably, the

subscription list was closed before the Act was obtained, and we know that the works were proceeded with at once. The capital was £40,000, divided into 400 £100 shares, with power to raise a further sum of £20,000 if necessary. The only initial difficulty that arose was that on April 13th, 1795, a meeting of the proprietors was called for the purpose of raising a further sum of £8,000, in consequence of the company having been compelled to purchase Beeleigh Mill.

In accordance with this Act, the canal was made from Moulsham Mill to near Beeleigh Mill, by widening, deepening, cleansing, straightening, and improving the river Chelmer; here a short cut along the Long Weir was made into the Blackwater, and the bed of that river was "widened, deepened, cleansed, and improved" to Heybridge Mill, whence a new canal was cut through Heybridge to what is now known as Heybridge Basin, falling into the estuary at Collier's Reach. The opposition from the borough of Maldon to this undertaking was so great that the company were not able to bring their canal within the borough boundaries.

I do not think that I need go into the commercial history of the undertaking. The topography of the canal we propose to explore to-day, and in conclusion it will suffice to say that a detailed plan of the navigation, as completed, may be seen in Mr. Andrew Meggy's office at Chelmsford.

A short stoppage afforded an opportunity for a walk to Beeleigh Mill. There in the mill pond a few species of aquatic mollusca were taken by Mr. Walter Crouch, but there was not much time for collecting them.²

Some again landing, Speeney Meadow, further on, was also perambulated, and at Hoe Mill, Woodham Walter, Mr. S. Garratt accorded permission to stroll through his beautiful gardens, grotto, and grounds. Here was seen a female Golden Eagle, about twenty-four years of age, and two of her eggs (blown) were shown. (Mr. Fitch described the history of this bird in the *ESSEX NATURALIST*, vol. iv., p. 124).

Ulting Church was the next place of call. The edifice, dedicated to All Saints, is a small stone structure, close to the river side, and consists solely of a nave and chancel, with wooden turret and shingled spire, a pure example of Thirteenth Century or Early English style.

The botany of the country traversed was, as the programme led the visitors to expect, of considerable interest. The district is Number 3 (Chelmsford) of the artificial divisions in Gibson's "Flora of Essex," and is embraced in River-basin Number iv. (Blackwater) of Prof. Boulger's more natural arrangement (see "On the River-basins of Essex as Natural History Provinces," *Trans. Essex Field Club*, vol. ii., pp. 79-87, and map). The following plants were noted in the programme as being likely to reward the botanists, and, curiously enough, as Dr. Taylor pointed out in his "Botanical Demonstration," given on board soon after leaving Ulting Church, every species anticipated had been found that morning on the banks of the river or in the meadows near:—

The Meadow-rue (*Thalictrum flavum*); Moore's beautiful "Virgin lily" (*Nymphaea alba*), near Hoe and Little Baddow Mills, and the commoner Yellow Water-lily (*N. lutea*); Meadow-sweet (*Spiraea ulmaria*) will be abundant and fragrant as usual; the remarkable trimorphic and showy Purple Loosestripe (*Lythrum salicaria*) and its namesake the Yellow Loosestripe (*Lysimachia vulgaris*); the true Forget-me-not (*Myosotis palustris*), a flower recalling many poetical associations; various species of Willow-herb (*Epilobium*), locally known as "Apple" or "Cherry-pie" plants; the tall Hemp Agrimony (*Eupatorium can-*

² On the succeeding day, however, Messrs. Fitch and Crouch spent a longer time in the grounds of Mr. Ward, at Beeleigh Mill, and found seven species existing in great numbers in the artificial lake there; all, however, had already been taken on the previous day in the river Chelmer (see list *post*).

nabium), and the lowly Scull-cap (*Scutellaria galericulata*). The more interesting of the water-plants may be the Great Water-Dock (*Rumex hydrolapathum*), the Yellow-Iris, or Flag (*Iris pseudacorus*), the Great Water Plantain (*Alisma plantago*), *Sagittaria sagittifolia*, with its arrowed-shaped leaves, the Flowering Rush (*Butomus umbellatus*), with its peculiarly elegant and handsome rosy umbels, the Bur-reed (*Sparganium*), and the aromatic Sweet Flag (*Acorus calamus*) at Springfield.

Indeed, Dr. Taylor added, they had noted more species than the compilers of the programme had expected, and although none of the plants were rare, there were many that were exceedingly pretty and suggestive. He had little sympathy with the person who studied a plant because of its rarity, which showed that it had not been able to keep its place in the great battle of life, while those that were common had adapted themselves to the changes going on around them. He had, in the plants on the table, so many, as it were, botanical museums—many suggestive specimens about which long yarns might be told, and which by their peculiarities registered their affinities, and the lines of their descent. Some were armed with thorns, prickles, and hairs; others had their leaves peculiarly placed, and there were those whose leaves or roots were edible and poisonous; while, in certain instances, the plant had become wholly poisonous. A thousand years ago, of the collection of plants before him, those that were useful to man were put down to Providence and the saints, and named accordingly; and those that were poisonous were put down to the other power. (Laughter.) Underlying the history of plants was this fact—they had not all toemarked the same line; some had fallen back, some had become rare. Believing as he did in the laws of evolution, he thought there were still existing some of the primitive types of vegetable life—not horse tails, but mare's tails, a true flowering plant, and it was to those he referred. Dr. Taylor then took severally in hand the flowers collected, and demonstrated, amid much interest, their several peculiarities, floral histories, structures, and relationships. Speaking of their folklore, he said that many of the traditions concerning them were the common property of Norwegian, Danish, German, French, English, Spanish, Russian, Hungarian, and other countries, and he expressed his belief that these traditions were of Aryan origin, older even than the evolution of European languages, and distributed all over Europe during the great Aryan emigration. In this way he connected the popular names and folklore of common plants with ethnological history.

It may be interesting to record the names of the plants collected, which is compiled from the notes taken on the spot by Dr. Pearl, who took the greatest care in identifying the species. The list will be useful to beginners as an indication of species to be looked for during a riverside midsummer ramble in Essex, and also as showing what a rich flora the district possesses. A thorough search would probably furnish a much more extensive list, including some scarce species:—

LIST OF PLANTS NOTED ON THE BANKS OF THE CHELMER AND IN THE NEIGHBOURING MEADOW LANDS, AUGUST 8th, 1861.

<i>Thalictrum flavum.</i>	<i>Nasturtium officinale.</i>
<i>Ranunculus sceleratus,</i>	" <i>amphibium.</i>
" <i>repens.</i>	<i>Erysimum cheiranthoides.</i>
<i>Caltha palustris.</i>	<i>Brassica nigra.</i>
<i>Nuphar luteum.</i>	<i>Hellaria aquatica.</i>
<i>Nymphaea alba.</i>	<i>Hypericum perforatum.</i>

Malva sylvestris.
Lathyrus pratensis.
Spiræa ulmaria.
Rubus cæsius.
Genum urbanum.
Potentilla reptans.
Agrimonia eupatoria.
Myriophyllum spicatum.
Lythrum salicaria.
Epilobium hirsutum.
 " *montanum.*
Apium nodiflorum.
Egopodium podagraria.
Torilis anthriscus.
Heracleum sphondylium.
Galium verum.
 " *mollujæ.*
 " *palustris.*
Valeriana officinalis.
Dipsacus sylvestris.
Pulicaria dysenterica.
Eupatorium cannabinum.
Achillea millefolium.
Matricaria inodora.
Artemisia vulgaris.
Arctium majus.
 " *minus.*
Sonchus palustris.
Senecio aquatica.
Lysimachia vulgaris.
Vinca major.
Symphytum officinale.
Myosotis palustris.
Calystegia sepium.
Solanum dulcamara.

Linaria vulgaris.
Scrophularia aquatica.
Veronica beccabunga.
 " *anagallis.*
Mentha sativa.
Lycopus europæus.
Senellaria galericulata.
Polygonum hydropiper.
 " *persicaria.*
 " *amphibium.*
Rumex hydrolapathium.
Humulus lupulus.
Alnus glutinosa.
Salix alba.
Ceratophyllum demersum.
Elodea canadensis.
Iris pseudacorus.
Typha latifolia.
Sparganium ramosum.
Acorus calamus.
Alisma plantago.
Sagittaria sagittifolia.
Butomus umbellatus.
Patamogeton natans.
 " *lucens.*
 " *prælongus.*
 " *perfoliatus.*
 " *pectinatus.*
Lemna minor.
Scirpus lacustris.
Caræ paludosa.
 " *vesicaria.*
Phalaris arundinacea.
Glyceria aquatica.
Nitella flexilis.

At the conclusion of Dr. Taylor's interesting address, Mrs. Marsh (sister of the Rev. S. Baring Gould), on behalf of the lady students of the Chelmsford Botanical Class (many of whom were of the party), presented him with a pair of gloves, in a neat and highly applauded little speech, thanking him for the time and trouble he had given as Botanical Director of the Class during the summer. Dr. Taylor was the only person present not in the secret, and he said the best and most practical use he could make of the gloves would be to put them on, which he accordingly did amid much laughter and applause.

Mr. Walter Crouch was the conchologist to the expedition, but there was not much time allowed for collecting the land mollusca, which require some search; although we landed many times during the day, walking along the tow-path, and across the fields. The common snail was of course seen, and a few specimens of the hedge snail, *Helix nemoralis*, usually found in banks or among nettles.

During the trip, a good many aquatic species were taken by means of a small

tow-net, chiefly by Messrs. Fitch, Crouch, and W. Cole; but the swirl of the water as the barge was pulled along hindered the success of their endeavours; and as Mr. Crouch opined, better results would probably be obtained by carefully working in the more quiet back waters. In Mr. French's paper in the ESSEX NATURALIST (vol. ii., pp. 1 and 46), many species are recorded from the Chelmer near Felstead. The results of the day's work were rather disappointing, only eighteen species being on record, as shown in the following list. Nearly all of these were taken alive, and were exhibited in a small aquarium brought for the purpose. A considerable number of caddis cases (Phryganidæ) were observed on the water weeds, some formed of stones, twigs, &c., whilst others were thickly covered with adherent shells, chiefly of *Sphærium*.

LIST OF AQUATIC MOLLUSCA OBSERVED IN THE CHELMER, AUGUST 8th, 1891.

BIVALVES.

Sphærium corneum, a few, very large.
 * *Pisidium amnicum*.
Unio pictorum (dead).
Anodonta cygnea.
 „ *anatina*.

UNIVALVES.

Neritina fluviatilis, operculated.
 * *Bythinia tentaculata* „
 * *Planorbis albus*.

* *Planorbis vortex*.
 * „ *carinatus*.
 „ *complanatus*.
 „ *corneus*.
 „ *contortus*.
 * *Physa fontinalis*.
 * *Limnæa peregra*.
 „ *truncatula*.
Ancylus lacustris.
Succinea putris.

* These were also taken at Beeleigh Mill, 9th August.

Some interest was evinced in two Musk Beetles (*Aromia moschata*) that were taken off the pollard willows. Only one butterfly, *Vanessa io* (the Peacock) was seen. Our President boxed several moths off the tree-trunks—the “Yellow-tail” (*Liparis auriflva*), the “Dagger” (*Acronycta psi*), the “July Highflyer” (*Ypsipetes elutata*) being the most abundant. As the tow-rope swept over the reeds and sedges many moths and Phryganids, &c., were disturbed but not secured. The “Scorpion Fly” (*Panorpa communis*) was also abundant, and its curious structure attracted notice.

During the afternoon, Mr. T. V. Holmes, F.G.S., read a very interesting paper on “The Geology and Scenery of the Club's Voyage from Maldon to Chelmsford, August 8th, 1891,” already printed in the ESSEX NATURALIST (*ante*, pp. 197-202.) The paper was illustrated with geological maps and sections.

Cordial votes of thanks were passed to all who had assisted in the success of the meeting.

Most ample provision of light refreshment was provided on board by our kind “skipper,” Mr. Fitch, and somewhat late in the afternoon a combined luncheon and tea was partaken of in the garden of the Paper (Livermore's or Huskett's) Mill, the use of which was kindly granted by Mr. Pharaoh Byford.

After luncheon, an ORDINARY MEETING (the 126th), was held for the proposal and election of new members, Mr. Fitch, President, in the chair.

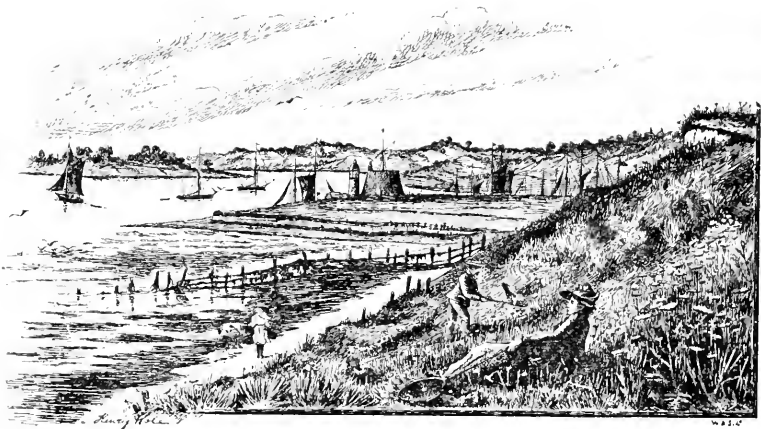
The following were duly elected: Messrs. J. H. Chapman-Coombs, A. H. Gray, and C. F. Osmond.

On the motion of the President, a special vote of thanks was passed to Mr. Byford and family, for allowing the luncheon to be served in their grounds, and for their kind aid in many ways given in the arrangement of the details of the meeting.

The voyage came to an end at Springfield Wharf, near Chelmsford, and the company separated, after hearty congratulations and thanks to Mr. Fitch and Mr. Durrant, and well pleased with a delightful day.

FIELD MEETING AT ST. OSYTH AND BRIGHTLINGSEA.

Monday, September 7th, 1891.



BRIGHTLINGSEA HARBOUR AND MOUTH OF THE COLNE, WITH MARTELLO TOWER, NO. 1.
(From a Sketch by H. A. COLE, August, 1880.)

FAVoured by glorious weather a large number of members and friends made an expedition into this interesting district, under the direction of Mr. C. E. Benham, Mr. J. C. Shenstone, and Prof. Boulger; Dr. Laver, whose name was on the programme, being unavoidably absent by reason of professional engagements. Members assembled at Thorington Station about 12.15, many coming from London, Colchester, Dovercourt, &c. The Secretary came over from Mersea, the President from West Mersea, having reached there by water a few days previously from Maldon, and Mr. Walter Crouch walked over from Brightlingsea. The business arrangements of the meeting had been kindly taken in hand by Mr. C. E. Benham, and were admirably managed.

As the London train travelled down, Prof. Boulger pointed out some plants on the railway banks—*Solidago virgaurea*, at Brentwood, *Eupatorium cannabinum*, *Lythrum salicaria* and *Alnus glutinosa*, at Mark's Tey, and *Epilobium angustifolium* on the banks at Brentwood and Wyvenhoe.

Leaving Thorington the party proceeded in brakes to St. Osyth, through most charming flower-decked lanes, the openings in the luxuriant hedgerows affording delightful glimpses of fields, meadows and woodlands, diversified with pretty homesteads and picturesque farm buildings. At Thorington a halt was made to inspect the remarkable oak trees (the pedunculate oak) of enormous girth near Thorington Church. These trees, with a circumference round the bole vary-

ing from 27 to 31 feet, are obviously of great antiquity, and it is thought by some that an indirect allusion to them may be traced in Domesday. These were noticed in a "Report on the Flowering Plants of the Neighbourhood of Colchester" (ESSEX NAT., i., 34), by Mr. J. C. Shenstone, who possesses excellent photographs of the venerable relics. It was observed that the hollies about Thorington appeared to be remarkably spineless, and among other interesting plants noticed were the Cotton Thistle (*Oxofordon acanthium*) and the great abundance of the Lesser Calamint (*Calamintha nepeta*).

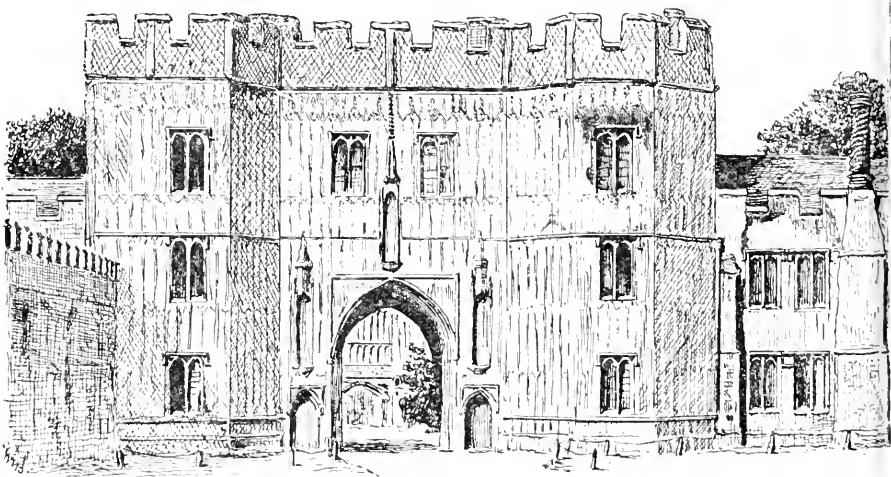
From Thorington the party was driven to the village of St. Osyth, of which the Saxon name (Chich or Chic) is of doubtful derivation, and which is one of the most interesting resorts in Essex. Numerous ancient homesteads exist in the parish, as is evident from the large number of "wicks" in their designations, but time would not permit a visit on this occasion to any of these manors, nor were the party able to inspect the beautiful Flower Farm of Messrs. Carter and Co., of High Holborn, which adjoins the vicarage, permission to visit which had been given by the firm. The present name of the village refers to Lady Osgith or Osith (daughter of King Frithwald), of whose career there are various traditions. According to Morant she was born at Quarendon, near Aylesbury. Her father endeavoured to persuade her to marry Sighere, the Christian king of the East Angles; but she had made a vow of virginity, and her intended husband at last consented to her wearing the veil and gave her his village of Chic, where she founded a church dedicated to St. Peter and St. Paul. She also instituted a nunnery here of the Order of the Holy Trinity. The monastery was plundered by the Danes under Inguar and Hubba, who caused St. Osyth's head to be cut off near the spring in Nun's Wood, where she used to bathe with her virgins. Other legends say that, at an early age, she was sent to visit a sister of King Alfred at St. Modwen, and then fell off a bridge into the river and was drowned, but was restored to life by the fervent prayers of St. Modwen. Tradition also relates that she refused to change her religion at the time the monastery was despoiled, and that where she was beheaded a spring of water burst forth from the ground, while the saint picked up her head and carried it in her hand as far as the church. This legend has many counterparts in other places—notably, at Holywell, in Wales, where an almost precisely similar story is told. After the death of St. Osyth, her body was removed to Aylesbury, where it remained forty-six years for fear of the Danes. It was then brought back to the parish, "and in those days," says Aubrey de Vere, "when people went to bed they did rake up the fire and make a cross in the ashes and prayed to God and St. Osyth to deliver them from fire and water and all misfortune."

At St. Osyth the church was first inspected, the vicar, Rev. J. E. Potts, accompanying the party and pointing out the most interesting features of the edifice, which has evidently undergone extensive alterations in the past. It was originally a cruciform structure, and in fourteenth century documents is alluded to as the minster of St. Peter and St. Paul. From an inventory of the goods and effects of the church and priory made by the King's commissioners after the dissolution, it appears that the church had a chapel on the south side, a chapel and vestry on the north, and a chapter-house and chapel at the west end. The vicar gave a quaint narrative relative to some ships' companies of pious Danes, who in days of yore landed at St. Osyth, and kneeling in the church offered up prayers for a favourable voyage to their native land. Upon concluding his orisons, one of the sea-captains purloined a valuable piece of marble from the

south porch of the church, but so dire were the misfortunes resulting to the voyagers that the sinful captain put back in haste and restored the stolen property. Carved in stone, above the north door of the church, is a wheel from which a fragment has been struck by the sword of an angel. This has reference to the story of St. Catherine and her release from the wheel by the angel. The noble monuments of the D'Arcy family and to the Earl and Countess of Rochfort came in for their share of attention, as also did the remarkable "fold" within which communicants were wont to kneel. It is shaped like a horse shoe, and together with other portions of the chancel has been recently restored by Sir J. H. Johnson. The vicar pointed out a monument prepared by an ancient worthy in his own commemoration. On it he in his own lifetime caused to be inscribed, with special reference to himself, "Blessed are the dead which die in the Lord . . . for they rest from their labours." The labours of this particular saint consisted, said the vicar, in hunting down old people and destroying them as witches. The roof of the north aisle of this ancient church merits special notice, being superbly carved in chestnut, each beam worked in a different design, and the whole executed in the spirit of a true artist.

A capital cold luncheon was served at the "Lion Inn," after which an ORDINARY MEETING (127th) was held for the proposal and election of members, the president, Mr. E. A. Fitch, in the chair.

The following were elected members of the Club: Messrs. S. F. Hurnard, W. du Fon Hutchinson, and G. Bentall.



GATEWAY OF ST. OSYTH PRIORY.

(Block kindly lent by MR. BENHAM.)

The priory and grounds were then visited, by the kind permission of Sir J. H. Johnson. It was originally an Augustinian monastery supposed to occupy the site of an ancient nunnery founded by St. Osyth. The old nunnery was plundered by the Danes, and, according to the legend already alluded to, St. Osyth's head was cut off near the spring in Nun's Wood (in the present park). The spring, says

the old story as related above, arose at this tragic scene of martyrdom. In the year 1118, Richard de Belmeis, Bishop of London, founded the priory, and up to the time of the suppression its endowment and possessions throughout the county were very considerable. After the suppression the site was converted into a seat by Lord D'Arcy, son of Roger D'Arcy, of Danbury, Sheriff of Essex, to members of whose family the handsome monuments and effigies in the church were erected. Here Queen Elizabeth was entertained in 1561 and 1579. The priory stands in a beautiful park of 250 acres, in which are some fine Cedars of Lebanon, and also some old Lombardy Poplars, planted in 1768 by Lord Rochfort, and supposed to be the first specimens of the tree introduced into England (see ESSEX NATURALIST, i., 34, and ii., 40). The extensive remains of the old building were visited, and a magnificent mulberry tree came in for some attention, but the theory that it might have been planted in the days of the monastery, was quickly disposed of by Prof. BOULGER, who stated that the tree was unknown in this country till a much later date. In the grounds was noticed a fine tulip tree, *Robinia pseudacacia*, and a profuse "escape" of *Impatiens parviflora*. And on the walls of the priory was noticed *Diplostaxis tenuifolia* (the wild mustard), a station recorded by Varenne in Gibson's "Flora of Essex."

The visitors would gladly have lingered longer amid these delightful surroundings so rich with historic interest, but the nineteenth century whistle of the directors abruptly interrupted their old world musings, and bidding a hasty farewell to this scene of mingled history and tradition a further stage in the day's pilgrimage was entered upon. The return journey was made by Brightlingsea, the first two miles in the brakes and the remainder on foot, over country of considerable interest to the botanist and entomologist. (A few notes on the entomology and botany of the district will be found in the ESSEX NATURALIST, ii., 115-116, and in Mr. Shenstone's papers in vol. i.)

The short drive over "The Hard" and on towards the first Martello Tower, disclosed a fine prospect of the mouth of the Colne with the open sea beyond, and away to the right appeared little red-brick Brightlingsea, fronted by an array of masts and rigging, clearly betokening the principal means whereby this small town maintains its livelihood. Resting on the grass at this vantage-point the company listened to some very interesting remarks by Mr. J. C. Shenstone on the valuable oyster fishery at Brightlingsea, where the celebrated "Colchester Natives" are reared:—

NOTES ON THE COLNE OYSTER FISHERY.

By J. C. SHENSTONE F.R.M.S., AND DR. HENRY LAVER, F.L.S.

It is a matter of regret that Dr. Laver should have been prevented from addressing us upon the subject of the Oyster Fishery to-day. Not only has he taken a very practical interest in this fishery, but has collected notes with a view of writing a full account of the subject, and would therefore have given us a valuable paper. I have to thank him for lending me some of his notes, and thus enabling me to address you with more confidence than I should have otherwise been able to do.

I will adopt the ordinary course and first deal with the history of the oyster: I mean, of course, the history of the oyster as an edible mollusc. It is quite possible, with a large number of modern food stuffs, to state accurately when they were first used by man, but the only statement with regard to the introduction of oysters that I know of is "That it must have been a very brave man who first swallowed one of these delicate but questionable-looking morsels of flesh."

Now my own opinion is, and possibly such of you as hold by the evolutionary

theory may agree with me, that this plucky man probably only existed in people's imagination. Is it not a fact that the lower animals are more discriminating than average man as to what is and what is not wholesome to eat, and is it not more than likely that man inherited his taste for oysters from that type of being from which he was evolved? It is, at any rate, certain that oyster shells may be found amongst the kitchen refuse near the ancient British camp, the Roman villa, or the modern house. There is not only no doubt that from earliest times the oyster has been esteemed a luxury by men, but also that the special qualities of Colchester oysters were fully appreciated, for in the remains of ancient Rome itself the shells of undoubted Colchester Natives are to be found.

The first documentary evidence of the Colchester Native is in the charter passed by Richard the First, A.D. 1189, to the borough of Colchester. This charter was a confirmation of previous rights, and gives to the freemen of the borough the sole right to fish from North Bridge to Westness. But the fishery was much neglected by the Corporation until recent times. Whilst carefully maintaining the exclusive rights, shown by litigation from the time of King Edward III. almost to the present date, they have in other respects left the fishery very much to take care of itself.

In 1683 the fishery was leased to William Garland for £50 per annum. In 1727, in an action *Waldegrave versus* the Corporation, its value was judged at £100 per year; evidently our forefathers of that date were not such good judges in gastronomic matters as the ancient Roman or as the modern Briton, though of course £100 then represented greater value than it would in modern times. In the year just ended the Corporation received £1,817 8s. 3d. from these fisheries as their share in the profits. Last year the amount received was over £2,000.

Morant states that in 1748 a peck of oysters is rarely obtained for less than 4s. Recently the prices have been as high as £12 and £14 per bushel.

The first documentary evidence of a body of dredgers, known as the "Colne Company," appears in the deeds in the Corporation archives (in the earlier part of the eighteenth century) granting to various lessees fishery rights for dredging in the Colne; and one, in 1718, authorising the lessees to grant licences at 10s. per dredge to the dredgers of eight parishes, and to the town of Colchester only.

Owing to disputes which arose in connection with these leases a special Act of Parliament was obtained in 1870. In this Act the parishes named are those bordering upon the fishery, and the control and ordering of the fishery is put into the hands of a Board, formed of six members elected by the dredgers forming the company, and six members elected by the Corporation. The company consists of all persons to whom the Corporation granted licences in 1867-8, and subsequent members are those who shall have been legally bound by indenture of apprenticeship to a member of the company for a period of seven years.

The company pays a fixed rent of £500 per annum to the Corporation and one-fourth of the net income derived from the fishery when the income exceeds £1,500 per annum. Also one-half of the net income derived from floating fish. Quite recently the Corporation has become alive to the necessity of taking vigorous steps to improve and develop this fishery which was quickly deteriorating, and the alterations made will result in great benefit to the members of the company and also to the Corporation of Colchester.

The young oyster is known in its minute stage as "Spat," and when further advanced as "Brood"; "Ware" and "Half Ware" are terms used to describe oysters still nearer the mature size.

About June the mature oyster is said to be "sick," and a magnifier will show apparently a quantity of dark sand (gritty to the touch) to be attached to the gills. These grains are the infant oysters, and are familiar to the microscopist, forming one of his most popular "objects." The number deposited by the parents is enormous; but only a small proportion survive to form mature oysters. The young oyster is furnished with a large number of cilia by means of which it survives free for a period, until a favourable spot is found for attachment. When this is accomplished the little creature never moves again until disturbed by outside agency.

In due time the brood is dredged up, and the young oysters carefully

separated from the "culch," a term used for the old shells, stones, &c., cleansed by exposure to wind and rain, which are deposited in suitable parts of the river to provide resting-places for the spat. The young oysters are again thrown into the water. If this separation were not carefully done the oysters would grow distorted and unmarketable.

At four years old the "Native" is at its best, and amongst the regalia at Colchester is a silver oyster, beautifully modelled from a Colne oyster, to serve as a standard of size, below which it is not proper to sell a Colne Native. During the late summer, after the spatting season is over, dredging goes on, and the four years old oysters picked out and conveyed to Pycfleet Creek, and deposited there, this ground, by experience, being found to fatten the oyster much better than the river. It is not, however, a good breeding-ground.

Large numbers of oysters are occasionally destroyed by Star-fishes, the "Whelk Tingle," and the Sea Hedgehog (*Echinus*).

The common Mussel is a very undesirable inhabitant of the oyster fishery, and the destruction of these enemies is an important feature in oyster cultivation.

In the autumn, the Colchester Corporation visit the fishery, and performs the opening ceremony. Upon their arrival at Brightlingsea, they embark upon a barge, when the declaration of the opening of the fishery is read by the Town Clerk, the company present immediately give a cheer, and at the same time a flag is hoisted to announce to those on shore that the fishery has been declared open. A gingerbread and a liqueur glass of gin is next handed round to each person present, and success to the fishery is drunk; finally some dredging is done, in order to judge how the season promises, and lunch is served.

It is needless to say that in these degenerate times this ceremony is carried out at the expense of the members of the Corporation. The time for the commencement of the fishing varies with the season. Later on it is customary for the Mayor to entertain the Corporation and a large number of friends to a feast upon oysters, a fixed number of the molluscs being supplied by the Oyster Company, the remainder and larger quantity at the Mayor's expense. This event is too well known to need enlarging upon.

At the conclusion of Mr. Shenstone's remarks, the President proposed a vote of thanks to him and to Dr. Laver, and also to Mr. C. E. Benham, who had taken so much trouble in organising the meeting. These votes were carried by acclamation, and the remainder of the afternoon was spent in strolling along the side of the creek, and in searching for such plants and shells as could be gathered on a hasty visit. *Equisetum telmateia* was noticed growing in great luxuriance in a hollow near the Martello Tower, in company with *Verlascum*. A considerable number of the young caterpillars of the "Fox Moth" (*Bombyx rubi*) were found feeding on the low herbage at St. Osyth Point, as well as plenty of the curious "semi-looper" larvæ of the pretty Noctuid moth, *Enclidia mi*, among the grass stems. The only butterfly seen worthy of note was *Cynthia cardui*.

On the day previous to the meeting, Mr. Walter Crouch had had some shore-hunting on Stone Point, St. Osyth, near the Martello Tower shown above in Mr. H. A. Cole's drawing. He found the mollusc *Hydrobia ventrosa* abounding by thousands in the green weed in a brackish-water pond, originally part of the Tower fosse; and to some of the members, who came to the Ferry by the sea wall, he pointed out the spot, and a number were taken. On the shore, and in the sea he had gathered about a score of common mollusca. A few shells of the bivalve *Anomia ephippium* occurred, and a quantity of *Lacuna crassior*. A shell of this gastropod was taken in the Blackwater trip, 1888, but was not recorded then, as it was not shown to Mr. Crouch till some time afterwards.³

³ On the succeeding day, on the shore of East Mersea, in company with Mr. W. Cole, Mr. Crouch again found some of these shells; and, amongst others, on the shell beach by the "Bowling Green," *Lacuna pallidula*, and quantities of *Hydrobia ulva*, *Rissoa membranacea*, and *Utriculus obtusus*, under the masses of *Zostera*, which are here washed up.

A quantity also occurred of the most interesting little mollusc, *Truncatella truncatula* (= *montaguï*), adhering to the under side of large stones on the "hard." These are not common, and Mr. Crouch believes they have never before been recorded on the Essex coast.

One of the most curious finds which he exhibited to those interested was a specimen of the slipper-limpet *Crepidula fornicata*, which he found dead, but adhering to an old oyster shell, not a native. On enquiry, he found that American oysters were brought over, and laid down here to fatten, and that would of course account for a shell which is not European being found on this coast.

The party then crossed the ferry to Brightlingsea, a town devoted to the fishing industries and to yachting, there being an excellent harbourage. An informal tea was taken at the "Royal Hotel" (in which building there is quite a little local Museum, accumulated by the landlord's son), and then the members made for home, some by train, some on cycles, and some in boats to Mersea and elsewhere.

SATURDAY, OCTOBER 10TH, 1891.

THE Twelfth Annual Cryptogamic Meeting was appointed to be held on this day in Hatfield Forest, and the circulars had been issued to members. A few days before the meeting, the somewhat sudden death of our member, Mr. J. Archer-Houblon, of Hallingbury Place, in whose grounds the meeting was to have been held, compelled the issue of a notice postponing the meeting. The weather becoming broken up, it was found impossible to organise another meeting during the autumn, and consequently, to the great regret of the officers and many members of the Club, the sequence of the Annual Fungus Forays was broken.

ORDINARY MEETING, Saturday, November 7th, 1891.

THE 128th Ordinary Meeting was held in the Public Hall, Loughton, at seven o'clock, Mr. E. A. Fitch, President, in the chair.

The Librarian read a list of the books and pamphlets bought or presented since the last meeting, and votes of thanks were passed to the several donors.

Mr. C. Oldham exhibited boxes of insects, including many aberrations of species of Lepidoptera, captured by himself during the past summer. Among other moths was a specimen of *Apamea ophiogramma* taken in the forest near Woodford on the 20th of July last.

Mr. Walter Crouch exhibited on behalf of Dr. Murie, specimens of the small Decapod, *Sepiola atlantica*, taken off Leigh, Essex, in August last.

Mr. A. J. Jenkins read a paper entitled: "Notes on the Mollusca of the Thames Estuary, with a List of the Species Observed" (printed, *ante*, pp. 220-232). In illustration of his paper, Mr. Jenkins exhibited a fine collection of the species of shells found in the marshes bordering the Thames on the Kentish and Essex shores, comprising eighteen fresh-water forms, six brackish-water, and nineteen land-shells. The author showed how much of interest was to be found in this "*terra incognita*"—one of the most interesting shells being the little *Hydrobia jenkinsi* (named after Mr. Jenkins), which was first noticed in the Essex marshes, and which is at present found nowhere else in the world but in the brackish ditches by the Thames estuary.

Both Mr. Jenkins and Mr. Fitch spoke of the immense injury now being done to animal and vegetable life by the gradual perversion of the Thames into an

immense open sewer. Not only are the shells and plants precious to the naturalist rapidly becoming exterminated by the filth of London and by the refuse of the chemical and other factories recklessly turned into the river, but the trade of the shrimper is almost destroyed, and valuable food fishes are being driven out, and are rapidly retreating seawards.

Mr. Crouch gave some particulars of the first discovery of the new Thames *Hydrobia* and other interesting forms mentioned; and the cordial thanks of the meeting were given to Mr. Jenkins for his paper, and also for his valuable donation to the Museum of the Club of an almost complete series of the Thames Estuarine Mollusca.

Mr. Jenkins also contributed some interesting remarks upon the aquatic plants of the Thames marshes, of which the following is an abstract:—

NOTES ON A FEW OF THE AQUATIC PLANTS OF THE THAMES MARSHES.

"In preparing my notes respecting the Estuarine Mollusca, I thought that it might interest the members of the Essex Field Club, and not be deemed out of character, if I were to exhibit a series of the aquatic plants commonly associated with them, and serving, in many cases, to furnish them with necessary food. Of the Fresh-water Mollusca some seem to have a preference for the living plants, whilst others, who are the scavengers of their aquatic world, generally feed upon them when partially decayed. My friend, Mr. W. Biddiscombe, of Plumstead, who has frequently accompanied me upon my trips to the marshes, has kindly furnished me with the mounted specimens of aquatic plants which I exhibit this evening, and also with a few notes descriptive of them. Although these remarks refer to plants which my friend has collected principally from the Plumstead Marshes, still I believe I can venture to assert, from personal observations, that they are common upon the marshes at Erith and Dartford, as well as upon the Essex side of the river.

"*Potamogeton*. Submerged or floating plants, with very cellular stems, and peculiar leaves, which are very thin and pellucid, and so sensitive to moisture after being dried, that when placed on the hand, they will shrivel up like a piece of goldbeaters' skin. The flowers are small, greenish, and two sexual, in axillary or terminal spikes. Three species are frequent in the marshes: viz., *Potamogeton pusillus*, *P. densus*, and *P. crispus*. The first is the commonest species, while *P. crispus* is the largest and handsomest of the three, having long alternate leaves, which are of a beautiful fresh-green colour, and very curly and pellucid. The three are all perennial and submerged, and flower from June to August.

"*Zannichellia palustris* ("Horned Pond-weed"). A plant belonging to the same order as the last genus—the Naiadaceæ—and very similar in appearance to *Potamogeton pusillus*, but having flowers in the axils of the leaves, minute, in pairs or solitary. It is frequent in most of the ditches, and flowers up to September.

"*Myriophyllum spicatum* ("Water Milfoil"). Common, flowering from July to August.

"*Anacharis alsinastrum* is, of course, very common in the fresher water ditches, as well as *Callitriche stagnalis* (the "Water Star-wort"). The latter is a very variable plant, no less than nine or ten "varieties" having been noticed by some botanists. In bloom from May to July.

"*Fepis portula* ("Water Purslane"). A humble creeping plant, with smooth opposite leaves, and small inconspicuous flowers in the axils of the leaves. The stems are more or less tinged with red, and when the plant grows in places from which the water has been dried up, the leaves acquire the same hue. It flowers from July to August.

Lemna minor and *L. trisulca* are the two commonest Duck-weeds of the marshes. The first is the universal one; the second, the Ivy-leaved Duck-weed, the peculiar side development of the young fronds forming a supposed resemblance to an ivy leaf. "The flowers are very minute, consisting of one or

two stamens and from one to four ovaries, enclosed in a sheath and produced on the under edge of the frond.

"Two of the Batrachian *Ranunculi* are very common in the marshes. One—*heterophyllus*—with a few floating reniform leaves, with the lower one submerged, multifid, with filiform segments. The other—*trichophyllus*—has all the leaves submerged, and smaller flowers. Flowers of both are white and float on the surface when expanded. These are very variable and confusing plants, no two botanists being, apparently, agreed about the nomenclature. They are said to be destitute of the acrid and poisonous properties of the terrestrial species—the common Buttercups.

"The above are the commonest aquatic plants which we have found in the dykes and drains which intersect the marshes, and I will add a few remarks, which may not be scientific, but which may possibly help the searcher after aquatic mollusca and microscopic algæ abounding in these ditches. Experience has taught me, that the examination of the water weeds often affords a valuable clue to the mollusca most likely to be found existing there, and they, too, also vary as to their preference of brackish or fresh water, while others can manage to exist indifferently in either. Amongst the pond-weeds previously mentioned, the following forms, to the best of my recollection, thrive equally well in fresh-water ditches and in those that are slightly brackish: *viz.*, *Potamogeton* and *Lemna minor*, or the Smaller Duckweed. The Ivy-leaf Duckweed (*Lemna trisulca*) and the American Pond-weed (*Anacharis alsinistrum*) seem to favour a fresh-water habitat, and in aquaria I have found they invariably die off if submerged in water that is at all brackish.

"An aquatic weed, abundant in the ditches inhabited by our new *Hydrobia*, is, I believe, the Horn-wort (*Ceratophyllum*). An Alga, which I take to be *Enteromorpha intestinalis*, is very abundant in the marshes on both sides of the river.

"The ditches upon the marshes are of course a favourite hunting-ground for the microscopist, abounding with the following minute Algæ:—*Nostoc caruleum*, in immense jelly-like masses; *Scenedesmus* and *Pediastrum*; Desmidiæ of the genus *Micrasterias* and *Cosmarium* abound, with innumerable shoals of Diatoms, amongst which I have frequently noticed *Pinnularia major* and *P. viridis*; quite a number of species of *Navicula*, *Orthosia* and *Fragilaria*. *Spirogyra* also may be taken here, but, to my thinking, it is not nearly so abundant as in many other fresh-water localities.

"In the future, I hope to devote more time and attention to the very interesting study of these aquatic plants, and particularly to the microscopic algæ of the Thames marshes."

Mr. Monckton kindly read for the author, Mr. French, of Felstead, a paper "On the Occurrence of Westleton Beds in parts of North-west Essex" (*ante*, pp. 210-217). Mr. Monckton made some remarks on the paper, which, together with a note from Mr. Dalton, are printed at the end of the paper (E.N., pp. 217, 218).

Cordial votes of thanks were accorded to Mr. Monckton and to the authors of the papers, and the meeting ended with the usual conversazione, at which Mr. Jenkins' fine collection of Mollusca was examined with much interest.

ORDINARY MEETING, Saturday, November 28th, 1891.

THE 129th Ordinary Meeting was held (by the kind permission of the Rev. W. Linton Wilson) in the hall of St. John's College, Loughton, at half-past six o'clock, Prof. R. Meldola, F.R.S., Vice-President, in the chair.

Extracts from a paper by Mr. French, "On some Ancient Lake-Remains at Felstead, with Notes on some similar Remains in the District," were read by the Secretary (the full text of the paper will be published in a succeeding number of the ESSEX NATURALIST).

Remarks upon the paper were made by Prof. Meldola and Mr. W. Cole, and a vote of thanks was returned to the author.

A lecture was then delivered by Mr. Frederick Enock, F.E.S. (Lecturer on Economic Entomology to the Organising Committee of the Essex County Council and Essex Field Club on Technical Instruction) on "The Life-History of the Hessian Fly." The lecture was fully illustrated by some very beautiful slides, prepared from Mr. Enock's original drawings, and exhibited by the oxy-hydrogen lantern.

In proposing a vote of thanks to the lecturer, Prof. Meldola alluded to the great value and interest of the original investigations carried on by Mr. Enock on the structure and transformations of this injurious insect, and to the excellent paper on the subject in the "Transactions of the Entomological Society of London." Mr. Meldola stated that it was to be hoped that Mr. Enock would be able to stir up some interest in the important subject of Economic Entomology in Essex now that the Organising Joint Committee had appointed him lecturer on the subject under the scheme of technical instruction now being initiated in the county.

The Rev. W. L. Wilson heartily seconded the vote of thanks, which was carried by acclamation.

At the conversazione, Mr. W. T. Christian exhibited some fine fossils from various formations, and many interesting objects under his microscope. Tea and coffee were served as usual at the close of the meeting.

It was announced that the long-delayed "Part 2 of Vol. iv." of the "Journal of Proceedings of the Essex Field Club" was in the press, and would shortly be ready for publication. It would contain extended reports of all meetings of the Club, from February 23rd, 1884, to January 29th, 1887, after which date reports appeared in the *ESSEX NATURALIST*. The "Journal" would be published by subscription, the price to members being probably about 5s.

It was also announced that the task of compiling the projected "Bibliography of Essex" (an important work which would be published by subscription as Vol. iii. of the "Special Memoirs" of the Club) was being actively carried on by a representative executive Committee. Those willing to aid the Committee by searching through series of periodicals, etc., should apply to the Secretaries (Mr. E. A. Fitch, "Brick House," Maldon, and Mr. Miller Christy, "Pryors," Broomfield, Chelmsford). Rules, specimen entries, slips, etc., would be sent to workers.

A NOTE ON THE MARINE ALGÆ AND FLOWERING PLANTS OBSERVED BE- TWEEN HARWICH AND DOVERCOURT.

By E. M. HOLMES, F.L.S.

ON landing at Harwich from the steamer, after accompanying the members on the excursion on the Orwell and Stour on July 25th, 1891 (see page 247), I found that I had about an hour's spare time before the train would start for London. A ramble along the shore was accordingly undertaken, and the following algæ were noticed, the shore on the Dovercourt side of the little breakwater being the richest part.

CHLOROPHYCEÆ

- Ulva latissima*, J. Ag.
Cladophora utriculosa, Kutz., var. β *latevirens*, Hauck.
C. rupestris, Ktz.
C. albida, Ktz., var. *refracta*, Thuret.

PHÆOPHYCEÆ.

- Ectocarpus confervoides*, Le Jol.
Ec. cronani, Thur.
Pylaiella littoralis, Kjellm.
Fucus platycarpus, Thur.
F. vesiculosus, L.
F. serratus, L.
Ascophyllum nodosum, Le Jol.

RHODOPHYCEÆ.

- Chondrus crispus*, Stackh.
Gracilaria confervoides, Grev.
Griffithsia setacea, Ag.
Furcellaria fastigiata, Lamx.
Melobesia cuticiformis, Kutz.
M. corallinæ, Cr.
Corallina officinalis, L.

Probably many more species would have been observed had it not been high water at the time of my visit, and that only a few of the pools were uncovered close to high-water mark.

FLOWERING PLANTS.

The following species were observed by the roadside and on the beach between Harwich Station and the small breakwater near Dovercourt. They are given in the order in which they were observed:—

Chenopodium olidum, *Hordeum maritimum*, *Helminthia echinoides*,
Anthemis cotula, *Borago officinalis*, *Rumex pulchra*.

Mentha sp. ? This plant had large coarse leaves, like those of *Mentha aquatica*, but having a purplish tinge and a strong taste of peppermint. It was not in flower, but may perhaps be *Mentha piperita*, L. β *sylvestris*, Sole. It grew in a small grassy enclosure between a lane leading to the beach and the first gate in the main road to Dovercourt.

Lamium amplexicaule, *Torilis nodosa*, *Cethusa cynapium*, *Malva sylvestris*.

[Many Notes, crowded out, are printed in the next volume.—ED.]

THE LOCAL (ESSEX) MUSEUM—*Continued.*

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.

The property of the Club will be placed under the care of the following 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.

Copies of APPEAL and pamphlet of papers relating to the proposal may be had from the *Hon. Secretaries*, Mr. W. COLE, Buckhurst Hill, Essex, and Mr. E. DURRANT, 90, High Street, Chelmsford, who will be glad to give further information to enquirers.

SUBSCRIPTIONS either to the CAPITAL FUND, or promises of annual donations to the MAINTENANCE FUND, may be sent to Messrs. Sparrow, Tufnell & Co., Bankers, Chelmsford, or to the National Bank, Old Broad Street, London, or to the Treasurer of the Club, Mr. A. Lockyer, Mornington Lodge, Wanstead, Essex.





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