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THE
ESSEX NATURALIST :

BEING THE

Journal of the Essex Field Club.

EDITED BY

WILLIAM COLE,

Honorary Secretary.

VOLUME VII.

JANUARY—DECEMBER, 1893.

“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.

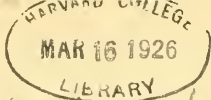
“Seldom was ever any knowledge given to keep, but to impart; the grace of this rich jewel is lost in concealment.”—BISHOP JOSEPH HALL.

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

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1893.



✓
"Was ever yet a stone that told a lie?"

"SADIE."

"Nature affords at least a glimm'ring light,
The lines, though touched but faintly, are drawn right."

POPE.

"O Nature!
Enrich me with the knowledge of thy works:
Snatch me to heaven."

THOMSON.

"Who great in search of God and Nature grow
They best the wise Crea'or's praise declare."

DRYDEN.

"Rural recreations abroad, and books at home, are the innocent
pleasures of a man who is early wise."

DRYDEN.

"The works of Nature will bear a thousand views and reviews;
the more frequently and narrowly we look into them the more occasion
we shall have to admire their beauty."

ATTERBURY.

"A man finds in the productions of Nature an inexhaustible stock
of material upon which he may employ himself, without any temptation
to envy or mal-volence."

DR. SAMUEL JOHNSON.

"In the vernal season of the year, when the air is calm and pleasant,
it were an injury and sullenness against Nature not to go out and see
her riches and partake of her rejoicing with heaven and earth."

MILTON.

"Rich with the wisdom of birds and of bees,
Sweet with the fragrance of blossoming trees,
Bright with the dragon-flies gay."

"SADIE."

26-24
8-6

INDEX TO VOLUME VII.

- Abraxas grossulariata*, Aberration of, 107.
- Abraxas ulmata* from Epping Forest, 107, 127.
- Achromatic Lens, Invention of, 186.
- Agrotis sylvia* from Mersea, 45.
- Algæ, Essex Freshwater, A Preliminary List of Recorded Species, 17c, 181.
- Algæ, Essex Marine, Presentation of the Hope Herbarium of, 181.
- Ambelis garrulus* (Waxwing) at Harwich, 67.
- Amalgamation of Essex and Chelmsford Museum with the Club, 42.
- Annual Meeting, the 13th, 76.
- Annual Report of Council for 1892, 70.
- Astronomy at Wanstead, 151.
- Auditors' Report, 78.
- Auk, Great, in Hoy Collection, and Eggs of, 149.
- "Aviary at Little Blake Hall, Visit to, 105.
- Baddow, Great, Visit to, 99.
- Baddow, Little, Rough-legged Buzzard at, 23.
- Balanoptera musculus* at Burnham, 50.
- Barking, Uphall Camp at, 94, 131.
- Barking Side—Roman and Romano-British Pottery at, 107; Visit to Gravel-pits at, 104.
- Barley-fly (*Chlorops*) in Essex, 106.
- BATEMAN, JOHN, Eucalyptus flouiri h-ing in the open in Essex, 128; Heronry at Brightlingsea, 124; Otters Breeding near Brightlingsea, 123; Ruff near Thorington, 125.
- BATTERS, A. E. L., Offer to Catalogue the Hope Collection of Algæ, 184.
- BEAUMONT, G. F., Ancient Pit at Coggeshall, 68; ditto at Dunmow, 150.
- BENHAM, C. E., "Canker-bloom" of Shakespeare, 128; John Constable as a Naturalist, 112.
- Bicknacre, Visit to, 100.
- Birds, Feeding of, in Winter, 198-9; Hoy Collection of, 149; Notes on, from Mistley, 124.
- Bird-catchers, a Hint, 200.
- Birchanger, Uncommon Birds at, 66.
- Blake Hall, Little, Visit to, 105.
- Boulder-clay beneath old River-gravel at Hornchurch; conclusions therefrom, 1.
- BOULGER, Prof. G. S., Exhibits Specimens of *Polyperus* with no Terminal Pileus, 181.
- Boyles Court, Visit to, and Collection of Birds at, 148.
- Brackish Water, Fresh-water Molluscs in, 25.
- Brephos parthenias* from Epping Forest, 127.
- Brightlingsea, Cormorant at, 125; Otters at, 124; Otters Breeding in Open near, 123.
- British Association, Report of Conference of Delegates of Corresponding Societies at Nottingham, 164; List of Committees of, 168.
- Broomfield, Visit to, 76.
- Buckhurst Hill, Aberration of *Abraxas grossulariata* from, 107; *Testaceus scutulum* at, 46.
- Burnham, Finner Whale (*Balanoptera musculus*) at, 50; Pottery from Red Hills at, 41.
- Bury Wood, Visit to 95
- Buzzard, Rough-legged, at Little Baddow, 23.
- Camp at Uphall, Barking, 94, 131.
- "Canker-bloom" of Shakespeare, 128.

- Carwell, Barking Side, Visit to, 104.
- Castle Hedingham, Ancient Deed relating to, 143; Pottery at, 139; Visit to Village, 138.
- CHANCELLOR, F., nominated as President, 115; Rainfall in Chelmsford, 1892, 28.
- Chelmsford, Meeting at, 78; Notes on Geology of, 65; Mollusca in Chelmer near, 76; Otters at, 66; Rainfall at, in 1892, 28.
- Chigwell, Moat at, 150.
- Chlorops tarniopus* in Essex, 106.
- CHRISTY, MILLE, receives Club at "Pryors," Broomfield, 77.
- CHURCH, A. P., Uncommon Birds at Birchanger, 66
- Clacton, Ancient Pottery at, 129.
- Coggeshall, Ancient Pit at, 68.
- Colchester, *Helix lapicida* at, 67; Joslin Museum, 69, 130.
- COLE, B. G., Exhibits Aberration of *Abraxas grossulariata*, 107, 127.
- COLE, W., Exhibits series of *Agrotis saucia* from Mersea, 45; on Spring Caterpillars in Epping Forest, 96; Conducts at Visit to Deneholes, 143; *Chlorops tarniopus* from Essex, 106; Entomological Notes from Mersea, 126; *Geometra papilionaria* from Epping Forest, 107, 127; *Hesperia lineola* in Essex and elsewhere, 67; on Mode of Concealment of *Hybernia aurantiaria* and *H. defoliaria*, 42; *Plusia moneta* from Woodford, 127; Exhibits "Slime-fungus" from Epping Forest, 45; "Locusts" in Essex, 196; Exhibits Pottery from Red Hills at Burnham and Mersea, 41.
- Cotias edusa* in South Devon, 125.
- Color-Blindness, a Few Facts about, 186.
- Committees of British Association, List of, 168.
- Constable, John, as a Naturalist, 112.
- COOKE, DR. M. C., Conducts at Fungus Meetings, 41, 180; Fresh-water Algæ of Essex, 170, 181; Exhibits Original Drawings of Desmids and Fresh-water Algæ, 180; Report on Fungi gathered at Field Meeting on November 19th, 1892, 41.
- Council, Annual Report of, for 1892, 70; Members of for 1893, 79; New Members of, 79.
- Corresponding Societies of British Association, Conference at Nottingham, 164.
- Cristacella mucedo* from Epping Forest, exhibited, 181.
- Crouch River, Marine Forms from, 81.
- CROUCH, WALTER, Ancient Entrenchment at Uphall, 131; Astronomy at Wanstead, 151; Conducts at Uphall Pit and Camp, 93; Conducts at Excursion on Stour River, 108; Further Notes on the Burnham Rorqual, 50; Exhibits "Black-letter" Book and Ancient Deed relating to Castle Hedingham, 143; Notice of late H. W. King, 185, 195; Invention of Achromatic Lens, 186; Account of Lea River near Sewardstone, 97; Exhibits Portrait of Sir Richard Owen, 81; Exhibits Marine Forms from River Crouch, 81; Exhibits Roman and Romano-British Pottery from Barking Side, 107.
- CUNNINGHAM, J. T., Lecture on Transformation of Marine Animals, 182.
- Dagenham and Dagnams, 27.
- Dagenham, Aberration of Common Sparrow at, 198.
- Danbury, Visit to, 99.
- Dannetts Hill, 86, 200.
- Dedham, Vale of, Excursion through, 107.
- Deneholes in Hangman's Wood, Visit to, 143.
- Destruction of Otters in Essex, 22.
- Drift-rocks in Epping Forest, 129.
- Dulmow, Ancient Pit at, 150.
- Dunstable, Priory Church at, Drawing of, exhibited, 43.
- DURRANT, EDMUND, Exhibits Portrait of Mr. C. Neale, 80; Exhibits Curious Nest of Mice, 80.

- ELLIOTT, F. W., Effect of want of Light on Colours of a Frog, 24.
- Entomological Notes from Mersea, 126.
- Epping Forest, *Abraxas ulmata*, *Brephos parthenias*, and other Lepidoptera from, 127; Autumnal Ramble in, 41; Additions to List of Lepidoptera of, 128; *Cristacella mucedo* from, 181; Drift Rocks in, 129; Fairmead and Queen Elizabeth's Lodges, 82; *Geometra papilionaria* in, 107, 127; Lepidoptera from, 41; Notes on Gravel in, 74; Collection of Rubi from, 181; Wood Specimens from, 184.
- Essex, Destruction of Otters in, 22; Falconidæ in, 198; Fresh-water Algae of, 170, 181; *Hesperia lineola* in, 67; Otters in, 197; Well-waters, Shallow and Deep, 28, 43.
- Essex and Chelmsford Museum, Amalgamation with Club, 42; Members of, Admitted under Terms of Amalgamation, 79.
- Essex Field Club, Autumnal Ramble in Epping Forest and 136th Ordinary Meeting, November 19th, 1892, 41; 137th Ordinary Meeting, February, 1893, 42; 138th Ordinary Meeting, March 14th, 45; Field Meeting at Broomfield, 76; Field Meeting at Ilford, 92; Field Meeting at Chingford, Sewardstone, etc., 95; Field Meeting at Barking Side and Wanstead, 105; Field Meeting through Vale of Dedham and Constable's Country, 107; Visit to Castle Hedingham, 138; Visit to Deneholes, 143; Visit to Boyles Court and South Weald, etc., 148; Cryptogamic Meeting, 180.
- Eucalyptus flourishing in Open in Essex, 128.
- Fairmead Lodge, Epping Forest, 82.
- Falconidæ in Essex, 198.
- Feeding the Birds, 198-9.
- Felstead, Notes on the Seasons of 1893 in the Neighbourhood of, 188.
- FITCH, E. A., on Castle Hedingham, 142; on "Locusts" in Essex, 182; Marine Forms from River Crouch, 81.
- Flatford Mill, Visit to, 111.
- Forest Lodges, Two, 82.
- Frest Museum, 45.
- Fowlness Island, Correct Spelling of, 25.
- FRENCH, J., Notes on the Seasons of 1893, principally in the Neighbourhood of Felstead, 188.
- Fresh-water Mollusca in Brackish Water, 25.
- Frog, Effect of Want of Light on Colour of, 24.
- Geometra papilionaria* from Epping Forest, 107, 127.
- Geology of Chelmsford, Notes on, 65.
- Geological Notes in the Neighbourhood of Ongar, 87.
- Geologists' Association at Ilford, 47.
- Gravels near Bishops Stortford, Wanstead and Walthamstow, 115.
- Gravels in Epping Forest, Notes on, 74.
- GROVES, Messrs. H. and J., Exhibit Series of British Unbelliferæ, 180.
- GOULD, I. CHALKLEY, on Stulpway, 200; Presents Specimens of Woods Grown on the Forest, 184.
- Hangman's Wood, Visit to Deneholes in, 143.
- HARTING, J. E., on Hoop Collection of Birds, 149.
- Harwich, Waxwings at, 67.
- Helix lapicida* at Colchester, 67.
- Heronry at Brightlingsea, 124.
- Hesperia lineola* in Essex, 67.
- Hobby at Birchanger, 67.
- HOLMES, T. V., Dagenham and Dagenams, 27; Notes on Geology of Chelmsford, 65; Conducts at Visit to Deneholes, 143; Notes on Conference of Delegates of Scientific Societies of British Association, 164; New Railway between Upminster and Romford — Boulder-Clay be-

- neath old River-gravel at Hornchurch—Conclusions therefrom, 1; Filtration of Water through Gravel and Mineral Springs, 43.
- "Holy Thorn" at Woodham Ferrers, 48.
- HOPE, G. P., Presents Valuable Herbarium of Marine Algæ to Club, 181.
- Hornchurch, Boulder Clay beneath Old River-gravel at, 1.
- HOWELL, Rev. W. C., exhibits Old Gregorian Telescope made by Short, 185.
- Hoy Collection of Birds, 149.
- HUTTON, LLEWYLLYN, receives Club at Carswell, 104.
- Hybernia avantiaria* and *defoliaria*, Mode of Concealment of 42.
- Hydrobia (Paludestrina) jenkensti*, 24.
- Ilford, Excursion of Geologists' Association to, 47; Visit of Club to, 92.
- Joslin Museum at Colchester, 69, 130.
- King, H. W., the late, Notice of, 185, 195.
- LAVER, HENRY, Periodicity in Organic Life—Presidential Address, 51.
- Lea River in Saxon Times, 98; near Sewardstone, 97.
- Lepidoptera of Epping Forest, Additions to, 128; from Epping Forest, 41; Scarcity of, 126.
- LESCHER, J. F., Receives Club at Boyles Court, 148.
- Light, Want of, on Colours of a Frog, 24.
- "Locusts in Essex, 181, 196."
- Loughton Hall, Old, 14, 70.
- Mammoth, Bones in Uphall Pits and near River Lena, 93.
- Marine Animals, Transformations of, Lecture, 182.
- Medlar, Abnormal, from Chelmsford, 181.
- MELDOLA, Prof. R., *Cotias edusa*, in South Devon, 125; On Acquired Characters in Animals, 183; Some Additions to the Lepidoptera of Epping Forest, 128.
- Mersea, *Agrotis saucia* from, 45; Entomological Notes from, 125; Pottery from Red Hill at, 41.
- Mimicry in Lepidoptera, Lecture, 95.
- Mistley, Ornithological Notes from, 125.
- Mnemonics, a Harmless, 130.
- Moat at Chigwell, 130.
- Mollusca in Chelmer, near Chelmsford 76; Fresh-water in Brackish-water, 25.
- MONCKTON, H. W., Geological Notes in the Neighbourhood of Ongar, 87; on Gravels near Barking Side, Wanstead, and Walthamstow, 105, 115.
- MOTHERSOLE, H., Exhibits Abnormal Medlar, 181.
- Mouse Nest, Curious, exhibited, 80.
- Museum at Chelmsford, Council Meeting in, 184.
- Myxomycete from Epping Forest, 45.
- Neale, Clarkson, the Founder of the Chelmsford Museum, 80.
- NICHOLS, WALTER B., Ornithological Notes from Mistley, 124.
- Nightingale, Young, in Longwood, Danbury, 103.
- Oakley, Waxwing at, 23.
- OLDHAM, CHARLES, *Abraxas ulmata* and *Brephos parthenias* from Epping Forest, 127; Lepidoptera from Epping Forest, 41; Lepidoptera from Woodford, 128; exhibits *Plusia monsta* from Woodford, 107, 127; exhibits Specimens of Rocks used in mending roads at Woodford, 42.
- Officers for 1893, 79.
- Ongar, Geological Notes in the Neighbourhood of, 87.
- Ordinary Meetings, 135th (Nov. 19th, 1892), 41; 137th (Feb. 21st, 1893), 42; 138th (March 14th), 45; 139th (April 29th), 92; 140th (July 1st), 105; 141st (Nov. 4th), 181; 142nd (Nov. 25th), 181; 143rd (Dec. 16th) 184.

- Ornithological Notes from Mistley, 124.
- Otters at Brightlingsea, 124; Breeding in Open near Brightlingsea, 123; at Chelmsford, 66; in Essex, 197; in Essex, Destruction of, 22; Preservation of, 197.
- Owen, Sir Richard, the late, Memorial Fund, and Portrait of, exhibited, 81.
- Pallas's Sand-grouse at Barking Side 105.
- Paludestrina (Hydrobia) jenkinsi*, 24.
- PEMBERTON BARNES (Mr. and Mrs.), receive Club at Little Blake Hall, 105.
- Periodicity in Organic Life, 51.
- Pit, Ancient, at Coggeshall, 68; at Dunmow, 150.
- Plants Noted near Chelmsford, 76.
- Plusia moneta* at Woodford, 107, 127.
- Polyporus lucidus*, with no Terminal Pileus, 181.
- Pottery, Ancient, at Clacton, 129; at Willingale Doe, 129.
- Pottery Works at Castle Hedingham, 139.
- POULTON, E. B., Lecture on Protection in Nature, 46.
- POWELL, J. T., exhibits Collection of Rubi from Epping Forest, 180.
- Presidential Address, Dr. Laver's, 51.
- PRITCHETT, G. E., presents Photograph of large Block of Conglomerate, 107.
- Protection in Nature, Lecture on, 46.
- "Pryors," Elizabethan Manor House at Broomfield, 77.
- Queen Elizabeth's Lodge, Chingford, 82.
- "Race" at Ilford Brick-pits, 94.
- Rainfall at Chelmsford in 1892, 28.
- Red-hills at Burnham and Mersea, Pottery from, 41.
- Robin Nesting in Winter, 24.
- Roman and Romano-British Pottery from Barking Side, 107.
- Romano-British Pottery at Clacton, 129; Urn at Willingale Doe, 129.
- Romford and Upminster, Geology of the New Railway between, 1.
- Rorqual Whale at Burnham, 50.
- Ruff (*Machetes pugnax*) near Thorington, 125.
- Rules, Alterations in, 80.
- Sacket, Mr. W. R., Death of, 69.
- St. Swithin's Farm, Barking Side, Roman and Romano-British Pottery from, 107.
- Sake's (commonly called "Snakes") Lane, Woodford, 25.
- SAUZÉ, Mr., Exhibits Diptera, Hymenoptera and Coleoptera, 42.
- Seal, Reported Occurrence of, near Walton-on-Naze, 124.
- Season of 1893, Notes on the, 188.
- Sewardstone District, Visit to, 95.
- Shakespeare, "Canker bloom" of, 128.
- SMOOTHY, CHARLES, Rough-legged Buzzard at Little Baddow, 23.
- SNELL, H. C., exhibits *Testacella scutulum* from Buckhurst Hill, 46.
- Solicitor, Honorary, elected, 42.
- Sparrow, Aberration in, 198.
- Special Meeting, 80.
- SPILLER, JOHN, a Few Words about Colour-blindness Lecture, 186.
- STEWART, Prof. CHARLES, elected Hon. Member, 95.
- Stock, Waxwing at, 23.
- Stour River, Excursion on, 107.
- Stulpway, 200.
- SWINHOE, Col. C., Lectures on Mimicry in Lepidoptera and Uniformity of Pattern in Protected Species, 95.
- Telescope, Old Gregorian, exhibited, 185-6.
- Testacella scutulum* from Buckhurst Hill, 46; Mode of Feeding of, 120.
- THOMPSON, THOMAS, exhibits Locusts found in Foreign Hay, 181.
- Thorington, Ruff at, 125.
- THRESH, DR. J. C., The Shallow and Deep Well-waters in Essex, 28, 43.

- Treasurer's Statement of Account, 72.
 Tyler's Common, Visit to, 148.
- Underground Waters of Essex, Remarks upon, 43, 44.
- Uphall, Barking, Ancient Entrenchment at, 131; Pits, Visits to 47, 92; Fossils at, 93, 94.
- Vice-Presidents Nominated, 95.
- WALLER, W. C., Chigwell Moat, 150; Dannett's Hill, 86, 200; Old Loughton Hall, 14, 70; Sake's (commonly called "Snakes") Lane, Woodford, 25; Two Forest Lodges, 82.
- Walthamstow, Gravels at, 115.
- Walton on-Naze, Reported Occurrence of a Seal at, 124.
- Wanstead, Astronomy at, 151; Gravels at, 115; Visit to, 104.
- Water Supply, Shallow and Deep Wells in Essex, 28.
- Waxwing, at Harwich, 23; at Oakley and Stock, 67.
- WEBB, W. M., on Mode of Feeding in *Testacella scutulium*, 120.
- Well-waters, Shallow and Deep, of Essex, 28.
- Whale, Finner, at Burnham, 50.
 "White Hart," Ancient Inn at Brentwood, 151.
- WHITE, WILLIAM, exhibits Illustrated Botanical Works, 185.
- Willingale Doe, Roman and Romano-British Pottery at, 129.
- WILSON, A. S., Ancient Pottery at Clacton, 129.
- WILSON, T. HAY, Drift Rocks in Epping Forest, 129; Notes on the Gravels in Epping Forest, 74.
- Winter, Robin Nesting in, 24.
- WOOD, J. M., on Underground Waters of Essex, 43.
- Woods Grown on Forest, Specimens presented, 184.
- Woodford, Lepidoptera from, 128; *Plusia moneta* at, 107, 127; Sake's Lane, 25.
- Woodham Ferrers, "Holy Thorn" at, 84.
- Woodham Walter, Hall and Common, 100.
- Woodpeckers, Green, Great Spotted and Lesser Spotted, at Birchanger, 66.
- X. Y. Z., A Harmless Mnemonic, 130.

ILLUSTRATIONS.

- Queen Elizabeth's Lodge, Epping Forest (*looking north*). *Frontispiece*.
- Sketch-map of Hornchurch Cutting, 5.
- Old Loughton Hall, 15.
- Queen Elizabeth's Lodge (*looking south*), 82.
- Fairmead Lodge, with Old Oak, 86.
- Sewardstone Meads in Maytime, 96.
- Plan of Danbury Camp, 101.
- Young Night-Jars in Long Wood, Danbury, 103.
- Sun Inn and Church Tower, Dedham, 108.
- Old Bay and Say Mills, Dedham, 111.
- Constable's House, Flatford Mill, 113.
- Testacella scutulium*, 121.
- Mound and Rampart at Uphall Camp (*seen from River Roding*), 132.
- Mound at Uphall Camp, (1814), 135.
- Plan of Uphall Camp, 137.
- Denehole No. 4 in Hangman's Wood 144.
- Denehole No. 3, Ground-plan, 145.
- Denehole No. 2, Section and Ground-plan, 147.
- Mineral Spring on Tyler's Common 149.
- Huygen's Telescope, 1684, 153.
- Portrait of late H. W. King, 195.
- Birds' Christmas Party, 199.

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WILLIAM COLE,
Honorary Secretary.

Contents.

	PAGE
The New Railway between Upminster and Romford. Boulder Clay beneath Old River Gravel at Hornchurch. Conclusions therefrom. By T. V. HOLMES, F.G.S., M.A.I., etc. (<i>With Sketch Map</i>)	1
Old Loughton Hall. By WILLIAM CHAPMAN WALLER, M.A., F.S.A. (<i>With Engraving</i>)	14
Notes—Original and Selected. Destruction of Otters in Essex; Rough-legged Buzzard (<i>Archibuteo lagopus</i>) at Little Baddow; Waxwing (<i>Ampelis garrulus</i>) at Oakley and Stock; Robin Nesting in the Winter; Effect of Want of Light (?) on Colour of a Frog; Hydrobia (<i>Paludestrina</i>) Jenkinsi; Freshwater Molluscs in Brackish Water; Sake's (commonly called "Snake's") Lane, Woodford; Correct Spelling of "Fowlness Island"; Dagenham and Dagnams; Rainfall at Chelmsford in 1892	22
The Shallow and Deep Well Waters of Essex. By JOHN C. THRESH, D.Sc., M.B., D.P.H., etc. (<i>With Appendix</i>)	28
The Essex Field Club. Autumnal Ramble in Epping Forest, and 136th Ordinary Meeting, Saturday, November 19th, 1892; Ordinary Meeting, Tuesday, February 21st, 1893; Ordinary Meeting, March 14th, 1893	41
Excursion of the Geologists' Association to Ilford	47
The "Holy Thorn" at Woodham Ferrers, Essex	48

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,"
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COMMUNICATIONS FOR THE "ESSEX NATURALIST."

Some time ago I printed an appeal to the readers of THE ESSEX NATURALIST to interest themselves in its welfare, and to aid me in the difficult task of editing by sending short papers and suitable notes of occurrences appertaining to the special subjects for the study of which the Essex Field Club was founded, for consideration and publication. I am sorry to say that this request has led to but scant response. As we are now entering upon another year, I venture again to call upon our friends and members for such aid, in the hope that it will be more freely and systematically rendered in the future.

Every reader could with but little trouble render most welcome assistance. Not only are longer and more important memoirs desired, but the greatest aid would be given by the communication of SHORT PAPERS, NOTES, and of books, periodicals, newspapers, etc. (*or extracts from the same*), containing matter (reports, captures, natural history, antiquarian or other "finds," topographical descriptions, news of the exposure of geological sections, etc.), likely to be useful for THE NATURALIST or for the information of the council and officers.

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

Further, PAPERS, and EXHIBITS for the MEETINGS are greatly desired, and I shall be glad to hear from those having such in preparation.

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

I feel sure that the members, thus appealed to, will exert themselves to aid the officers in carrying on the work of the Club in accordance with the objects for which it was founded. They should hold themselves responsible, in some measure, for the progress of the Club, and look upon themselves as a band of "enthusiasts" gathered together for the study and investigation of the natural history of Essex. I most sincerely hope that during the year 1893 our Journal will be freely used for recording observations original and selected, and as a *monthly* medium of intercommunication between lovers of natural science dwelling in, or having a friendly regard for, our interesting county.

WILLIAM COLE,

Hon. Secretary and Editor.

Buckhurst Hill,

March, 1893.

THE
ESSEX NATURALIST:

BEING THE

Journal of the Essex Field Club

FOR 1893.

THE NEW RAILWAY BETWEEN UPMINSTER
AND ROMFORD.

BOULDER CLAY BENEATH OLD RIVER GRAVEL AT
HORNCHURCH. CONCLUSIONS THEREFROM.¹

By T. V. HOLMES, F.G.S., M.A.L., etc.

[*Read February 21st, 1893.*]

THE new railway from Upminster to Romford is the most northerly portion of the line connecting Grays Thurrock with Romford. In THE ESSEX NATURALIST for 1890 (vol. iv., p. 143) I gave some account of the sections then visible in the most southerly part of this railway. I there stated that south of Back Lane Chalk appeared, while between Back Lane and the stream known as the Mardyke it became covered by the Lower Tertiary formations, the Thanet Sand and Woolwich Beds, the overlying London Clay being seen on the northern side of the Mardyke Valley, and thence constituting the oldest rock visible anywhere, not merely along the course of the railway, but anywhere southward of the uprise of the Chalk and Lower Tertiaries in northern Essex.

But a glance at the section given in THE ESSEX NATURALIST (vol. iv., p. 146), showing the arrangement of the beds just mentioned from West Thurrock to the northern flank of the valley of the Mardyke, reveals the fact that the surface of the high ground, both

¹ For the block of the section and map illustrating this paper, the Editor is indebted to the courtesy of the Council of the Geological Society.

north and south of the Mardyke, consists of old river-gravel, except where some bare Chalk appears near West Thurrock. This old river-gravel lies indifferently on the Chalk or Tertiary deposits, and that on each flank of the Mardyke valley evidently once formed a continuous sheet. Between a point rather more than a mile south of the Mardyke, and another between Stubbers and North Ockendon, this gravel, along the course of the railway, has a surface level varying between sixty and seventy feet above Ordnance Datum. In the cutting at and south of the road between Manor Farm and North Ockendon, brick-earth, clay, and sand appeared, as also in others northward towards Cranham Hall. Between Cranham Hall and Upminster the railway is on an embankment. Between the Mardyke and Upminster the cuttings are shallow, seldom, if ever, exceeding ten to twelve feet in depth, and in my journeys along the line I never saw the underlying London Clay in this part of the course of the railway except for a distance of two or three hundred yards close to the Mardyke valley. In short, the sections afforded by the cuttings revealed nothing but the gravel and brick-earth shown on the map of the Geological Survey.

A glance at the map just referred to makes it obvious that the Thames in this south-western corner of Essex has once flowed by Hainault Forest, Romford, Hornchurch, and North Ockendon to Hangman's Wood, Mucking, and Stanford-le-hope—a course much more northerly than that of its present channel. And examination of the tract of river-gravel, which remains as a record of this fact, shows that it consists of flat ground very gradually increasing in height as we recede from the present Thames and approach the undulating London Clay, which lies beyond the gravel plain. Thus we find that the surface of the gravel of Hainault Forest, of the ground close to but north of Romford, Hornchurch, and Upminster, and on the eastern side of North Ockendon, has a height above Ordnance Datum of 100 feet, or a little more. If we look for gravel averaging sixty to seventy feet, we find it occupying a belt of ground roughly parallel with that just indicated, but nearer the Thames, at Chadwell Heath, south of Hornchurch and Upminster, and west of South Ockendon. Similarly, areas below fifty feet are those around Ilford, Dagenham, Barking, and Rainham. These facts all point to the conclusion that the Thames once flowed at a height of 100 feet or more above its present level, and some four or five miles northward of its present course; and that the river has

during many ages been occupied in deepening its valley, and in gradually taking a more southerly channel. This last-named tendency of the Thames is still more obvious between London and Windsor, in the still greater breadth there of the gravel plain on the northern bank of the present stream.

The embankment mentioned as existing on the railway between Cranham Hall and Upminster rests on London Clay. Between Cranham Hall and the Mardyke (as already observed) the line traverses a continuous gravelly or loamy plateau ; but from Cranham Hall to Romford the gravel or loam covering the flat-topped higher ground is cut through, and the London Clay exposed, in the valleys of the Ingrebourne and other streams which intersect the route.

In the cutting at and west of Upminster Station, London Clay was seen capped by a variable amount of gravel and loam. These surface deposits were seldom more than six to seven feet thick, their base being from eighty-five to ninety feet, and the surface from ninety to a little over 100 feet above Ordnance Datum. The gravel hence to Romford belongs entirely to this highest and oldest of the terraces of the Thames valley in this district. It was noticeable that in this cutting it was often seen to lie in festoon-like hollows on the surface of the London Clay, which sometimes even formed the surface for a few feet between two of these festoons. This mode of deposition is usually observed to be a characteristic of these old river-gravels at all levels, wherever the junction with the London Clay is clearly visible for any distance.

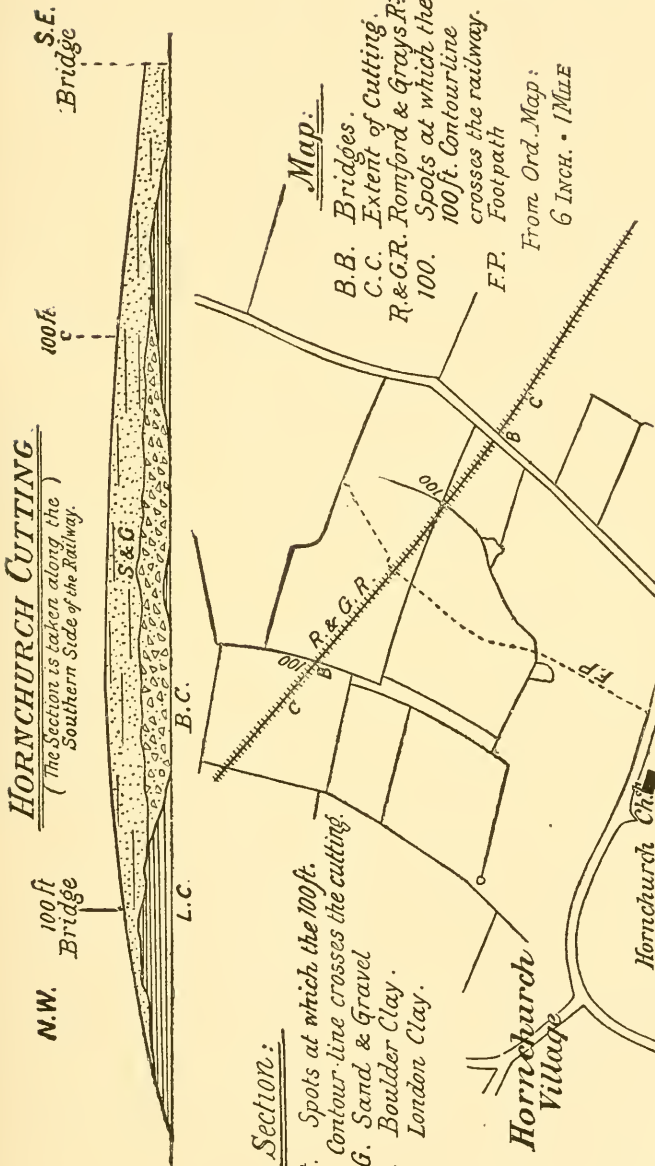
Crossing the Ingrebourne, we enter another cutting, the most interesting and important along the whole line from Grays to Romford, though it has now been for some months sloped and soiled, and yields no sign of its former attractions. About 250 yards east of the church at Hornchurch the road to Upminster is crossed by others ranging north and south. About 400 yards north of this point of junction is the cutting, extending mainly westward, and having a total length of about 600 yards. Towards its two ends, only London Clay capped by sand and gravel could be seen ; but in the centre, where the cutting attains a depth of from twenty to twenty-five feet, a considerable mass of Boulder Clay was once visible, lying in a hollow on the surface of the London Clay. It extended along the cutting for a distance of 300 yards, and was in every respect typical Chalky Boulder Clay. Indeed, when I read a short paper before the Geological Society on these sections between Upminster and

Romford last March, Mr. H. B. Woodward stated that, having seen this section, he thought it afforded a better exposure of Boulder Clay than he had elsewhere seen in Essex during two years' work on the Geological Survey. The greatest thickness measured was fifteen feet. When this cutting was visited by the Geologists' Association on March 5th, 1892, Mr. Robertson, the engineer of the line, very kindly exhibited a collection of the most interesting specimens obtained from the Boulder Clay. They included many lumps of Kimeridge Clay, some examples of *Gryphæa dilatata* from the Oxford Clay, and a vertebra which had been determined by Prof. Seeley as plesiosaurian. Some small shells in a glacially-scratched lump of bituminous shale belonging to the Kimeridge Clay were identified by Mr. H. B. Woodward as *Lucina minuscula*.

A space of about 250 yards, without any section, intervenes between the cutting just described and that on both sides of the road at Butts Green. Towards the eastern end of the Butts Green cutting only sand and gravel could be seen, the greatest thickness shown being about ten feet. But near the road five or six feet of London Clay appeared beneath eight or nine feet of sand and gravel, and London Clay was more or less visible at the bottom of the cutting as far as it extended in a westerly direction.

West of the stream, which crosses the railway about 500 yards from Butts Green, there are cuttings as far as the junction of the new railway with the Great Eastern line, about half a mile east of Romford Station. Close to this junction I have seen London Clay, as well as the overlying sand, gravel or loam; but nearer the Brentwood Road a permanent wetness in the sand and gravel, at a depth of about ten feet, afforded the only sign of the proximity of clay.

In my description, already referred to, in THE ESSEX NATURALIST, of the sections between Grays and Stifford, I somewhat rashly remarked that having arrived at the London Clay on the northern flank of the Mardyke valley, we might be sure that the sections seen southward were those of the most geologically interesting part of the line, the rest of it being likely to show nothing but London Clay, with a capping of gravel or loam. Fortunately, as the Hornchurch cutting demonstrates, my prediction was a mistake. On the other hand, my remarks deprecating the assumption that signs of ice-action of some kind necessarily imply that beds showing it belong to the Glacial Period (in forgetfulness of the fact that ice has been a geological agent from a very early period, and is one now),



Section:

- 100 ft. Spots at which the 100 ft. Contour-line crosses the cutting.
- S. & G. Sand & Gravel
- B.C. Boulder Clay.
- L.C. London Clay.

Map:

- B.B. Bridges.
- C.C. Extent of Cutting.
- R. & G.R. Romford & Grays Rly
- 100. Spots at which the 100 ft. Contourline crosses the railway.
- F.P. Footpath

From Ord. Map:
6 INCH. • 1 MILE

Note.—The length of the Section is about 540 yards, and the distance between the two bridges is 450 yards; the greatest depth of the cutting is 25 feet. For “Contourline” in explanation of Map, read “Contour line.”

have received a signal illustration in the Boulder Clay of the Hornchurch cutting. For, in the absence of special evidence to the contrary, we may rightly assume that the gravel covering the Boulder Clay at Hornchurch, which forms part of a higher terrace than that traversed by the railway south of Upminster, belongs therefore to an older one. Hence, if the Boulder Clay is evidently older than the Hornchurch gravel, it must rightly be considered to be still more ancient than the gravel nearer the Mardyke. Locally, the only sound test of the Glacial or post-Glacial age of a bed is the nature of its relation to the Chalky Boulder Clay of the district, and to attempt to employ any other is but to introduce confusion. Of course, the age of the Chalky Boulder Clay of Essex as compared with that of any given deposit of the Glacial Period in Lancashire, Scotland, or elsewhere, may rightly be a question for discussion and speculation. But in Essex and Middlesex the only standard of comparative age is that furnished by the local Boulder Clay.

It is then evident that if we may rightly conclude that the Hornchurch gravel is older than that at less elevation between Upminster and the Mardyke, we are also justified in deciding that it is older than the river deposits which occur at a lower level at Grays and Ilford, or at Erith and Crayford on the Kentish shore.

It is also obvious, that if we compare the Hornchurch gravel with fluvial deposits fifteen or twenty miles higher up the course of the river, we should expect to find its equivalent in beds with an elevation as much greater than that at Hornchurch as the fall of the river per mile, when the gravel was deposited, would indicate. If, for example, the average level of the Hornchurch gravel should be 100 feet, then, supposing a fall of one foot per mile, the equivalent terrace fifteen miles higher up would be 115 feet, and so on.

Thus the natural inference is that as the Hornchurch gravel is older than the various river deposits of Grays, Ilford, Erith, and Crayford, and the Chalky Boulder Clay is evidently older than the Hornchurch gravel, the fossil remains found in the river deposits of all the places just named are rightly considered to be post-Glacial. The probable age of the Chalky Boulder Clay, as compared with that of beds of Glacial age in Wales, Scandinavia, or elsewhere, is, as I have already remarked, a wholly distinct question. In what is termed the Glacial Period, glacial beds may well have been in process of formation in the north of Scotland long after they had ceased in

southern England, and have ceased in Scotland long before they came to an end in northern Russia.

The fossil remains found at Grays, Ilford, Erith, and Crayford, include those of the Mammoth (*Elephas primigenius*), a creature whose geological range has given rise to much discussion. Remains of the mammoth have also been found in river deposits higher up the stream in London. The most recent discovery has lately been recorded by Dr. Hicks, in a paper read before the Geological Society on May 25th, 1892. (*Q. J. G. S.*, vol. *xlviii.*, p. 453.)² But as that able geologist inclines to think that the beds overlying the mammoth tusks in Endsleigh Street are of the Glacial Period, from their resemblance to those which underlie the Boulder Clay of Finchley, it becomes necessary to discuss the probable age of these beds in order to ascertain the amount and nature of the evidence for this conclusion. For it seems to me that they are simply river deposits, which, from their surface being only eighty feet or less above Ordnance Datum, are in all probability decidedly later in date than the river gravel of Hornchurch, which unconformably overlies the Boulder Clay there.

The excavations which were, so fortunately for geologists, brought under the notice of Dr. Hicks, were made in Endsleigh and other streets on the southern side of Endsleigh Gardens, south of Euston Square. The sections were much alike as regards their general character. On an eroded surface of London Clay lay gravel, resting on the gravel was sand, and, above the sand, clay which contained the calcareous nodules called "race." The surface consisted of "made ground." All the strata mentioned were very variable in thickness. In addition to the beds just named a thin stratum of dark clayey loam with seeds was met with below the gravel here and there, where the surface of the London Clay was more concave than usual, and in this clayey loam the remains of the Mammoth were found, at a depth of twenty-two feet from the surface, and a height of sixty feet above Ordnance Datum. In this clayey loam Mr. Clement Reid recognised the seeds of plants usually seen in ponds and marshy places, and which, in the present day, range from the Arctic Circle to Southern Europe.

The contours of the surface in a town are frequently so obscured by winding streets, and a lack of open spaces, that it becomes impos-

²"On the Discovery of Mammoth and other remains in Endsleigh Street, and in sections exposed in Endsleigh Gardens, Gordon Street, Gordon Square, and Tavistock Square, London." By Henry Hicks, M.D., F.R.S.

sible for the most careful observer to note, with any approach to accuracy, the limits of a terrace of river deposits cut in so soft a formation as the London Clay. But the straight streets and open squares of the district south of Endsleigh Gardens, in which these excavations were made, afford much better views than usual of the shape of the ground. And they reveal the perfect flatness of an old river terrace, averaging originally about 75 feet above Ordnance Datum, though now with a surface elevation of five or six feet more, owing to the overlying "made ground." In short, the appearance and position of this level tract seem to me to suggest nothing whatever but an old terrace belonging to the present Thames Valley system.

Then, if we consult the Geological Survey Map, we find that the area between Euston Square and the river is coloured as one of old river deposits, a little bare London Clay being shown here and there along the course of a valley. Mr. Whitaker, in his memoir on the "Geology of London and of part of the Thames Valley,"³ has the following remarks on the boundary of the River Drift between the Serpentine and the Fleet :

"The boundary-line follows the course of the Serpentine Brook northward as far as the Great Western Railway, whence eastward by Paddington to the southern part of Regent's Park it is doubtful. In Mr. Mylne's map the gravel is coloured farther to the north than on the Survey map, perhaps rightly.⁴ From Regent's Park the boundary runs eastward to Euston Square, beyond which the tunnel of the Metropolitan Railway is in London Clay." And in another part of this memoir (vol. ii., p. 321), we learn that at Gower Street Station and at Euston Square, on the Metropolitan Railway, there was at the first-named spot, "sand and gravel with yellow clay," thirteen to seventeen feet, resting on the London Clay, and at Euston Square gravel and sand up to eight feet. The made ground at the surface varied from four to seven feet in thickness. Indeed, in spite of the obscurity arising from the buildings and the "made ground," which cover the surface, the Geological Surveyor has been, on the whole, by no means at any special disadvantage hereabouts, owing to the record of the deep and continuous sections on the Inner Circle Railway. Thus the general evidence bearing upon the affinities of the beds overlying the London Clay around Endsleigh

³ Vol. i., p. 398.

⁴ Mr. Whitaker holds that where the boundaries of a superficial formation are doubtful, it is better to err on the side of under-estimating the area it covers, than of over-estimating it.

Street, is by no means either slight or obscure, and it seems to me quite sufficient to warrant us in regarding them as River Drift, unless there should be strong special evidence to the contrary. And, on the other hand, the decided presumption that they are River Drift derives additional strength from what seem to me to be the very slight grounds for the formation of an adverse opinion.

For if the gravel, sand, and clay much resemble the material and arrangement of the beds below the Upper Boulder Clay of Hendon and Finchley, they equally suggest the gravel, sand, and loam which are the usual constituents of river drifts, as well as the order in which they usually occur. And when we remember that the beds under the Finchley Boulder Clay are some five miles away, and are found only at heights of more than 200 feet above the sea, it seems to me that nothing but the finding of unquestionable Boulder Clay capping the beds at Endsleigh Street could establish a real affinity between them and the deposits at Finchley. "Race," also, may be found in these Finchley beds; but it may also be seen in clays and loams of the most diverse ages. Readers of the chapter on the Woolwich and Reading beds in Mr. Whitaker's memoir from which I have already quoted, may note that "race" is mentioned as existing in clay or loam in at least ten different sections. And if we turn to that on River Drift we find that "race" was found in many sections in the unquestionable River Drift of Ilford, Erith, and Crayford. Thus its presence furnishes no presumption whatever as to the age of any bed in which it occurs; but leaves that question to be decided on the general evidence, which seems to me wholly in favour of the River Drift view.

It may be worth while to add that Mr. Hudleston (Proc. Geol. Soc.) remarked after the reading of Dr. Hicks' paper that "so long ago as 1715, the Mammoth was found in deposits on the same plateau (at Gray's Inn Lane) along with a Palæolithic implement."

I now return to Hornchurch. There are two points on which I should like to add a few words in connection with this Hornchurch Boulder Clay, and the conclusions deducible from its presence there. Firstly, in the discussion on my paper at the Geological Society last March it was remarked that the river deposits of the Thames valley were not really terrace gravels at all. Now, it is quite true that if anyone tries to map the boundaries of the various terraces at and south of Hornchurch, he will soon find himself engaged in a hopeless task, a bank which appears comparatively clear and sharp at a given

spot becoming merged in a vague slope in the course of a few yards. But, on the other hand, the position of the highest gravels towards the northern edge of the broad plain, the very gradual descent thence towards the present channel of the river, and the whole aspect of the valley, is simply that of a district in which the Thames has been slowly cutting its way laterally from north to south, and vertically from a higher level to a lower one. The absence of well-defined terraces is entirely caused by the softness of the strata in which they have been cut, and occurs, as I can personally testify, wherever a river has cut its way through soft and incoherent beds such as London Clay. But where the same stream has been eating its way through harder rocks, distinct terraces appear. Thus, the Geologists' Association, in July, 1891, visited Henley-on-Thames. There, on an eminence known as No Man's Hill, the members stood on a gravel terrace overlying Chalk, 315 feet above Ordnance Datum, and 210 feet above the Thames at Henley, and saw, most clearly and sharply cut, in the distance, at Remenham, another gravel terrace cut out of the Chalk, a little more than 100 feet lower than that on which they were standing.

Similarly in the low, drift-covered districts of Cumberland, near the Solway, I found it impossible to map the terraces on the left bank of the Eden below Carlisle, because they were but vaguely indicated here and there, precisely like those of southern Essex. But a few miles away, on the Esk at Longtown and Netherby, two or three clearly marked terraces could be traced throughout their course. The explanation of this difference was to be found in the facts that, on the Esk, a soft sandstone underlying the Glacial Drift existed to some height above the surface of the stream, and the terraces were cut in it; while on the Eden, at the spot mentioned, the Glacial Drift came down nearly to the water's edge. Consequently the terraces cut in it had become as vague and doubtful, and as impossible to trace for any distance, as those in the London Clay of the Lower Thames. But the mapping of alluvial flats and river terraces is part of the duty of a worker on the Geological Survey, while it is a matter unlikely to attract the attention of most other geologists.

The second point on which I wish to touch is this. Previous to the discovery of Boulder Clay beneath Thames Valley Gravel at Hornchurch, the most southerly exposures of Chalky Boulder Clay known were those north of Romford and at Finchley. In each

case the Boulder Clay ended a short distance northward of the edge of the River Drift, and the probable relations of the two formations could be but matter for speculation. The most southerly point at which the Boulder Clay appears at the surface, in the Romford district, is at Maylands, about three miles north of the Hornchurch cutting. And it is noticeable that at Maylands the Boulder Clay comes down to a level considerably below the 200 feet contour-line, though almost all of it, in the immediate district, lies above that height. It was, therefore, suggested during the discussion on my paper at the Geological Society last March, that the Hornchurch Boulder Clay, being at a level still lower than that at Maylands, pointed towards the probability of the pre-Glacial age of the Thames valley system. But this is, I think, to exaggerate greatly the significance of the low level of the Boulder Clay at Hornchurch. All that it really does tend to show is, that there once was probably a hollow or valley parallel with that of the Ingrebourne, having a direction from north to south, or nearly at right angles to that of the present course of the Thames, and that the Boulder Clay more or less occupied this hollow. There may have been at the time a valley to some extent coincident, here and there, with that of the present Thames; but its deposits remain unknown to us.⁵ Of those which we find in the present valley system, the oldest terrace—as we are entitled to assume that at Hornchurch to be, in the absence of special evidence to the contrary—is manifestly post-Glacial in the sense of being later in date than the Chalky Boulder Clay. And this, as I have already remarked, seems to me the only sense in which the term can rightly be used in south-eastern England.

I have said that we may easily exaggerate the significance of the low level of the Boulder Clay at Hornchurch. Where, as in northern Essex, we see Boulder Clay forming a continuous plateau; or one the continuity of which is broken only by the valleys of streams in which lower beds are exposed, we find the base of the Boulder Clay at the most various levels. In the Geological Survey Memoir, on Sheet 47 (which includes north-western Essex with portions of adjacent counties), we find the following general statement:—"It is evident the clay was not formed in fragments as mapped, but in one continuous sheet. It has been cut through in post-Glacial time by the present valleys; but, with this exception, it spreads over

⁵ See Notes at end of paper.

high and low ground alike, being found from the top of the Chalk escarpment down to points not greatly above the level of the sea."

I may illustrate this statement by the following case. In the valley of the Stort, about Sawbridgeworth, we find the Boulder Clay forming the plateau on each side, and lower beds of Glacial age exposed in the valley itself. Crossing the plateau in an easterly direction, we come to the valley of the Chelmer, two or three miles north of Chelmsford, in which lower Glacial Beds are also visible. But, whereas the level of the Boulder Clay plateau about Sawbridgeworth is between 200 and 300 feet, on the Chelmer, near Broomfield, it is between 100 and 200 feet, averaging nearly 100 feet less. And, in addition to examples of this broad and general kind, many might be brought forward illustrating the local variations of small patches. In the Geological Survey Memoir on the Geology of the Neighbourhood of Colchester, by Mr. W. H. Dalton, it is stated that "between East Thorpe and Birch" (villages about two miles apart) "the Boulder Clay lies in a hollow, either denuded in, or formed by, the irregular deposition of the gravel." Now this hollow appears to have no connection with any existing system of drainage.

Many examples might be given, showing the very varied height of the outlying patches of Boulder Clay found on or near the course of a straight line drawn from Maldon to Brentwood; but it seems unnecessary to do more than to allude to them, without attempting to describe them in detail.

It may be useful, in conclusion, to give a brief summary of the leading points in what I have written on this Hornchurch Boulder Clay and the Thames Valley Beds.

In the first place, the discovery of the Boulder Clay beneath the highest and oldest gravel terrace of the Thames valley system, justifies the remarks made in a previous communication to the Essex Field Club, as to the rashness of assuming that evidence of the action of ice in some form is equivalent to evidence that the deposit showing it dates from the Glacial Period. For if the Boulder Clay is older than the Hornchurch gravel, it must be still more ancient than the river deposits south of Upminster, or those of Erith, Crayford, Ilford, or Grays. Secondly, the beds in which the Mammoth remains were found at Endsleigh Street seem to me to be simply River Drift, of more recent date than the Hornchurch gravel; and the Mammoth there, as at Erith, Crayford, Ilford, or Grays, to be in strata rightly termed post-Glacial, or, in other words, of later

date than the Chalky Boulder Clay ; the only standard of age that can be taken without introducing confusion.⁶

On the other hand, I pointed out that the absence of definite, traceable terraces was invariably to be found where a river cuts through soft, incoherent strata ; and that it implied no peculiarity in the formation of the river valley. That the general evidence all pointed towards the view that the highest terrace was in this case, as usual, the oldest ; and that, in default of special evidence pointing yet more strongly another way, the only rational course was to hold this view. That the low level of the Hornchurch Boulder Clay *necessarily* implied merely deposition in a narrow valley, or hollow with a direction at right angles to that of the present Thames. That there may have been at the time a valley, possibly coinciding here and there, more or less, with that of the Thames ; but that we had no evidence of it and its deposits, the present valley and its beds being post-Glacial. And that the Essex Boulder Clay lies on a very uneven surface, and at various levels.

In short, I maintain that the evidence now available clearly points to the conclusion that the River Drift of the lower Thames, with the Mammoth and other remains contained therein, is post-Glacial. Absolute proof is, of course, unattainable. But it seems to me that this conclusion can be discredited only by the discovery of some special evidence pointing yet more strongly in another direction. And of this we have, at present, no sign.

NOTES.

A most interesting example of the occasional coincidence and frequent variation between the pre-Glacial and post-Glacial channels of an English river, is given by Sir Andrew Ramsay in his "Physical Geology and Geography of Great Britain" (edit. 5, p. 531). It is that of the Wear, in Durham. A letter from Mr. H. H. Howell (who superintended the Geological Survey of the Newcastle coalfield) to Sir A. Ramsay thus describes the changes that occurred :—

"The pre-Glacial valley runs nearly north and south from Durham to Newcastle. The river Wear, instead of following this old valley, meanders about, winding in and out of it, and at Durham cutting right across it, and passing into the sandstones of the Coal-measures, through which it has cut its way in a narrow gorge. At Chester-le-Street, half-way between Durham and Newcastle, the river

⁶ Of course I by no means assert that the Mammoth is necessarily to be found only in post-Glacial Beds. I see no reason why it should not be pre-Glacial as well. Each case must be decided on its own evidence.

Wear leaves the course of the old valley altogether, and turning to the east, makes its way to the sea at Sunderland, and, principally passing through sandstones and shales of the Coal-measures, and cutting through the Magnesian Limestone just before entering the sea."

And on the same page it is stated that, for this reason, coal-miners in Northumberland and Durham sometimes find that a coal crops up underground "against a mass of Boulder Clay that fills an ancient (pre-Glacial) rocky valley, of which the plain above gives no indication."

Of the south-east of England he writes :—

"We find that in places the Ouse and its tributaries in Bedfordshire, and also many other streams, flow through areas covered with this (Boulder) clay, and have cut themselves channels through it in such a way as to lead to the inference that parts of the valleys in which they run did not exist before the Boulder-bed period, but that they have excavated their courses through it and the underlying Oolitic strata, and thus formed a new system of valleys."

See also Mr. Whitaker's "On a Deep Channel of Drift in the Valley of the Cam, Essex," *ESSEX NATURALIST*, 1889, vol. iii., p. 140. (An abstract of a paper read at the Newcastle meeting of the British Association.)

OLD LOUGHTON HALL.¹

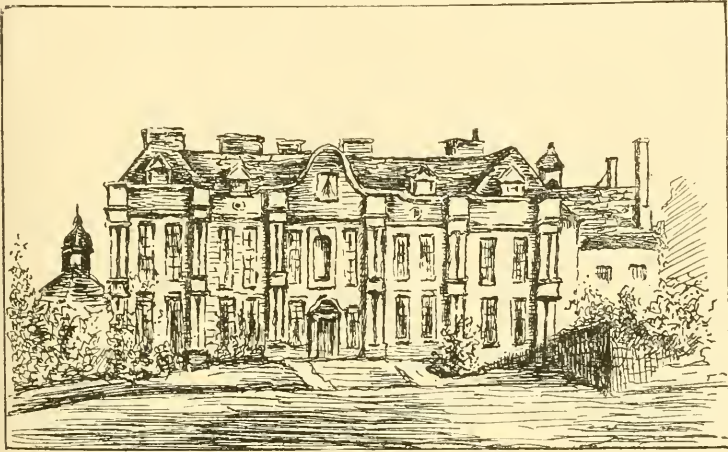
By WILLIAM CHAPMAN WALLER, M.A., F.S.A.

FROM the days of Harold, Godwin's son, down to the time of James I., the Manor of Loughton knew no resident lord. First the canons of the Holy Cross at Waltham; and then, after the dissolution of the monasteries, the kings and queens of England, in their order, numbered it among their possessions. By both the demesne lands were let out to farm, and the royal owners sometimes even leased out the profits of the Manor Court.² But it is probable that, from very early times, the site of Loughton Hall was occupied by a manor-house, which was inhabited by the *firmarii*, or lessees, of the demesne. At all events, in 1522, we find one of them under-

¹ This paper, although almost purely historical and antiquarian, may be admitted into our pages, inasmuch as it relates to one of the most important of the Forest Manors. And further, Mr. Waller has collected so much original matter, not to be found in the county histories, that we feel sure our readers will pardon this incursion into the preserves of our friends the Essex Archaeological Society!—Ed.

² Duchy of Lancaster: Leases; Div. xi., No. 35 (19 May, 19 Eliz.).

taking³ to provide all the costs and expenses of the cellarer, steward, and receiver of the Abbey, together with their servants, for two days and two nights, when they resorted to Loughton to hold the courts and leets there. This condition would naturally be fulfilled, in times when hostleries were rare and payments in kind common, by the reception and entertainment of the cavalcade at the house of the *firmarius*, who was doubtless the most important resident in the parish, and probably the only one whose resources were at all equal to such extensive hospitality.



OLD LOUGHTON HALL BEFORE THE FIRE.

From a Water-colour Drawing at Golding's Hill.

It is not, however, until much later times that we come on any direct mention of Loughton Hall. Writing (in February, 160 $\frac{1}{2}$) to his "very good freind Saint Michael," Sir Robert Wroth, in the course of a long letter,⁴ refers to a report that certain Duchy of Lancaster lands are to be sold, and that the Manor of "Lucton Hawle" (Sir Robert always writes "Lucton"), in which he dwells, is classed among them. He goes on to give particulars as to the leases granted "by the Abbot to ould Mr. Stonard," and to his own father-in-law, Mr. Stonard's namesake and grandson. These leases,

³ Conventual Leases (Essex); B. 238: fo. 74.

⁴ Lansdowne MSS. 83, fo. 59. "To Michael Hickes, Esquire." In a subsequent letter he is addressed as "no longer Saint, but Sir Michael."

he says, he was "forced to buy to keep my Lord of Lester⁵ for cominge so neere, who was earnestly in hand to have bought them." After a general allusion to his own services to the Queen, he adds that, if it be his fortune to obtain it in time, he purposes to make such an alteration of the house (being very ruinous, and part of it in such decay that, if it be not repaired, it will fall down) that it shall be fit to entertain her Majesty. The letter concludes with a request to Hickes to use his influence in the matter.

Although Sir Robert lived for some time⁶ after preferring this request, his death, as we shall see later on, anticipated the proposed purchase. But in the interval a survey of the Manor⁷ was made, which furnishes some interesting particulars as to the house, in which, albeit he gave so unpromising a description of it, he seems to have entertained his sovereign for two nights in July, 1605.⁸ But some repairs may have been effected in the meanwhile. For, in consequence of his representations as to the great decay in which the house and buildings were, commissioners were appointed, and in their report, dated June 17, 1602, they state that they repaired to the Manor House, and then, as well by view of the defects in the said house and the gate-house, and other tiled buildings, as by conference with artificers and workmen, determined what the charges, both in stuff and workmanship, would be. The buildings specified are—the gate-house and fore-house adjoining; the brew-house; the corn-barn; the cow-house; the hay-barn. Coming to the house itself, they find the kitchen and offices are most needful of speedy repair, being in danger of ruin, but that they are supported for the time being; and that the chimneys and ovens, by reason of some cracks therein, are to be taken down and new builded, while the larder and pastry need repair. The cost of all this, "after conference had with workmen in their several trades," is found to be—in carpentry, £26 13s. 4d.; in tiling, walling, and underpinning, with the stuff, £13. Mention is then made of "three payre of stayres within the howse," which, with the roof over them, are greatly decayed, and the walls and ceilings overhead also. The cost of repairing them is set down at £18 for carpentering; and the tiling over the parlour and chambers, with repair of the walls, will cost another £16. The total cost of the

⁵ Robert Dudley, the great Earl of Leicester, who, in 1578, acquired the Manor of Wanstead, where he lived and built much. He died in 1588. (Morant.)

⁶ He was buried at Enfield, Jan. 28, 1603 (*Par. Reg.*).

⁷ Duchy of Lancaster: Surveys and Depositions (44 Eliz.).

⁸ Nichols' "Progresses of K. James I.": i., 517; and Lansdowne MSS. 83, fo. 127.

repairs, exclusive of seventy timber trees to be had on the Manor, is set down at £100. "The consideracion of all which premisses," add the commissioners, "wee doe referre to yo^r wisdomes."

What was done in consequence of this report remains doubtful. But some time afterwards we find the Lady Mary Wroth, Sir Robert's daughter-in-law, in an undated letter⁹ addressed to Anne, the Queen of James I., beseeching Her Majesty to recommend to the king Mr. Wroth's petition for a new lease. The request was evidently, in some sort, a repetition of that addressed by his father, old Sir Robert, to Michael Hicke; for, in the course of her letter, the Lady Mary alludes to the house as being old and in decay, and like every day to fall down, and promises that her husband will make it his chief dwelling-place and fit for Their Majesties. He is also willing to pay £600 as a fine, or to spend that sum upon the building; and to lose £100 a year by letting the deer feed in his best grounds, to which, by his lease, he is not bound. And, as a further inducement to the Queen, who was clearly her very good friend,¹⁰ the writer humbly beseeches Her Majesty's furtherance in the business, on the ground that it will be much for the petitioner's good, "Mr. Wroth having promised to add itt to my jointure, all the rest of his lands beinge entailed." The result of the negotiations was the grant, in 1609, of a new lease,¹¹ to run for forty-one years from 1644, when a former one, granted in May, 1579, to John Stonerd, and then vested in Sir Robert Wroth (he was knighted in 1603), would expire. For this renewal the lessee paid £184, by way of a fine, and bound himself to maintain in good condition all thatched buildings, hedges, ditches, and enclosures, the annual rent being, as in the time of the last Abbot of Waltham, £46—a sufficiently good bargain, it would seem, for the fortunate lessee.

Some three years later, a fresh survey¹² of the manor was ordered to be made, on the ground that the Manor of Loughton had "not been of long time exactly survaied, by reason whereof divers rents, services, and boundaries, were concealed, detayned, and suppressed"; and the sheriff was instructed to provide a jury. The survey was accordingly made on June 30th, 1612, and the first paragraph of it runs as follows:—

⁹ Lord Salisbury's MSS. (Hatfield House): Cecil Papers, 139.

¹⁰ Nichols (*op. cit.*), iii., 541, names her as attending the Queen's funeral later on; and also (ii., 756) states that the king stood sponsor to her son, by his deputy, the Earl of Pembroke.

¹¹ D. of Lanc.: Counterpart Leases; Class xv., No. 28.

¹² D. of Lanc.: Surveys and Depositions (10 Jac. I.).

“Imprimis, the mannor or mansion house contains a Hall, a Buttry, Kitchen, Larder, Bakehouse, Pastry, Mylkhovse, Wash-hovse, and eight other Lodgings, with faire Lodginge and greate Roomes over the said Roomes new built and redified at the chardgs of Sir Robert Wroth, the now ffarmer thereof; with two barnes of nine bayes a peece, two duble stables, brewhouse, Garnerhovse and sundry other out offices and Lodgings; with an orchard and a garden now in plantinge, all consisting of Six acres and one rood of ground, valued at, per annum, the Repair and the late new building considered—vj li. xiijs. iiij^d.”

The rest of the document is taken up with the lands and other appurtenances of the manor, the gross annual value of which is stated to be £768 2s. 10d. The nett value, after deduction of the rent reserved (£58 8s. 4d.), and one-fourth “in respect of feeding of His Majesty’s deer, both red and fallow, upon all the grounds throughout the said manor,” is set down as £517 13s. 9½d. The timber, separately valued, and taken as 1,028 loads, is said to be worth £3,028. Just one year later, on June 15, 1613, a grant in fee of the manor,¹³ with the advowson of the Rectory, was made to Sir Robert and the Lady Mary Wroth, in consideration of the payment by them of £1,224, and a fee-farm rent of £58 8s. 4d.

It appears, therefore, that, relying on the length of his lease, or, perhaps, having his subsequent purchase already in view, Sir Robert Wroth, the younger, rebuilt Loughton Hall; but of this the allusion in the survey appears to be the only existing evidence. It is possible, however, that an allusion to Sir Robert’s rebuilding of the house is intended in the following passage from his wife’s book:—¹⁴

“Hee replied, the place hee was on was called the Forrest Champion . . . a little way from thence hee told him was a faire house, where a noble Knight and his Lady liued within a part of the same Forrest, which they had inclosed, and made like an orderly ciuil place, from the others wildnesse, and shut themselves within a Pale; woods were within this place, the rest all Heath and Rocks, scarce a Bush, but no tree that could sheltre one from a small shower. . . . The Knight was a braue Gentleman . . . his Lady a young woman, cheerefull and pleasant, the daughter of a great Lord,¹⁵ and Sister to as fine a gentleman as was in that kingdom.”

¹³ D. of Lanc. : Div. xii., B. 26; and Originalia : 11 Jac. I., part 4.

¹⁴ “The Countesse of Montgomerie’s Urania,” by the Lady Mary Wroath, p. 534.

¹⁵ The Lady Mary was daughter to Robert Sydney, Baron Penshurst, and Viscount Lisle; and, later, Earl of Leicester.

More than two centuries afterwards, an anonymous writer¹⁶ described the Hall as an Elizabethan pile of considerable beauty, the front and ceiling of the inner hall and a stone staircase being by Inigo Jones. It is not improbable that Inigo Jones was employed to design the interior alterations; for not only must he have been well known to Sir Robert and the Lady Mary as the deviser of the machinery and decorations of the costly masques in which they themselves, as courtiers, doubtless often played a part,¹⁷ but he was also the particular *protégé* of their kinsman, the third Earl of Pembroke. Whether he had anything to do with the exterior seems more doubtful, as it is generally spoken of as being Elizabethan in character; and a writer in 1770 said of it¹⁸ (in accordance with the taste of the time, half apologetically) that Loughton Hall, "though it is not a regular, is a large, handsome building."

From the beginning of the seventeenth down to the middle of the nineteenth century we get but one peep into Loughton Hall, and that is through the windows of the High Court of Chancery.¹⁹ On the death of John Wroth, in 170 $\frac{7}{8}$, a dispute arose between his widow and the children of his two former wives. This resulted in the filing of long "Bills" and "Answers," through which it is a weariness to wade. John Wroth, the son, refers in his statement to certain goods in the Hall, which he, now resident there, had bought from the complainant, his stepmother, and her co-executors. The value of the whole amounted to £547 5s. 2d., and, among others, the following items occur: Goods in the King's chamber, £34; in the dining-room, £10; in the drawing-room above, £6; in the drawing-room below, £30; in the great parlour, £12; and—irons in the hall, 6s. The garden, cellars, buttery, and press-room are also named.

It is needless to trace here the descent of the manor, which remained in the possession of the Wroth family until 1738, when, on the death of Elizabeth, the childless widow of John Wroth, it passed, under his will,²⁰ to her great-nephew, William Henry, fourth Earl of Rochford. It was sold by him in 1745; and, thenceforward passing by will, it became, in 1825, the property of William Whitaker Maitland, of Woodford Hall. Soon after this the old manor-house once more emerges from its obscurity—an obscurity

16 "Lewis' Topographical Dictionary," 1844.

17 Nichols, *op. cit.*, i., 479.

18 "History of Essex," by a Gentleman, vol. iii.

19 Chanc. Proc. b. 1714: Hamilton, 645—Wroth *vs.* Wroth.

20 P.C.C.; 91, Tenison: proved by the widow, April 28, 1718.

illuminated for a moment by the lurid light of the conflagration in which it vanished for ever.

After his accession to the estate, Mr. Maitland took the house in hand and carried out extensive alterations, both inside and out. The illustration which accompanies this paper (taken from a water-colour sketch at Golding's Hill, the home for many years of his widow) is thought to represent the exterior as it was just before the fire. The building presented, according to a contemporary account,²¹ two frontages, each 162 feet long, with a depth of 65 feet, being of what is called the Elizabethan style originally, and, from a date on the leaden spouts, would seem to have been erected about the year 1616. The front had been modernized, continues the writer, and ornamented along the line of façade with pilasters, over which ran a range of columns, both of the Doric order. Within, the recent decorations were generally of the Ionic and Corinthian orders, richly gilded at the capitals. Over £6,000 had, it is said, been recently spent on mere building operations, and fifty rooms were destroyed or damaged.

The fire seems to have had its origin in a beam in the library chimney, and burst forth early on the morning of Sunday, December 11th, 1836. The butler, awakened by the library bell, which was fortunately set ringing by the fall of some burning material on to the wire attached to it, roused the household, and all were soon got out of danger. But none too soon; for "in a few seconds the whole [west] wing was one body of fire." The subscription fire-engine ("from Chigwell," says one account) and the neighbours were quickly on the spot ready to help. The only supply of water, however, was from a pond 360 yards distant. Two servants rode off to London, and by ten o'clock two other fire-engines, hurried down as fast as four post-horses in each could drag them, were on the spot. The west wing was then hopelessly burnt, and the energies of the firemen were bent on the east one, containing the kitchen offices, with rooms above them. Fears were at one time entertained for the ancient church of S. Nicholas, in which, of course, no morning service was held. Fortunately, however, there was no wind, and it escaped damage. Some few things were dragged out of the house on to the lawn and saved; but the magnificent library of over 10,000 printed volumes and MSS., many rare, and some said to be unique, was destroyed, together with a costly collection of pictures which, it

²¹ "Essex Standard," December 16, 23, 30, 1836; "Essex Herald," December 13, 1836.

is stated, had been accumulating during two centuries. The mere pecuniary loss was estimated at something between £20,000 and £30,000, to say nothing of the greater losses on which no money value could be set. Even at this distance of time, the thought of that disaster, endured, as it was, with manly fortitude, serves to awaken in one emotions of sympathy and regret.

The gloom which followed on the glare of the burning house is penetrated for us by a ray of kindlier light, when we read of the good services of friends and neighbours, and of the "extraordinary exertions of the labourers, with whom Mr. Maitland was a great favourite." These exertions he himself was not, in spite of all, backward in recognising. For just three weeks later "The Essex Standard" (December 30th) reported that Mr. Maitland, in commissioning his steward to announce that he would that year double his customary liberal Christmas gifts, "emphatically observed: 'When the Hall was on fire, full 200 of my humble neighbours came to my assistance, and they worked hard; and not one of them was a thief.'"

For many years the great iron gates, surmounted by the Wroth crest and the interlaced initials of John and Elizabeth, the last of the Loughton branch of the family, kept guard over the foundations of the ancient house. In the year 1879, however, the road, which passed in front of them and beside the old church of S. Nicholas, was diverted to its present course, and a new house, designed by Mr. W. Eden Nesfield, was built on the old site by the Rev. John Whitaker Maitland, the first clerical owner of the manor since Robert Fuller, last of the long line of Abbots of the Holy Cross at Waltham, signed the Deed of Surrender on March 23rd, 1540.²²

NOTE.—An incidental reference to the rebuilding of Old Loughton Hall, on which I have since lighted, occurs in the Chancery Forest Roll, No. 153, which is dated Sep. 21, 1630 (6 Car. I.):—"Item, wee finde that S^r Robte. Wroth, K^{te}, deceased, about sixteene yeres past did build some parte of the howse called Loughton Hall upon an old ffoundacion, nowe in the occupacion of the Lady Mary Wroth." This, which does not profess to be exact, brings us sufficiently near to 1616, the date said to have been found on the leaden spouts.—W. C. W.

NOTES—ORIGINAL AND SELECTED.

Destruction of Otters in Essex.—We, regretfully, find no dearth of records with which to continue the dismal story of the persistent persecution of these interesting animals in our county (see list in *THE ESSEX NATURALIST*, vol. vi., pp. 41-42). We have noticed in the papers the following cases :—

Maldon.—“Mr. Harry Poole this week came upon another otter on the banks of the canal, and shot him dead in a clean and workmanlike manner. The animal is a splendid and well-grown specimen, in the ‘puppy’ stage, good in shape, colour, and symmetry, and is altogether a typical example. Its destiny, of course, will be the usual glass case.”—“*Essex Weekly News*,” March 4th, 1892.

Chappel.—“On Monday, Mr. J. S. Goodey, of Broom Hall, shot a remarkably fine dog otter, measuring 47½ inches from the tip of the nose to the end of the pole, and weighing 22lbs. 5ozs. This makes the fourth otter which Mr. Goodey has shot almost at the same spot in the river.”—“*Essex County Chronicle*,” January 6th, 1893.

Wethersfield.—“A fine dog otter was shot in the River Pant on Tuesday, from the land occupied by Mrs. Marsh. The otter has been about for some time, but was eventually got after a couple of shots.”—“*Essex County Chronicle*,” February 10th, 1893.

Colchester.—“Early on Friday, Feb. 3, p.c. Stannard, of the Borough Police, saw a fine otter in the river, lying on the mud near Mr. Chisnall’s boats. On being observed it plunged into the water, and made off in the direction of Sheepen Farm.”—“*Essex County Standard*,” February 11th, 1893.

The actions of these “noble sportsmen” are not, however, allowed to pass without protest. A writer (“C. C. S.”) thus admonishes them in the “*Essex Herald*” for January 10th :—“Among the paragraphs in your papers, I occasionally read, ‘Another otter shot,’ and in the last number I see that Mr. J. S. Goodey, of Broom Hall, Chappel, is credited with having recently shot no less than four, nearly in the same place. What pleasure he or anyone can find in shooting these rare and interesting wild animals I cannot conceive. For my part, I think it a great pity, and if I had it in my power, instead of endeavouring to exterminate otters in this senseless manner, I would afford them all the protection I possibly could. They are very harmless, and extremely scarce in most parts of Essex, and I think the sight of one to any person with a love of natural history in its living condition would be infinitely more gratifying than the same animal stuffed in a glass case. Something may, no doubt, be said for otter hunting, where they are numerous, with a pack of otter hounds, which affords amusement to a large number of people ; but shooting them is another matter altogether, and one which I think justly merits the disapproval of all right-minded persons. Anybody who has had an opportunity of seeing an otter at play in the water would indeed feel sorry to see his gambols ended by a charge of shot through his head ; and I hope the next time Mr. Goodey finds himself within sight of an otter at this favourite spot, he will refrain from shooting it, and confine himself to watching the interesting exhibition of aquatic skill which no doubt the animal will afford him.”

Some excellent observations were printed in a late number of the “*Fishing Gazette*,” which confirm the conclusion we have more than once alluded to that the otter is not an enemy of the fisherman, but is, in reality, one of his best friends :—“The otter is still found, though in decreasing numbers, in nearly every part of Great Britain and Ireland ; and we would say a word in its behalf, for with its

extinction an irreparable mischief would be done to our rivers, our lakes and tarns, and to the tens of thousands of anglers who derive pleasure and profit upon their banks. The otter is one of the fisherman's best friends; and, reckless as some may think this assertion, we repeat it, and have reason for so doing. Whilst we write, we have in our mind a little river in our own neighbourhood than which, for its size, there is not a better in the kingdom as a trout stream; and yet this river, figuratively speaking, actually swarms with otters. Depend upon it, the otter lends respectability to a river, for where he is found, there will the fish be found also. Perhaps his presence may not be desirable in the rearing pond; but were we on the look out for fresh fishing ground, the known haunt of the 'water-dog' would decidedly have preference over a stream which knew him not. . . . Notwithstanding the evil character given this animal as a river poacher, we have every reason for knowing that fish forms only one course, and that not always a considerable one, of its daily meals. The young of water-hens, coots, and other birds breeding by the waterside, and at times rabbits, and even large worms, are common changes in the otter's diet; while frogs, eels, and the crustaceous crayfish are probably thought as great a dainty as the brightest of silvery salmon. These facts are easily proved by an examination of the animal's 'foil'; while we have over and over again had ocular demonstration of the avidity with which vegetable food is consumed. It is not intended to assert that the otter does not relish a salmon cutlet or toothsome trout; but that he is the wanton destroyer of fish to the extent often imputed to him, those best acquainted with his habits firmly deny. Cunning and quick in his actions as the otter may be, a salmon is more so; and this fact alone should weigh in the otter's favour, when charges are made about the depopulation of our fishing streams. *It is more likely that he acts the part of a river scavenger, destroying, as a rule, only such fish as are diseased, and which from their weakness are unable to escape his clutches.*"

Rough-legged Buzzard (*Archibuteo lagopus*) at Little Baddow.—Mr. C. Smoothy, of Little Baddow, writes: "I saw a fine specimen of the Rough-legged Buzzard on March 5th. It was seen again on the 7th. The bird is very rare in Essex, I may say almost extinct. This specimen was not shy. I might easily have shot it, but trust it will share a better fate. It was sailing over one of my fields some time. It caused several partridges to scuttle off to the fence. At the same time I do not think this bird is destructive to game, being very slow of flight. I have not seen any for several years. I have two good specimens, one killed in Norfolk and one in Cambridgeshire."

[Many records of the occurrence of the bird in Essex are given in the "Birds of Essex." Mr. Hope writes, "Common on the coast, first arriving at the end of September, but coming in flocks in very cold weather." The occurrence of a fine female specimen at Patching Hall, near Chelmsford, in 1879, is recorded by Mr. Miller Christy in "Trans. Essex Field Club," vol. i., p. 63.—ED.]

Waxwing (*Ampelis garrulus*) at Oakley and Stock.—The "Essex County Chronicle," for February 8th, records that "on Monday, Mr. Keeble, the carrier, shot a pair of Waxwings, a bird very rarely seen in this country. The 'Chronicle' of March 30th, 1883, records the shooting of one by Mr. B. Watson, jun., at Dedham, about that date. Mr. T. W. Offin shot one at Rayleigh about ten years ago, while Mr. Charles Smoothy saw one at Danbury on several occasions during January, 1890. Further back, Turrell records that his friend Mr. Joseph Clarke killed one out of a flock in 1835, at Saffron Walden. Like most of the winter visitors to this country, the Waxwing comes to us from the north.

The country in which it produces its young is not decidedly ascertained." This is, according to Christy ("Birds of Essex"), a rare and irregular winter visitor, although sometimes occurring in considerable numbers, as in the years 1835, 1849-50, 1866, etc. He gives many records in addition to those quoted above. The writer in the "Essex County Chronicle" is in error in stating that the breeding-place is not known. It extends, as was discovered some years ago by Mr. Wolley, across Behring Strait to Alaska and the Rocky Mountains. The first nests and eggs were found in 1856 in Russian Lapland, since which a great many have been taken; and the breeding range is now known to extend westward to the north-eastern portion of Norway, and southward to about 65° N. lat., on the shores of the Gulf of Bothnia.

Since the above was written the "Essex County Chronicle" records that on the 28th of February "a beautiful male specimen of this rare bird was shot by Mr. H. Heywood, at 'Greenwoods,' in the parish of Stock. The bird has been carefully preserved by Mr. C. Cable, naturalist, of Stock."

Robin Nesting in the Winter.—"A robin's nest, with five young ones, exists in an unused milk churn, placed close to the fire in one of the cow-houses at Terling Hall. A nest has been built there for five successive years, and each year there have been five young ones at Christmas time. It is a strange occurrence that a robin should build her nest in the dead of winter and have young ones. The birds are quite healthy, and thrive as well as other birds."—"Essex County Chronicle," February 10th, 1893.

Effect of Want of Light (?) on Colour of a Frog.—Early last year a friend of mine, living at Wanstead, found a frog beneath a flower-pot which had been standing right way up and full of earth in the same place for two or three months. The body of the frog was shrunken and the skin transparent, so that the internal organs could be seen. The head, however, which was outside the pot, had not changed colour to any appreciable extent, but the eyes were unusually protruding. My friend released the frog, and fed it upon worms for seven or eight days, by which time it had recovered its colour, and it then escaped. Some of our members may be able to mention other instances which would show whether the alteration in colour was due to the pressure of the flower-pot, or the want of light. Perhaps the Ethiopian could change his skin by dwelling in the dark.—F. W. ELLIOTT, Woodford Green.

Hydrobia (Paludestrina) Jenkinsi.—Supplementing the information respecting this estuarine mollusc, which was given in volumes iv. and v. of THE ESSEX NATURALIST (vol. iv., p. 212, etc.; vol. v., p. 220, etc.) by Messrs. Smith, Crouch, and Jenkins, it may be useful to refer to a paper by Mr. Lionel E. Adams, in the "Journal of Conchology," for January last (vol. vii., p. 148), giving a theory as to the possible introduction of the species into this country. Mr. Adams states that he found *H. jenkinsi* at Countess Weir, halfway between Exeter and Topsham, in August last. Noticing that the habitat was similar to those at Plumstead and Sandwich, where this very local species had previously been found, it occurred to him that this similarity might throw some light upon the manner of its introduction into Britain—provided, of course, that the mollusc is not really indigenous. Mr. Adams remarks how greatly Topsham reminded him of the old-world, sleepy, and decayed Cinq Port of Sandwich, and both towns were of considerable importance as trading ports 200 years ago. Mr. MacMurdo, of Topsham, informed Mr. Adams that in the reign of

Henry VIII. two men of war, which afterwards fought against the Armada, were built upon the spot where *H. jenkinsi* now flourishes, and for many years vessels used to go regularly to Countess Weir. Between 1840 and 1855 there was a trade between St. Petersburg and Finland and Topsham in hemp, tar, and timber. Sandwich, too, in former times, imported timber from Cronstadt (whence timber from Finland may also have been shipped), and from several Swedish and Russian ports. Along the banks of the Thames (where *H. jenkinsi* was first observed) timber has been unloaded from most parts of the world, and certainly largely from Russia and Finland. The only ports then trading mutually with two of our three English ports are Cronstadt (St. Petersburg) and some Finnish ports along the Gulf of Bothnia. Though Topsham imported timber from America, Mr. Adams could not find that Sandwich ever did so. Sandwich, again, imported timber from Sweden, Norway, and Russia; but he could find no record of the same for Topsham. Mr. Adams thus sums up and concludes from the above: "Now the fact of the same foreign locality exporting timber to three different English ports (the only known habitats of *H. jenkinsi*), and that same foreign locality being the only one, as far as my information goes, trading mutually with two of the three, seems a curious coincidence, and, though by no means amounting to anything like a proof, forms a provisional hypothesis. This hypothesis would be greatly strengthened if the shells were found in any other of our ports which trade or have traded with Russia or Finland, e.g., Newhaven and Wisbech, where I would suggest that search should be made. And, lastly, it would vastly increase its probability if the species were found to exist in some of the low-lying marshes along the Russian and Finnish coast, which have been little explored, and are very desolate. . . . It may be remembered that the habitat of *H. jenkinsi* is slightly brackish dykes, such as timber is likely to be stored in while waiting shipment." This species is so very interesting to Essex naturalists that the above observations will be welcomed; and we shall be glad to have any remarks or criticisms on Mr. Adams' hypothesis (which seems to be a workable one) from our local conchologists.—ED.

Freshwater Molluscs in Brackish Water.—Mr. L. E. Adams remarks in the "Journal of Conchology" (vol. vii., p. 150, Jan., 1893) that *Limnaea peregrina* is well known to exist and thrive in brackish water, and that he had found *Planorbis vortex* and *Pl. spirorbis* in a very salt marsh at Dovercourt, near Harwich.

Sake's (commonly called "Snake's") Lane, Woodford.—Since my note on this subject in the preceding number of THE ESSEX NATURALIST was printed (vol. vi., p. 208), I have come on an earlier mention of the Sake family in a Woodford Court Roll of 5 Henry IV. (1403-4). At that date the wives of John Sake, senior, and John Sake, junior, are described as being brewers, and for their shortcomings in that capacity, their respective husbands were mulcted in 2d. each. John Sake, junior, himself incurred a like penalty, for an unscoured ditch in Mottes lane; and he is also charged with carrying off a house (*amovebat unam domum*) from the holding, which once belonged to Thomas-in-the-lane. (*Rec. Off. Court Rolls: 174|42.*)—W. C. WALLER, Loughton.

Correct Spelling of "Fowlness Island."—Some of the good people of Camden's "Promontory of Birds or Fowls" are very properly protesting against the official spelling, "Foulness," as being not only derogatory to their native soil and hurtful to their feelings, but incorrect philologically and historically.

Mr. W. H. Dalton, F.G.S., author of the very interesting paper on "Fowlness" in THE ESSEX NATURALIST for 1889 (vol. iii., p. 239), has written vigorously in defence of the true orthography:—"As a native of this interesting, if not romantic, island (and proud of the fact), allow me to point out that on a few occasions a properly educated official has used the above orthography; that it has to my knowledge been used for forty-five years in the local centre of light and leading, the rectory, and elsewhere; that it was changed from Vogelness, Fughelness, and Foulness, to Fowlness (*temp. Will. et Mar.*) in accordance with the general name for wild birds, and that the retention of the "u" is both incorrect and misleading. A parallel name, Foulmire, in Cambridgeshire, was a few months ago corrected to Fowlmere by the Post-office authorities, on precisely similar evidence. If any real change of name be adopted, I would suggest 'Fowlers' Island,' as connoting the presence of both feathered and unfeathered bipeds. The only objection to any change is that when, by the exploitation of the mineral wealth of Essex, the Crouch and other estuaries come to resemble the Wear and Tyne, with their fleets of collier craft, the present common misspelling may become appropriate. I may add that natives speak of 'Fow'ness'; it is only the inhabitants of the adjacent island of Great Britain that sound the 'l,' the elision of which necessitates the use of 'w,' as the diphthong 'ou' would sound differently before a single consonant." In a later letter, alluding to an idea put forward in the newspapers that the name had some reference to the form of the promontory, Mr. Dalton continues:—"I take it that the name Fowlness was not applied from any resemblance to a bird's beak, which is indeed perceptible only to a poetic mind, aided by a map, but from its being emphatically the 'ness' frequented by wildfowl. The broad, sandy flat running out as a sharp promontory (naze, nose, or ness), affords still, despite the cannonade from Shoebury, a feeding-place for myriads of birds of many species, being not only a gathering ground for organic refuse brought down by the Thames and Medway, but the crowded habitat of cockles, worms, and other marine consumers of garbage, who there fulfil the great law, 'Eat and be eaten.' That the name applied primarily to the sands is evident from the rounded outline of the enclosed land till within a period much more recent than the name. If we cut back the land in imagination to the road leading from the Crouch through Courtsend to Eastwick and the Rugwood Head road, a curved line which is evidently that of an old wall, we shall have nothing worth the name of ness. There is yet much to be learned about not only the nomenclature, but the former geography of our Essex estuaries. Within the memory of even young men, considerable changes have occurred, in the loss of land here, and its increase there. When to the effect of alterations in the set of tidal currents we add that of oscillations of level, as evidenced in raised beaches and submerged forests, it becomes clear that our present maps do not show the past, any more than the future, outline of our county."

From the many letters in the local papers on this subject, we extract the following interesting particulars from an anonymous correspondent ("Bird of Prey, Oxon.") in "The Essex Herald," for January 10th:—"Concerning the earliest records of Fowlness, anciently written Fughelness, it may be of interest to state that although there is no actual mention of it in Domesday Book, a note appended to the translation of Domesday says, 'There is little doubt that Fowlness Island was included in some of these estates of Suene in Rochford Hundred.' This takes us back to the time of the Danes towards the end of the tenth century, implying that the island was, at any rate in part, reclaimed before

the Conquest. In a history of Essex, published a hundred and twenty years ago, the name is spelt four times with a 'w.' The Saxon derivation of Foulness is *Fugel*, a fowl, and *næse*, a promontory. In very early English the word was written *Foulsnesse*, *Foulsnesse*, the first 's' conclusively proving its meaning. The farm of which the earliest mention is made is *Nazewick*, probably the Wick of Fowlness, as then being nearest the Cape. There is, of course, another and a far-fetched derivation of 'ness' or 'naze,' namely, *nassa*, a noose or snare; in support of which theory there is undoubted evidence of a former decoy pond in the centre of the island, close to which the discovery of Roman remains was made. 'Sir Guy de Rochford dyed in 1274, and besides the Manors of Rochford, Burden, and Elsenham, held a hundred and twenty acres of marsh in Foulness, called *Nasewyk*.' His nephew, John de Rochford, dying in 1309, besides *Nazewick*, held the Marsh of *Eastwodwick*, afterwards held by Robert de Rochford. William de Bohun, Earl of Northampton, possessed *Middlewyk Marsh* in 1343, through whose successors, William and Humfrey de Bohun, the estate went to *Alianor*, wife of Thomas of Woodstock, on whose tragic death it came to the Crown. King Henry VI. granted these lands to Thomas Earl Ormond, from whom they passed to the families of Bullen, Stafford, and Rich, and to the female heirs of the Earl of Warwick, one of which brought it to the Right Honble. Daniel, Earl of Nottingham. Thence it passed to the Earl of Winchilsea and Nottingham. 'In the steward's account of Robert, Earl of Warwick, in 1651, the quit rents of the Manor of Foulness amounted to £8 17s. 10d. Fowlness Hall, that is, New Hall and Old Hall, were £150 per annum.' The old church of Foulness was dedicated to the Virgin Mary, St. Thomas the Martyr, and All Saints, and is described as a wooden fabric, about the middle of the island, of one pace forty-seven feet long and twenty broad. At first called chapel institutive, it was presented to by the Lady Joane de Bohun in 1386, and from that time by lords of the manors; but, being slenderly provided for, and the curate but little resident, a chantry was founded in 1408 by the same Joane, Countess of Hereford, in whom, with the archbishop and other lords of the manor, the right of patronage was vested. After the dissolution of chantries in 1547, this chapel was erected into a rectory in 1554, the advowson being then the property of Richard Lord Rich. 'Robert, Earl of Warwick, at the time of his decease, March 24, 1619, held the Manor of Fowlness and divers lands, etc., called *Nasewick*, *Arundell Marsh*, *New Wicke*, *East Wicke*, *South Wicke*, *Muncken Barn*, and two marshes, in *Packleshame* and *Wakering*, parcel of the Manor of Fowlness—otherwise called *Isle of Fowlness*.' 'In creeks round these islands are fed small oysters called *Wall-fleet oysters*.' The remains of old counter walls, much more distinctly marked on the island of *Wallasea*, are still to be seen on the higher grounds of Fowlness, showing that the island was reclaimed at different periods. In early modern English, fowl, a bird, was also spelt 'foul' and 'foule,' and in middle English, 'foule,' 'fowel,' etc."

Dagenham and Dagnams.—In a short paper on "The Geology of the District around Dagenham Breach, Essex" (*ESSEX NAT.*, vol. iv., p. 142, September, 1892), I quoted from a well-section given by Mr. Whitaker ("Geol. Lond.," vol. ii., p. 18), the locality of which is there stated to be "Dagenhall Hall," as showing the remarkable thickness of the London Clay beneath the River Drift at that spot, which I then supposed to be the Hall about half a mile north of the village of Dagenham. Mr. Whitaker, who appears to have obtained the details of the well-section from the MSS. of Dr. J. Mitchell, held this view of the

position of the well when the Memoir was published, and has consequently placed the explanatory words "Valley Drift," against the details of the superficial brick-earth and gravel. But he informs me that he has since discovered that the true locality of the well-section is not *Dagenham* but *Dagnams*, between three and four miles north-east of Romford. The very great thickness of London Clay given as existing at Dagenham, together with the round numbers "400 feet," seemed to me, last July, to suggest a want of perfect accuracy in the account. But as the words "Valley Drift" applied to the superficial beds at Dagenham, and are utterly inapplicable to those at Dagnams, which are more than 200 feet above the sea, and as 200 feet of London Clay would have been enough for my purpose, I thought I might safely quote this well-section. However, though it cannot be mentioned as confirming the existence of the continuation of the long line of synclinal fold spoken of in my little paper, nothing else there seems to me to need any modification.—T. V. HOLMES, February 23rd, 1893.

Rainfall at Chelmsford in 1892.—Mr. F. Chancellor has recorded the following monthly summaries of the rainfall at Chelmsford as observed by himself during 1892:—January, 0·48; February, 2·42; March, 1·08; April, 1·21; May, 0·87; June, 2·64; July, 1·27; August, 3·52; September, 2·22; October, 4·05; November, 2·09; December, 1·31; Total, 23·16.

THE SHALLOW AND DEEP WELL WATERS OF ESSEX.

By JOHN C. THRESH, D.Sc., M.B., D.P.H. ETC.

[Read, February 21st, 1893.]

CONTENTS.—Sources of our Water Supplies—Variation in the character of the water from various kinds of Gravel—Effect of a stratum of Boulder Clay—Magnesian Waters—Deep well waters (1) from Tertiary Sands (2) from the Chalk—Great variation in character—Causes—Effect of proximity to the Ocean, etc.

The paper is written in the hope that Essex Geologists may be able to explain some of the author's difficulties, and that others may help by procuring for him samples from certain districts not yet represented.

THE above somewhat hurriedly adopted title is probably not the most appropriate one for the subject we have to discuss this evening, and on that account our secretary acted wisely in giving my short syllabus in the circular convening this meeting.

During the past three and a-half years I find that I have examined 874 samples of water from various portions of Essex (by far the largest majority from the district around Maldon and Chelmsford), the object, in every case, being to ascertain whether they were sufficiently free from pollution and otherwise of such a character as to be fit for drinking and domestic purposes. About two years ago, I published a "Report on the Water Supplies of the

various Villages and Hamlets in the Chelmsford and Maldon Rural Sanitary Districts," which contained the results of the analyses of 400 samples of drinking water derived from the most varied sources—rain-water tanks, ponds, ditches, streams, springs, shallow wells in Boulder clay and in various kinds of gravel, and deep or artesian wells, sunk through the London Clay to the sands and chalk beneath.

In the introduction it was affirmed that the waters yielded by gravels of different origin differed much in character. A copy of this report reached the hands of our esteemed member, Mr. W. Whitaker, F.R.S., and he wrote me saying that he had noticed this remark, and that "it would be interesting to study such differences, if they existed." He adds, "There may possibly be some difference between gravel-water and sand-water, of whatever age the deposits may be, and you might be on the look out for this."

Tables of analyses of typical waters, or of waters which for some other reason are interesting, have been prepared and are appended to this paper.¹ Out of the hundreds of analyses of shallow well-waters I have made, there are few which are of any use for our purpose. In many instances the subsoil water supplying the wells has become so contaminated with the filth deposited on the surface of the ground, or in defective cesspits, cesspools, and bumbies, that the character of the water has become entirely altered. For examples I would refer you to my Report on the Writtle Water Supply, a few copies of which are upon the table for distribution. Writtle village stands upon a patch of Glacial gravel. At the edge there are numerous springs. The analyses of five of these are given as being typical of what the water from this gravel patch should be. We may compare these with the analyses of the water from the village wells.

	Springs.		Village Wells.	
Total solids in grains per gallon vary from	28	to 31·5	32	to 160
Temporary Hardness „	14·4	to 20·3	11·5	to 45
Total „ „	20	to 26	18	to 58
Chlorine „ „	1	to 1·5	2·3	to 18·4
Nitric Nitrogen „ „	·25	to ·45	·07	to 9·1

Out of the forty-eight shallow well waters only one or two bear any close resemblance to the spring waters; all the others are more

¹ See appendix of Tables of Analyses, inserted in the present number.—ED.

or less seriously affected by the filthy deposits of the centuries during which Writtle village has existed. In all the gravel waters I have examined I have found that when the chlorine exceeds about two grains per gallon (corresponding to 3.3 grains of chloride of sodium, common salt), there are other signs of pollution and of change in character due to such pollution. For instance, you will find that whenever the chlorine is high the nitric nitrogen (which is a measure of the amount of nitrates present derived from the oxidation of organic filth) is also high; whereas generally, but not invariably, when the chlorine is low the nitrogen is low also.

On Table I. some analyses are given of waters from the Bagshot sands and pebble beds. One peculiarity of such waters is the low temporary hardness (due to carbonate of lime) and the comparatively low total hardness (due to carbonate and sulphate of lime). My attention has been particularly drawn to these waters, because I find they have a powerful action upon lead pipe, and upon iron pipes, whether galvanised or not. I found, however, that I was not the first person to note this peculiarity, since, upon communicating the fact to Dr. Barry, one of the inspectors of the Local Government Board, who is at the present time engaged upon an exhaustive examination as to the cause of the lead-dissolving power of certain waters, he informed me that Dr. Harcourt had already sent him a series of analyses of waters from the Bagshot beds, all of which waters acted powerfully on lead. Dr. Barry, at the time, appeared to think that this was a property possessed only by waters from this particular source. Analyses showed that such waters contained little or no carbonate of lime (temporary hardness) and therefore had no alkaline reaction; and in the north of England, where moorland surface waters often act strongly on lead, the reaction of the water is either neutral or faintly acid, and the addition of a little chalk (carbonate of lime) effectually destroys this solvent power. Such waters, however, are yielded by gravels which, on the Drift maps, are referred to as "Glacial Drift," especially if such gravels occur on the tops of hills, or far removed from any Boulder clay. Table II. contains analyses of many waters containing little or no carbonate of lime, and most of them can dissolve lead freely. Such waters occur at Asheldham (an isolated gravel patch), Great Baddow, Little Baddow, Danbury, Woodham Mortimer, and Woodham Walter, the gravel upon which these parishes lie being far from any Boulder clay. At Galleywood, Writtle, Fryerning, Ingatestone, and Stock, the Bagshot

beds again yield us samples ; but at Great and Little Braxted, Great and Little Totham, Wickham Bishop, and Tiptree Heath, where the Glacial gravel is raised and exposed so as to be beyond the influence of the Boulder clay, we also obtain water almost destitute of carbonate of lime. In the Chelmsford and Maldon districts these are the only parishes yielding such waters. In all others, we find that most of the water in the gravel must have percolated through the Boulder clay which, in some places, is far more pervious than is generally supposed. The springs at Writtle, Roxwell, Chignall, and Ford End are at the edge of patches of gravel, most of which is covered with Boulder clay. As this latter contains a considerable amount of chalk, the water, in percolating through, dissolves a certain amount, and its temporary hardness, due to the dissolved carbonate of lime, is increased (*vide* analyses). I have also given a few analyses of waters obtained from wells sunk through the Boulder clay to the gravels and sand lying between this and the London Clay, and it will be observed that they contain from ten to thirty grains of carbonate of lime per gallon.

At present, therefore, I have no evidence that there is any difference between "Bagshot" and "Drift" waters, except such as can be accounted for by the influence of the Boulder clay, or the proximity of villages with defective sanitary arrangements.

In certain localities, I have observed a peculiarity of the Boulder clay water which I find other analysts and medical officers have noted, *viz.*, that the water, when freshly drawn, has the odour of rotten eggs. This smell is due to a trace of sulphuretted hydrogen ; but how the gas is produced, and why peculiar to localised areas, I cannot explain. It is very probably formed by the reduction of a sulphate by some peculiar organism, or by dead organic matter, vegetable humus. The general public, however, invariably ascribe the smell to sewage pollution ; but my analyses do not confirm this opinion. The smell very rapidly disappears if the water is left in an open vessel, the gas being oxidized by the exposure to air.

In other districts, again, we meet with waters containing much sulphate of magnesia. In such cases the water seems to be derived from small beds of sand in the London Clay. On the east of Galleywood Common we recently made a few trial bores, finding water at a depth of about twenty feet ; but it contained so much sulphate of magnesia (Epsom Salts) as to be unfit for any domestic purpose. At Margaretting Tye there is a well (now closed) yielding

such water, and at West Hanningfield there is a similar well. A brook running from South Hanningfield also contains such magnesian waters. What is the source of this magnesia? and are the beds of sand yielding such waters limited to the upper portion of the London Clay? The importance of this question will be manifest when we come to speak of the deep well waters. For examples of such waters, refer to my report on the Chelmsford and Maldon District Water Supplies. C. Nos. 15, 16, 17, 21, 24, 26, 31, 38, 39, 45, 63, 94, 98, 107, 121, 126, 159, 168, 176, 198, 213. M. Nos. 62 to 81, 86 to 90, 133 to 146. At Bradwell, Southminster, Galleywood, and possibly other places, where such waters are found, the proximity of beds of brick-earth have possibly some connection with this peculiarity.

Passing on to the consideration of the waters yielded by wells sunk through the London Clay, here again we meet with serious difficulties, due to the fact that many of the wells, more especially the older ones, are so badly constructed that it is quite uncertain what proportion of surface or sub-soil water they contain. As the water from these superficial sources is usually, if not always, very impure, containing much organic matter and nitrates, we can invariably detect its presence, but we can only very roughly estimate the quantity. According to the varying proportion of surface to subterranean water will the constituents vary on analysis. Take, for example, the water at Goldhanger Rectory and at Cold Norton Railway Station. In 1889, the water from the rectory well was uncontaminated. In 1891, there were reasons for suspecting that the water was being fouled, and upon analysis such proved to be the case. Evidently water containing less saline matter and more lime salts and nitrates (*i.e.*, impure surface water) was gaining access to the well. At Cold Norton Railway the water obtained soon after the well was bored contained so much nitrates and lime salts that I felt justified in condemning it as impure. The well was opened and some improvements made. The quality of the water also improved; but it still was impure. The well was again examined, and, I believe, some puddling done, or the brickwork cemented. The result was that when the water was again submitted to analysis it proved to be pure. At Stow Maries (Hogwell) we have not been so fortunate. When I examined the water, in 1890, I found it very impure, and I reported that sub-soil water was entering the well. The railway company had the water pumped to a low level, and

something was done at the well itself (I do not know what), and at my next visit the water taken gave no indication of impurity. Recently, however, I was told that the water was again very hard, and, upon examining a sample, I found it as bad as at first.

Before considering the variations in character of the deep well waters throughout the county, it may be instructive to consider to what extent such waters may differ in composition over a much more limited area. As I recently examined the waters from all the wells in the parish of Latchingdon, we will take this area as an example. The analyses of fourteen waters are embodied in Table VII. These waters varied in total solids from 85 to 582 grains per gallon: the hardness from 3° to far over 100°. In fact the hardness of the water from Hitch's well is so excessive as not to be capable of estimation by the ordinary process. The alkalinity, due to the presence of carbonates, varied from 17 to 34·5° per gallon; the chlorine from 14·8 to 71 grains per gallon. All these wells are said to be about 300 feet deep, save the one at Tyle Hall, the surface elevation there being much higher than in the other portions of the parish where the deep wells are found. In all cases the water is said to come from the Tertiary sands: yet some contain, as we have seen, only 3 to 4 grains of lime salts per gallon, and no magnesia salts; whilst others (Snoreham Hall, Bullock's, and Hitch's) contain so much sulphate and chloride of magnesium as to unfit them for any domestic purpose. I know of no other district, however, in which the variation in character is so marked as around Latchingdon. Many of the wells bored here have been closed because the water was unusable; and anyone wishing to sink a well must take the risk as to what the character of the water will be. Up to the present time I have only met with these magnesia waters in the district between Foulness Island and Latchingdon. What is the origin of these magnesian salts, or of the water containing it? It resembles closely the water referred to as contained in small beds of sand in the upper portion of the London Clay. Do such beds also occur at various depths or beneath the clay? The water from Hitch's well, for a great many years, was as soft and good as any deep well water in the parish. The supply, however, began to fail, owing, it is said, to the sinking of a similar well on Bridgemarsh Island, and the owner decided to have the tube "shelled" and the well bored a few feet deeper. This was done; but it was then discovered that the water was totally altered in character, and it has

since only been used for slopping purposes. What caused this change?—the deepening of the well, or the process of shelling, which may have destroyed the continuity of the tube and allowed water from some source at a lesser depth to enter? This is a question upon which I should like to have your opinions.

My analyses of the deep well waters are divided into three groups.

1. Those of waters not exceeding 5° of hardness.
2. ,, with a hardness of over 5°, but not exceeding 10°.
3. ,, with a hardness exceeding 10°.

(I may here remark that the depth of the wells given in Col. I. are almost all taken from Mr. Whitaker's Sections, and that it is tolerably certain that the water from the wells of unknown depth is from the Tertiary sands.)

In each of the three groups we find waters from both the chalk and sands, and it is impossible to tell from the analyses from which source the water is obtained. Take, for instance, the first group, Table III., the waters from the very carefully made wells of the Southend Waterworks Co.—wells sunk expressly to exclude all water except that coming from the chalk. Compare these with the water from the Tertiary sands at Woodham Ferris, Rettendon, and Runwell. All contain very small quantities of lime salts, and a considerable amount of chloride and carbonate of sodium. At Brentwood, and south of Brentwood, however, the soft chalk waters contain much less salt (*vide*, waters from Brentwood Asylum, Pyrgo Park, and Britannia Works, Ilford). A few of these waters contain a larger quantity of sodium chloride than the others, more especially the chalk water at Tiptree Brewery, and the sand water at Bridgewick Farm, Dengie. The latter is close to the sea, the former many miles distant. The soft waters obtained near Maldon also contain an excess of salt; but the wells here are close to a tidal basin. If the salt, however, be due to infiltration of sea water, how is it we obtain no indications of the presence of magnesia? I may also draw your attention to the fact that nearly all these soft waters are exceptionally pure, as indicated by the small quantities of nitrates present.

When we examine the second group (Table IV.), we find there are only three chalk waters (two at Colchester and one at East Donyland, near Colchester). These differ somewhat in character.

The East Donyland water contains about fifteen grains of carbonate of soda per gallon, the Colchester water No. I. about six grains, and No. II. none, the whole alkalinity being accounted for by the lime salts present. In all respects the Donyland water closely resembles many of the sand waters. Amongst this group of moderately soft waters we find the amount of chlorides varies very considerably; but the wells yielding the largest quantity are sunk near the sea and close to a tidal river, the Blackwater. It will be observed that the waters in these two groups are all obtained from wells at and south of Colchester. North of that town all the deep well waters I have examined are from the chalk and contain over ten grains of carbonate of lime per gallon. They therefore fall into group III. (Table V.).

The first eleven waters in this group, and five out of the last six, are derived from near the outcrop of the chalk or from places in which the London Clay and Tertiary sands are thinning out. In nearly all, the chlorides are very small in amount. The exceptions are at Mistley and Grays, both near the sea or a tidal river. In nearly all the alkalinity is due to carbonate of lime, the exceptions being the Mistley water, which contains probably about four grains of carbonate of soda per gallon, and the Stratford water (Phoenix Works), which contains about ten grains. The only other sample from Stratford (Howard's Chemical Works), on the other hand, contains little, if any carbonate of soda. Many of the Tertiary sand waters are very hard (due to both magnesia and lime), but contain very much more chlorides, sulphates, etc. (of soda chiefly), and some are so brackish as almost certainly to suggest infiltration of sea water. This is more probable, since all of them come from sources near tidal rivers or the sea. The last water on this list, that from the Beckton Gas Works, resembles some of these waters in being brackish; yet it is sunk well into the chalk, and I am told that many wells in that neighbourhood have been sunk to considerable depths into the chalk, yet have yielded waters so brackish as to be useless, and the wells have been closed.

Reviewing the whole three groups, we find that most of the chalk waters in the south of the county and in the north-east resemble each other in containing considerable amounts of carbonate of lime and very little chloride and carbonate of sodium; but differ from the chalk waters in other portions of the county, where the chalk lies at a much greater depth, since the latter contain very little lime and

much sodium chloride and carbonate. On the other hand, in the central portions of the county the waters from the sands and the chalk beneath are practically identical. (*Vide* also Whitaker's "Geology of London," vol. i., 514.) How are these differences and agreements to be accounted for? What is the source of the carbonate of sodium found in both the sand and chalk waters throughout the county? Possibly the water under the central and eastern portion of the county, whether derived from the Tertiary sands or the chalk, is from one and the same source.

Near the outcrop of the chalk, the water is undoubtedly derived from that portion of the rainfall which percolates into the chalk or passes in through fissures from the superficial sands. Is the water in the deeper portions, under central and east Essex, in part derived from the sea, the character of the water being altered by the sands or chalk through which it percolates? (The abundance of chlorides and of magnesia salts would seem to indicate a much more direct connection between the sea and the wells in several localities.) Could slow filtration of the sea water, through such strata as we find beneath the clay, remove certain salts from the sea water and at the same time by some chemical action give rise to the formation of the carbonate of sodium found in these waters? If so, these saline waters would naturally be found at the lower levels, whilst the water percolating into the chalk near its outcrop, being less dense, would, as it were, float upon it, and the line of demarcation might be defined by the examination of waters from various depths and from various parts towards the south, west, and north of the county.

The discussion of the relative values of these deep well waters for domestic purposes is beyond the scope of the present paper; but is one to which I am devoting some attention.

I had not intended publishing my analyses, or a paper on this subject, until many more samples of water had been examined; but I have had so much difficulty in obtaining samples from well authenticated sources, and have been so perplexed with the variations found, that I decided to communicate to the Field Club the results already obtained in order to elicit criticism and opinions, and, if possible, to obtain the aid of its members in conducting further researches, which can scarcely fail to yield results of an interesting character.

APPENDIX.

OF

TABLES

ILLUSTRATING DR. THRESH'S PAPER

ON

ESSEX SPRING & SHALLOW WELL WATERS.

NOTE.—Waters marked with an asterisk were not examined by me. The Analyses were kindly communicated by Mr. Shenstone, Dr. Turner, and others.—J. C. THRESH.

TABLE I.

PARISH.	Source.	Total Solids.	Tem- porary Hard- ness.	Total Hard- ness.	Chlo- rine.	Nitric Nitro- gen.
BAGSHOT SAND.						
South Hanningfield	Spring	19'	75	5'	1'2	...
Ditto	"	19'	75	4'7	1'6	95
Fryerning	"	22'	1'	6'	3'4	...
" Mill Green	"	20'	1'5	12.	4'1	87
BAGSHOT PEBBLE BEDS.						
Writtle Park	Spring	19'	1'5	6'5	2'1	79
" Coptfold Hall	"	21'	1'3	14' ?	2'3	62
GLACIAL GRAVEL.						
Writtle—Oxney Green	Springs	31'5	18'3	22'	1'5	42
" " " " " " "	"	31'	20'3	26'	1'1	25
" " " " " " "	"	28'	14'5	20'	1'1	45
" " " " " " "	"	29'	19'	22'	1'9	25
" " " " " " "	"	28'	16'5	20'	1'5	33
Roxwell	"	34'5	11'4	25'	1'5	85
Chignalls	"	32'	22'5	26'	2'2	25
Pleshey	"	36'	22'	26'	1'1	25
Ford End	"	39'	17'5	22'	2'4	13
GRAVEL UNDER BOULDER CLAY.						
Roxwell	Well	75'	20'5	33'	12'8	1'10
" Tyle Hall	"	148'	21'	44'	12'8	2'15
Good Easter	"	98'	10'	40'	11'4	1'05
" Tye	"	46'5	10'8	22'	3'5	55
Pleshey	"	94'	31'	44'	13'5	82

TABLES OF ESSEX SPRING AND

TABLE II.

GRAVEL WATERS CONTAINING VERY LITTLE CARBONATE OF LIME.

PARISH.	Source.	Total Solids.	Temporary Hardness.	Total Hardness.	Chlorine.	Nitric-Nitrogen.
Asheldham	Spring	19'	2'	6'	2'	1.05
" " " " " "	"	19'	1'	5.2	1.5	1.0
" " " " " "	"	32'	1.5	17.6	2'	.90
" " " " " "	"	34'	1.5	20.8	3.6	1.01
" " " " " "	Well	14'	5'	1.5	1.5	.45
Baddow, Great	"	29'	1.5	7'	3'	.60
" " Public supply ...	Spring	16'	2.5	6'	1.8	.85
" " Meadgate Farm ...	Well	64'	1'	24'	6.4	...
Baddow, Little, School ...	Spring	30'	1.0	9'	2.6	1.10
" " P.O.	"	25'	.5	4.5	2.5	.50
Bienacre P.P.	Well	16'	2.4	7'	2.2	.25
" " " " " "	Trial Bore	14'	.0	8'	3.3	.18
Braxted, Little, P.P.	Well	18'	1'	4.5	1.7	.85
" " Great, " " " "	"	30'	.5	5.5	3.7	.86
Danbury, Buell Spring	Spring	17'	2'	5'	2.1	.76
" " near Black Boy	"	24'	2'	6.6	2.4	.70
" " Village	Well	34'	2'	10'	3.2	.76
" " Runsell P.P.	"	...	2'	15'	2.1	.41
" " Mill House	"	20'	.0	9'	2.2	.99
Fryerning P.P.	"	18'	1'	9.5	4.9	1.05
" " Mill Green	"	31'	2'	12'	4.6	1.52
Galleywood, Bush Farm	"	122'	.0	33'	15.4	3.2
" " Godfrey's	"	10'	.0	4'	.9	.17
" " Mill House	"	48'	.5	9.5	4.1	1.10
Highwood, Green Man	"	27'	2'	7'	3.8	.23
Ingatstone, Trueloves	"	130'	1.2	14'	24.5	2.4
(Fryerning) Public Supply	"	18'	3'	5.5	1.9	.14
Sandon, Lt. Giberacks	"	15'	2'	4'	1.5	.10
Stock, Jubilee Pump	"	49'	1'	14'	5.3	1.15
" " Wrights	"	56'	2'	12'	11.2	1.80
" " Beyond Slough House	Spring	21'	2.5	5'	2.7	.15
" " Mr. Gillow's	Well	...	2.5	16'	7.3	1.26
" " App's Farm	"	39'	2.5	12'	5.1	1.37
" " Forest Hall	"	19'	2'	9'	2.5	.33
Tiptree Heath Hall	Spring	23'	1'	6.5	2.3	.34
" " Arnold's	Well	43'	1.5	15'	5.3	.83
" " " near	Spring	19.5	3.5	7'	2.2	.10
" " " jun.... ..	Well	43'	.0	18'	5.8	1.7
" " " opposite P.O.	"	62'	1.5	11'	9.1	1.7
" " " Rectory	Spring	28'	1.5	9'	3.2	.60
" " " New Well	Well	38'	2.5	11'	5.0	.85
" " " P.C.	"	82'	2'	34'	16.8	2.94
" " " School	"	178.?	.0	26'	19.3	2.90
Totham, Gt., Great Mountains	Old Well	49.5	3.5	18'	10.3	1.15
" " " " " "	New "	46.5	2.0	16'	7.7	1.90
" " " P.O.	Well	17'	1'	5'	1.5	.52
Ulting	Spring	24'	1.5	7.5	2.2	.41
Writtle Park, Bailiff's House	Well	41'	1'	7.5	5.4	.30
Woodham Walter P.H.	Spring	17'	1.7	6.5	1.7	.40
" " Mortimer	"	18'	2.5	11'	1.8	.85
" " " Conduit	"	26'	3.5	10'	3'	.60
Wickham Bishops, Hon. Mrs. Byron's P.P.	Well	64'	.0	23'	12.8	2.48
" " " " " "	"	22'	1'	4.5	1.7	.85

SHALLOW WELL WATERS—continued.

TABLE III.

HARDNESS NOT EXCEEDING 5 DEGREES.

PARISH.	Depth of Well in feet	Supposed Source of Water.	Total Solids.	Total Hardness.	Alkalinity.	Chlorine.	Nitric Nitrogen.
Colchester Sewage Works ...	218	Chalk	83	5	21	24.8	.03
Felsted School ...	404	Chalk	67	4.5	23.2	19.1	.07
Tiptree Brewery ...	562	Chalk	133	2.5	30.5	43.1	.27
Heybridge—Mr. Bentall's Ho.	126	T Sands	98	2.5	25	23.4	.30
" Bentall's Works...	126 +	" "	105	3	22	37.2	.05
" Hall ...	...	" "	98.5	3.5	26	35.1	.12
" Basin—Hardy's ...	...	" "	98	2.5	26.5	31.3	.12
" " Jolly Sailor ...	...	" "	97	2.5	26.5	31.5	.01
" " Clement's ...	...	" "	94	2.5	27	31.1	.00
" Harrington's ...	...	" "	108.5	3.5	25.5	37.6	.05
Maldon—Wantz road ...	...	" "	126	5	27.5	36.2	.06
Maldon Water Works ...	234 +	Chalk	87	4.0	27.5	24.8	.07
Chelmsford ditto ...	568	Chalk	...	3.0	...	20.7	.10
Writtle—Oxney Green ...	...	" "	70	3.5	23.5	17.4	.12
Mundon ...	...	" "	94	3.5	27.4	27.3	.08
Parleigh Public Pump ...	...	" "	87	2	27	23	.12
Dengie—Bridgewick ...	275?	T Sands	114	3	23.5	47	.05
Althorne Black Lion ...	...	" "	92	4	26	28.5	.20
Althorne—Bridgemarsh Island ...	...	" "	95	2.5	26.5	27.2	.05
Cold Norton Railway ...	392	T Sands	81	2	23.5	22.9	.07
Fambridge Public Pump ...	...	" "	90	3.5	25	26.6	.12
" Clarke's ...	...	" "	97	3.5	26.5	26	.05
Stow Maries Public Pump ...	...	" "	95.5	3	27	23	.05
Woodham Ferris—Pertwee's ...	...	" "	85	2	26	23.4	.05
" " Pearl's ...	...	" "	76	3.5	29	22.2	.06
Latchingdon—Tyle Hall ...	475	T Sands	86	2.5	26	26.6	.03
" Engineer's Arms ...	...	" "	100	4	32	27.4	.09
" Miss Ram's ...	...	" "	92	3.5	25	28	.07
" Nix's ...	...	" "	90	3.0	25.5	28.6	.14
Rettendon—Clarke's ...	423	" "	64	2.4	24.5	25	.03
" Battles Bridge Ry.	365	" "	80	3	22	23.6	.05
" Bell's Farm ...	...	" "	...	4.5	21	24.9	.05
Runwell—Pease's Farm ...	...	" "	74	4.5	23	22.5	.04
Eastwood } Southend ...	685	Chalk	66	2.5	19.7	19.2	.05
Prittlewell } Water Works ...	866	" "	73	2.5	18.7	23.5	.07
Southend } Company. ...	900	" "	66.5	3.0	18.5	23.2	.05
Brentwood Asylum ...	709	" "	50	2.5	20	9.9	.05
Havering—Pyrgo Park ...	665	" "	50	2	19.5	9.6	.03
Ilford ...	292	" "	34.5	3.5	17	3.1	.07

TABLE IV.

HARDNESS BETWEEN 5 AND 10 DEGREES.

Colchester Brewery* ...	...	Chalk	69.5	10	16.4	24.2	.00
" * ...	...	" "	72.1	9.8	9.3	21.3	—
East Donyland ...	305	Chalk	81.5	8.5	26	27.1	.00
Goldhanger—Francis Farm ...	...	" "	111	6.5	26.5	37.2	.02
Steeple Public Pump ...	250?	T Sands	106	6.5	26.5	36.2	.32
" Wick ...	...	" "	140	10	24	61.4	.15
" Grange ...	...	" "	126	8	27.5	60	.40
St. Lawrence Rectory ...	...	" "	138	7.5	27	50.8	.22
Hazeleigh—Jenkins ...	...	" "	83	6	28	25.6	.03
Woodham Mortimer ...	...	" "	103	6	19.5	19.1	.32
Cold Norton Railway ...	392	T Sands	91	6.5	20.5	22.5	.34
Fambridge Railway ...	361	" "	93	7	19.5	28	.16
Stow Maries—Hogwell ...	337	" "	150	9.5	24.5	29	.07
Cricksea Ferry ...	385	" "	96	9.5	22.5	26	.55
Woodham Ferris—Ilgar's ...	...	" "	105	8	25	26.6	.16
Latchingdon—Sharp's ...	...	" "	85	9	26.5	28.3	.25
Rettendon—Motts ...	...	" "	80	8	25	27	.10
" Pitts ...	...	" "	76	5.5	23.5	23	.16
" Malting ...	350	T Sands	75	6	23.5	23	.08
Runwell Rectory ...	...	" "	83	6	24	23	.11
Foulness—New Wick ...	400?	T Sands	116	8	32.5	37.8	.06

TABLES OF ESSEX DEEP WELL WATERS.

TABLE V.

HARDNESS OVER 10 DEGREES.

PARISH.	Depth of Well in feet	Supposed Source of Water	Total Solids.	Total Hardness.	Alkalinity.	Chlorine.	Nitric Nitrogen.
Saffron Walden P.S. ...	46 +	Chalk	46	23	18.6	2.6	.95
Sudbury ...	200	Chalk	37	20	21.7	3.4	.30
" * ...	"	Chalk	34	21.5	16.6	3.2	.17
Mistley Water Co. ...	400	Chalk	55	14	18.5	16.4	.05
Dedham* ...	81 +	Chalk	43.4	25	18.5	9.8	trace
Bishops Stortford P.S.* ...	...	Chalk	29.6	20	17	1.7	"
" Brewery* ...	...	Chalk	25.6	20.2	16.5	1.7	.16
Hallingbury College ...	...	Chalk	22.7	...	...	1.1	.04
Musey Hill* ...	...	Chalk	28	21.5	18	1.7	...
Hoddesdon P.S.* ...	...	Chalk	23.5	18.5	14	1.5	.0
" Brewery* ...	...	Chalk	39.2	20	14	2.7	.8
Goldhanger Rectory ...	...	...	103	12.5	23.5	34.5	.55
Althorne Railway, 1890 ...	346	T. Sands	271	25	11	32	.23
" " 1892 ...	...	...	130	72	17.5	25	.33
" Bridgemarsh Island ...	...	...	904	104	12	48.3	.10
Cold Norton Railway ...	392	T. Sands	130	19	13	14	.40
Stow Maries, Hogwell ...	337	"	358	31	15	37	.70
" " ...	"	"	404	40	22	47.5	.45
Woodham Ferris Railway ...	321	"	103	12	23.5	21.9	.09
Burnham Marshes ...	300	"	132	11	31	43.4	.45
Latchingdon, Snoreham Hall ...	...	...	256	47	23.7	55.2	.38
Rettendon, Haye's Farm ...	...	...	93	18	27.5	12.4	1.3
Fowlness Old Hall ...	400 ²	T. Sands	263	14	22.5	126	.05
Romford Brewery* ...	152 +	Chalk	41.5	23	17.5	6.3	...
Grays Cement Works ...	140	Chalk	44	22	11.5	12.2	.26
Stratford, Howard's ...	250	Chalk	33.5	17	19.2	2.9	.05
" Phoenix Works ...	200	Chalk	33.5	11	21	2.6	.00
Plaistow C. Maure Works ...	351	Chalk	46	24	17.5	10.2	...
Beckton Gas Works ...	157 +	Chalk	112	55	18.8	52.5	...

TABLES VI.

VARIATIONS IN WATER FROM SAME WELL.

Goldhanger Rectory, 1889 ...	...	...	120	6	24.5	46.4	.035
" " 1891 ...	...	...	103	12.5	23.5	34.5	.55
Althorne Railway Station, 1890 ...	346	Reading B.	271	25	11	32	.23
" " 1892 ...	...	"	130	72	17.5	25	.32
Cold Norton Railway ... 1890	392	T. Sands	130	19	13	14	.40
" " ... 1891	"	"	91	6.5	20.5	22.5	.34
" " ... 1892	"	"	81	2	23.5	22.9	.075
Stow Maries, Hogwell, 1890 ...	337	"	358	31	15	37	.70
" " 1891 ...	"	"	150	9.5	24.5	29	.075
" " 1892 ...	"	"	404	40	22	47.5	.45

TABLES VII.

VARIATIONS IN WATERS FROM SAME PARISH.

Latchingdon—Nix's Farm ...	...	T. Sands	90	3	25.5	28.6	.14
Rams ...	...	"	92	3.5	25	28	.07
Tyle Hall ...	475	"	86	3.5	26	26.6	.03
Sharp's ...	...	"	85	9	26.5	28.3	.25
Lawling Hall ...	...	"	104	11	29.5	30	.24
Engineer's Arms ...	...	"	100	4	32	27.4	.09
Green Lane ...	...	"	150	12.5	17.5	36	2.50
Freeman's ...	...	"	123	14	28	32	.11
Police Station ...	...	"	113	19	17	14.8	1.44
Red Lion ...	...	"	155	27	29	25.6	1.50
Snoreham Hall ...	...	"	256	47	28.7	55.2	.38
Warden's ...	...	"	162	48	18.5	32	1.97
Bullocks ...	...	"	253	v. g.	27.3	56.4	.99
Hitch's ...	...	"	352	v. g.	34.5	71	2.80

THE ESSEX FIELD CLUB.

AUTUMNAL RAMBLE IN EPPING FOREST, AND 136TH ORDINARY MEETING.
Saturday, November 19th, 1892.

THIS meeting was arranged to take the place of the usual Fungus Meeting, and to afford an opportunity of imparting some elementary information about the structure and habits of some of the tribes of Cryptogamia found in the Forest.

The Public Hall, Loughton, was the headquarters for the day, and the members and visitors drove or walked to High Beach and other parts of the Forest. Collectors were recommended to pay particular attention to the smaller forms of Fungi and specimens adapted for microscopic illustration.

The day was fine, but the late period of the year, and the recent cold weather, precluded the possibility of obtaining many of the larger and more showy species. Dr. Cooke kindly acted as conductor, and, in spite of adverse circumstances, many interesting species were obtained for exhibition in the evening.

Tea was taken at the "Crown Hotel," the exhibition of specimens being arranged in the Loughton Public Hall. Many microscopical preparations and slides were shown, and there were a large number of microscopes. The naming and arranging of the specimens was under the direction of Dr. Cooke, Mr. D. Houston, F.L.S., and the secretaries.

THE 136TH ORDINARY MEETING was held under the chairmanship of Prof. R. Meldola, F.R.S., Vice-President.

Mr. C. Oldham exhibited some specimens of Lepidoptera recently taken in Epping Forest, including *Cymatophora ocularis* and *Leucania turca*, which he had not previously seen in the district, and *Dicycla oo*, *Nylophasia hepatica*, *Euthemonia russula*, etc., etc.

Mr. W. Cole exhibited a set of specimens of pottery, etc., from the Red Hills at Burnham, and on Mersea, in which latter place he had made some diggings during the autumn. He made some remarks upon the specimens, and on the character of the Red Hills, which will be published in a future number of THE ESSEX NATURALIST.

Prof. Meldola referred to the very mysterious and interesting problem presented by the existence of these Red Hills, particularly relating to the period of their construction. He hoped that further efforts would be made to investigate the subject.

Dr. Cooke reported upon the specimens of Fungi gathered during the afternoon. But little had been observed deserving of special notice, and no additions to the Epping Forest list had been made. But in spite of this Dr. Cooke made, as usual, a most interesting address, and alluded to the extraordinary sporadic nature of some species—appearing one year, and then disappearing for many years.

A cordial vote of thanks was passed to Dr. Cooke for his kindness in conducting the meeting, a service he had performed for the Club from the first year of its existence.

Mr. Dixon gave a short address on the nature and life-history of the Fungus causing the potato disease, his remarks being illustrated by specimens exhibited under the microscope, and by drawings.

Mr. Wray gave a similar short address on the Fresh-water Algæ, illustrated by specimens.

Miss Mansfield explained the structure of an *Agaric*, as an introduction to the study of Fungi.

Mr. D. Houston gave a demonstration of many of the objects of special botanical interest on the tables, illustrating his remarks by numerous drawings on the black-board.

The demonstrators and lecturers were cordially thanked by the meeting for their interesting and instructive addresses, and the meeting ended with the usual *conversazione*, very many botanical and other specimens having been brought for exhibition by members and others.

ORDINARY MEETING.

Tuesday, February 21st, 1893.

THE 137th Ordinary Meeting of the Club was held in the Committee Room of the West Ham Town Hall, Stratford,¹ at seven o'clock, Mr. T. V. Holmes, V.P., in the chair, and afterwards Mr. Walter Crouch, V.P.

Nominations of new members of the Council and officers for 1893 were made preparatory to the Annual General Meeting.

The Secretary stated that Mr. Henry I. Coburn had kindly consented to serve the Club in the capacity of Hon. Solicitor, in the place of the late Mr. Howard Vaughan, and on behalf of the Council he nominated him for the post.

The following were elected members:—T. S. Dymond, F.C.S., F.I.C., Rev. W. T. Dyne, Francis C. Martley, M.A., M.B., and Wilfred M. Webb, F.L.S.

The Secretary stated that by resolutions of the Council and the Committee of the Museum, the amalgamation of the Essex and Chelmsford Museum and the Essex Field Club was an accomplished fact, but that certain legal formalities had to be complied with. At an early meeting a statement of the whole matter would be laid before the members.

Mr. Sauzé exhibited some beautifully set and mounted specimens of Diptera, Hymenoptera, Coleoptera, Neuroptera, etc., all caught and prepared by himself.

Mr. W. Cole exhibited a series of specimens of *Flybernia aurantiaria* and *H. defoliaria*, taken in November last in Lord's Bushes, Epping Forest, for the purpose of calling attention to the interesting mode of concealment adopted by the moths. The ground in the forest at the time was thickly strewn with the yellow and brown fallen leaves of the beeches and hornbeams. The colours in both species of moths are various shades of yellow and golden-brown. Instead of resting upon the trunks of the trees, or on the twigs, where, owing to the leafless state of the trees, they would be very conspicuous, the moths settled down upon, and often partly under, the fallen leaves, and, owing to the close similarity of colouring between the insects and leaves, it required a sharp entomological eye to detect the former. Although the moths were evidently very numerous, but few could be collected in an hour by reason of the perfection of the concealment thus afforded.

Mr. C. Oldham exhibited specimens of various kinds of rock, which he had gathered from the heaps of ballast used in mending the roads in the Woodford district.

Mr. Wire exhibited photographs of some beautiful pen-and-ink sketches of

¹ In the circular calling the meeting it was stated that Stratford, as a place of meeting, had been "suggested as an experiment, so as to allow County Members to attend more easily, it being on the Main Line. *Tuesday* evening is also a tentative change, in order to elicit the opinions of members. *Saturday* is said to be inconvenient for many evening meetings."

Dunstable Priory Church by Mr. Worthington G. Smith, hon. member of the Club.

Dr. J. C. Thresh read a paper entitled, "The Shallow and Deep Well Waters of Essex" (see p. 28), which was illustrated by tables of analyses of waters, specially printed for the occasion.

During the discussion following the paper, Mr. T. V. Holmes remarked on the bearing of Dr. Thresh's observations and analyses on the efficiency of the filtration through a considerable thickness of gravel. Dr. Thresh strongly contrasted the purity of *springs* from the gravels, such as that underlying the Boulder Clay, with the impurity of *wells* in which the water was derived from the same source. This could only be the result of the comparative remoteness of houses and farm-buildings with their cesspools, etc., in the case of the springs in question; while wells in villages were necessarily situated where the inhabitants could most conveniently and quickly get their supply—in other words, close to their houses and cesspools. This showed the necessity, when water was obtained from superficial beds, of ensuring the absence of dwellings, etc., within a certain distance of the source of supply, whether spring or well. Mr. Holmes also alluded to the lack of enthusiasm shown by Essex people in their mineral springs. An attempt was once made to "run" the medicinal well at Hockley, but unsuccessfully; and there was a mineral spring on Tyler's Common, near Upminster, once visited by the Club, but which had never been utilized. Essex people did not care for Epsom Salts.

Mr. Sworder said many agricultural labourers of Stanford Rivers and Stapleford Tawney went in hay time and harvest to a spring between Navestock and Brentwood to "take the waters." After a gallon of beer a day, they no doubt needed some little corrective. [Laughter.]

Prof. Meldola and Mr. G. J. Symons, F.R.S., alluded to the value of Dr. Thresh's observations, and trusted he would continue them; and the former speaker referred to the value of bacteriological investigations in all enquiries respecting the hygienic qualities of drinking water.

Mr. J. M. Wood, C.E., of the New River Company, remarked that the sinking of a well or bore-hole always afforded an opportunity of obtaining valuable information of a geological, chemical, hydraulic, and engineering character. Each observer interested probably records the results of his own particular science: the consequence was that the information is usually of a disjointed character, in the possession of several individuals, and often difficult to obtain.

So far as Essex is concerned, Mr. Whitaker had done much in recording in the Journal the geological formations through which wells and bore holes have passed, and now Dr. Thresh was doing most interesting and valuable work in recording the analyses of the surface and underground waters of Essex. But there yet remained much to be done in the county, in studying and especially recording the hydro-geological conditions of water after it had passed into the formations and is beyond the influence of evaporation.

Little or nothing was known of the underground waters of Essex, say north of a line drawn from Bishop Stortford to Maldon, such, for instance, as the capacity of the formations for storing water, direction of flow of the underground waters, the natural fall, fluctuations of the standing water levels, the effects of rain upon the water levels, high and low water levels, artesian districts—that is, districts in which wells overflow, etc., etc.

Mr. Wood thought that a committee of the Essex Field Club could do

excellent work in this direction, if formed upon somewhat similar lines as the Underground Water Committee of the British Association. Its function should be to collect together every possible information and detail of a geological, chemical, physical, engineering, and structural character. With reference to wells, springs, and rivers, the mere bringing together of such information, and tabulating the same in some standard form to admit of comparison, would be a work of the highest value. This, it appeared to him, could be achieved without much difficulty if members of the Club could be induced to assist, being distributed as they are all over the county. Mr. Wood had endeavoured, in a private capacity, to get information for making a hydro-geological survey of the district before mentioned, similar to what Mr. Lucas had done for parts of Kent and Surrey, but met with so many difficulties that he gave it up after six months' work.

Mr. Wood mentioned that the River Stour and valley was highly interesting from a hydraulic point of view, and that several places existed where gauging of the daily flow of the river could easily be obtained, as weirs already existed, especially at Liston near Long Melford, where the mill has been removed and the flow of the river is passing over a board fixed across the old wheel race; but unfortunately he knew of no one in the neighbourhood who would take sufficient interest to make a daily gauging.

He further mentioned the possibility that a large quantity of Chalk water was discharged into the bed of the River Stour between Long Melford and Bures, probably in the neighbourhood of Sudbury, Suffolk, where the Chalk came to the surface. The river always appeared full between Borely and Bures, however dry the seasons might be; and, what was more, the water was usually bright and clear, except in flood time. Interesting results would no doubt be obtained if the river was gauged between the points mentioned.

From the results of the analyses in Dr. Thresh's paper, it appeared conclusive that where the Chalk is overlaid with considerable thickness of Tertiaries (London Clay, Woolwich Beds, and especially Thanet Sands), the water obtained from the Chalk by means of a boring contained a much greater quantity of solids and chlorine, besides being a softer water, than water obtained from a boring or well sunk in the open Chalk.

Mr. Wood instanced the following eight wells sunk down to the Chalk, and mentioned in Dr. Thresh's paper, but overlaid with a considerable thickness of Tertiaries, viz., the three wells of the Southend Water Company, Brentwood Asylum, Havering, Maldon Water Park Felstead, and Tiptree. The average solids were 74, average hardness 2·9, average chlorine 21·5; whereas if the five wells in the open Chalk were taken, viz., Saffron Walden, Sudbury (two), Hoddesdon (two), the average solids were 35·9, average hardness 20·6, average chlorine 2·7.

The above differences were remarkable in water derived apparently from the same formation. The only suggestion that one could offer was that the water from the sands (especially the Thanet Sands) above the Chalk intermingled freely with the Upper Chalk waters, due to the absence of impervious beds.

In conclusion, Mr. Wood thought that it would probably be highly interesting if Dr. Thresh could examine a series of waters (say taken in a line from Haverhill to Southend) from the open Chalk to where it is overlaid by a maximum thickness of Tertiaries, and state the changes in the solids, hardness, and chlorine, as the case might be.

The discussion was continued by Mr. Andrew Johnston and Mr. Royle; and Dr. Thresh in his reply observed that to work out such an extensive subject properly required the association of a geologist with a chemist, and perhaps an engineer. He hoped to get some information from his geological friends on the Club in different parts of the county.

Mr. Holmes then vacated the chair in favour of Mr. Walter Crouch, and read a paper on "Sections on the New Railway between Upminster and Romford," dealing especially with the discovery of Boulder Clay beneath old River-gravel at Hornchurch (see p. 1). The paper was illustrated with geological maps and sections.

A short discussion ensued in which Prof. Meldola alluded to the possibly local character of some of the phenomena which are known as Glacial.

Mr. Double, C.C., in proposing a cordial vote of thanks to Dr. Thresh and Mr. Holmes for their valuable papers, alluded with satisfaction to the museum scheme of the Club, and suggested that the Corporation of London might be approached with the object of obtaining some recognition and assistance.

In seconding the vote of thanks (which was passed by acclamation) Mr. Wm. Cole stated that the Council had in mind the forming of a forest museum, representing the natural history, geology, and antiquities of the Forest, in which it was hoped that the authorities of the Forest would participate; and he anticipated being able to make an announcement on the subject in a short time.

The usual conversazione, at which tea and coffee were served, concluded the meeting.

ORDINARY MEETING.

Tuesday, March 14th, 1893.

THE 138th Ordinary Meeting of the Club was held in the committee room of the West Ham Town Hall, Stratford, at seven o'clock, Professor R. Meldola, F.R.S., Vice-president, in the chair.

The Secretary stated that Dr. Henry Laver, the President, had explained to the Council that the probable great pressure of professional engagements would prevent his being present at many meetings of the Club, and had suggested, in the interests of the society, that some other member should be nominated as President. The Council therefore nominated Mr. F. Chancellor, J.P., for election by the members at the annual meeting.

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

Major Lamarock Flower, F.Sant.L., of the Lea Conservancy, Mr. E. Johnston, and Mr. A. S. Wilson, were elected members.

The Librarian read a long list of acquisitions to the library by donation, purchase, or exchange, and votes of thanks were passed to the donors.

Mr. W. Cole exhibited a series of the moth *Agrotis saucia*, from Mersea Island in September and October last. According to his experience it was in most seasons a very rare moth in Essex; but last autumn it had been taken in several parts of the kingdom, and had been fairly abundant at "sugar" in a cottage garden in the above remote part of Essex.

Mr. Cole also exhibited, under the microscope, preparations of the plasmodium of a species of "Slime-fungus" (of the group Myxomycetes) which had appeared on the freshly-cut stumps of the hornbeam trees recently felled in Lord's Bushes,

Epping Forest. Almost immediately after the stumps were cut the slimy layers of this curious organism had spread with rapidity over the sap-bathed surface. The fungus consisted of masses of naked protoplasm, having considerable powers of movement, like the *Amœba*, although botanists now consider the *Myxomycetes* to be fungal, and not animal, in their nature.

Mr. H. C. Snell exhibited several specimens of the somewhat rare subterranean slug, *Testacella scutulum*, which he had found during this season's spring-digging in his garden at Buckhurst Hill. The creature is very interesting in its habits, being carnivorous, and feeding upon earth-worms, which it hunts underground. Mr. Cole remarked that Mr. Crouch had found the slug at Wanstead, and he himself had taken it somewhat abundantly in an old garden at Stoke Newington, many years ago.

Mr. Oldham exhibited species of *Noctua* captured in Epping Forest during the last autumn, and Mr. Wire explained an admirable system he had devised for mounting, indexing, and grouping in volumes, newspaper cuttings, leaflets, and small pamphlets.

Prof. Meldola said that Col. Swinhoe, M.A., F.L.S., of Oxford, had intended to give them a lecture on "Protection in Nature"; but most unfortunately, owing to sudden illness, he was unable to leave home. In the kindest manner, their member, Mr. E. B. Poulton, M.A., F.R.S., had come to their rescue, travelling specially from Oxford that afternoon to deliver a lecture on very similar lines to those which had been proposed by Col. Swinhoe.

Mr. Poulton then delivered a most interesting address, which was illustrated by a large number of coloured pictures from original drawings (shown by the oxy-hydrogen lantern) of various animals considered from the point of view of their powers of concealment or other modes of protection from their enemies. Mr. Poulton clearly showed that not only have animals the power of concealment when the conditions of environment are constant, as when they resembled sand, rocks, bark of trees, etc., but that many animals, particularly insects, had the power of adaptation to varying surroundings. The colour of oceanic animals frequently assimilated in a truly wonderful way to the tint of the sea or the prevailing colour of the seaweeds, etc. Land animals often resembled the sand, rocks, or twigs of trees, or dead leaves, etc., upon which they rested. The lecturer explained a series of examples drawn from a wide range of animal life, showing the modes of concealment acquired by fish, crustacea, spiders, insects, etc. The most interesting part of the address was that in which Mr. Poulton detailed the results of his own researches upon the varying colour relations of caterpillars and chrysalids with their surroundings. Perhaps the most remarkable example was the caterpillar of our common "Peppered moth" (*Amphidasis betularia*), which varied in a most startling way in accordance with the prevailing tint of the twigs or leaves upon which it happened to rest. By a series of skilfully conducted experiments, Mr. Poulton had proved that it was possible to obtain from the same batch of eggs of the moth, caterpillars differing most widely in colour, simply by varying the tints of the surrounding objects. Cocoons and chrysalids of moths and butterflies were shown to vary in a similar manner. The lecturer showed that the variation was not the effect of food, as had been formerly supposed, but that it was the result of the action of light upon the superficial tissues of the caterpillars, whereby they were rendered opaque or transparent, so concealing or revealing the colours of the deeper situated tissues in the bodies of the animals. Mr. Poulton concluded by exhibiting the coloured

papers and other appliances used in his experiments, and explaining their optical action. He made several references to the work of the chairman, Professor Meldola, upon the colours of insects, and said that it was Meldola's translation of Dr. Weismann's "Studies in the Theory of Descent," published in 1882, which first directed his attention to this fascinating subject.

Mr. Poulton had to leave hurriedly in order to catch the return train to Oxford, so that no discussion was possible; but a very cordial vote of thanks was passed, and the chairman said that, although they all regretted the cause of Col. Swinhoe's absence, it was evident that they had lost nothing in having such an address from a master of his subject. He recommended all interested to read Mr. Poulton's book on "Colours of Animals" (Intern. Sci. Series, 1890), in which his important researches were summarised.

A vote of thanks was passed to Mr. Wire for providing and skilfully manipulating the lantern.

Tea and coffee were served as usual in an upper room of the building.

EXCURSION OF THE GEOLOGISTS' ASSOCIATION TO ILFORD.

ON Saturday, March 25th, about fifty members of the Geologists' Association visited Ilford, under the experienced guidance of Mr. F. C. J. Spurrell, in order to inspect the brickyards so famous for the quantity of mammalian and other remains which have been found in them from time to time. Strange to say, the Association does not appear to have visited these pits since June, 1871, but the Essex Field Club had a most interesting visit there in July, 1880, under the guidance of the late Sir Antonio Brady, Mr. A. R. Wallace, and Mr. Henry Walker (see report in Journal of Proceedings, E.F.C., vol. i, pp. xxviii.). At Ilford, as a glance at the Geological Survey map shows, the river-gravel is covered by a few feet of clay and brickearth. The first pit visited was east of the town of Ilford and north of the railway, between Ley Street and St. Mary's Church, where "fossil remains found here," may be seen on the Ordnance map of 6 inches to a mile. The second pit was south of the railway and east of St. Mary's Church. In each pit the section consisted of sand at the bottom with loam and clay, containing many of the calcareous nodules known as *race*, above the sand. The surface beds to a depth of about three feet were very variable and irregular, some fine gravel being seen here and there. Penetrating into the clayey beds for some feet were veins of sand of a few inches in breadth. The mammalian remains for which these pits are famous were found chiefly in the sand underlying the clay and loam. Dr. H. Woodward remarked at the last visit of the Association to Ilford, that though elephant remains had been obtained both from Ilford and Grays, *Elephas primigenius* (the mammoth) was the common species at Ilford, and *Elephas antiquus* at Grays. But the reader desiring full details of these Ilford sections must be referred to Mr. Whitaker's Memoir on "The Geology of London and of part of the Thames Valley," vol. 1, pp. 410—15. A section of the Uphall Pit, the sides of which are now sloped and afford no section whatever, may be seen in the "Record of Excursions of the Geologists' Association," p. 174. As it is probable that the pits near St. Mary's Church will shortly be in the same condition, members of the Essex Field Club interested in geology should visit them before it is too late.

After we had gazed at the spot where the Uphall Pit had once been, Mr. Walter Crouch kindly volunteered to show any members interested in archæology the remains of Uphall Camp, which is on a terrace of river-gravel on the eastern bank of the Roding, north of Barking. Most of the party accompanied Mr. Crouch to the mound close to the farmhouse, from which an excellent view was obtained of the dwindling remains of this old camp, probably, as our director remarked, of Roman age. The site is certainly such as the Romans frequently selected. For their object was to ensure domination over a district by means of camps mostly situated in fertile and populous districts, while that of the prehistoric constructors of earthworks was to secure places of refuge from forays and invasions on sites of the greatest natural strength.

The Camp was visited by the Essex Field Club in 1885 (see Journal of Proceedings, E.F.C., vol. iv, p. cxlviii.)

T. V. HOLMES.

THE "HOLY THORN" AT WOODHAM FERRERS, ESSEX.

" Blossoms at Christmas, mindful of our Lord."

A PARAGRAPH appeared in the London "Standard" of January 16th, relating a somewhat wonderful story that on Old Christmas Eve a number of persons went on a pilgrimage to the parish of Woodham Ferrers to "witness the bursting into leaf of a bush, locally known as the 'Holy Thorn.' It is a fact that at midnight the bush did burst into leaf. The peculiar features of the phenomenon are that the bush assumes its normal condition a few hours afterwards, and breaks forth with renewed vigour in the spring."

The Rev. C. P. Plumtree, rector of Woodham Ferrers, afterwards wrote to the "Standard" as follows :

" I find that there is a certain foundation in fact for the strange circumstances related. There is an old tree, or large thorn bush, locally called the 'Holy Thorn,' standing in a hedgerow, in a somewhat distant part of the parish. This tree is visited by more or fewer persons each year on the eve of January 5th. I have inquired of neighbours on the spot, and they tell me that it produces buds and green shoots in the depth of winter. Indeed, a very credible witness informed me that he had gathered on that night this year a sprig with a small show of green on it. Even small May blossoms have appeared at this season in some years. I need hardly say that the statement that the tree buds and blossoms during a certain hour on Old Christmas Eve has not and cannot be proved.

" I have myself secured a branch of this tree to-day, and find that its appearance is that of ordinary thorns, only that I find the sap is more up than I should expect after such late severe weather. I may, however, say that the people near declare that the colder the winter the better is the show of green and flower. I can deny the miraculous, but I cannot explain why this particular thorn should show such vitality at such an unwonted season.

" I may, in conclusion, state that the thorn is in a decidedly exposed situation ; that it is certainly of considerable age ; that I can hear of no legend or story in connection with it ; nor can I find out anything of its origin."

A large number of letters appeared in the "Standard" and some of the county papers, giving some very interesting particulars of these thorns in various parts of the kingdom. Of course, the well-known "Holy Thorn" of Glastonbury Abbey was referred to, an excellent account of the legends connected with which will be found in the "Proceedings of the Somersetshire Archæological and

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[Continued on p. 4.

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March, 1893.

The Essex Naturalist:

BEING THE
JOURNAL
OF THE
ESSEX FIELD CLUB.

EDITED BY
WILLIAM COLE,
Honorary Secretary.

Contents.

	PAGE
The "Holy Thorn" at Woodham Ferrers, Essex (<i>concluded</i>)	49
Further Notes on the Burnham Rorqual (<i>Balenoptera musculus</i>). By WALTER CROUCH, F.Z.S.	50
Periodicity in Organic Life. (Being the Presidential Address, delivered at Chelmsford, April 15th, 1893.) By DR. HENRY LAVER, J.P., F.L.S., F.S.A.	51
Notes on the Geology of the Neighbourhood of Chelmsford. By T. V. HOLMES, F.G.S.	65
Notes—Original and Selected. Capture of Otters near Chelmsford; Uncommon Birds near Birchanger; Waxwings (<i>Ampelis garrulus</i>) at Harwich; <i>Helix Lapidica</i> (Linn.) at Colchester; <i>Hesperia Lincola</i> , Ochs., in Essex and Elsewhere; Ancient Pit at Coggeshall; Proposed Purchase of Mr. Joslin's Museum of Romano-British Antiquities; Death of Mr. W. R. Sackett; Old Loughton Hall—Erratum	66
The Essex Field Club. Annual Report of the Council for the Year ended December 31st, 1892	70
Notes on the Gravel in Epping Forest. By T. HAY WILSON	74
The Essex Field Club. Field Meeting at Broomfield and 13th Annual Meeting, and Special Meeting at Chelmsford, Saturday April 15th, 1893	76
Title-page and Index to Vol. VI.	

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Natural History Society" for 1880 (vol. xxvi., pp. 117-125). Mr. Charles Cable wrote from Stock, Essex, that

"in our late rector's time there was a 'Holy Thorn' in the rectory garden at Stock. It used to bloom on Old Christmas Eve, and the blossom was of pure white, similar to the white bush. No leaves appeared—only the blossom, and it kept on for about three weeks. There was also another 'Holy Thorn' at Billericay."

Another correspondent says that there is a "Holy Thorn" at Coggeshall, Essex.

Some differences of opinion prevail among botanists as to whether the "Holy Thorns" found in so many places is only an accidental variety of the Common Hawthorn, or a distinct race. Our own naturalist, Ray, was of the former opinion, but Witherington gave it a distinct name, and described it as *Cratægus oxyacantha præcox*. He says ("Arrangement of British Plants," 1818, vol. iii., p. 604) "it blossoms twice a year; the winter blossoms, which are about the size of a sixpence, appear about Christmas, and sooner if the winter be severe. These produce no fruit. The berries contain only one seed . . . I was informed that the berries, when sown, produce plants in no wise differing from the Common Hawthorn." Mr. T. J. Saltmarsh, of Chelmsford, to whom Mr. Plumtree sent a shoot of the Woodham bush, certifies that it is the plant known to him as the "*præcox*" variety of the Common Thorn, which is recognised in the trade. Mr. E. Chisholm Batten, in the paper alluded to above, in the Somersetshire Society's "Proceedings," says that the Glastonbury Thorn has during the last fifty years been propagated freely, and sold by the Glastonbury nurserymen. Mr. Lawrence Bulleid, of Glastonbury, in the course of a recent letter, says:

"I am not aware of any old tree now existing here; but there are several comparatively young ones, all of which, I believe, retain the peculiarities of the original stock. As a rule, the thorns are in full bud and ready to burst into bloom for some time before and after Christmas. I have seen several full blooms this winter, and for years as long as I can remember.

"Mr. James Austin, the owner of Glastonbury Abbey, tells me that he once saw a 'Holy Thorn' in the abbey grounds white with blossom on Christmas Day, when snow was on the ground. There is the same local tradition here as to the bursting into bloom on Old Christmas Eve as of other 'Holy Thorns,' but I have never heard of a Glastonbury person testing the truth of the saying. The flowers are often sent away at Christmas time, and the local gardeners have for years forwarded small trees to many parts of the country. Some of these may be the subjects of the letters of your correspondents. The trees blossom freely again in May or June."

From the above evidence it may safely be concluded that the bush at Woodham Ferrers is a specimen of this curious race of the Common Hawthorn, but whether the "Holy Thorns" have all been propagated from one stock, or whether the aberration arises spontaneously in the species, is at present a moot point, and one worthy of investigation. Our old correspondent, Mr. J. French, of Felstead, has sent some remarks upon the Woodham example from which we extract the following. After referring to the manifest influence, within certain limits, of the weather upon plant life, Mr. French says that:—

"Those cases in which the inherent forces of growth of the plant overcome the uncongenial influences of the weather are more common than is generally supposed. For some years I made notes of the abnormal flowering of open-air plants; and, had I continued, I believe that I should by this time have recorded half our common species as aberrant upon certain occasions. The causes I do not know. With some it appears to be hereditary. The Chickweed (*Stellaria media*) and the Daisy are perhaps

examples, and there are certain others that may be found in bloom throughout the year. With some I have thought it to be due to the influence of the soil, for the following reason. At certain spots, in almost any year, plants may be found much in advance of their fellows as regards vegetation. The theory of country folk is that it is the effect of a 'warm corner.' That theory is not always applicable, for all warm corners do not show similar results. Near Willows Green, Felstead, on the first of this month (February), I observed the catkins of the Hazel on several plants fully developed and shedding pollen. Adjoining these were some fully developed catkins of the Sallow, but not as yet shedding pollen. At the same place, in a previous year, I picked a spray of Hawthorn fully one month in advance of its time, and similar phenomena have been noticed there by other folks. This place is high and bleak; and it seems, therefore, impossible to come to any other conclusion than that the soil, in some manner, has a stimulating influence. I believe many other places give like results, could they be put upon record. It is generally, however, difficult to say positively whether they are not in some manner sheltered.

"If we are, then, justified in saying that plants have an inherent principle of variation in their periods of rest, and this principle of variation, although generally controlled by meteorological agencies, is sometimes affected by causes of which we are in ignorance, then the transition to any abnormal case does not appear to be very great. In that of the 'Holy Thorn' the variation seems to have been so pronounced as to have become to a certain degree hereditary. It is even possible, when we consider what has been done with culinary plants in obtaining *early* varieties that the Glastonbury Thorn might, by a process of artificial selection, be obtained from the ordinary Hawthorn."

FURTHER NOTES ON THE BURNHAM RORQUAL

(*BALÆNOPTERA MUSCULUS*).

(*Vide* THE ESSEX NATURALIST, vol. v., pp. 124-8, and vol. vi., p. 115.)

By WALTER CROUCH, F.Z.S.

AS related by our Editor in a note quoted in the second reference above, the skeleton of the Finner Whale figured by me in THE ESSEX NATURALIST (vol. v. Plate v.), was exhibited last autumn at Burnham and Southend. It did not, however, find much favour as a "show" at the latter place, and was removed before I had an opportunity of seeing it. Since then, when visiting Burnham, I made enquiry, and found it lying in a loft at the Temperance Hotel.

The bones were carefully cleaned and articulated by Mr. E. Gerrard, but are now only partly mounted, the pieces of *baleen*, and some of the smaller bones, such as those of the *manus*, etc., being packed up in boxes.

There is no very remarkable feature to record ; but the general condition of the bones gives evidence of a non-adult animal, especially the *epiphyses* of the dorsal and lumbar vertebræ, which are distinct, though loosely adherent to the body of each vertebra. In the cervical vertebræ they are nearly free, and in the caudal they are mostly loose plates. Mr. Gerrard informs me that the vestigial remains of the hind limbs were only two small pieces of cartilage.

The *sternum* of this species differs very greatly in individuals, and varies also in shape, according to the age of the animal. The median notch in the *presternum* forms, in the Burnham specimen, a relatively large pear-shaped sinus.

It may be interesting to append a few of the measurements I was enabled to make :—

		ft.	ins.
<i>Skull</i>	Length, minus a few inches broken off the ends of premaxille, measured in a straight line	9	6½
	Breadth, at zygomatic process of squamosals	4	8½
<i>Mandible</i>	Length of each ramus, straight line	9	9½
	" " in curve	10	4
<i>Atlas</i>	Greatest breadth, including transverse processes	1	8
	" height, base to apex of neural arch	1	0
<i>Sternum</i>	Breadth	1	1¾
	Height	0	10½
	Median opening of presternum	0	0¾
	Width of sinus	0	2¾
	Base of sinus to xiphoid point	0	6¼
<i>Hyoid</i>	Breadth	1	11½
	Height, straight line	0	5½
	" base to end of median notch	0	3¾
<i>Scapula</i>	Greatest breadth	2	8
	Width, supra-scapular border to the glenoid cavity	1	6½

P.S.—Since the above was written, I have been informed by Mr. A. Newman that he has sold the skeleton, and it is now in a museum at Grimsby.

PERIODICITY IN ORGANIC LIFE.

By HENRY LAVER, M.R.C.S., F.L.S., F.S.A.

Being the Presidential Address, delivered at Chelmsford, April 15th, 1893.

I HAVE used this term "Periodicity" to indicate that state or condition of a species, either animal or vegetable, which most of those who have paid much attention to natural history in any of its branches must have noticed. I mean that there are periods, not

of definite duration however, when the individuals of a species are very abundant or the reverse, scarce and apparently extinct, or nearly so. The scarcity or abundance in any year of insect life would appear to be quite independent of seasons, or of food-supply, or of any other surroundings, as far as our present knowledge extends. True, there are occasionally years of great heat, and therefore of presumably favourable effect on animal life, but it is not to these years and their effects that I wish to draw the attention of naturalists; the explanation of the abundance of life in such periods being so obvious to all. It is rather to the fact that there are periods in the existence of every species, when from no apparent cause the individuals gradually increase year by year until we have them in great abundance.

After this period of what may be termed prosperity of a species, which may continue for some years, a decline begins, when the numbers gradually go down until it would appear that the species becomes nearly extinct. This period of scarcity may also be of some long continuance, or it may possibly lead to the extinction of the species in reality. The extinction of any species of insect by artificial causes very rarely happens, but is much more common amongst mammals and birds, especially with those creatures having a limited habitat. The case most frequently quoted is that of the Dodo, but there are many others equally decisive, and as clearly due to man's interference with Nature; such as the Rhytina in Behring's Island, the Moa in New Zealand, and the last, and the most disgraceful case of wanton destruction, that of the Bison in North America, and many others.

One insect is said to have been destroyed during the last few years by the hand of man. I refer to the Great Copper Butterfly (*Polyommatus dispar*). It is said that the drainage of Whittlesea Mere, by destroying the plant on which the caterpillars fed, caused the extermination of the butterfly. This may have been so; but I very much doubt the assertion. The habitat certainly was not confined to Whittlesea Mere, and even if it were, the food-plant (the Great Water Dock, *Rumex hydrolapathum*) abounded everywhere in the district where sufficient water was present. On this it might have remained, perhaps in greatly diminished numbers, and it may possibly now be still existing. Although the grand butterfly has not for some years gladdened the eyes of the collector, I should never be surprised to hear that it had been again discovered in some

numbers; when it would be an illustration of the phenomenon of periodicity, to which I am now calling attention.

Periodicity in abundance is not confined to any class in organic life; it occurs in the highest as well as in the lowest, and I propose to illustrate my meaning by taking examples first from the lowest forms of life and afterwards from the higher.

Epidemic diseases are, in all classes of organic life, due to a germ; this theory is, I think, now universally acknowledged. The disease germ, then, shall be our first example, and as there is one disease which will enable me to make my ideas on this subject of periodicity more plain and clear perhaps than any other, I will take that first.

For many years, ages almost, there existed in the neighbourhood of Boulogne a disease which was known to the French physicians by the name of "Diphtherite," and to many of our countrymen who visited that district as "Boulogne Sore-throat." Possibly there may have been cases in this country also, and perhaps elsewhere in Europe, but if so, the cases were so few in number that they attracted little or no attention. Here, then, we have this species of germ at its rare or almost extinct period; it existed, but it was not prolific. In 1852 or thereabout cases began, though rarely, to occur in various parts of Britain, but they did not spread, and never became epidemic. Gradually, however, more and more was heard of them—the germ was approaching its period of activity—and at last, in 1858, Diphtheria, for this was the disease, overran not only Europe but the whole world.

This was the period of the abundance of the Diphtheria germ, but, happily for mankind, its period of rarity seems approaching. It is not so virulent (although even now bad enough), nor is it so spreading as in its period of prolificness and abundance.

This disease also enables me to illustrate the fact that man's proceedings neither caused the sudden increase in the number of attacks, nor did he in any way diminish them, excepting that by care, and the adoption of the teachings of sanitary science, he, to a certain extent, protected some portions of the population, and in individual cases placed the affected in a better position to resist the ravages of the disease. But he certainly did not bring about the diminished virulence which was so apparent after the disease had existed for some time, any more than he can be said to have made the disease epidemic in the first instance. It will no doubt be said

that bad sanitary surroundings encouraged and made this disease epidemic. If so, why did it not spread over the world ages before? There was the same neglectfulness of sanitary precautions, and all unsanitary dwellings and surroundings had not disappeared when the extreme virulence of the disorder had abated. The same may be said of the disease I propose next to mention, and, in fact, of any epidemic.

The phenomena attending the appearance and disappearance of other epidemics might easily be given, and the horrible disease, Cholera, now, I fear, approaching our shores, affords another excellent example of periodicity in abundance and decline. For ages Cholera existed in India, but it did not put on the virulent epidemic form which overran the world until about 1830. Then, after a great increase for several years in India, an approaching prosperity as I call it, started on its progress of destruction throughout the world, killing all, or the greater part, of those it attacked, and after a time following the usual course, diminishing in virulence, until finally it disappeared from Europe. But it still went on in its weaker form in India, until its period of abundance gradually approached, and it then again spread over the world.

These two diseases are as good examples of what I have called "Periodicity in Organic Life" as could possibly be wished for.

In plant life generally, the same periodical abundance of species may be noticed. I do not wish any one to infer that there is any regularity in the intervals between the periods; there is nothing of the kind. The times of prosperity in the species are most uncertain, and cannot always be explained, as I have said before, by either hot seasons, wet years, or any apparent surrounding causes.

The first illustration I will take shall be from the lower plants, the Fungi. Some of us remember, and all must have heard of, the first appearance of the Potato Disease. In 1848, or thereabout, a disease appeared in the potatoes in many parts of the kingdom, arousing some interest from its effects on, and the destruction of, the crops which it attacked. The next year, over large areas, the whole potato crop was destroyed. In Ireland, where the people depended almost entirely on the potato for their food, a famine was caused; and throughout Europe much distress, disease, and suffering. This was the time I have spoken of as the "period of prosperity" in the species. In the following years much damage also resulted, but the destruction has been gradually diminishing since that time, and, let us hope, the

period of scarcity is approaching. The only thing man has done, or can do, apparently, to diminish the evil effects of the disease, has been to cultivate those forms of the potato which have been proved the best to resist attack.

Has weather had any effect? Certainly it has to some extent; heat and moisture always encourage the growth of fungi. But an examination of the recorded temperatures of the disease years since 1848, will show that, as frequently as not, the bad years have been cold as often as hot ones—in short, as far as we can see, meteorological effects have had little or no influence in promoting or preventing the appearance of this disease.

Some years since, that condition of certain corn and grass seeds known as Ergot was very prevalent in Essex. It was the period of prosperity of the Ergot fungus.

Now we appear to be approaching the time of scarcity, and can anyone say that man's proceedings favoured the abundance of the fungus or that meteorological conditions reduced it? The Ergot has had its abundance in our county, and although now rare, it certainly will appear again.

Those who live in Essex will sometimes notice, it may be for some years in succession, how very abundant the wild oat (*Avena fatua*) is, in wheat or other crops, over large districts of the county.

Why is this? Is it not an illustration of the same law, that everything has its period of abundance and the contrary? I may be told that the wild oat is more common in wet years, but some further explanation more than this is required, because I have noticed them just as abundant during a succeeding dry year.

Parasitic plants, like fungi and disease germs, are good examples of periodicity. Who has not noticed the extreme abundance for a few years of the Orobanch of the clover (*Orobanche minor*) and then its almost entire disappearance for a shorter or longer period.

Meteorological effects seem here also to exert no influence, and, as far as I know, no explanation can be given for its abundance. We can only say it is undergoing, from some cause, a period of prosperity.

About 1844, there appeared in British waters a plant from America (*Anacharis alsinastrum*) which could have been well spared. It soon overran the whole kingdom and threatened to block up all our more slowly flowing rivers and canals.

This plant's appearance is a good example of the abundant period. It will be remembered how alarmed those who had charge of the canals were, and how they were at their wits' end, to find out some means for reducing the mischief ere the canals were rendered quite impassable. Our native water-plants were choked and destroyed, and it seemed as if the new-comer was going to appropriate all our waters, to the destruction of everything besides; but the period of prosperity is over; the plant is gradually becoming less of a pest; our British plants are again able to assert and maintain their proper place; our waters are becoming less clogged, and let us hope that we are approaching the period of scarcity of this species, which we could so well spare. How can the extreme abundance of this species be accounted for, and how can its gradual diminution be explained? The waters are as before, their ingredients are the same, and the surroundings have not altered, but still *Anacharis* is apparently dying out. This may be a case of periodicity, and if so, this water-pest will some day again be growing in the same rampant condition.

Who is there, dwelling in the country, of observant habits, that has not noticed the abundance at uncertain intervals of the common thistle. In those seasons it may be seen everywhere, not only in the badly-cultivated and neglected fields, but also in pastures which have been for years fed down by cattle only, and where the soil is undisturbed also, and no manure put on. This condition may exist, and does do so frequently, over large districts. After a time it may be noticed that the thistles are less abundant, and then for years only the normal quantity may be seen.

It must be understood I am not referring to such arable lands as may be neglected and out of cultivation, for here weeds of all kinds are sure to abound. Neither do I believe that this periodic abundance is caused by the seeds that are blown from neglected spots, because, some years since, when every part of Essex was well and carefully cultivated, the extreme prevalence of this weed was noticeable for a few seasons in succession. This periodic abundance occurs in many plants, but the examples given may be sufficient to illustrate my meaning.

All members of the Essex Field Club collecting any of the orders of insects, must have noticed that for several successive years certain species are rare, and that after an interval, longer or shorter, they begin to find the individuals of these species more commonly,

until at last the insects become abundant, the range of abundance varying with the species; some even in their maximum abundance never being very common. How then can we explain these variations? Meteorological conditions are not sufficient, for the scarcity may be found in periods of apparently favourable weather, or the abundance may be apparent in a series of cold and otherwise unsuitable seasons. Again, the period of scarcity or the reverse continues for several seasons, all of which cannot present conditions favourable or unfavourable for the welfare of the species. I will illustrate this by referring to a few well-known examples. In 1859, and for several years afterwards, the common Lackey Moth (*Bombyx neustria*) was very rare in Essex. I do not think I dislodged with the beating-stick a dozen larvæ in any season for certainly four or five years. If this scarcity had occurred only in this northern part of the county, I should not have remarked it so much; but as I had opportunities, which I fully embraced, for beating in South Essex as well, it struck me as something inexplicable. After an interval of this scarcity, one began again to see the larvæ more frequently, and at last the nests were as apparent on every hedge as in the years of abundance previously to 1859. Sometimes it is said that an insect is scarce in consequence of the destruction of its food-plant in previous seasons by the great abundance of the larvæ. This may be, and is no doubt true of some species; but to a general feeder like the Lackey Moth, the explanation cannot apply, as no one in this country has ever seen the whole of the common trees and shrubs on which this insect feeds defoliated at one time. There must be some other cause for this condition of periodicity.

Another insect, the "Small Oak-Egger" (*Eriogaster lanestris*), at the time mentioned (1859) was very abundant on every white-thorn hedge, and in this district a nest might be found every few rods. This period of abundance having lasted for some years, a decline gradually set in, until now very few nests are seen, but not having time to collect, I cannot say whether the insect is absolutely rare. Defoliation and the consequent starvation of the larvæ cannot be the cause of the scarcity, for in this district, the white-thorn hedges have never in late years been defoliated, except in some limited localities, and then not by this insect; it was never in sufficient numbers.

It may seem scarcely worth while to take up your time with

further examples from the insect world, as both the above-mentioned species are such excellent illustrations of periodicity, in the sense I have used the term. Insects are, however, one of the best classes of animals for working up this subject, as there are so many species which, during their period of abundance, are so very numerous in individuals that the changes may be the more readily observed than if the specimens were less frequent and more difficult to obtain.

I have no doubt that many of our entomological friends will be able to call to mind further examples of this periodicity in abundance, for all must have heard of a "Clouded Yellow year," a "Camberwell-Beauty year," a "*Convolvuli* year," and so on.

All of these years of abundance have not been due, in the case of many insects, to the parents being blown over from the Continent, although it is just possible that this cause may explain the occasional apparition of great numbers of "Clouded Yellow" and "Camberwell Beauty" butterflies.

Occasionally it has happened, and perhaps more frequently than hitherto noticed, that the period of abundance of a species in this country coincides with the abundance of the species throughout the continent of Europe. This was notably so, a few years since, with regard to the "Gamma-moth" (*Plusia gamma*). Now in this instance, it could neither be the suitability of the season nor the abundance of food, as these causes could not have produced the same effect in the hotter regions of the South of Europe, and the cooler climate of Scandinavia. For this mysterious something, then, I use the term "Periodicity," not at all as an explanation, but simply as a term to note the fact.

It is easy to say in explanation of the immense hordes of locusts which occur in many parts of the world, that they are migrating for the purpose of finding food. But is this an explanation of periodicity in these insects? How is it they are in such abundance that they must migrate? They are always in the districts from whence they start on their migrations, and to which they never return. How is it they do not find it necessary to migrate every year? It cannot be in consequence of meteorological causes. Nor is it a question of food, because frequently years elapse between one period of abundance and another, and at other times for several years in succession swarms follow swarms. When I come to mention the Lemming, we shall find the same difficulty in explaining the

migrations and the abundance of that animal. I might cite almost any number of instances of periodicity in insects, but I will only refer to a few more cases, taking the well-known ones.

The Black-veined White Butterfly (*Aporia crataegi*) used to be common in many parts of England. But where is it now? It is getting rarer every year in the few localities where it is still found, and looking as if it would soon become extinct. Can any explanation be given of its diminution? I know of none. The same may be said of the Great Blue Butterfly (*Lycæna arion*) and many others. Again, numerous species which the earlier Aurelians considered rare are now common. Why is this? I may be told we know better how to find them, but I question if this is the true explanation. I should rather say the species is undergoing the condition of periodic abundance, quite independent of any proceedings of man. In many species we, who have given years to the study of insects, know it is not improved knowledge or ability that enables us to find more of them, and I would use the same reasoning in dealing with the views of the older Aurelians, and say that it is not greater skill, but rather that the insect is more abundant.

There is one other insect I should like to refer to in illustration of periodicity. In this (the Colchester) district, in the third and fourth decades of this century, the Blister-fly (*Lytta vesicatoria*) was very abundant on every ash tree; at the present time it is rare. Every variety of weather occurred during these years, and the variations from hot to cold and from wet to dry, have been as frequent since; and therefore is it not reasonable to suppose that meteorological conditions have had no effect? Man's proceedings in this case certainly had none; for the number of beetle collectors were so few, and none of these insects were captured for commercial purposes; therefore some other cause must have been at work, and what was it? It could not be natural enemies as birds, for the birds leave them alone, neither could it be want of food, for as far as we can see all their various articles of diet were equally common throughout both periods.

No attempt has ever been made to explain that scarcity or abundance of Fish, which is so marked in the gregarious species, such as cod, herring, sprat, mackerel, etc., excepting that it is said "It is a bad season," or that they have left the part of the coast where they previously abounded. This change of habitat, no doubt, explains the scarcity in certain localities, but something more than

this is required to account for periodic abundance and scarcity when the area over which either may occur is very large.

For some few years, on our Essex and Suffolk coasts, sprats have not been in their usual abundance, and, as far as known, there is nothing to account for the scarcity. Their comparative scarcity has not been due to either change of locality or over-fishing, and we can only surmise that this fish is now passing through its period of less abundance. It is to be hoped, for the sake of our seaside dwellers, its period of abundance may soon return. Fish are most difficult subjects for observation, and I will therefore simply pass them over, noting only as a matter of common observation, we have bad years in many species, that is years when few are taken.

Birds are much better subjects for study and observation, and we find periodicity in abundance and scarcity well marked in many species.

The first I will take is the House Martin. In many, in fact in most, parts of the kingdom, we hear that this bird is becoming rarer ever year, and the cause is said to be that the sparrow, being so abundant, takes possession of the nests of the Martin, and so prevents their increase. This may be one cause of the lessening numbers, but I do not believe that it is the only one, for the Martin is diminishing even in those parts where the sparrow is not, and never has been, numerous. There must, therefore, be other causes; I do not know that man has had anything more to do with it than have the seasons. Everywhere in this kingdom the Martin is a favourite, and as such is rarely interfered with; even on the Continent, where bird slaughter is so common, I do not think that it is esteemed as an article of food. From some cause this most interesting little creature is diminishing in numbers; undergoing its period of scarcity, one hopes, but almost fearing that the facts point to approaching extinction.

As an illustration of the opposite condition—a period of abundance—we may take the Hawfinch (*Coccothraustes vulgaris*). It is not many years since this species was esteemed rare, and the find of a nest was almost unheard of. This was in its period of scarcity; but now, not only do we hear of its breeding in Epping Forest, where Mr. Doubleday first recorded its nest as occurring, but also in every part of this county its nest is frequently found. And to those who know when and where to look for it there is generally no difficulty in finding a specimen. Now, if the scarcity of species is to be

considered as due to the agency of man, to what are we to attribute the abundance of this bird during the last few years? I am not aware that man has destroyed any of its enemies, nor am I aware that he has cultivated any fresh crop which can have been utilized by it for food : nor do I know that meteorological conditions have been peculiarly favourable. The only way of explaining it is by stating the fact that this species is passing through its period of abundance.

The Goldfinch is an instance of a species passing through, one must hope, a period of scarcity only and not of approaching extinction. The agency of man may possibly have some effect in producing a portion of this rarity, but he certainly is not the sole cause.

Amongst the migratory birds we often see a great abundance at times, sometimes for two or three or more years in succession. There may have been in the district from which they came abundance of food or other favourable causes, which may account for their increase, and therefore for the large numbers of our annual visitors. Sometimes a greater degree of cold would appear to be the explanation ; but we must remember there are cold seasons when the flocks are few, so that cold weather cannot be the only factor. I have no doubt that if we could get a correct estimate for every part of the globe visited by these northern breeders, we should find the same inexplicable periodicity of abundance and the reverse obtaining as the rule with these creatures as with all the classes we have been considering : and that the numbers we see have nothing to do with either heat, cold, or abundant food.

The next great division of nature, Mammalia, will furnish us with many examples of the law of periodicity, and we shall in these be able to follow the various apparent means by which the abundance or scarcity is occasioned ; but we cannot tell even then how these means were brought about. This we can do from the more stationary habits of the creatures, and from the large number under the control of man.

Plenty, as regards food and favourable weather, will be found very active agents in the welfare of, and abundance of, this class ; but meteorological agents, as far as we can see, have but little influence. This I will illustrate by reference to a domestic animal first. The expression "a good fall of lambs" is well known, and it is a matter of observation that there are seasons when a very

large proportion of the lambs born are twins. There are other years when twins are few. I have never been able to account for this ; and on looking back to the previous season, there seems to have been nothing remarkable ; a fine summer may have been followed by few twins, and a cold unfavourable season may have had many. In the matter of food, so purely an artificial animal kept under the conditions as the sheep in this country is, knows little of scarcity, and therefore this cannot much interfere with the fruitfulness of the ewes.

There is another domesticated animal which gives us an example of the contrary result, and shows us how periodicity in scarcity may be produced.

During certain years, without any apparent difference in season or food, it is noted throughout this kingdom that large numbers of cows abort. This unfortunate accident is not confined to one farm or one county, but is general throughout the kingdom. When a season of this kind occurs, it must have a very considerable effect on the number of the young to be raised ; and, therefore, if these animals were living in a state of nature, periodicity in scarcity would be the result.

Something of this kind may occur amongst creatures not under man's control, but from want of opportunity we cannot say that it does or does not do so. Arguing from what we see and know of our domestic animals, it is, I think, a fair inference that possibly this temporary fruitfulness or unfruitfulness may be one of the causes contributing to the period of abundance or scarcity throughout all nature.

At various times for many years past, the Field Vole (*Arvicola agrestis*) has become so numerous in the marshes of Essex, that the whole of the grass has been eaten by them. The first mention of this plague was in 1580. Since this time there are many records of the destruction produced by these swarms of mice in these same marshes. We now hear that the fields in the south of Scotland are overrun with mice, to the serious detriment of the pasturage, and that an application has been made to the Government for assistance in ridding the district, which is a very large one, of these unwelcome visitors or natives. Many theories are promulgated to account for the vast numbers existing ; amongst others that the destruction of so-called vermin has, by doing away with nature's means of checking undue increase, brought about this sad state of things. There

may be some truth in this notion, but the destruction of owls, etc., is probably not the only cause of the increase of the voles. In other places they are increasing, for instance in Greece. Does strict game preserving obtain in that kingdom, and are all hawks, owls, and other mice-destroying animals exterminated there? If they are not, then we cannot say game preserving and the destruction of the carnivorous birds and animals of Scotland has brought about the plague of mice, as Greece is also suffering in a similar and probably more extensive scale, from the same mischievous little beasts.

Again, in 1580 I do not think any great progress had been made in Essex towards reducing the numbers of the mice-eating birds and animals; still the pest appeared, got gradually worse, and at last began gradually again to diminish, until only about the normal numbers remained. It may perhaps be well to try and diminish the number of these creatures in Scotland, but I think man will be able to do but little in effecting this desirable object, and in my opinion they might as well be left alone, as the laws which govern this periodicity in abundance and scarcity will bring about most surely their usual results, and only a proper number of these animals will be found in the course of a few seasons. This diminution has always occurred wherever the pest has prevailed.¹

I will take the next illustration from a foreign rodent, the Lemming. At uncertain intervals these animals abound to a marvellous extent, and then commences a migration, the details of which are very extraordinary, but we need not go into these, except so far as they throw light on our subject.

It would appear that this animal is very common throughout the Scandinavian peninsula, just as the Vole is in this country. After a period (which may be long or short) it is noticed that there occurs a considerable increase in the animal's numbers. This multiplication goes on for some time, and at last it is found that the Lemmings are evidently moving on, it may be towards the west. Nothing will turn them from their course; even a river or a lake will not stem the migration. It must not be supposed that they assemble and start off all at one time, as the swallow does, and so complete their journey as quickly as possible. It would rather appear that they

¹ Since writing this paper, an article by the Editor has appeared in the "Zoologist" for April, 1893, not only confirmatory of the views I have expressed as to the influence of mice-eating birds and mammals, but also, what is perhaps more interesting, bearing out the idea previously mentioned that probably a larger fecundity may have had some influence in producing their abundance. The writer states that *Arvicola agrestis* normally produces from four to six young at a birth, but at the present time in the districts of Scotland suffering from this plague of mice litters of eight or ten are very common—the equivalent of "a good fall of lambs."

follow their usual habits, gradually and persistently moving onwards in one direction, never returning to the place from whence they started. What does all this point to? Simply this—that the species has arrived at its period of greatest abundance, and that Nature is about to put a check on its increase, this being one of the ways in which the period of scarcity is produced in this species, just as the same migratory habits produce a similar effect in the locust. It would appear that it is not the want of food which brings the migration of the Lemming about. The only thing we know is that they appear in greater numbers than usual, and then are noticed to be moving in one direction, the horde being increased by the numbers which join it from every district through which the band of Lemmings passes. If the gathering is large, of course, like the swarms of locusts, the animals must do much damage by destroying all the food of the district in their line of march.

I think from the illustrations I have given, that you all will be able to understand what I mean by the term “periodicity.” I think that the examples given prove that when abnormal numbers of any animal or plant occur, we may expect to see this abundance followed by a period of scarcity, and that this periodic range of maximum and minimum numbers is the result of a natural law controlling every organized being, and is an effect not necessarily brought about by man’s agency, nor by climatic changes, nor variation in the supplies of food.

Applying the same law to diseases, we must not suppose because the Black-death and other plagues of the Middle Ages have not appeared for many years that they are necessarily extinct. They probably exist, but at their minimum period; and we may find at any moment that one of these dreadful scourges has started on its career of destruction. It may be that the increase of these diseases will be the mode by which the enormous increase of the human race will be checked, an increase which, at a not very distant period, threatens to so overcrowd the world as to make it a serious problem how all will be fed. If there is any truth in the idea that there is a law of periodicity we may make ourselves very easy, feeling sure that in the armoury of Nature there is some beneficent law which will prevent the dire results dreaded by many.

NOTES ON THE GEOLOGY OF THE NEIGH- BOURHOOD OF CHELMSFORD.

By T. V. HOLMES, F.G.S.

[Prepared for the Meeting at Broomfield and Chelmsford, on April 15th, 1893.]

AT Chelmsford we are in the middle of a district in which the London Clay is the oldest formation anywhere visible. Southward this area includes the whole of Essex, with the exception of the small tract between Rainham and Stanford-le-hope; northward, its boundary is a nearly straight line connecting Bishop Stortford with Sudbury and Ipswich. Looking at Chelmsford as a centre from which to make geological excursions, we find it well-suited to that purpose. If we walk or drive ten or twelve miles in a southerly direction, we are in a district of London Clay, which at one spot may form the surface for a few square miles, while at another it appears only in the intervals between overlying beds of the Bagshot Series or patches of Boulder Clay. There are, besides, many isolated patches of gravel, some probably older, some later in date than the Boulder Clay. Thus in southern Essex, in spite of the uniform softness of the rocks composing its geological structure, there is a considerable variety as regards height and contour of the surface. But if we travel north of Chelmsford, towards and beyond Broomfield for instance, we find ourselves in a region in which the varied contours of the south are altogether wanting. We see that the country consists of a remarkably flat-topped plateau, intersected here and there by the valley of some stream, which is as uniform in aspect as in composition. We are, in short, entering the district occupied by the broad expanse of the Chalky Boulder Clay, a formation which gives so strong an impression of monotonous flatness to the traveller through northern Essex, Suffolk, and Norfolk. This monotony of the landscape north of Chelmsford and its comparative variety southward are simply the result of geological structure. About Broomfield the plateau is everywhere capped by Boulder Clay, the underlying sand and gravel associated with it becoming visible in the sides of the river-valleys intersecting the plateau, while below the sand and gravel London Clay occasionally appears. This sand and gravel is well shown in the pit near the new water-tower at Rainsford

End, visited during our excursion to Writtle. There are also some fine pits in it near the water-tower south of the town.

These constituents of the Glacial Drift hereabouts, the Sand and Gravel Beds and the Boulder Clay, vary very considerably in thickness. We may also discover that in one place Boulder Clay lies directly on London Clay, while in another the Sand and Gravel has but a few small patches of Boulder Clay resting upon it. But a glance at the map of the Geological Survey shows the close association of the two formations, and makes it evident that they both belong to the same geological period, though there may be nothing in any sections to stamp the Sand and Gravel series as *Glacial*, in the sense in which the Boulder Clay is rightly so termed. As regards the variations in thickness of these constituents of the Glacial Drift, I learn from the Geological Survey Memoir, on Sheet 47, that "in wells at Scravels, near Broomfield, there are 12 feet of gravel, and at Broomfield School 18 feet, covered respectively by 3 and 7 feet of Boulder Clay." And near Great Waltham Church the gravel is more than 24 feet thick; at Great Leigh's Parsonage, 20 feet; and 5 furlongs east of it, 30 feet of gravel were found under a like thickness of Boulder Clay. At Troys Hall, Fairsted, there were 60 feet of Boulder Clay above but $1\frac{1}{2}$ foot of gravel.

Formerly the Chalky Boulder Clay was much used for marling the land, and the old marl pits continue to furnish sections, though they have become disused as sources of manure. Inspection of some of them will show how much the uppermost two or three feet have been deprived of the Chalk they once contained through the action of the weather. The depth to which the Chalk has been dissolved away is variable, as it depends on the greater or less permeability of the Boulder Clay at any given spot.

NOTES—ORIGINAL AND SELECTED.

Capture of Otters near Chelmsford.—"The Essex County Chronicle" of May 12th, records that on "Monday afternoon, May 8th, a man named Abbott, in the employment of Mr. G. B. Ling, caught a young otter in the head-water at Springfield Mill, Chelmsford. The animal, which is about three months old, is being kept alive. The same afternoon, also, some pupils at the Arc Works caught a small otter in the river at Chelmsford."

Uncommon Birds near Birchanger.—Mr. A. P. Church, in a letter recently received, says: "It may interest you to know that we have a pair of Green Woodpeckers breeding within a very few yards of our house at

Birchanger. This neighbourhood seems to be well visited by the Woodpeckers, as during the last three or four years I have seen the Green, the Great Spotted, and the Lesser Spotted Woodpeckers, and one of the latter I shot in the winter of 1889. In the spring of 1887 I assisted in taking a nest of the Hobby (*Falco subbuteo*), an egg from which I have in my collection. The eggs were laid in a nest from which we had taken Kestrels' only a fortnight before."

Waxwings (*Ampelis garrulus*) at Harwich.—Mr. F. Kerry records in the "Zoologist" for April, that on February 23rd a Waxwing was shot at Harwich, whilst feeding on privet berries. "It was either very fearless or stupid, for it allowed several persons to place their hands within a few inches of it. On dissection it proved to be a female bird, and it has five wax-like appendages on each wing. On March 4th another was killed by a boy with a stone. This was a male, and is the finest bird of four killed in this neighbourhood, the wax-like appendages being larger than in any of the others, and numbering six on the right wing, and five on the left." The Waxwings killed at Great Oakley (see E. N., *ante*, p. 23) were male and female, with four wax tips to each wing. Mr. Kerry has purchased them, and they are now in his collection. Many records of Waxwings in other parts of the country appear in the various natural history journals.

Helix Lapidica (Linn.) at Colchester.—When I wrote my account of the "Land and Fresh-Water Mollusca of the District around Colchester" ("Trans. Essex Field Club," vol. ii.) I mentioned (at page 95) the fact of finding a dead shell of this species at Layer de la Haye. I thought then that it would probably be found somewhere in this part of the county. I have to-day seen two specimens that were taken by my little friend, who has, at my request, given me the following note: "I found two specimens of this snail crawling on hedge-rubbish on the Myland Road, Colchester, between the church and the rectory, about the last week in September, or the first week in October, 1892.—PHILIP HARWOOD, 2, Brooklyn Villas, Colchester." The small boy's eyes are, I suppose, sharper than mine; anyhow, I am glad to be enabled to add *Helix lapidica* to the list of Colchester snails.—HENRY LAVER, F.L.S., Colchester, April 19th, 1893.

Hesperia Lineola, Ochs., in Essex and Elsewhere.—Mr. Charles G. Barrett, in his fine work on the "Lepidoptera of the British Islands," now in course of publication, gives the following information respecting the occurrence of this butterfly, which is a species so interesting to the Essex naturalists. The information may be taken as supplementing that given in *ESSEX NATURALIST*, vol. iv., p. 191; vol. vi., pp. 43 and 141:—"Of species now known to exist as British, the present is the latest addition to the British fauna. In July, 1888, Mr. F. W. Hawes, desiring to improve his series of *H. lineola*, collected a number of specimens in Essex, and, among them, brought home three which, after having been for some time supposed to be varieties of that species, were ultimately recognised as belonging to the present. In the following year specimens were taken by Mr. J. T. Carrington, who had assisted Mr. Hawes in identifying the species, and it has in the subsequent years been taken in plenty, the most favoured locality being along the north bank of the Thames, at Leigh, Southend, and Shoeburyness. Upon the publication of this discovery, much examination of the specimens of *H. lineola* in collections ensued, with in some cases satisfactory (?) results. Mr. J. Jenner Weir found that it had been taken many years ago in either Kent or Sussex; Mr. H. W. Barker had found it in Sussex, on chalk formation;

Mr. W. G. Mackmurdo had taken it in the years 1863-5, at Felstead, Essex; Mr. J. N. Young in 1880, at Clumber, Notts.; Lieut. G. F. Mathew, in 1886, at Harwich; I found two old specimens in the British collection in the Museum at Taunton, which had almost certainly been taken in the West of England. In 1890 it was found also at Wicken Fen and at Burswell, a silvery white specimen being secured at the former place. Besides the localities already mentioned, it has been met with at Purfleet, Benfleet, and St. Osyth, in Essex, and at Chappel and Bures, in Suffolk. In all probability its range in this country is far from being yet known, but its metropolis is evidently in Essex and Suffolk. It shows a partiality for the embankments which protect the cultivated land from the inroad of the high tides which flood the salt marshes. Here it flits about, or sits on the coarse sea-side grasses, or on blossoms of thistle or *Lotus corniculatus*, indicating rather sluggish habits, yet flying swiftly when disturbed. Further inland it seems to frequent chalky hillsides and marshes. Abroad, it has a wide range throughout the greater part of Europe, Northern Asia, and Northern Africa. Kirby says that it occurs in meadows in July and August, and that he has seen it most commonly along paths by the side of cornfields." As noted in THE ESSEX NATURALIST (vol. vi., p. 141), the larva feeds from April to June on *Triticum repens* and its var. *littorale*, and other coarse grasses occurring on the sea-walls.—ED.

Ancient Pit at Coggeshall.—A somewhat absurd rumour was lately spread by some of the Essex papers respecting the discovery of a pit containing charcoal, some fragments of pottery, and bones, at Coggeshall, namely, that the relics were the charred remains of Thomas Hawkes, a martyr of the tenth century. Our member, Mr. G. F. Beaumont, F.S.A., thus describes the pit and its contents: "The recent discovery in the Vicarage Field, Coggeshall (No. 297 Ordnance Survey), consisted of a bowl-shaped hollow, about 9 feet 6 inches in diameter at the top, and about 5 feet in diameter at the base and having a depth of 5 feet. At the bottom was a layer of charred wood, 2 inches in thickness, and above it a few inches of flint and other stones, which had been discoloured by the action of heat; the remainder of the pit was filled in with soil. At the base of the pit I found a small piece of coarse, partially-baked, pottery, and a few fragments of bone. These remains were insufficient to enable me to form a definite opinion as to the date or object of the original excavation. It appears to be of similar character to excavations at Roxwell, near Chelmsford, which Mr. R. W. Christy discovered in 1887, and described (ESSEX NATURALIST, i. 82) as 'mysterious holes filled with black earth, mingled with charred wood and pieces of pottery.' The Roxwell pits were circular, about 5 feet in diameter at the surface, and 2 feet at the bottom, some being as much as 5 feet deep, and most of them about 3 feet. I do not think there is sufficient evidence to lead to the conclusion that the pit was made by the Roman *Agrimensores* to serve as a *Botontinus*, although that was originally the idea which presented itself to me. It certainly was not used for baking purposes, as the sides showed no traces of heat. It may have been made for sepulchral purposes. The suggestion that it marks the site of the martyrdom of Thomas Hawkes is too fanciful, for to support such a theory it must be assumed that the persecutors dug a hole 5 feet deep, placed the stake therein, burned the martyr, carefully moved the ashes, re-excavated the hollow, placed the ashes at the bottom, a layer of the burned stones above, and then refilled the pit with earth." We understand that Mr. Beaumont has since been

assured by an expert that the bones are those of a horse. Similar pits are by no means uncommon, and have been noticed in several parts of the county.

Proposed Purchase of Mr. Joslin's Museum of Romano-British Antiquities.—We are very glad to see that an energetic effort is now being made to acquire Mr. Joslin's collections for the Colchester Museum. In our reports of visits of the Club to Colchester, we have repeatedly advocated the purchase of the museum—in the opinion of experts it is one of great local value, and added to the existing museum, would put Colchester in the front rank of those towns possessing collections illustrating their ancient history. A representative Committee, headed by the Mayor, and with Dr. Laver and Mr. J. C. Shenstone as Hon. Secretaries, has been formed; and promises of very considerable sums of money have already been obtained. On Wednesday, April 12th, a most interesting meeting, convened by the Mayor (Mr. W. Gurney Benham, who has shown in this matter a just appreciation of the duties of his high office which should be an example to other Essex mayors) was held in Colchester for the inspection of the collection, which was largely attended by many eminent archæologists and others taking an interest in such matters. In the programme of the meeting it was stated that "Many antiquarians are familiar with Mr. Geo. Joslin's exceptionally valuable and interesting collection of Romano-British Antiquities at Colchester. This collection, which has been gradually brought together during the last quarter of a century by Mr. Joslin, is the result of careful and costly research, and the Museum includes many objects which are unique and of great historical interest. They are chiefly finds within about a quarter of a mile of his residence, and entirely from those in the Colchester district: it is therefore a Local Museum, illustrating the history of this town, principally during the Roman occupation. It will be found richest in objects of a sepulchral character, and from these we may see the various modes the Romans had of disposing of their dead, and of the importance they attached to the rites of burial. It may be noticed that many of the exhibits are arranged in groups; this means that the various vases, lamps, bottles, and so on, in this division were derived from one burial, thus adding very materially to their value, especially so, as they are arranged in the same position as found in the tomb or cist, wherever possible. There are other groups in which this arrangement could not be followed, as there was no cist, and these were the most frequent."

At the luncheon many excellent speeches were made by the Mayor, Prof. McKenny Hughes, Mr. John Leighton, F.S.A., Mr. E. A. Fitch, Dr. Laver, Captain Naylor-Leyland, M.P., and others, strongly advocating the acquirement of the Museum, and letters to the same purpose were read from the Lord Mayor of London, Mr. Alma Tadema, R.A., Professor Meldola, F.R.S., Mr. George Payne, F.S.A., Rev. E. L. Cutts, and many others. Dr. Laver, Mr. E. A. Fitch, Mr. Shenstone, Mr. W. Cole, and many other members of the Club were present at the meeting, and we sincerely hope that all our members will aid the efforts of the committee. To allow such a collection, so fully illustrative of a most interesting period of our local and national history, to go to America would simply be a lasting disgrace to Essex.—ED.

Death of Mr. W. R. Sackett.—We notice with regret the announcement of the death of Mr. Walter Randall Sackett, eldest son of Mr. W. H. Sackett, of Wingfield House, Orsett, which occurred on April 12th at Vancouver, British Columbia, where he had been living since the autumn of 1891. Mr. Sackett,

though only twenty-three years of age, gave promise of becoming an exceptionally close observer and a good ornithologist. Before leaving England he deposited a volume containing a summary of his observations on the birds of the Orsett district up to the summer of 1891 with Mr. Miller Christy, who will make use of it when preparing the first supplement to his "Birds of Essex."—ED.

Old Loughton Hall—Erratum.—In my article on Old Loughton Hall (p. 19, *supra*) there is, as Mr. Maitland kindly points out to me, an error, which I hasten to correct. It was not Mr. W. W. Maitland, but his father, Mr. John Maitland, who succeeded to the property in 1825, on the death of Miss Whitaker. This mistake will also involve a *corrigendum* on page 20, where (line 6) the "home of his widow" should read "the home of his son's widow."—W. C. WALLER.

THE ESSEX FIELD CLUB.

ANNUAL REPORT OF THE COUNCIL FOR THE YEAR ENDED
DECEMBER 31ST, 1892.

[Read and adopted at the Annual Meeting, held at Chelmsford on April 15th, 1893.]

THE main official business of the Council during at least the latter half of last year was concerned with the negotiations for the amalgamation of the Essex and Chelmsford Museum with the Club, and the final arrangements not having been completed within that year, it is deemed best to present on this occasion only a summarised report, with the view of placing full details of the present position and prospects of the Club on record in the form of a statement in THE ESSEX NATURALIST and in the next Annual Report.

After very careful consideration of the circumstances of the case, the Council and the Committee of the Essex and Chelmsford Museum came to the conclusion that they would best serve the interests of the Club by carrying out the amalgamation at once, under the powers conferred by the agreement, without waiting for attainment of the sum necessary to commence the proposed building of the Museum. They were of opinion that work should be commenced as soon as possible in the old Museum at Chelmsford pending the erection of new buildings. They considered that the interest of the members and the public in the scheme would be greatly enhanced by making a beginning in the Museum, and that the work of preparing and arranging the specimens already in the possession of the two Societies, and those which will be presented, could be as well carried on in the old as in a new building. It was therefore agreed to effect the amalgamation, and that a certain proportion of the funds already promised should be called in and spent in the purchase of suitable cabinets and cases, so that such specimens might be properly displayed.

In accordance with these resolutions, the amalgamation has now been arranged, needing only some legal formalities to be completed. It is hoped that these will be in order by the annual meeting, and when finally settled the deed of amalgamation and other particulars will, as above mentioned, be printed

in *THE ESSEX NATURALIST* for the information of the members, and as a permanent record of the agreements and conditions entered into.

The amalgamation will necessitate very considerable additions to, and some few alterations in, the Rules. These will be submitted for the approval of the members at the annual meeting.

Under the terms of the agreement for the amalgamation, subscribers to the Essex and Chelmsford Museum for 1892 are admitted as members of the Club without payment of entrance fee, and with the status and privileges of those members of the Club elected previous to December 31st, 1892. Accordingly a letter has been sent to the subscribers as aforesaid, informing them that they have been so admitted members, with this proviso—that the subscription to the Club for 1893 be paid to the Treasurer before the 24th of June next. This admission of the subscribers to the Museum will probably add about ninety members to the Club. At Midsummer next the list of members will be carefully revised and printed. This the Council propose to do each year in June, as experience has shown that the expenditure is a necessary one, an annually revised list being of the greatest service to the officers and members.

It is also intended to issue a new edition of the prospectus of the Club, and it is hoped that members generally will ask for copies, and use them judiciously in gathering in recruits. When it is remembered that each new member pays a contribution of at least £1 5s. 6d. the first year, it is evident that in this way the funds and strength of the Society may be considerably improved.

FINANCIAL.—It will be seen from the balance sheet that the economies promised in the last report have been duly carried out, but unfortunately the income has diminished in a corresponding degree, so that the finances of the Club do not exhibit much improvement. A considerable number of the outstanding subscriptions have, however, been paid since the accounts were made up. Four lapsed life compositions have been transferred to the general account, the net result of the year's operations being that the adverse balance of £113 6s. 9d. has been reduced to £95 13s. 10d. It has been found desirable (in order to avoid further disturbance of the General Account) to charge the cost of printing the part of the old *PROCEEDINGS* to the "Special Memoirs Publication Account," where it will probably remain as a heavy incubus for some years to come. The Museum Fund shows a balance in hand of £51 16s. 9d.

PUBLICATIONS.—*THE ESSEX NATURALIST* has been carried on successfully during 1892. Including the part belonging to volume v. issued in 1892, and the Index, 248 pages have been published within the year, each number containing papers, reports, and notes, all having a direct interest for Essex scientists. But the Editor has repeatedly had occasion to complain of the comparatively slight aid he has received in his difficult task; the contributions are mainly the work of a limited band of members, and it is a source of great regret that the members at large do not take a more active share in contributing to the Journal. Almost everyone could help in this work, and the Editor will be glad to give instructions and information as to the way in which such aid could be afforded.

Part 2, vol iv., of the *JOURNAL OF PROCEEDINGS* was issued in July, bringing up the reports of all meetings of the Club to January 29th, 1887, after which date the publication of *THE ESSEX NATURALIST* commenced. The reports of the Club are now absolutely up to date, and at the end of 1892 the series of the Club's publications consisted of five volumes of *TRANSACTIONS AND PROCEEDINGS*, six

Dr. TREASURER'S ACCOUNT OF INCOME AND EXPENDITURE FOR THE YEAR ENDED 31ST DECEMBER, 1892.

	£ s. d.	£ s. d.	
To Subscriptions, 1892	1 11 6	By balance from 1891 (excess of Payments over Receipts)	103 6 9
" " 1891	3 3 0	Printing and Illustrating "Essex Naturalist"	104 1 0
" " 1890	8 17 0	" " General Printing, Stationery, and Binding	13 9 9
" " 1889	164 1 3	" " Postage of "Essex Naturalist," Circulars, Officers' Correspondence, etc.	21 16 4
" " 1883	3 0 0	Incidental Expenses	9 7 7
Entrance Fees	189 12 9	Rent of Headquarters	29 9 0
" " Donation	5 5 0	Purchase of Books, etc.	6 5 8
" " Subscriptions	0 10 6	Fees to Lecturers and Contributors	8 18 6
" " Transfer from Compositions Account (four lapsed subscriptions)	21 0 0	Loss on Field Meetings	1 6 2
" " Balance (excess of Payments over Receipts)	95 13 10		
	<u>£204 11 9</u>		<u>£204 11 9</u>

LIFE COMPOSITION ACCOUNT.

To Balance from 1891	125 10 6	By Transfer to General Account (four lapsed subscriptions at £5 5s.)	21 0 0
	<u>£125 10 6</u>	" Balance to 1893	104 10 6
			<u>£125 10 6</u>

SPECIAL MEMOIRS PUBLICATION ACCOUNT.

To Macmillan and Co., (Earthquake Report)	0 4 5	By Balance from 1891 (excess of Payments over Receipts)	4 16 5
" " One Copy "Birds of Essex"	0 10 6	" " Payment on account for Printing Part 2, Vol. IV. "Journal of Proceedings"	25 0 0
" " 56 Copies "Proceedings" at 5s.	14 0 0	" " Postage, etc., of ditto	0 17 6
" " Balance (excess of Payments over Receipts)	15 19 0		
	<u>£30 13 11</u>		<u>£30 13 11</u>

MUSEUM FUND.

To Balance from 1891	5 14 9	By Printing Circulars, etc.	9 13 0
" " Donations paid, 1892	55 15 0	" Balance in hand	51 16 9
	<u>£61 9 9</u>		<u>£61 9 9</u>

LIABILITIES.

Due for Printing "Essex Naturalist"	7 0 10	Cash in hand and in Bank	44 14 5
" " "Journal of Proceedings"	25 2 0	Due for Advertisements in "Essex Naturalist"	0 0 0
Surplus of Assets over Liabilities	171 11 7	Unpaid Subscriptions, estimated at	50 0 0
		Articles, Books, Specimens, etc., estimated at	50 0 0
		Stock of Publications, estimated at	50 0 0
			<u>£203 14 5</u>

ASSETS.

Examined with Vouchers and found correct,
 WALTER CROUCH, } Auditors.
 CHARLES RIDLEY, }

volumes of *THE ESSEX NATURALIST*, and two "Special Memoirs," making thirteen volumes in all.

The Council have accepted the MS. of Dr. Laver's book on the "Mammals, Reptiles, and Fishes of Essex" for publication as one of the "Special Memoirs," and it will be issued by subscription in 1893.

MEETINGS AND PAPERS CONTRIBUTED.—Owing to unfortunate failures in connection with the fixtures for two Field Meetings, and great pressure of other work in the autumn preventing the Secretary from remedying these failures, the number of meetings was less than usual. Eight meetings were held, full reports of which will be found in *THE ESSEX NATURALIST*. The Council have to thank Prof. Boulger, Sir T. Fowell Buxton, Mr. Walter Crouch, Mr. C. B. Sworder, Mr. David Houston, Mr. I. Chalkley Gould, Mr. G. E. Pritchett, Mr. Miller Christy, Lord Petre, Mr. Arthur Pryor, Mr. T. V. Holmes, Rev. Dr. Moore, Mr. W. Varco Williams, Mr. John Gaspard Fanshawe, Mr. John Hilliar, Dr. Cooke, and others for kind aid afforded at the Field Meetings; and the special thanks of the Club are due to Prof. Stewart for his reception of the Society at the Royal College of Surgeons, and to the Rev. Lewis N. Prance and Mrs. Prance for their reception of the Club at tea at Stapleford Tawney Rectory on May 28th.

A considerable number of papers and other communications were read at these meetings, and they, with others sent direct to the Editor, have all been printed in *THE ESSEX NATURALIST*.

THE LIBRARY has received the usual increments of Journals and Transactions of Societies, and some local books have been purchased. It is hoped when the libraries of the two Societies are amalgamated that a strong effort will be made to bind the numerous valuable sets of periodicals and transactions, etc., in possession of the Club. The want of funds to accomplish this extremely necessary work is a source of great anxiety to the Librarian, and greatly increases the labour of arranging the books.

TECHNICAL INSTRUCTION.—The members nominated by the Club to serve upon the Technical Instruction Committee of the Essex County Council, under the terms of the resolution of the County Council of March 15th, 1892, were the same gentlemen as last year, with the exception of Prof. Boulger and Mr. F. W. Rudler, who wished to retire owing to pressure of other engagements. The members of the Club so elected by the County Council, under section i. (2) of the Technical Instruction Act, 1889, are now as follows:—Sir H. E. Roscoe, F.R.S., Prof. R. Meldola, F.R.S., Mr. J. C. Shenstone, F.R.M.S., Mr. G. J. Symons, F.R.S., Mr. J. Spiller, F.I.C., etc., and Mr. F. Chancellor, J.P., F.R.I.B.A.

The Council beg to tender the thanks of the Club to Dr. Laver for his occupancy of the post of President during the year. Owing to pressure of professional engagements, Dr. Laver has been compelled to ask the Council not to nominate him for the presidency for 1893, and the Council have placed the name of Mr. F. Chancellor, J.P., F.R.I.B.A., before the members as President for the ensuing year. Mr. Chancellor is an old member of the Club, having frequently most ably assisted at the meetings, and was the chairman of the Committee of the Essex and Chelmsford Museum at the time of its amalgamation with the Essex Field Club.

NOTES ON THE GRAVEL IN EPPING FOREST.

By T. HAY WILSON.

SINCE Mr. Whitaker's work on the "Geology of London" was issued, some new sections have been made in various parts of the Forest, north of Chingford, which I have been able to examine from time to time, and it has been suggested that a few notes of my observations might be of some interest to the geological members of the Club.

Section at "Copt Hall." One of these sections I was able to examine by the kindness of Mr. Jennings, the agent of the "Copt Hall" estate. It is in "Warren Wood," nearly opposite the Forest Camp, Ambresbury Banks; its position is practically indicated on the Drift Map of the Geological Survey by the letter "L." in "Loam," where a very good section has been opened. A little farther north-east, in the same wood, a good deal more gravel has been dug out, and the siftings are still there. This gravel differs from that of the neighbouring pits at "Jack's Hill," classed by Professor Prestwich¹ as "Westleton Beds" inasmuch as the pebbles of quartz and quartzite are of considerable size, and there are also large flints, some worn and others unworn. Some of the larger blocks of hard, weathered sandstone contained about 300 cubic inches. The bulk of the gravel is of well-rolled flints, and the small quartz pebbles, found at "Coopersale Common" and "Jack's Hill" (Westleton) are not plentiful. The section is about 5 feet deep, and the gravel lies in festoons, the upper part being close to the surface of the ground; the sandy matrix is reddish brown in colour, bleaching to grey when exposed.

"Earl's Path," High Beach. At the side of the "Earl's Path," between High Beach and Loughton, a large quantity of gravel has been excavated, to a depth of about 15 feet from the surface. The sandy matrix is somewhat similar to that in "Warren Wood." Quartz and quartzites of a good size are common, but not the small pebbles of the "Westleton Beds" type. Large flints of all shapes are also plentiful, and small rolled pebbles reach to the surface; they are not, however, as close together as they are lower down. The larger flints are in the lowest position.

¹ Quart. Journal Geol. Soc. May 1890, (vol. xlvi.).

"*Forest Hotel*," *Chingford*. A short distance east of the "Forest Hotel," and on the southern side of the road, a gravel pit was dug last summer. To about 6 feet from the surface the beds consist of brown, clayey-sand, with a few scattered pebbles of rolled flint. The uppermost 2 feet of this sand had weathered to a grey colour. Below this clayey-sand a good pebble-bed was found, about 8 feet thick, and of similar composition to that of the two other beds; the larger flints and drift rocks being at the lowest depth, as in the "Earl's Path" pit.

Buckhurst Hill. The gravel pits behind the "Roebuck Inn" contain only small rolled flints, without quartz or quartzite, as far as I have been able to observe; and the pits seemed to have produced nothing else but this kind of gravel since they were noted by Professor Prestwich, who refers to them as Bagshot.

The Gravel in the Forest lies very irregularly, the hollows in the London Clay which it fills varying from 1 or 2 feet to nearly 20 feet in depth. Thus, while the pit near the "Forest Hotel," at Chingford, shows about 14 feet of gravel, on the north side of the road a few yards distant water, marking the nearness of the underlying clay, is seen at a depth of 4 feet.

In the "Proceedings of the Geologists' Association," for August, 1891 (vol. xii., p. 108), Messrs Monckton and Herries in an interesting paper on some "Hill Gravels North of the Thames," call attention to the "hollows" in the London Clay, alluded to above, but I think the deeper sections to which I have referred have been opened since.

In addition to the quartz and quartzite already named, there are some pieces of grit and also of very hard black flinty rock, much worn. Mr. Clement Reid very kindly examined some of the specimens I have collected, and he is of opinion that they belong to the Northern Drift. As yet no Boulder Clay seems to have been exposed in what now constitutes the Forest district, though Mr. T. V. Holmes has found it further south at Hornchurch.² These foreign rocks of Epping Forest are similar to those in the Drift at Hatfield Heath, Chelmsford, etc., but the masses of veined quartz and hard block-flint are not quite so large.

² ESSEX NAT. (vol. vii., pp. 1-14).

THE ESSEX FIELD CLUB.

FIELD MEETING AT BROOMFIELD AND 13TH ANNUAL GENERAL MEETING,
AND SPECIAL MEETING AT CHELMSFORD.

Saturday, April 15th, 1893.

In order to fill up the time previous to the Annual Meeting in the Museum in the evening, a ramble in the neighbourhood of Chelmsford was projected, and on the receipt of Mr. Christy's kind invitation to the Club to visit him at "Pryors," our steps naturally turned in the direction of Broomfield.

The members assembled at the railway station about three o'clock, under the guidance of Mr. Durrant. Mr. David Houston was botanist, and Mr. Chancellor archæologist to the party. The route led by the alluvial meadows bordering the Chelmer, where the marsh-marigold (*Caltha palustris*) was very abundant, many plants showing their first blooms. "Our Lady's Smock" (*Cardamine*), was fully out, and in the river the yellow water lilies were throwing up their foliage leaves, while the alder trees on the banks were covered with male and female cones, intermixed with the old black fruit cones of last year. The early sedge was just exposing its brown spikes of unisexual flowers. Mr. Walter Crouch, Mr. Fitch, and Mr. Reginald Christy managed to do a little shell-hunting in the river near Bishopshall Mill. The species noted were:—*Limnæa peregra* and *L. auricularia*; *Planorbis carinatus*, *P. vortex*, and *P. albus*; *Bythinia tentaculata*; *Succinea putris*; *Sphærium corneum*, and *Pisidium amnicum*.

[On the following day Messrs. Miller Christy and Crouch obtained (besides some of the above) other species from the river, near Gutters Farm, Broomfield, including a large *Unio pictorum*, *Anodonta cygnea*, a number of *Limnæa palustris*, *Planorbis corneus*, and *Neritina fluviatilis*.]

The party regretfully left the pleasant meadows for the road leading to Broomfield, but on the hedge banks the botanists found consolation in examining the quantities of the "Crow Garlic" (*Allium vineale*). The flowers in this plant are either partially or entirely replaced by small greenish or purplish bulbs, about one-fourth inch in size, and, as it is a frequent weed in some Essex cornfields, Mr. Houston remarked that the plants were often harvested with the corn, and the strong-flavoured bulbils get ground up with the grain, so that tons of flour are frequently spoiled in this way.

Every one was pleased with the picturesque little village of Broomfield (so-called, perhaps, because Broom may have grown there, the gravelly soil being well adapted for the plant). Mr. Chancellor fully explained the structure of the church (St. Mary). It is one of the round-towered churches of Essex, and is fully described in Buckler's "Twenty-two Churches of Essex." It is probably Norman, or earlier, and much Roman tile has been used in its construction. Mr. Chancellor said that, as a diocesan architect, he had had a good deal to do with the church, and when examining it some years ago, he came to the conclusion that the original church was built by the Romans, or that a Roman building stood where the nave now stands. Portions of the walls he considered as decidedly of Roman work. The church is also interesting as being the burial-place of certain relatives of Sir John Manwood, the historian of the ancient

forest laws of the Norman kings, who lived at "Pryors," to which way was then made across the meadows.

Vegetation was especially advanced in sheltered, sunny places. The Hawthorns showed an abundance of flower-buds, and at least one fully opened spray was gathered. It was noted that the foliage on that particular flowering shoot was more like that of the Plum than Hawthorn, both as regards form and margin. Ivy-leaved Speedwell (*Veronica hederifolia*), Jack-by-the-Hedge (*Erysimum alliaria*), Stitchwort, *Arum*, Strawberry-leaved Potentilla (*P. fragariastrum*), Beaked Parsley, Ground-ivy, Goldilocks (*Ranunculus auricomus*) were a few of the plants collected. In many spots Mr. Houston found that the leaves of *Ranunculus ficaria* were covered with the "Cluster-cups" of *Uromyces poæ*, a fungal parasite, which, as its name testifies, passes part of its life in some species of *Poa* (either *P. annua*, *P. pratensis*, or *P. trivialis*). One or two examples of the "Cluster-cups" of *Puccinia perplexans* on *Ranunculus acris* were also found. The summer stage of this parasite is passed on the Meadow Fox-tail grass (*Alopecurus pratensis*).

At "Pryors," the members were most hospitably received by Mr. Miller Christy, and some time was spent over "afternoon tea," and in examining the house and its contents, including some very fine rubbings of Essex Brasses, which are pet studies of Mr. Christy.

"Pryors" is the remains of what was until recently an extremely picturesque, but moderate-sized and unpretentious Elizabethan manor-house. It is situate in the south-west part of Broomfield parish, about a mile from the church. The estate originally belonged to the Priory of Blackmore, hence the origin of its name. Upon the suppression of the monasteries, it was granted, on 17th October, 1544, by Henry VIII. to Richard Roger and Robert Taverner. After being owned in succession by William Garrard, William Eyre, father and son, Thomas Wallenger, and Edward Elliot (see Morant's "Essex," vol. ii., p. 77), the estate passed about 1590 into the possession of the Manwoods, who held it for more than a century. John Manwood, of Lincoln's Inn, counsellor-at-law, and author of a well-known work on the "Forest Laws" (London, 4to, 1592), probably built the present house. He devised the estate to his son Thomas, of Lincoln's Inn, and of Pryors, who died 20th September, 1656. He married Anne, daughter of Sir Thomas Love, Vice-Admiral in the reign of James I., and left an only surviving son John, and numerous daughters, one of whom, Love Manwood, married Thomas Cox, vicar of Broomfield, the author of many learned translations, and compiler of six vols. of "Magna Britannia," and died at the age of ninety-nine. John Manwood died 11th April, 1705, leaving a son Thomas, who died unmarried, and bequeathed the estate to Thomas, son of his sister Catherine, married as second wife to Oliver Pocklington, rector of Chelmsford. Thomas Pocklington, attorney-at-law, of Chelmsford, erected, on 26th January, 1728, a marble monument in Broomfield Church, to the memory of his ancestors, of the Latin inscription of which a translation is given by Wright in his "History of Essex" (vol. ii., p. 187). From Thomas Pocklington, or his descendants, "Pryors" was purchased, about the beginning of the present century, by Mr. Miller Christy, great-grandfather of the present tenant. From him it descended to Mr. Samuel Christy (afterwards Christie-Miller), and, on his death in 1889, it became the property of Mr. Wakefield Christie-Miller.

Until the year 1890, the house, which stands some distance back from the road, among a number of fine elm-trees, exhibited on its eastern side, a series of five antique gables, with two clusters of imposing, though rather plain, brick chimneys, four in each. The northernmost gable, which is of brick, is the most picturesque, presenting a bow window with brick mullions, carried up to the second storey. This gable, together with the chimney-stacks, and the northern

end (which shows four small original windows, now mured), are evidently the oldest portions of the house, being of Elizabethan brickwork. Most of the rest of the house is of timber and plaster, but the south face is of last century brick. In 1890, one of the large chimney-stacks and the two westernmost gables were pulled down, having become dilapidated, and the end was made good by a smaller brick addition, which has greatly marred the former picturesque appearance of the house. Running up from the road to the front of the now-removed gables may be seen traces of an old drive, which, doubtless, was once an avenue, as a row of fine elm-trees, sixteen in number, still remains on one side. The present drive runs parallel to the old at a distance of about fifty yards.

The interior of the house presents some fine old oak-work. One of the largest bedrooms is very handsomely panelled from floor to ceiling, and the kitchen is also partly panelled. In one of the downstairs rooms, too, there is a large beam encased in panel-work. The best feature, however, is the staircase and landing of solid oak, with fairly good carving on the tall square uprights, which are placed at each bend of the stairway. Though not imposing as regards size, this staircase is a very good and handsome example of its kind. The whole of this oak work, Mr. Chancellor considers to be coeval with the older portion of the house, but Mr. Christy is inclined to regard it as somewhat later—perhaps Jacobean.

The house is certainly one of the most interesting and picturesque in the neighbourhood of Chelmsford, and it is little wonder that it has long enjoyed a reputation for being haunted. The ghostly inhabitant (which has never been seen by the present tenant, who is a teetotaller) is not known to have assumed any definite shape; but the late Mr. Bott, who resided many years at Pryors, told Mr. Christy many years ago that when, or shortly before, he took the house (which was early in the present century) it had lain for fifty or sixty years uninhabited, solely because it was supposed to be haunted, hurdles being placed at the windows to allow of the ascent of the turkeys and other poultry which were kept in all the upstairs rooms.

The garden, which is probably the site of an earlier house, is surrounded by the remains of a moat.

The necessity for an early return to Chelmsford, to hold the Annual Meeting, prevented a long stay at this interesting spot, nor could Mr. T. V. Holmes' address on the Geology of Chelmsford be taken (notes of it are printed in this part of THE ESSEX NATURALIST, *ante*, p. 65). After a cordial vote of thanks to our host, a brisk walk across the ploughed fields brought the visitors back to Chelmsford for "high tea" at the "Saracen's Head."

In the evening the THIRTEENTH ANNUAL GENERAL MEETING of the Club was held in the MUSEUM, New Bridge Street, Chelmsford, Dr. Henry Laver, *President*, in the chair, and afterwards Mr. F. Chancellor.

The minutes of the twelfth Annual General Meeting, held at Loughton on March 19th, 1892, were read and confirmed.

The Secretary read the report of the Council for the year 1892 (see p. 70), and referred to the fact that that was the first meeting of the amalgamated societies, the Essex Field Club and the Essex and Chelmsford Museum.

Mr. Walter Crouch read the report of the Auditors, which showed that the amount received during the year was £208 17s. 11d. There is about £50 outstanding for subscriptions. The amount spent was £191, and the adverse balance of £113 6s. 9d. with which the year commenced had been reduced to £95 13s. 10d. The assets and liabilities account showed assets of £171 over liabilities.

The Report and Statement of Accounts were received and adopted.

Mr. J. C. Shenstone and Mr. Cook were nominated as scrutineers of the ballot for the election of officers.

At the meeting on February 21st, the following members were announced as retiring from the Council: Messrs. E. N. Buxton, F. C. Gould, Rev. W. L. Wilson, the Right Hon. Lord Rayleigh, and Mr. Edmund Durrant (*on nomination as one of the Librarians*).

To fill the seats so rendered vacant, the following members were proposed for election into the Council: Rev. R. E. Bartlett, Mr. C. E. Benham, Mr. E. N. Buxton, Right Hon. Lord Rayleigh, and Rev. W. L. Wilson. No other candidates having been proposed, these five gentlemen were consequently declared to be elected.

Under the circumstances explained at the Ordinary Meeting on March 14th (*ante p. 45*), the Council had nominated Mr. F. Chancellor for the office of President.

The scrutineers reported that the following members had been unanimously elected as officers for 1893: *President*, Mr. Frederic Chancellor; *Treasurer*, Mr. Alfred Lockyer; *Hon. Sec. and Editor*, Mr. W. Cole; *Hon. Assistant Secretary*, Mr. B. G. Cole; *Hon. Librarians*, Mr. Edmund Durrant and Mr. A. P. Wire.

It was also announced that on retirement from the Presidency, Dr. H. Laver became one of the *Permanent Vice-Presidents* of the Club under rule V.

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

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

PRESIDENT.—Frederic Chancellor, J.P., F.R.I.B.A., &c.

PERMANENT VICE-PRESIDENTS (*Under Rule IV.*).—Prof. R. Meldola, F.R.S., F.R.A.S., F.E.S., &c. (*President*, 1880-82); Prof. G. S. Boulger, F.L.S., F.G.S. (*President*, 1883-84); T. V. Holmes, F.G.S., M.A.I. (*President*, 1885-87); E. A. Fitch, J.P., C.C., F.L.S., F.E.S. (*President*, 1888-91); Dr. Henry Laver, F.L.S., F.S.A. (*President*, 1892).

OTHER MEMBERS OF COUNCIL.—John Avery; Rev. R. E. Bartlett, M.A.; C. E. Benham; Gen. B. R. Branfill, J.P., C.C.; E. N. Buxton, J.P., Aldm. C.C., D.L., &c.; Miller Christy, F.L.S.; Walter Crouch, F.Z.S.; Bryan Corcoran; L. Cranmer-Byng; George Day, F.R.M.S.; F. W. Elliott; A. J. Furbank; Andrew Johnston, Chm. C.C., J.P., &c.; Rev. W. C. Howell, M.A.; Rev. W. S. Lach-Szyrma, M.A.; Thomas J. Mann; Charles Oldham; J. H. Porter; Right Hon. Lord Rayleigh, F.R.S.; J. C. Shenstone, F.R.M.S.; J. C. Thresh, D.Sc., M.B.; F. H. Varley, F.R.A.S.; T. Hay Wilson; Rev. W. L. Wilson, M.A.

HON. TREASURER.—Alfred Lockyer.

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

HON. LIBRARIANS.—Edmund Durrant and A. P. Wire.]

The nomination of *Vice-Presidents* by the President, under Rule III., was postponed.

The amalgamation of the Essex and Chelmsford Museum with the Essex Field Club having been effected (in accordance with resolutions passed by the Council of the Club and the Committee of the Museum under the powers conferred by the Agreement for Amalgamation), members of the Museum for 1892 thereby became members of the Essex Field Club. Mr. Edmund Durrant read out the names of the ladies and gentlemen so admitted as members of the Club, and it was announced that the list of members would be, in future, made up annually in

June, and that the members of the Museum would be printed in that list as members of the Club.

Mr. Chancellor thanked the members for electing him as President, and proposed a vote of thanks to Dr. Laver and to the officers of the Club. This was seconded by Mr. J. C. Shenstone and carried unanimously.

Dr. Laver returned thanks on his own behalf and on behalf of the other officers.

The meeting was then made a SPECIAL one, for the consideration of some additions to and alterations in the rules.

The Hon. Secretary explained the alterations and additions of and to the rules which had been most carefully made by a small Sub-Committee and by the Council, and which were rendered necessary by the amalgamation of the two societies. Proofs of the new rules were placed in the members' hands.

[*The principal additions were the incorporation of the stipulations contained in the Agreement for Amalgamation passed at the Special Meeting, held on January 31st, 1891, and printed in THE ESSEX NATURALIST, Vol. IV., pp. 236—241, and the establishment of a class of Associates, limited in number, elected by the Council on the recommendation of the members, paying a smaller subscription. The alterations are, that the subscription for new members shall be not less than 15s. per annum, to include THE ESSEX NATURALIST (the subscription for new members after the amalgamation now stands at £1 1s.); the change of date of Annual Meeting from January to March; a modification of the mode of nomination of the officers; and consequent additions and alterations.*]

An amendment by Mr. Avery to the effect that retiring members of the Council should stand for re-election without re-nomination, was, by permission of the meeting, put to the vote, but was lost, and the rules, as altered and added to, were passed *nem. con.*, and ordered to be distributed to the members as the rules of the Club.

On the resumption of the ordinary business of the meeting, Mr. Edmund Durrant, the Secretary for thirteen years of the Essex and Chelmsford Museum, exhibited a portrait in oils of the founder of the Museum, the late Mr. Thomas Clarkson Neale, formerly governor of the county gaol. The portrait was lent by Mr. Neale's daughter, who is still living in Chelmsford. Mr. Durrant alluded to the way in which the deceased gentleman started the institution and the good work he did. He was connected with it from 1828 to 1862, and was Hon. Secretary for nearly a quarter of a century. His views as to the functions of a local Museum were evidently somewhat in advance of his time, but Mr. Durrant expressed a hope that under the care of the amalgamated societies the old Essex and Chelmsford Museum "would take a new lease of life, and before long realise the intention of its founder by becoming one of the best natural history and scientific museums in East Anglia."¹

Mr. Durrant also exhibited, on behalf of Master Vigne, the eldest son of Mr. Vigne, of Writtlewick, a very curious nest, constructed by mice. Last autumn a string of chestnuts—beloved of boys—was left in a basket in an aviary in the garden, and recently it was found that the string had been cleverly disintegrated

¹ A very interesting article by Mr. Durrant on the foundation and early history of the Museum appears in "The Essex Review" for April (vol. ii., pp. 113—118). As soon as the amalgamation is legally completed we hope to publish an account of the Museum and the Club, with full details.—ED.

“SPECIAL MEMOIR” SERIES OF THE ESSEX
FIELD CLUB.

PRELIMINARY ANNOUNCEMENT.

The Council intend to publish shortly, by Subscription, a work to be entitled

THE
MAMMALS, REPTILES, AND FISHES OF ESSEX :
A CONTRIBUTION TO THE NATURAL HISTORY OF THE
COUNTY.

(*Forming Volume III. of the Special Memoirs of the Essex
Field Club.*)

By HENRY LAVER, M.R.C.S., F.L.S., F.S.A., &c., *Vice-President
of the Essex Field Club.*

This work, in conjunction with Mr. Miller Christy's "Birds of Essex," issued in 1891, as Vol. II. of the "Special Memoirs," will afford a complete and valuable guide to the Vertebrate Fauna of the county.

The "Mammals, Reptiles, and Fishes of Essex" will be published in Demy 8vo. form (uniform with the other publications of the Club), well printed on superior paper, and handsomely bound in scarlet cloth. The price of the volume will probably be 7s. 6d.; to Subscribers, 5s.; and to Members of the Club, 4s.; but these quotations are subject to revision.

Full particulars and Prospectuses will shortly be issued.

The "BIBLIOGRAPHY OF ESSEX," which will probably form Vol. IV. of the "Special Memoir" Series, is now in active preparation.

March, 1893.

THE ESSEX FIELD CLUB.

LOCAL (ESSEX) MUSEUM AND LIBRARY, NEW LONDON ROAD, CHELMSFORD.

THE Establishment of a truly LOCAL MUSEUM has always been a leading idea with the Club, and towards that end many specimens have been collected. The Essex and Chelmsford Museum is now incorporated with the Club, and contains many specimens of considerable interest and value. The Museum has been in existence since 1828, and has done excellent work. The Club is, therefore, now in a position to establish a really useful Museum, to contain authentic collections to illustrate the Geology, Mineralogy, Botany, Zoology, Ethnology, Pre-historic Archæology and Technology, etc., 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.

Chelmsford has been chosen as the site of the principal Museum and Library, being the County Town and occupying a central position in Essex, but it is hoped that loan and temporary collections may be arranged for in other localities in the County. Funds are now being raised to build and fit up rooms worthy of the comprehensive scope of the Museum and Library.

DONATIONS OF SPECIMENS AND COLLECTIONS OF A LOCAL (ESSEX) CHARACTER are invited. They should be sent at present to Mr. W. Cole, *Hon. Sec. and Director*, care of Mr. Edmund Durrant, 90, High Street, Chelmsford. A letter should precede the donation, and the Council reserves to itself the right to refuse any unsuitable specimens.

The fullest details should be given of the locality, finder, and other precise information about each specimen, for insertion in the Register.

The Director will be glad to give any instructions in his power to those proposing to collect for the Museum.

The Club already possesses a very considerable LIBRARY, consisting of books, MSS., prints, photographs, etc., appertaining in any way to the County of Essex, and also of scientific, antiquarian, topographical, and other literature, and every effort is being made to enlarge it and increase its usefulness. The Library is for the use of the members only, and such visitors as may be admitted under the regulations of the Librarians.

DONATIONS OF BOOKS, prints, maps, etc., of the classes above indicated should be sent, at present, to either of the Librarians, Mr. Edmund Durrant, 90, High Street, Chelmsford, or to Mr. A. P. Wire, at the Quarters of the Club, 8, Knighton Villas, Buckhurst Hill, Essex.

The
Essex Naturalist:

BEING THE
 JOURNAL
 OF THE
 ESSEX FIELD CLUB.

EDITED BY
 WILLIAM COLE,
Honorary Secretary.

Contents.

	PAGE
The Essex Field Club. Field Meeting at Broomfield and 13th Annual Meeting, and Special Meeting at Chelmsford, Saturday, April 15th, 1893 (<i>concluded</i>)	81
Two Forest Lodges. By WILLIAM CHAPMAN WALLER, M.A., F.S.A. (<i>With Plate I., and two illustrations</i>)	82
Geological Notes in the Neighbourhood of Ongar, Essex. By HORACE W. MONCKTON, F.L.S., F.G.S.	87
The Essex Field Club. Field Meeting and 139th Ordinary Meeting at Ilford, Saturday, April 29th, 92; Field Meeting at Chingford, Bury Wood, Sewardstone, etc., May 13th (<i>with illustration</i>), 95; Excursion to Bicknacre, Danbury, and Maldon, June 17th (<i>with two illustrations</i>), 99; Field Meeting at Barkingside and Wanstead, July 1st, 104; Water Excursion on the River Stour, through the Vale of Dedham and "Constable's Country," July 29th (<i>with three illustrations</i>)	107
John Constable as a "Naturalist." By CHARLES E. BENHAM	112
On the Gravels near Barking Side, Wanstead, and Walthamstow, Essex. By HORACE W. MONCKTON, F.L.S., F.G.S.	115
Testacella Scutulum, Sowerby. (<i>With illustration</i>)	120
Notes—Original and Selected. Otters breeding in the open at Brightlingsea; Otters near Brightlingsea; Reported occurrence of a Seal (? sp.) near Walton-on-Naze; Ornithological Notes from Mistley; the Brightlingsea Heronry; Cormorant at Brightlingsea; Ruff (<i>Machetes pugnax</i>) near Thorrington; <i>Colias edusa</i> in South Devon; Entomological Notes from Mersea; Scarcity of Lepidoptera; A Butterfly on the War-path; <i>Geometra papilionaria</i> in Epping Forest; <i>Abraxas ulmata</i> and <i>Brepbos parthenias</i> in Epping Forest; <i>Plusia moneta</i> at Woodford; a Noctua new to Essex; Lepidoptera at Woodford; Additions to List of Lepidoptera of Epping Forest district; <i>Eucalyptus</i> flourishing in the open in Essex; the "Canker-Bloom" of Shakespeare; Drift Rocks in Epping Forest; Ancient Pottery at Clacton-on-Sea; Romano-British Urn at Willingale-Doe; an ancient Pit at Little Dunmow; Chigwell Moat; the Joslin Museum; a Harmless Mnemonic	pp. 123-131
Ancient Entrenchments at Uphall, near Barking, Essex. By WALTER CROUCH, F.Z.S. (<i>With three illustrations</i>)	131
The Essex Field Club.—Joint visit of the Club and the "Sette of Chelmsford Odde Volumes" to Castle Heddingham, August 2nd, 138; Visit to the Deneholes in Hangman's Wood, in conjunction with the Geologists' Association, August 11th and 12th	143

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

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(Founded January 10th, 1880.)

[With which is incorporated "The Essex and Chelmsford Museum," established October 7th, 1828.]

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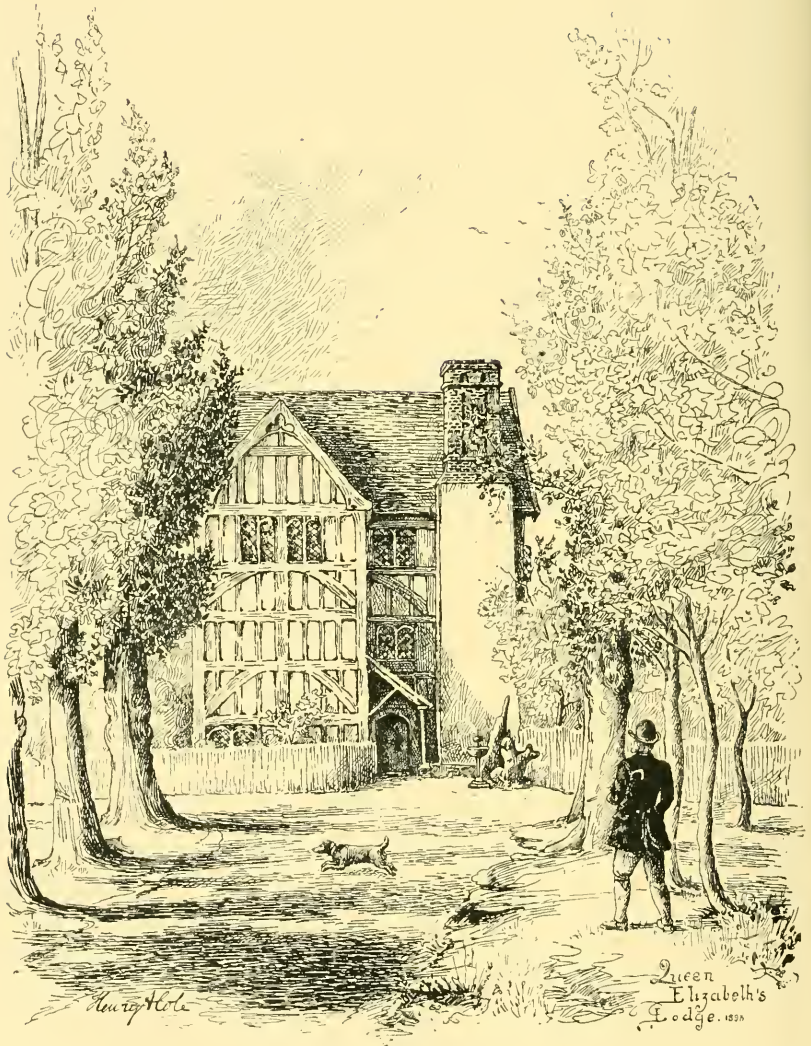
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NEW LONDON ROAD, CHELMSFORD.



QUEEN ELIZABETH'S LODGE, EPPING FOREST,
LOOKING NORTH.

Drawn by Henry A. Cole, June, 1873.

after the manner of oakum-picking by a family of mice, and utilised as a domicile, and the chestnuts had served as food through the winter, only two remaining.

Dr. Laver said that the nest was the most curious one he had ever seen, and a picture of it should be published. He had seen a good deal of oakum-picking (laughter), but had never met with a better example of that useful art.²

On behalf of Mr. E. A. Fitch, who was unfortunately compelled to leave the meeting early, Mr. Walter Crouch exhibited a few marine forms from the River Crouch, being two living examples of the beautiful sea-anemone, *Actinia mesembryanthemum*; some pretty varieties of the voracious tingle, *Purpura lapillus*; a few large *Modiola modiolus*, or cock-mussel; a specimen of the small cockle, *Cardium exiguum*; and some live oyster-spat deposited on glass, which might safely be pronounced as tame, having been carefully watched for nearly a year. These, and other specimens which were received by Mr. Crouch some weeks ago, had been captured by the indefatigable John Bacon, whose recent haul (on Easter Monday) of six adult specimens of *Homo insapiens*, capsized at Cricksea Hole, and the loss of some of the party, will probably be within the recollection of many members.

Mr. Walter Crouch also exhibited a fine photograph of our late hon. member, Sir Richard Owen, K.C.B., F.R.S., etc.—an excellent portrait, taken about six years ago; also some engravings and prints of other portraits; views of his house and plan of the garden at Sheen Lodge; of the whale vertebra seat, library, and the clock on the staircase, formerly belonging to Dr. Hunter. He also showed a photograph of the two altar-tombs in Wanstead Churchyard to the memory of some members of the old Huguenot family of Froyssell, from whom the late Professor claimed descent on the maternal side.

Mr. Crouch mentioned that the Owen Memorial Fund, to which the Club had made a contribution of three guineas, had now reached over £900, the proposal being to erect a marble statue in the British Museum of Natural History, and also, if possible, to issue a complete bibliography of his numerous contributions to science. A biography is also in course of preparation, which will be written by his grandson, the Rev. R. Owen, and Mr. E. Davies Sherborn, F.G.S. The latter had for some time before Sir Richard's death been arranging and cataloguing his letters (some 20,000 in number) and papers.

Dr. Laver having vacated the chair in favour of Mr. Chancellor, who assumed the office of President amid applause and some congratulatory words from the retiring President, Dr. Laver delivered his address, "Periodicity in Organic Life," showing that animals have periods of abundance and rarity, and that this is not due to meteorological causes nor to the agency of man.

Mr. Chancellor proposed and Mr. Crouch seconded a hearty vote of thanks to Dr. Laver for his extremely interesting and instructive paper, which is printed in full in THE ESSEX NATURALIST (*ante* pp. 51-64).

This brought the first meeting of the amalgamated societies to an end.

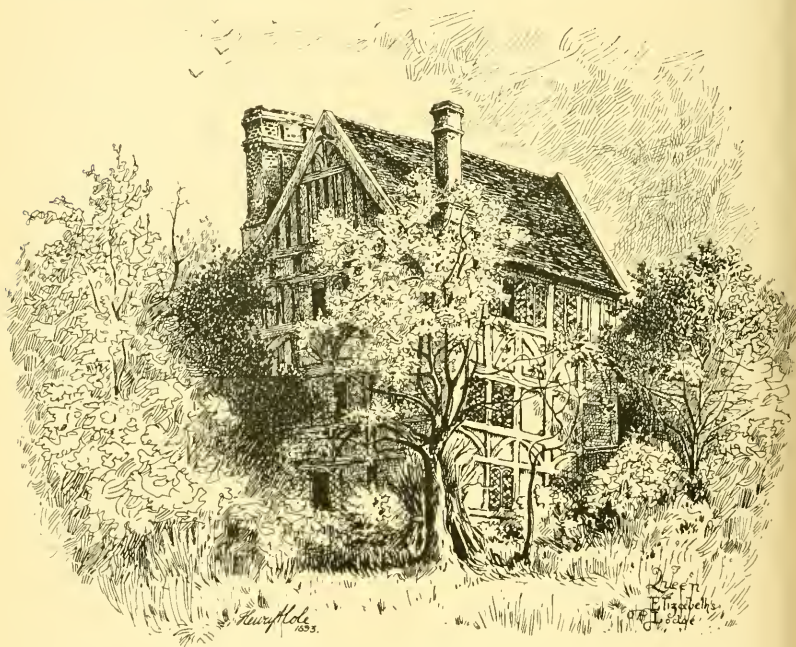
² Master Vigne has very kindly presented this interesting nest to the museum of the Club.

TWO FOREST LODGES.

By WILLIAM CHAPMAN WALLER, M.A., F.S.A.

[*Frontispiece Plate 1.*]

ON June 12th, in the thirty-first year of Elizabeth, by the grace of God, Queen, and in the year of our Lord 1589, there issued out of the Exchequer a Special Commission¹ to her well-beloved Robert Wrothe, John Hyll, Francis Stonerde, Francis Stacey, and William Rowe, Esquires, with whom was associated



QUEEN ELIZABETH'S LODGE, CHINGFORD, LOOKING SOUTH.

Drawn by H. A. Cole, June, 1893.

Edward Ellyott, Esquire, the surveyor of all her Majesty's honours, castles, lordships, manors, lands, tenements, and hereditaments in her county of Essex; whereby they were empowered to survey and examine two houses in Waltham Forest. Of these, one was called

¹ Excheq. Special Commissions: 834 (31 Eliz.).

Greate Standinge, and is described as standing in or on Dannetts Hill; the other, called the Lodge, is said to be situated in "le Neue lodge walke," in the parish of Waltham Holy Cross.

The Commissioners' instructions were to inquire, in every way they were able, into the condition of the houses and the necessary costs of repairing them; and their report was to be delivered, written on parchment, and with as little delay as possible, to the Barons of the Exchequer at Westminster.

A quorum of the Commissioners made the survey, and their report, dated June 23rd, 1589, was delivered into Court on November 11th in the same year. Though this document is unfortunately in a somewhat decayed condition (as is indicated by the *lacune*), enough remains legible to make a transcript of it worth printing:—

The Certificate of Robt Wroth John Hill ffiranc
 esquiers Comissioners amongst others assigned by
 her hignes Court of Exchequire bearing date
 . her ma^{ts} reigne to Survey & veiwe
 upon Dannetts Hill in Waltham Forest
 Walt in the parish of Waltham w^t in the forest
 want of Reparacions of the saide houses
 By vertue of which Commission
 . . knowledge as by the opinions of

The great [lo]dg upon Dannet Hill being built
 cheife roomes or Stories in height The first whereof
 serving for necessarie Uses. The second
 for convenient standing to viewe the game (?). The Th[ird]
 serveth likewise for convenient standing to view the game (?).
 And the height Is f

Walles and	{	Lyme 3 loades at xvijjs the load w ^t car .
about the howse . . . . .		. care ^{xx} iiij bushel
to be plastered . . . . .		. . . . . loades wt
mended with		Lath x bund . with
		Lath . ailes 5000 (?)
		Workmanship
		Lome 3 loades

Penthouses will require	{	Inch bord (?) Oke
		Cost for every price and for caridg vj
		nailes for this work 4000
		Eves timber to the same pent house 2 load
		at xvj . viij the load xxxij
		Quarter to be used under the Pent house
		making the pent house and bordering for
		ye ij. xvjs. viijd.

Men[d]ing the roof and kovering the same with tyle will require	{ Tyles, 5000 at xj . . .	lxs.
	{ ridge tyles 60	
	{ lyme one load with caridg	
	{ tyle pins, one bushell	xvjd.
	{ lath x bundles with	xiijs. iiijd.
	{ lath naile, 5000	
	{ Workmanship of the tyler to ripp up the old t[yles] over the house and to lay them again and also the newe	

There is a chimney of lome must needs be taken down because it annoyeth greatly And the building of a newe with repairing the Oven will cost in	{	Brick Lyme, Sand, Workmanship and scaffolding	1

Windows and flowers to be mended.	{	Iron hinges for the windows, 5 paire, xs., mending the broken windows and flow- re in diverse places xiijs.	xxiijs. iiijd.
		iiijd.	

ffencing work	{	There is a Court compassing the said lodge wch. hath ben pailed and is decayed but we think it fytt the same were ditched and sett wt. quick sett the charges whereof will amount to	xl.s.

The other house or keeper's lodge scituate in the new lodge walke being built of tymber but after the ordinary manner consisteth of two low Romes at the gronde with two roomes of chambering over them conteyneth in length 46 feete in bredth 16 and in height
[*blank in original*]

One peece of tymber to hold up the
Loyne Roofe with the quarters and work-
manship at y^e sowth-west end of ye howse
xs.

Some laths and workmanship there
xs.

new tyles 2000 wt. caridg	xxiijs.
Lyme halfe a load with caridg	ixs.
Lath 4 bundells with caridg	vs. iiijd.
Lath nailes 2000	ijs. viijd.
Eves board for the whole howse	xijs. vjd.
Sixpenny nails 200	xijd.
tile pins halfe a bushell	viijd.

Rafters for the wings decayd at the Est end of the house with workmanship thereof	vjs. viijd.
Brickes for mending the harth of the chimney and under- pinning the howse in diverse places wt. workmanship	xs.
Total	xlv li. xvijs.

In testimony of the premisses the said Commissioners have hereunto sett their handes and seales the xxiiijth day of June in the xxxjth yeere of the reigne of our sovereigne Lady Elizabeth by the grace of God Queene of England ffraunce and Ireland, defender of the faith, etc.

Robert Wrothe. John Hill. frauncis Stonard. fransye Stacy.

[*Endorsed*] Delivered into Court November 11, 31 reg., by the hand of John Hickes, and oath made.

With regard to these two lodges, I incline to think that the one called The Great Standing may be identified with what we now know as Queen Elizabeth's Lodge. For it does not appear that any other considerable lodge ever stood on high ground between the Roding and the Lea; and the ancient description tallies sufficiently well with the structure as we know it. Moreover, supposing that the very thorough repairs indicated were carried out during the Queen's reign, that circumstance, even apart from her actual presence, might conceivably lead to the association of her name with the building. But, according to Mr. Fisher,² the Queen, when hunting in the Forest, did resort thither. Elsewhere³ he notes that the roof of the lodge appears to be of earlier date than the reign of Elizabeth—a point in my favour, since the lodge mentioned in the Commission would seem, from its then condition, to have been in existence considerably more than thirty years. Again in the Forest Rolls of Henry Seventh's time,⁴ in which lists of the woodwards (some thirty in number) are given, we find one of these officers in charge of Danherst or Danhurst, and his name is usually, if not always, found next to that of the woodward of Chingford Hawe, or Halke. And, just about a century later on (1590) an Attachment Roll⁵ furnishes a like list. In this, under the heading "Chincford Walke," we find set down "William Wagner,

² The Forest of Essex: p. 197.

³ *Ibid.*, p. 94 (Note).

⁴ D. of Lanc., Class xxv. F. 17. k.

⁵ B. M. Rot. Harl. CC. 13 (32 Eliz.).

woodward of Danetts hills and Chingford Haurke." A much earlier roll⁶ is unfortunately imperfect, having apparently been cut off just below the name of the fourth woodward in Waltham Half Hundred. My suggestion, then, is that Dannetts is merely a variant from the earlier Danhurst; and that Danhurst was once the name of a part of the Forest between Chingford Halk (Hawk Wood) and Buckhurst Hill. I can only hope that this suggestion will lead to the production of evidence either in its favour or conclusively against it. And such may well exist among the Heathcote archives or elsewhere.



FAIRMEAD LODGE, EPPING FOREST, WITH OLD OAK.

Drawing by H. A. Cole, June, 1893.

The second lodge may, I think, be safely identified with that indifferently known as Fairmead or Sotheby's, near High Beach, mention of which was made in a recent article in *THE ESSEX NATURALIST*.⁷ The Standing also there mentioned seems to have been always a copyhold of Loughton Manor, and there is no reason to think that it was ever a Forest lodge.

⁶ B. M. Rott. Cott. xiii. 5. (24 Hen. III.)

⁷ E. N., vi. 206.

GEOLOGICAL NOTES IN THE NEIGH- BOURHOOD OF ONGAR, ESSEX.

By HORACE W. MONCKTON, F.L.S., F.G.S.

THE following notes were made during the years 1887-88-89-90, during which I had numerous opportunities of exploring the country round Ongar when on visits to my kind friend, the late Mr. A. H. Christie. One of the most interesting sections, and one which I visited many times, is the sand pit, five furlongs south-east of Chipping Ongar Castle, and three furlongs south of High Ongar Mill. It was described by Mr. S. V. Wood in 1883 as a pit in Bagshot Sand.¹ Mr. Penning, who mapped the district, considered that the sands belonged to the Glacial Gravel Series, and it is mapped accordingly.

In Whitaker's "Geology of London," vol. i. (1889), it is referred to on page 276 as a sand pit at High Ongar, and on page 314 as a pit nearly a mile south-east of Chipping Ongar Station. Mr. Whitaker considers it to be Glacial Drift made up of Bagshot Sand.

The section when I first saw the pit was as follows :—

1. Dark reddish earthy clay with numerous bits of broken flint, small pebbles of flint and quartz, and some pebbles of old rock, 2 feet to 7 feet.
2. Yellow and white sand stratified in a very irregular manner and broken up by numerous small faults. In one place the sand included a small patch of red clay, 4 feet to 5 feet.

The sand bed extends from about 175 to 150 feet above ordnance datum level, and there are small sections in it at various levels on both sides of the road from High Ongar to Hallsford Bridge. I agree with Mr. Whitaker that the sand is derived from the Bagshot Beds, and that it is not Bagshot Sand *in situ*. I am inclined to think that the following is its true history. There was a time before the coming of the Boulder Clay when the Bagshot Beds extended over all this part of the country. Through them and the underlying London Clay the River Roding cut its valley, and the sands of the High Ongar sand pit are the remains of a landslip which occurred in the Roding Valley before the period of the Boulder Clay. Subsequently the Bagshot Beds have been worn and denuded back as

¹ Trans. Essex Field Club, vol. iv., p. 76.

far as Kelvedon Hatch, and this little slipped patch alone remains protected by the sides of the valley and the Boulder Clay.

I shall return soon to the gravels of the Roding Valley, but I must first say a word or two about the high level gravels, and I will first take the hills on the west which are a part of the Epping Ridge and are capped with gravel at Coopersale Common and Gaynes Park Wood. It has been described as Pebble Gravel by Mr. S. V. Wood and the Geological Survey² and as Westleton Shingle by Prof. Prestwich,³ who is scarcely correct in speaking of Coopersale Common as a range of hills distinct from the Epping hills. It is all part of one crescent-shaped ridge as I have already pointed out.⁴

I noted the following section at Coopersale Common:—

1. Clay, in places very like London Clay, but sometimes mottled, and always containing many small stones and fragments of flint, thickness up to 4 feet.
2. A mass of pebbles and small quartz grit and sand usually of a greyish colour, but sometimes mottled red and grey, 5 feet.

Bed 2 consists mainly of flint pebbles, but subangular flints and pebbles of quartz of $\frac{1}{2}$ inch or more in diameter are found without difficulty. I found some small bits of white cherty stone, some fragments of ironstone, and a very small red pebble, probably a quartzite. I consider this gravel to be a good example of the pre-glacial pebble gravel of this district, and it seems to have been very little disturbed during glacial times.

On the opposite side of the River Roding is the plateau of Kelvedon Common, and it is capped in places by patches of gravel. They have been described as Bagshot Pebble Beds by Mr. S. V. Wood,⁵ and are to some extent mapped as such by the Geological Survey.

I noted the following sections:—

Gravel Pit one furlong N.W. of Dudbrook House. Level 308 feet O.D. Gravel (not mapped) 5 feet or more thick, not stratified, of a reddish colour or mottled yellow and red; in some places a little clayey sand. Mainly flint pebbles, but there are a good many subangular flints and a few quartz pebbles up to $\frac{1}{2}$ inch diameter.

² Quart. Journ. Geol. Soc. (1868), vol. xxiv., p. 467; Whitaker's "Geology of London (1889), vol. i., p. 294.

³ Quart. Journ. Geol. Soc. (1890), vol. xlvi., p. 136.

⁴ ESSEX NAT. (1890) vol. iv., p. 200; Proc. Geol. Assoc. (1891), vol. xii., p. 110.

⁵ Quart. Journ. Geol. Soc. (1868), vol. xxiv., p. 466.

Gravel Pit by the high road, nearly three furlongs south of "Bryces." 333 feet O.D. Gravel (not mapped). The section is five feet deep and shows beds of sand with scattered pebbles—masses of pebbles, many on end. Masses of mottled reddish sand and clayey sand. The whole without a sign of stratification. The stones are mainly flint pebbles, but there are a good many subangular flints and few small quartz pebbles and some flints very little water-worn.

The pebbles in these gravel patches are most probably derived from pebble beds of Bagshot age. The subangular flints probably came from the south, brought by streams or rivers, or they may be relics of a very old submergence. Even if we do not believe in a submergence at the time of the deposition of the Boulder-Clay, there is every probability that the sea covered the south of England during some part of the long time which elapsed between the Bagshot Period and the Glacial Period, and during that submergence many a foreign rock or pebble may have been scattered over the sea bottom. In this way I account for the presence of the quartz boulders which I found in the Berkshire plateau gravels and for the foreign rocks described from the same gravels by Mr. Shrubsole.⁶

The presence of unworn flints and the absence of stratification lead me to believe that the gravels at Dudbrook and Bryces were much disturbed and the materials rearranged in Glacial times. Perhaps it is most correct to call them rearranged pre-glacial gravels.

There is, I believe, a patch of this rearranged pre-glacial gravel on Norton Heath.⁷ I did not see a very good section, but there seemed to be a good deal of quartz and many unrolled flints in the gravel. Level about 320 feet O.D.

Near Chiver's Paun Manor House, on the south of Norton Heath, there is a large gravel pit. The gravel is over 6 feet thick and glacial erratics are very abundant.⁸ The place is mapped "Hill gravel of doubtful age," but I fail to see why it should not be called Glacial gravel, for I have no doubt it is of Glacial origin.

At Nine Ashes I saw a small pit in gravel of flint pebbles, subangular flints, and quartz; there was, however, no good section. (Mapped loam.⁹)

6 Quart. Journ. Geol. Soc. (1892), vol. xlvi., p. 34, and (1893), vol. xlix., August number.

7 Whitaker, *op. cit.*, p. 276.—Mr. Penning's notes.

8 Monckton and Herries, Proc. Geol. Assoc. (1891), vol. xii., p. 110.

9 Whitaker, *op. cit.*, p. 297.—Mr. Bennett's notes.

At Stondon Massey there are very fine sections in gravel¹⁰ between Stondon Hall and the church. The gravel coats the hill and is very thick, and consists largely of flint pebbles. There is also a large proportion of subangular flints, and of small quartz pebbles, half or one inch in length. Glacial erratics in the shape of quartzites and quartz pebbles are common, and many are of large size. At the lower end of the pits there was in 1890 a section 14 feet deep, showing gravel with irregular sandy and clayey patches in places.

The gravel pit marked on the Geological Map, near Paslow Hall Farm gave the following section :

1. Mottled red and blue clay with small stones, and here and there irregular patches of small gravel=Boulder-Clay.
2. Gravel of subangular flints, flint pebbles, black unworn flints, quartz blocks up to $4\frac{3}{4}$ inches in length, quartzites up to $6\frac{1}{2}$ inches in length=Glacial Gravel.

The gravel here is remarkably like that in the pit at Chiver's Paun Manor House and at Stondon Massey already alluded to, that is one reason why I believe they are all Glacial Gravel.

The Cripsey Brook has, as will be seen from the map, cut through the Boulder-Clay and exposed the underlying Glacial Gravel. I noted a series of sections along it, of which the following are the details :—

Gravel Pit, five furlongs W. of Little Laver Church, 217 feet O.D. Three feet of gravel shown, composed of flint pebbles, subangular flints, and quartz pebbles, with many pebbles of quartzite. This gravel is of the character of Glacial Gravel, the pit is just below, east of, the patch of gravel which is mapped Glacial Gravel in sheet 1, and Plateau Gravel in sheet 47.

Moreton, three furlongs N.W. of the Church, small gravel working by the roadside. 200 feet O.D. Gravel six feet thick, composed of quartz, quartzite, flint pebbles, and sub-angular flints. Mapped Glacial Gravel.

*Shelley, Gravel Pit north of Shelley Bridge. 175 feet O.D.*¹¹

1. Earthy Bed with many stones.

¹⁰ Whitaker, *op. cit.*, p. 314.—Professor Dawkins' and Mr. Bennett's notes.

¹¹ Whitaker, *op. cit.* p. 314.—Professor Dawkins' notes.

2. Gravel roughly stratified, composed of flint pebbles and subangular flints with some large unworn flints, many small quartz pebbles and a few pieces of large quartz, one three inches in longest diameter, also a little chert and ironstone.

Gravel pit close to Greensted Church. 219 feet O.D.¹²

1. At one place there is a patch of red clay $1\frac{1}{2}$ feet thick, and at another 2 feet of grey clay. Boulder Clay.
2. Well stratified gravel, 6 feet seen. Glacial Gravel.

The gravel is composed of flint pebbles, subangular flints, a little quartz, some fragments of ironstone and chert. I could not find quartzites or quartz blocks, or other glacial erratics.

Pit in field 3 furlongs north-west of Greensted Church, near Old Barn, 240 feet O.D.

Gravel, 4 feet, very like the Westleton Shingle of Cooper-sale Common at first sight, being of a greyish-white colour, very clayey.

Composed as follows :

Flint pebbles, very large proportion, many three, some four inches in length.

Subangular flints, several *in situ*, low down in the section, and on the heaps.

Quartz, very little, largest pebble one inch long.

I could find no glacial erratics.

The gravel at Greensted differs from that described at Laver, Moreton and Shelly Bridge in the greater abundance of flint pebbles, and in the scarcity, or perhaps absence, of erratics. The reason, no doubt, is that it is mainly derived from the Pre-Glacial pebble gravels of the neighbourhood ; indeed, if, as I suspect, the Roding Valley had been partially excavated before the Boulder Clay period, it is quite possible that some of the Greensted gravel may be pre-glacial.

Gravel Pit west of the Lake in Navestock Park, about 140 ft. O.D. Whitaker, *op. cit.*, p. 314 ; Mr. Woodward's notes. Gravel, seven feet of a yellow colour with some colourless patches, coarse sand in places, roughly stratified and in one place contorted. The gravel is composed of flint pebbles and subangular flints in about equal proportion, quartz pebbles up to half an inch in length occur.

I did not find erratics here, but further search is required. I

¹² See Whitaker, *op. cit.*, p. 314.—Professor Dawkins' notes.

may, however, safely say that erratics are very much more abundant at Chiver's Paun, Stondon Massey, Paslow Hall Farm, and at the localities I have described along the Cripsey Brook than at Greensted or Navestock Park.

At Marden Ash there were some very good sections in Boulder Clay, one of them two furlongs N.W. of Marden Ash House, at a level of 200 feet O.D., showed three feet of very white and chalky Boulder Clay, containing pebbles of chalk and unworn flints, one of these latter being eight inches long. I also noted a large broken flint over one foot long, shells of *Gryphaea* and small quartz pebbles.

The question whether the valley of the River Roding is Pre-Glacial or not has given rise to some discussion.¹³ On the whole I am inclined to think that to a certain extent it is. There are a most pleasing number of footpaths in the fields round Ongar, and I have therefore been able to explore the boundary of the Boulder-Clay as mapped very carefully, and it seems to me that the Boulder-Clay shows a tendency to descend into the valley to a certain extent on both sides of the river from Abridge to Ongar. Thus, at Theydon Bois the Boulder-Clay runs down the slope from 254 ft. O.D. to 160 ft. O.D. ; near Shonks Mill it comes down to about 150 ft. O.D. on both sides of the river, and at Marden Ash the bottom of the Boulder-Clay is about 190 ft. O.D. Above Ongar there is nothing to show whether the Roding follows the course of an old Pre-Glacial stream or not, for the glacial deposits have not been cut through by the modern river.

THE ESSEX FIELD CLUB.

FIELD MEETING AND 139TH ORDINARY MEETING AT ILFORD.

Saturday, April 29th, 1893.

On this afternoon an excursion was made in the neighbourhood of Ilford, under the guidance of Mr. Walter Crouch, F.Z.S., Vice-President. The other directors announced on the programme were Mr. F. C. J. Spurrell, F.G.S., and Mr. T. G. Holmes, F.G.S., V.P., but both these at the last were unable to come.

Starting from the station about 2.40, the members proceeded to Uphall, where Mr. Crouch pointed out the site of the famous pits, which have now for some years been worked out and levelled. Here he gave an account of the interesting remains of the mammals found in the brick earth, of Pleistocene age,

¹³ Whitaker, *op. cit.*, pp. 366-7.

taken during a period of over thirty years by the late Sir Antonio Brady. Some thirteen years ago this Club had visited the pits under the guidance of Sir Antonio himself, when fossil bones were still obtainable.

A full account of the first visit of the Club to the Uphall Pits, under the guidance of the late Sir Antonio Brady, Mr. A. R. Wallace, and Mr. Henry Walker, will be found in the "Journal of Proceedings," E.F.C., Vol. i. pp. xxviii.—xxxviii. An excellent popular account of this celebrated locality is Mr. H. Walker's "A Day's Elephant Hunting in Essex" (Trans. E.F.C., Vol. i., pp. 27-58), and reprinted as a pamphlet. Mr. Holmes gave some notes in the last number of THE ESSEX NATURALIST (Vol. vii., pp. 47-48). Full details of sections will be found in Mr. Whitaker's "Geology of London," Vol. i. pp. 410-15. The Geological Survey Map is Sheet 1, S.W. (Drift Edition).

In the course of his remarks Mr. Crouch alluded to the various "finds" in the vicinity. In 1812 some bones of elephant, ox, and stag had been dug up at Clements (these are noticed in Ogborne's "History of Essex," 1814, and one of the teeth of the elephant is figured on page 53); and others found by Mr. Gibson, of Stratford, in 1824. The Uphall pits, which are now quite "classic," were begun about the year 1840; and it was from these that such extensive and important remains were subsequently unearthed; not only of the mammalia, but many hundreds of land and river shells. Here, at a depth of 15 to 20 feet, were found the bones of various species of such tropical animals as hippopotamus, rhinoceros, bison, lion, and straight-tusked elephant (*Elephas antiquus*); associated with the gigantic extinct ox, Irish elk, wild horse, bear, &c., and the mammoth (*Elephas primigenius*), a huge hairy elephant with incurved tusks, a purely northern and Arctic form. Perhaps the most interesting discovery was that made in 1863 of a nearly perfect skull and tusks, some 10 feet in length, of this animal, which, with the bulk of the Brady collection, is now in the British Museum of Natural History. Mr. Crouch showed a sepia drawing he had made of this skull, and said it was the only one that had been found in good condition in this country, and, so far as he was aware, there were only three others preserved—two in the museum at Brussels, and the first discovered one, in the Petersburg Museum. The latter was found in 1799, near the river Lena, in Arctic Siberia, the whole carcass being embedded in transparent ice. As the ice broke away the frozen flesh was soon devoured by wild animals, so that when Adams visited the spot in 1806, he could only rescue the head and some of the bones; but fortunately secured a portion of the hide, with a quantity of the long woolly hair a foot and a half in length, and the eye and brain, which were well preserved. Numerous remains have since been found in various parts of Siberia, and a large number of valuable tusks, some over 12 feet in length, released from the ice, are annually collected on the shores and sent for sale. That the mammoth was contemporary with early man, we have undoubted evidence from the incised bones found in the caves of Auvergne, on which this animal is clearly depicted. In one of these it is shown with the trunk raised and open mouth in attitude of charging.

The bones of the various species of British fossil elephants form the subject of a monograph by Professor Leith Adams, published in 1877-81 by the Palæontographical Society; and the privately printed catalogue of the Brady collection is full of interesting information regarding the Uphall specimens. Therein is figured the skull and jawbones of *Rhinoceros leptorhinus*, a fine adult

specimen, with the molar teeth, measuring 33 inches in length. All these Ilford remains were, when found, in a very brittle condition, and great care had to be taken in extracting and hardening them in a solution of gelatine. The careful and delicate work required was arranged by the late W. Davies, F.G.S., a zealous and painstaking assistant in the British Museum.

Passing along southward to the pre-historic camp of Uphall, the members were taken to the top of "Lavender Mount," close by the river Roding, by the kind permission of Mr. Hollington. From that point of vantage Mr. Crouch explained, with the aid of a detailed plan prepared by him some years ago, the remaining earth works and entrenchments, and the probable course of the old camp, the circumference of which had certainly exceeded a mile in length, enclosing about forty-eight acres; extending from the river to Barking Lane, and from the farmhouse to Lowbrook. The camp in general contour and size much resembles the well-known one at Pleshy. It is somewhat square in form, and has been supposed to be Roman, but only careful excavations could settle the age, and it is hoped that an investigation will be undertaken before the earth works disappear, as so many others near London have done. From its general form and position it was probably a British settlement, subsequently occupied by the Romans, who commonly adopted them as sites for their own camps. So far as he was aware, however, no remains of any kind, such as pottery, coins, or implements, had ever been found there, or at any rate recorded, that would in any way furnish a clue to its origin. The earth works may still be traced for a considerable distance round by the lane, but were much higher and more distinct some thirty years ago when covered with grass. At the present time the action of the plough is gradually reducing their height, and in a few years that portion will, in all probability, have entirely disappeared. [*Vide* Mr. Crouch's paper, "Ancient Entrenchments at Uphall, near Barking, Essex," in present number.]

Mr. Crouch concluded his brief sketch by saying that it was at all times a pleasure to him to revisit this neighbourhood, having in years past spent many happy days, not only in the house here, but in the Old Manor House at Little Ilford, across the river.

Leaving the camp, the party proceeded by Barking Lane and Ley Street to the brick-earth pits nearly a mile eastward of Ilford, now in course of working. Here the interesting sections of fossiliferous brick-earth were inspected, containing abundant "pockets" of "race," concretionary nodules, composed mainly of carbonate of lime, with a small percentage of phosphate and alumina.

The remains found here have been less in number, and more fragmentary than the old "classic" finds at Uphall. A few bones of mammoth, ox, and horse taken here were shown by Mr. Crouch, who had prepared rough sketches to show the actual position of these bones in the skeleton. A few broken portions of bones of mammoth and ox were found on this occasion.

At a meeting of the Geologists' Association, held here on March 25th, a search was made for the fossil shells (non-marine) which occur sometimes in great abundance both here and formerly at the Uphall pits. Only a few were found, of the genera *Succinea*, *Planorbis*, *Bythinia*, and *Pisidium*, and a block of siliceous stone, tested with the hammer, was pronounced to be a "Sarsen boulder."

From the pits, the foot-bridge over the railway was taken leading to the main

road, and the party then adjourned to the Ilford schools, where the usual high tea had been arranged in the infants' schoolroom by Mrs. George Ingram, of Ilford.

An Ordinary Meeting of the Club (the 139th) was subsequently held in the reading-room adjoining, the new President, Mr. F. Chancellor, in the chair.

The following were elected members of the Club: Messrs. Percy G. Powell and R. J. Sheldon.

The President announced that the Council had elected Prof. Charles Stewart, M.A., Hunterian Curator at the Royal College of Surgeons, and President of the Linnean Society, as an honorary member, in the place of the late Sir Richard Owen.

The President also nominated the following members of the Council to act as his Vice-Presidents during his year of office: Mr. E. N. Buxton, D.L., J.P., &c.; the Right Hon. Lord Rayleigh, F.R.S.; Mr. Walter Crouch, F.Z.S., and Mr. J. C. Shenstone.

A lecture was then given by Colonel C. Swinhoe, M.A., F.L.S., F.Z.S., F.E.S., &c., of Oxford, "On Mimicry in Lepidoptera and the Uniformity of Pattern in Protected Species," which was well illustrated by a fine series of slides of mimetic butterflies, shown by the oxy-hydrogen lantern. The lecture was of an exceedingly interesting character, touching as it did on phases of biological research and evolution which have only been worked at of late years. The details were naturally of a very technical character, and it would be useless in the absence of figures to attempt any reproduction of Col. Swinhoe's remarks.

A vote of thanks was moved by Professor Meldola, in a speech which touched upon many of the points in the lecture, upon which he had himself worked, and this was seconded by Mr. Crouch. Col. Swinhoe briefly replied, and promised to give another lecture to the Club at an early date.

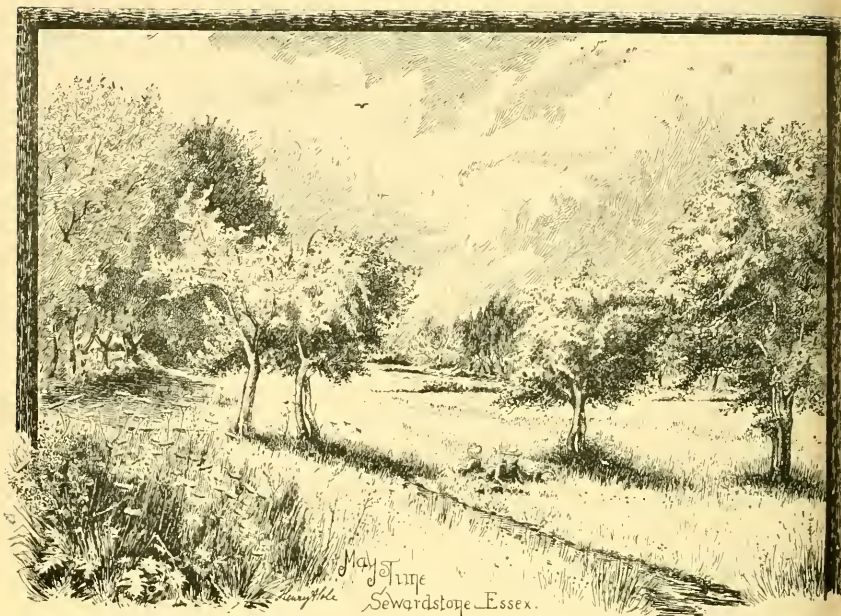
Thanks were also voted on the motion of Mr. Crouch to Mr. Ashmole, who had so kindly arranged for the free use of the rooms; and Mr. Hollington, for permission to visit the camp at Uphall, and the meeting soon afterwards broke up.

FIELD MEETING TO CHINGFORD, BURY WOOD, SEWARDSTONE, ETC.

Saturday, May 13th, 1893 (Old May-day).

THE usual spring forest ramble of the Club was taken on this day, under the leadership of Mr. Walter Crouch, F.Z.S., and Mr. William Cole, F.E.S., and was well attended by a goodly number of members.

The programme, which was illustrated by a pretty drawing showing "Sewardstone Meads in May-time," by Mr. Henry A. Cole, announced that the route had been carefully chosen as mostly new ground to the Club; and in the glorious spring afternoon (it was old May-day) it was especially interesting from the abundance of early flowers and insects. The sky was clear, the air warm, and all damp had disappeared from the forest glades. Insects and caterpillars were abundant, and nets, boxes, and vascula were soon plentifully filled. All along the route the lark and cuckoo's song were heard, whilst the wild flowers added their silent beauty to hedge, ditch, and wayside. But the bloom of the hawthorn had already passed its best, and was fading away.



SEWARDSTONE MEADS IN MAY-TIME.

Drawn by Henry A. Cole.

Leaving Chingford Station about three o'clock, the party proceeded by Bury Path to the Woodman and Bury Wood, where a halt was made for the capture of larvæ, by beating the bushes into an open umbrella, and some remarks were made by the hon. secretary, Mr. W. Cole. Attention was called to the grievous damage being done to the oaks in the forest by caterpillars, which Mr. Cole pointed out were mainly of two kinds, the greatest culprit being that of the small green oak moth (*Tortrix viridana*), one of the leaf-rolling caterpillars, which was engaged in speedily defoliating many trees, and covering the branches and trunks with layers of silk. Another very injurious caterpillar was that of the winter moth (*Cheimatobia brumata*), so called because it comes out in the perfect state in November, one of the "loopers," or Geometridæ. Thousands of these could be seen on the oaks and hornbeams. Mr. Cole also exhibited and talked about some of the spring butterflies and other insects likely to be seen that afternoon.

Thence by Davis's Lane, the Sewardstone Road was reached. By the way a pretty but ill-smelling plant, the "Ramsons," or wild garlic, was pointed out, a plant for which Bury Wood is notable, and a station for the "Traveller's-joy" (*Clematis*) was shown, the plant being rare in this part of the Forest, probably owing to the absence of chalk in the soil; near Epping, where the Chalky Boulder Clay appears, it is plentiful.

A little way past the "Fox and Hounds" the field-path through The Meads

was traversed, leading to Sewardstone Mill on the river Lea, which divides the county from Middlesex. Here it was pleasant to rest under the cool shade of the willows on the little island formed by the Lea and the old feeding stream of the now disused mill, the latter, with its sluices and the fast decaying water wheel, being the sole remnants left; whilst butterflies flitted by, and bright dragon-flies were seen flashing in the sunlight over the stream. Mr. H. Cole had printed off on transfer papers a little sketch of the wheel, so that each member might have a copy.

Here some notes were given on the surroundings and past history by Mr. Crouch, who produced a plan of the district, showing the county boundary formed by the river Lea, and pointed out the Lea navigation channel, and the surrounding features of the place.

We give the following extracts: "In early Saxon days this was probably a tidal estuary,¹ and about this spot in 876 the well-known episode took place when the Danes, having brought their war ships here, found themselves outwitted by King Alfred, who had trenches cut to divert the waters. The Danish foe, leaving their stranded vessels, escaped by land to the westward.

"From Ogborne's 'History of Essex,' 1814, we learn that: 'The hamlet of Sewardston (in the parish of Waltham Holy Cross), tradition says, was once a separate parish, and so named from Siward, a Saxon, an ancient possessor of it. Here is a small silk Mill, in the occupation of Messrs. Carr and Dobson, Foster Lane, Cheapside, London, and also a flour mill, the property of Mrs. Teush. The inhabitants of the antient demesne in Sewardston have the liberty of cutting wood on the wastes, sufficient for their firing, from All Saints' Day till the festival of St. George, to be drawn away each time, on a sledge only, with two horses.'

"In olden times this was a fulling mill, and is named on Chapman and Andre's map, 1777, 'Blue Mill, a fulling mill.' Later on it was used for the manufacture of silk, and subsequently for dyeing and scouring, until about eight years ago, when Mr. Connell gave up the occupancy; then the large dyeing sheds, etc., were taken down and the mill dismantled. The old garden adjoining the dwelling-house apparently claims a Dutch origin, being intersected by dykes with little foot-bridges from one portion to the other. It is owned by the New River Company.

"This is a well-known haunt of anglers, and the greatest of them all, our dear old friend, Izaak Walton, chatted thus to his pupil of the pleasant country, on just such another May day as this, in the second Charles's time:—

"'But turn out of the way a little, good scholar, towards yonder high honeysuckle hedge; there we'll sit and sing, whilst this shower falls so gently upon the teeming earth, and gives a yet sweeter smell to the lovely flowers that adorn these verdant meadows. Look! under that broad beech tree I sat down when I was last this way a-fishing. And the birds in the adjoining grove seemed to have a friendly contention with an echo, whose dead voice seemed to live in a hollow tree, near to the brow of that primrose hill.'

"This description apparently suits a spot some two miles south at Chingford Ford, where there is still a house named Mount Echo.

"From here is a field path leading over the river near 'Patty pool' and by Mill Marsh to the Royal Small Arms Factory at Enfield Lock."

¹ On this question the reader is referred to some interesting remarks by "S. J. A.," appended to the report of this meeting.—ED.

The botanists and entomologists of the party found here much employment among the spring flowers and insects. The beautiful Demoiselle dragon-flies and other water-loving creatures were abundant, and every one was glad to see an occasional Wood-lady, or Orange-tipped butterfly, one of the loveliest of its kind, flitting over the flowers.

The members returned to the Sewardstone Road by Mill Lane, and thence northward past Sewardstone Lodge and Luthers, to the Royal Oak, a quiet, roadside inn, where the usual high tea had been prepared. This welcome refreshment was partaken of by nearly forty members.

The return walk was by the footpath nearly opposite the inn, *via* Sewardstone Green and the old forest way, Bury Path. On the hill slope a halt was called to view the beautiful prospect of the Lea Valley over into Middlesex, with the Alexandra Palace and many a tall spire denoting the numerous villages on the high river terraces, glistening under the rays of the setting sun.

Subsequent to the above meeting, the following remarks by a writer signing "S.J.A." were printed in the "Waltham Abbey Times" for May 26th, having reference to Mr. Crouch's observation, that about Alfred's period the Lea at Waltham was probably a tidal estuary. Under the heading of "The River Lea in Saxon Times" the writer says:—"I have read with much interest your report of the meeting of the Essex Field Club, and particularly that part of it referring to Sewardstone and the River Lea, for the country thereabouts is a favourite haunt of mine, and the historical associations of the spot have an attraction for every student of the doings of men in the distant past, and that famous 'voyage' to Ware of the Scandinavian cattle-lifters in the days of Alfred the Good was one of the most remarkable. The 'great' men of history were so seldom good, that when referring to our Saxon King, who 'died much bewailed of his subjects,' I can't make up my mind to call him Alfred the Great, although his military achievements are to be considered among the greatest of his age, and his engineering skill as exhibited in his 'drainage works' at Sewardstone must have impressed other people besides the Danes with proper respect for his greatness.

"It seems the Danes had constructed at Ware a kind of depot for plunder of all sorts. Whether they were going to or returning from it when they found themselves left high and dry, does not appear; but the question is, how did they manage to sail to Ware? The explanation generally given is that in those days the River Lea was a tidal estuary as far as Sewardstone and perhaps beyond; but unless there has been a vast change in the relative levels of the Sewardstone marsh and the high water mark in the Thames, a tidal estuary at Sewardstone could not have existed—and there is much to show that no such change has taken place within the last thousand years at any rate. Of course we know that in the pre-historic times the bottom of the Lea Valley must have been covered with water, and ages before Roman, Saxon, or Dane was heard of, the pre-historic savage—the very Ancient Briton—dwelt in the woods on the hill sides, or made his home in the tangled jungle by the lake shore. We know he was there, for beneath (? or rather in the river-gravels.—E.D.) the marsh we find his weapons of flint and bone. But we must not confound him with the Ancient Briton of Cæsar, for he had been dead and gone thousands of years before the legions of Rome were seen on the Kentish hills. But to return to the question of the tidal estuary. Sewardstone marsh, near the mill, is about thirty-six feet above high-water level

at the point where the Lea joins the Thames (Bow Creek), and that must have been much the same at the time of the Conquest, for we read that 'the Bastard burnt the village of Southwark' when the Saxon-cockneys crossed the river to oppose him, and there could have been no 'village of Southwark' if the high-water level in the Thames had been much above what it is at present. Hardicanute, the Dane, died at Lambeth, Harold was crowned there; and in 1191, Baldwin, Archbishop of Canterbury, built a chapel on the site of the existing palace, and that is very few feet above high-water level in the river. Moreover, the wooden bridge over the Thames, which was carried away in a violent hurricane in the year 1090, was probably at a lower level than either of the bridges that succeeded it, and it is pretty certain that the river bank on the Essex Marshes was in existence at that time, for the same storm caused the river to overflow the marshes. Then we have at the Tower, the Traitor's Gate, with the stairs to the water, indicating clearly that the water level was much the same when they were built as it is now. In fact there is nothing to show any material difference in the level of high water at London since the Conquest, and no reason to suppose it was different in the time of Alfred, and so there could have been no tidal estuary at Sewardstone, unless the bottom of it were from thirty to forty feet below that of the mill pool. But the general level of the marsh is much the same now as it was before the Conquest. There can hardly be a doubt about it. The town of Waltham is said to have been built in the time of Canute—the Canute of sea-side fame—and if the tidal estuary extended to Waltham in his time the surface of the water in it, at high tide, would be between forty and fifty feet below the level of the town. And so we must give up the theory entirely. How, then, did the Danes sail up to Ware? Now, before the Lea Navigation was constructed there was of course much more water in the old river than at present; it was much wider and generally deeper; but in Saxon times it was still wider and deeper, for the country was covered with a dense forest, and the rainfall must have been much greater than at present. The 'ships' of the Danes were open boats, with a kind of covered 'bunk' at each end; they seem to have been about forty feet long and eight or ten feet wide, and did not probably draw more than three feet of water. On the shallow 'fiords' of Jutland the Danes of our day use a long punting pole, with which they are exceedingly expert, and drive their boats along at a speed that is quite astonishing. Might it not be that they learnt the trick from their ancestors, and might it not be that their ancestors, or some of them, 'sailed' up to Ware by the help of punting poles?"—S. J. A.

EXCURSION TO BICKNACRE, DANBURY, AND TO MALDON.

Saturday, June 17th, 1893.

A VERY pleasant whole-day Field Meeting was held on this date, under the direction of the President, Mr. F. Chancellor, and of Messrs. E. A. Fitch, J.P., F.L.S., Charles Smoothy, Walter Crouch, F.Z.S., Edmund Durrant, and H. A. Cole (in the absence of his brother, Mr. W. Cole, the Hon. Secretary, through illness).

Leaving Chelmsford railway station in brakes, the party proceeded first to Great Baddow. Here, in the few minutes allowed, Mr. Chancellor pointed out the chief points of interest about St. Mary's Church, stating that the tower, nave, aisles, and chancel were probably built in the time of Edward II., but later

windowing of the Perpendicular Period was introduced in the north aisle. He particularly drew attention to the work in red brick executed late in the fifteenth or early in the sixteenth century by the addition of another bay to each aisle, clerestory and battlements to nave, and dormers, gable, and buttressing to chancel. The tower is large, and bears a lofty spire.

Of this church Alexander Barclay was an early rector (1546), well known as a writer, and for his paraphrase of Brant's emblem-book "*Stultifera nauis*," entitled "*The Shyp of Folyes of the Worlde*," folio, printed by Richard Pynson in 1509 (first edition), an exceedingly rare and valuable work.¹

The name of an early owner here, Sir Hugh de Badew (temp. Ed. III,) still occurs about a mile S. of Howe Green, where two houses are entitled "Great" and "Little Sir Hugh's."

The party then proceeded by Howe Green to the Hamlet of Bicknacre (Parish of Woodham Ferrers), where the carriages were dismissed and some time occupied in visiting all that now remains of the old Priory. Mr. Chancellor pointed out that the fragment, which consists of two piers with shafts and moulded arch, probably formed part of the central tower of the old Priory Church, its date being of the thirteenth century. Attention was drawn to the fact that but little was known of the history of Bicknacre Priory, although for 400 years the Priors and Canons, possessed as they were of very considerable estates in Danbury, Woodham Ferrers, and elsewhere, and the largest ecclesiastical building in the district, must have exercised considerable influence over our forefathers in Chelmsford, Danbury, and surrounding parishes. The original Priory was founded by King Henry II., at the instigation of Maurice Fitz-Geoffrey, Sheriff of Essex from 1157 to 1164, who built and endowed this Priory for the Canons of S. Augustine, and which he dedicated to the Virgin Mary and S. John the Baptist. There were seventeen Priors who in succession ruled the establishment from its foundation to the latter part of the reign of Henry VII., when Edmund Goding, the last Prior, died. "At this time, through the carelessness of the Priors, and other occasions being grown poor, and Edmund Goding, the last Prior, being dead, and but one Canon left in the House, became in a manner wholly neglected, upon which the Prior and Convent of the Blessed Virgin Mary without Bishopsgate procured of the said King to grant them his royal license bearing date 21 April, 1507, to have this Priory of Byknacre, with all its lands, rights, and appurtenances to be united and appropriated to their hospital." By an inquisition, taken after the death of the last Prior, the possessions are described as the Manor of Bicknacre, with 30 messuages, 300 acres of arable, 40 of meadow, 60 of wood, 500 of pasture, 62 of marsh, and £5 yearly rent, with a Court Leet and view of frank pledge in Woodham Ferrers, Danbury, Norton, Steeple, Chelmsford, Mayland, Stow, East and West Hanningfield, Purleigh, Burnham, and Downham.

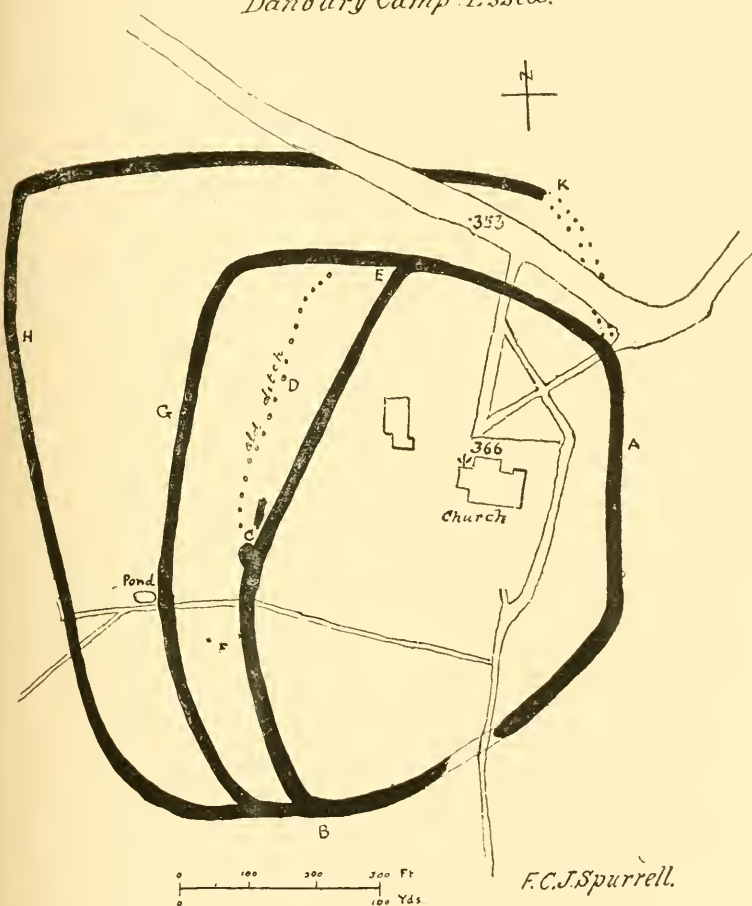
Upon the suppression, King Henry VIII. granted, 3 Feb., 1539, the site of the

1 At the end is this curious rhymed note :

Our Shyp here leuyth the sees brode
By helpe of God almyght and quyertly
At Anker we lye within the rode
But who that lysteth of them to bye
In Flete Streete shall them fynde truly
At the George: in Richade Pynsōnes place
Prynter unto the Kyngs noble grace.
Deo gratias.

Priory, with manor and its appurtenances, to Henry Polsted and Alice his wife. On 20 Sept., 1548, Polsted sold it to Sir Walter Mildmay. His grandson sold it to Gobert Barrington. Slowly but too surely the various buildings have disappeared, and the land has been ploughed up so as to destroy nearly all traces of the once powerful settlement. For a sketch of this interesting ruin in 1819, *vide* "Excursions in Essex," vol. i, p. 39, plate and p. 136.

314

Danbury Camp. Essex.

PLAN OF DANBURY CAMP.

From a survey by Mr. F. C. J. Spurrell (from THE ESSEX NATURALIST, vol. iv.).

After a short stay at the remains of the Priory, the members were led up to the extensive furze-covered common to Danbury. The temperature was too high to admit of much collecting in this interesting locality, and the natural history

notes and records made were very meagre. At Danbury are the remains of an old (Danish?) Camp, of which a plan was given, and the earthwork described, by Mr. F. C. J. Spurrell, F.G.S., in *THE ESSEX NATURALIST*, vol. iv., p. 138. Mr. Spurrell points out its strong likeness to "Withambury" (of which a plan was given in the *E. N.*, vol. i., p. 19), but he says that the works are difficult to understand; the Camp is not mentioned in any early work, and its history is unknown. No attempt has yet been made, by exploring the ramparts, to ascertain its age, and mere conjecture in these cases is useless.

The views from Danbury Hill are extremely fine and extensive. It has been commonly reputed to be the highest spot in Essex, but this is an error (see *THE ESSEX NATURALIST*, vol. v., p. 172). Its highest point is 332 feet above O.D. It is worthy of note that an old house about a mile to the S.E. named "Gay Bowers" is the scene of a legendary romance, "Queenhoo Hall," written by Joseph Strutt, completed by Sir Walter Scott, and published (after Strutt's death) in 1808. He was an engraver, son of an Essex miller, and a connection of Elizabeth Osborne, and author of a "Biographical Dictionary of Engravers," "Regal and Ecclesiastical Antiquities of England," "Sports and Pastimes of the People of England," etc., etc.

At Danbury some other members joined the party, and a brief visit was made to the Church, where Mr. Chancellor drew attention to the most interesting features in the Church (see "Essex Review" for January, 1893). The tower was ascended, from which an excellent view was obtained of the general contour of the Camp. The party then adjourned to the well-known hostelry called "The Griffin," where a cold lunch was served.

In the afternoon, the northern side of Danbury Hill was traversed, over Lingwood Common to Old Riffhams, the residence of Mr. Charles Smoothy, by whom the members were kindly received.

Mr. Smoothy then led the party through Holly Wood, where the White Climbing Fumitory (*Corydalis claviculata*) was abundant and in fine bloom. As is usual near Danbury in July, the Foxglove, perhaps the most beautiful of our native plants, was in profusion, but owing to the great drought not so conspicuous and showy as we have seen it, few of the flowering stems being taller than four feet. A variety was found in this wood in which all the flowers on the raceme were quite *white*, and yellow varieties had previously been found behind Old Riffhams. After traversing Long Wood, the party passed along the path between Pheasant House and Fir-Tree Woods, and it was here that several large Fritillary Butterflies (probably *Argynnis adippe*) were seen, but not captured.

Tracks were then made through the thick oak-scrub of Woodham Walter Common, and so across the downs of the Warren Farm to Woodham Walter Church, which Mr. Chancellor described as having been built in 1563-64, by Thomas, Earl of Sussex, who obtained a licence from Queen Elizabeth to pull down the old church and build a new one on the present site, as being more convenient for the inhabitants.

A short walk brought the party to the relics of Woodham Walter Hall, the baronial residence of the Fitzwalters; a few fragments of rubble walling, abutting upon the road, being all that remains of this historic mansion. The "Wilderness" and "Queen Anne's Cellars" were also inspected, and here in the open a stoat in summer fur was captured.

It is said that the local name, Queen Anne's Cellar, refers to some connection with that noted Essex character, the unfortunate Anne Boleyn, born at Rochford

Hall—[her heart is said to be enclosed in an altar-tomb at East Horndon]—but more probably it is of a later date, and in some way connected with the pulling down of Woodham Walter Hall, about 1700, by William Fytch, an Alderman of Maldon, who presented the portrait of Queen Anne which still hangs in the Council Chamber of the Moot Hall.

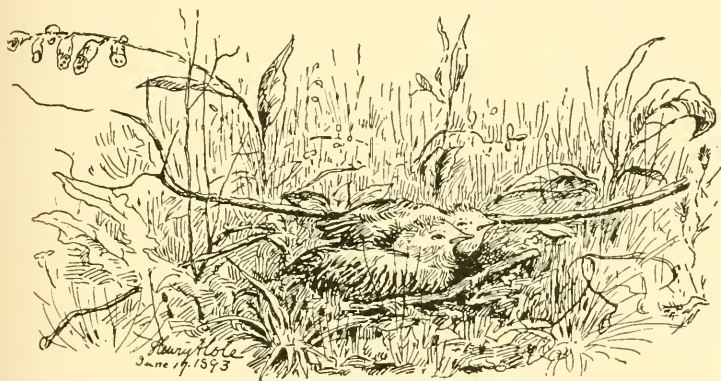
The supposed site of the Old Church, about 150 yards to the N. of the remains of the Hall, was pointed out, as also the building, the last place where the Duke of St. Albans, as Lord High Falconer of England, had his Hawks' Mews.

A short rest, and then the walk (too long, perhaps, on such a sultry day) was continued to the ancient town of Maldon.

"A struggling burgh of ancient charter known
And dignified by battlements and towers."

—WORDSWORTH.

And after a welcome cup of tea, the return to various stations in Essex was made by the seven o'clock train.



YOUNG NIGHT-JARS IN LONG WOOD, DANBURY.

Sketched by H. A. Cole.

Many birds and insects were noticed during the excursion, but none that call for special mention, excepting the pair of young fledgling Night-jars ("Goat-suckers" or "Fern-owls," *Caprimulgus europæus*) that Mr. Smoothy pointed out upon the ground in Long Wood. A few weeks before, when the spot had been visited by Messrs. Fitch, Crouch, Durrant, and John Freeman, the eggs had been shown, lying quite exposed on a bare "nest" on the ground, yet perfectly protected by the similarity of colouring to the surrounding soil; now it was with considerable difficulty that some of our members, not accustomed to bird observation, could be shown this attractive sight, so well were the young birds protected by resemblance to the ground on which they lay. They were upon the bare ground, with no attempt at a nest, although the broken egg-shells out of which they had hatched were still lying beside them. The crouching attitude of the young fledglings, and the solicitous wheeling around of the parent birds, much troubled at our intrusion, were the admiration of all for some minutes.

FIELD MEETING AT BARKINGSIDE AND WANSTEAD.

Saturday, July 1st, 1893.

THE chief object of this afternoon excursion was to examine the fine and extensive sections of River Drift gravel on St. Swithin's farm, Barkingside, by the kind permission of the owner, Mr. Llewellyn Hatton, of Carswell.

Starting from Snaresbrook station, the party, numbering about forty, under the direction of Messrs. Walter Crouch, F.Z.S., V.-P., and H. W. Monckton, F.G.S., F.L.S., passed through the old grounds of "The Grove" estate to the meadows of the river Roding, over the footbridge, and then by the lane past Fern Hall to the gravel pit.

The way was neither long nor tedious, but the weather was decidedly warm, and the delightful breeze which sprang up across the meadows was very welcome. Some notes were given *en route* by Mr. Crouch. He mentioned that "The Grove," Wanstead, had on a previous occasion been visited by the Club, on April 21st, 1888 (*vide* ESSEX NATURALIST, vol. ii., p. 80). The mansion was then uninhabited, but has since been pulled down, the grounds laid out with roads, the long lake filled up, and many houses erected. A series of four interesting lithographs of this place on Indian paper, from drawings by the Hon. Anne Rushout, and copies of miniatures by Plimer of herself and two sisters and their mother, Lady Northwick (*née* Bowles), were exhibited at the evening meeting.

The Roding meadows lie low, and the centre of the river is for a long distance the boundary of the parishes of Wanstead and Ilford. The footbridge was rebuilt in 1891, at the joint expense of the two Local Boards, costing over £80, the old, narrow, but more picturesque one being in bad repair, and indeed dangerous. On gaining the lane a hollow may be seen opposite Red Bridge House; here some hundred years ago was a tile and brick kiln, but the earth has long ago been worked out. In olden times this place was known by the name of "Hockley at the Watering."

St. Swithin's Farm is now in the occupation of Mr. James Ingram, of Hedgesmans. The farm house, which has recently undergone extensive repairs, is now in private occupation. It was built over 200 years ago. The oaken beams are very thick, and the drawing room is covered with small oak panels, much like the work at Gaysham Hall (*vide* ESSEX NATURALIST, vol. v., p. 184), but here, unfortunately, it is all covered with paint. The house stands high, and is covered with a well grown "Wistaria" (*Millettia*).

The residence, "Carswell," is only about 100 years old. The ancient mansion of that name stood nearer the farm house on much higher ground, from whence a good view extends over the valley of the Roding from Claybury to Buckhurst Hill, Woodford, and Wanstead. The site is now called "The Hilly Hoppet," and, until recently, an old man was living who remembered the remains of the old house, which was used as a quarry for building cottages, etc. The foundations are yet close under the surface. This mansion was of great age, the earliest record to be found being in the draft will of Henry Fanshawe (the Queen's Remembrancer, Ob. 1568), of Clay Hall.—"I will Willm. Hopkyns, my father in lawe, to dwell in the house at Carswell, where he now dwelleth, during his lyfe, paying yerely to myne executor fortie shillings and no more." Thomasine, his first wife, who died in 1562, was daughter of W. Hopkyns (*vide* ESSEX NATURALIST, vol. vi., p. 152).

At the gravel pit, which now extends over an acre, the sections were examined, and a paper read by Mr. Monckton, "On the Gravels near Barkingside, Wanstead, and Walthamstow," treating on River-gravel in general, and these and similar deposits, which had been carefully noted both by Mr. Monckton and Mr. T. V. Holmes, F.G.S. (Mr. Monckton's paper is printed in the present number, pp. 115-120.) Time, however, would not allow of a visit to the latter sections. The gravel-pit on the south side of Wanstead Park forms part of the parish sewage farm. These sections of gravel and sand lie much lower, and a quantity of London Clay occurs. On this ground the new Cottage Hospital for Wanstead Parish is now being erected.

Mr. Crouch remarked that the greater part of the gravel and sand had been excavated during the past few years, for the construction of the roads and buildings of the new Middlesex Lunatic Asylum at Claybury, about two miles away. A note of this was given by Mr. Crouch, at the Field Meeting in Hainault Forest, in 1891 (*vide* ESSEX NATURALIST, vol. v., p. 184), and the Asylum was opened on 17th June last. He also pointed out the spot where, during the excavations, a quantity of old pottery and other remains had been found, which he would exhibit and remark upon at the evening meeting (see below).

A few words on the parish were also given by the Rev. W. S. Lach-Szyrma, the vicar.

The members then passed into the garden at Carswell, where the members had an opportunity of examining the fine pair of Pallas's sand grouse (*Syrhaptes paradoxus*), shot there out of a covey of sixteen in June, 1888, during the extraordinary irruption of these rare and singular birds (see ESSEX NATURALIST for 1888, vol. ii., p. 63). Here also Mr. Hatton had provided some light refreshment, in the shape of wine and fruit and biscuits, which proved exceedingly welcome, owing to the intense heat of the day; and for this, and permission to visit the pit, a vote of thanks was duly passed on the motion of Professor Meldola.

After a rest the walk was continued up the downs, where other good views were seen over Wanstead Park, Ilford, Shooter's Hill, etc. Not far off is the curious triangular tower, erected by Sir Charles Raymond, of Valentines, in 1765, as a mausoleum, but never consecrated. For years it was called "Raymond's Folly," but is now generally known as Ilford Castle. It stands on the old estate of Highlands. The roof is now in bad condition, and scarcely safe for a party to ascend.

The return to Wanstead was made by field-path and road, past the Rectory to Little Blake Hall, where by the kind permission of Mr. and Mrs. Pemberton-Barnes, the usual high tea was served on the lawn, under the shelter of the fine trees.

The aviaries here, containing a large number of peacocks (including specimens of the white variety), golden pheasants, foxes, monkeys, etc., claimed a great deal of attention. Amongst the trees, many of which are lofty and well grown, perhaps the most noticeable is a good specimen of the Ginkgo or maidenhair tree (*Salisburia adiantifolia*). This tree is not often seen, though one, which many years ago grew close to Ham House, may still be seen in West Ham Park.

An Ordinary Meeting of the Club (the 140th) was subsequently held in the drawing-room, Prof. R. Meldola, F.R.S. (*Vice-President*), in the chair.

The following were elected Members of the Club:—Messrs. H. Havelock Brown, M.B., and Joseph Wheatley and Miss E. M. Bruton.

Mr. W. Cole (*Hon. Secretary*) exhibited a series of specimens illustrating the attacks of a farmer's pest, which had not appeared in Essex for many years, viz., *Chlorops tæniopus* of Curtis, an insect extremely injurious to barley. Mr. Cole's attention was first called to the subject by the following paragraph which appeared in the "Essex County Chronicle" for June 23rd, under the heading of "Another Pest for Farmers":

"On Friday Mr. Herbert Dowsett, of Park Farm, Pleshey, brought for our inspection three ears of barley which had small maggots eating into them. He says that he has on his farm about fifty acres of barley, and about one-fourth of the crop is infested with these maggots, which will, of course, destroy all the ears in which they get a lodgment. Neighbouring farmers have found their crops attacked in the same way. We have submitted the samples Mr. Dowsett brought us to the Essex Field Club and the County Technical Instruction Committee."

Subsequently Mr. Cole received a good supply of infected barley plants from Mr. Dowsett, and reported as follows in the next issue of the same newspaper:

"The attacking insect is clearly *Chlorops tæniopus*, of Curtis, a small two-winged fly, black striped with yellow, which may often be found in numbers in and around barley stacks. The insect has been known for fifty years, but the injury is often overlooked, as it bears a close resemblance to distortions caused by fungi or abnormal growth. The plants sent me by Mr. Dowsett are stunted in growth, the ears still in sheath, and the leaves often twisted and distorted in a grievous fashion. On cutting open the sheaths, the cause of the injury is easily seen in the shape of a small white, legless, sluggish maggot, snugly ensconced between the sheath and the ear, which latter is in most cases partly destroyed, distorted, and aborted. In many cases the maggot is already laid up in its last skin for the purpose of turning into the chrysalis or *pupa* stage, the skin forming an elongated brown case, called by entomologists a *puparium*. In Mr. Dowsett's case, the injuries are certainly most serious. He tells me that he used his own seed-corn (which came to over nine quarters per acre) with the exception of two acres, which were sown with barley bought at 10s. per bushel from a well-known firm. During forty years' experience, Mr. Dowsett has never seen a like destruction; he estimates that one-fourth of his entire crop will never ear out.

"Mr. R. W. Christy sends me this morning a bundle of plants similarly affected from Little Boyton Hall Farm, Chelmsford, and other reports have reached me.

"The fly lays her eggs in the autumn corn plants, and from these maggots the flies come out at the right season in early summer to deposit eggs in the young barley. But little is known of its habits in England during the winter, and further observation is much needed. The only practical remedy proposed is the pulling up of the injured plants by hand—they are easily recognised from their swollen, stunted appearance, hence the word 'gout' significantly applied to the injury. Further knowledge of the habits of the fly will doubtless furnish remedies. It is quite clear that some means should be found to destroy the fly or the pupæ or maggots in the autumn or winter, and so prevent the egg-laying in the early barley in the spring.

"Mr. Christy speaks of the Hessian Fly attacking his barley, but I could find none in the specimens he sent—only *Chlorops*. I shall be glad to receive specimens of infested crops from other parts of the county—I fear that the pest is wide-spread."

Infested plants have since been noticed at Stonage Farm, Little Waltham, and at Black Hall, Great Canfield.

Mr. Cole exhibited the larva, pupa, and dissections of the barley plants, showing the mode of life of the maggot, and the injury it does to the young ears.

Mr. Cole also exhibited some uncommon moths from various parts of Essex,

including a fine series of the rare *Geometra papilionaria* (the "Large Emerald Moth") from Epping Forest, the first time he had met with the insect in Essex (see "Notes," *post*).

Mr. Oldham exhibited a specimen of the new English moth, *Plusia moneta*, taken in his garden at Woodford in June, and *Abraxas ulmata* from Epping Forest, the second known Essex specimen (see "Notes," *post*).

Mr. G. B. Cole showed a fine aberration of the common "Magpie-moth," *Abraxas grossulariata*, found that morning at Buckhurst Hill.

Quite a small museum had been arranged in the room by Mr. Crouch, and among his exhibits were some local views, etc., and a very large photograph, presented to the Club by Mr. G. E. Pritchett, F.S.A., of a huge block of conglomerate from Farnham, Essex, in the grounds of his residence, Oak Hall, near Bishops Stortford (see ESSEX NATURALIST, vol. iii., p. 89, and iv., p. 225).

The most important show, however, was a number of large cases containing a quantity of Roman and Romano-British pottery, and other remains, found in the gravel pit on St. Swithin's from 1888 to 1891. They are all in a fragmentary condition. On these a running comment was made by Mr. Crouch, who handed round the most interesting and typical specimens. Amongst these were:—a rim of a Roman mortarium with potter's label, SOLLVS. F., some fragments of incised Upchurch ware, portions of a huge amphora, which was probably about the size of the perfect one in the Club's Museum, about three feet in height, but far the greater portion were pieces of rude and coarse British pottery, which occurred in vast quantity. Only one piece of bronze—a Roman key—has been taken; but portions of dried clay have occurred, part of the "wattle and daub" of early dwellings, such as those mentioned by Strabo and Cæsar. From the high position of the field it is probable that a pre-historic camp was once here, but of this we have no direct evidence, the land having been for so many centuries under cultivation. Only one Palæolithic implement has been found (by Mr. W. Cole), which has been already recorded in THE ESSEX NATURALIST, 1888, vol. ii, p. 262. These finds have been confined to a limited area, and during the past two years scarcely anything has been found. Various specimens of the constituent minerals and composition of the gravel, pebbles, derived fossils, etc., and some remains of bones and teeth of ox, horse, etc., were also mentioned and shown.

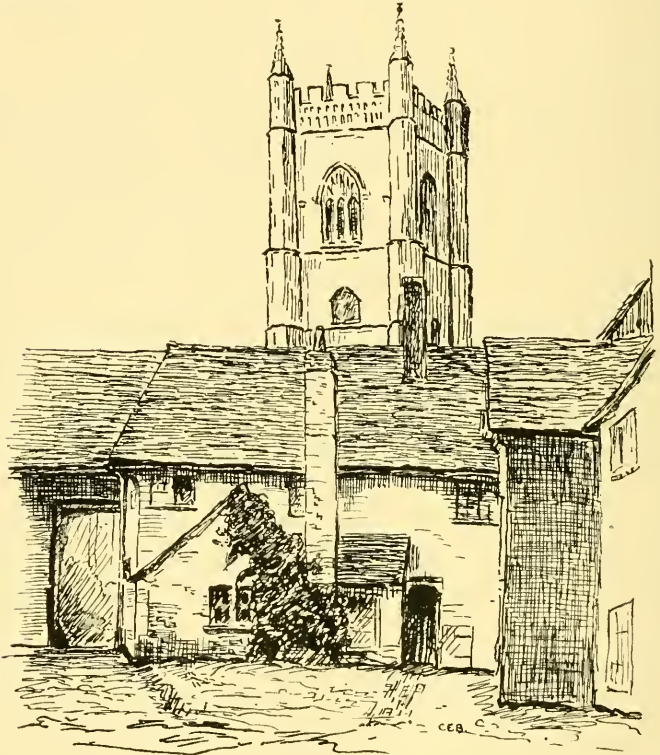
On the motion of Prof. Meldola, a very cordial vote of thanks was passed to Mr. and Mrs. Pemberton-Barnes for their kindness in allowing the use of their house and grounds for the meeting, which was suitably acknowledged by Mr. Barnes; and after another visit to the birds and animals, the members dispersed about nine o'clock, well pleased with the most enjoyable visit.

WATER EXCURSION ON THE RIVER STOUR, THROUGH THE VALE OF DEDHAM AND "CONSTABLE'S COUNTRY."

Saturday, July 29th, 1893.

THE valley of the river Stour, which forms the boundary for many miles of our county, is famous for its rural beauty, and contains some of the most charming scenery in Essex. To the artistic mind it recalls at once the name of John

Constable, R.A., who was born there, and sought amidst its surroundings subjects for the most important of his pictures. In the same valley, though higher up the river, on the Suffolk side, it was that Gainsborough painted some of his masterpieces.



THE SUN INN AND CHURCH TOWER, DEDHAM.

Drawn by C. E. Benham.

To enable members to enjoy this natural scenery this trip was organised, and a well-illustrated programme prepared: the directors for the day being Messrs. C. E. Benham and Walter Crouch, F.Z.S. Mr. Charles A. Wright, F.L.S., acted as botanical adviser. The hon. Secretary, Mr. W. Cole, was, greatly to his regret, unavoidably absent, and he is indebted to Mr. Crouch for the main details of the day's proceedings.

The consent of the Navigation Company and the various millers having been obtained to use the locks, the river was traversed to Brantham Lock, near Manningtree, about 11 or 12 miles, passing the parishes of Stoke-by-Nayland, Boxted, Higham, Stratford St. Mary, Langham, Dedham, and East Bergholt.

From various causes there was not so large an attendance as had been anticipated, but about forty members and friends were present, including Mr. F.

Chancellor, J.P. (President), the Mayor and Mayoress of Chelmsford, and the Mayor of Colchester. Unfortunately, several well-known scientific members were unable at the last moment to attend, including the Vice-Presidents, Mr. E. A. Fitch, and Dr. H. Laver; Mr. Shenstone came on board for a short time at Dedham.

Starting from Colchester station about 10.40 in dull weather, which was expected by the weather-wise to clear up, the party drove in three brakes to Nayland. It was a pleasant drive through Myland—with the far-famed Colchester rose gardens on either side of the way—and through the long village of Great Horkesley.

There was not much in the way of scenery, however, until the hill above Nayland was reached. From that point a glorious view of the valley of the Stour is obtained, stretching out as far as the eye can see on either hand, and bounded in front by wooded slopes, with the square tower of Stoke-by-Nayland Church standing out boldly amidst the dark green foliage. This was the finest panoramic glimpse obtained during the day of "Constable's country," and it was presented under just such a sky as the great artist himself loved to paint.

Descending the hill about a mile, the party alighted at the Anchor Bridge, where two of Mr. Stannard's barges were in readiness for the voyage down the Stour. Before starting, attention was called to the keystone of this bridge, the curious point being that it is carved with the letter A and a Bell, with date 1775, a rebus on the name of the builder, a man named "Abel." Mr. Crouch mentioned that for the upkeep of this bridge the rent of a small farm in Laver is used. It was for a long time in the hands of trustees, but now the rent is divided between the two counties, who jointly repair it.

Nayland village is in Suffolk, and was not visited, but mention may be made here of an oil painting by John Constable, R.A., which is over the Communion Table in the Church. The subject is Christ with outspread hands blessing the bread and wine, and the general effect is pleasing. It was painted in 1809. The only other subject of the kind he painted was in 1804, as an altar-piece for Brantham Church, and depicts Christ blessing little children. In this the figures are life-size, all standing, except the infant in His arms. At one time some fine brasses were here, the matrices of six large ones may still be seen, one with 20 children, each separate brass figures—but only two effigies, the head of a lady with "butterfly head dress" and some crotchetted canopies remain.

The barge was neatly-lined with "Hessian," and with an awning, supported by poles draped in red, afforded very comfortable accommodation for the party. The barges used on the Stour Navigation, and some peculiarities of the method of towing, excited much interest amongst visitors from a distance. These nearly flat-bottomed craft, which fit the locks to a hair's breadth almost, are built to go in pairs, end on to each other. The towing horse was attached not to the barge containing the company but to another chained in front. From the sternmost boat a long kind of bowsprit projects over three-parts of the length of the boat in front, and this is used as a steering-pole—such being its name in fact—for both vessels.

It seemed a marvel, as one observed, that the tail doesn't sometimes wag the dog; but, as a matter of fact, an immense amount of leverage is required to get round the sharp turns of the river, and the arrangement is an interesting adaptation of means to ends. As far as the towing is concerned, most honourable mention must be made of the horse—a grand Shirebred—employed in that work.

At different places the towing path changes from one side of the river to the other ; at these points the animal jumped on board the leading barge, and was thus ferried across ; and the way in which he cleared the low stiles on the towing-path, with a boy on his back, would have done credit to a heavy-weight hunter. Altogether that horse was almost the hero of the adventure, and reminded us of the picture "The Jumping Horse," exhibited by Constable at the Royal Academy in 1825—a boy on the top of a chestnut horse, with crimson fringe on the harness, leaping over one of these barriers along the Stour.

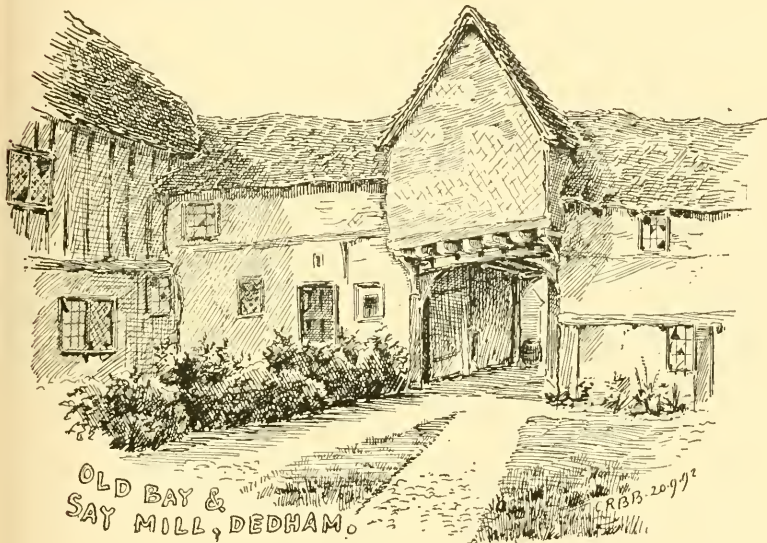
At the first lock Mr. Stannard came on board. He had lent the barges for the occasion, and his good company was not less valued than his kindness. Not long after this, the rain came down in earnest, so heavily that one of the party facetiously congratulated the company on the extraordinary appropriateness of the weather, which thoroughly exemplified the kind of atmospheric conditions that Constable was so fond of introducing into his paintings. A cleverly-contrived awning was then put up for the protection of the ladies, but it was a drenching wet voyage during the next hour or more, and the lovely glades of Tendring Park were seen through a mist, dimly. Sir Joshua Rowley's splendid herd of red polls was down on the marshes. Where to have luncheon soon became an anxious question. There was no room on the barge, the tables were wet, and a picnic on the bank was now impossible. In this difficulty, Mr. Stannard rendered the party good service before leaving them for Colchester Market. He went forward and opened negotiations with Mr. Johnson, at Boxted Mill ; that gentleman responded in the most generous way, and the upshot was that the mid-day meal was served in the lower story of the mill. Little room could be found for tables, and the company sat down on flour and meal bags, in dark out-of-the-way corners, holding plates on their "laps," and foraging round for what could be got. Under these extraordinary conditions, Mr. R. W. Mutton, of the George Hotel, Colchester—who had brought the necessaries along in the barge—gave immense satisfaction, and one and all were pleased.

By this time the rain had ceased, and looking round with a Mark Tapley eye, so to speak, Mr. Crouch summed up the situation in a little story. It was that of a village doctor, who met one of his poorer patients and asked him how he was getting on. "Well, I don't know," was the dubious reply, "I've taken all your nasty stuff ; thank goodness ! I'm none the wuss." The party felt none the worse for their adventure up to this time, and thanked Mr. Johnson with three cheers as they joined the barge, and passed out of his lock.

The rain and the delay, however, had prevented the possibility of botanising or other natural history collecting. Thenceforth the barges proceeded at a fair speed down the river, the banks of which were covered with big clumps of yellow tansy, hemp agrimony, comfrey, and the ever-present and pleasing *Epilobium* in full bloom. Mr. Wright, always ready to impart botanical information, made the journey pleasant and instructive to many of those present. The tower of Langham Church, from the summit of which Constable painted his famous picture of the "Vale of Dedham," remained in sight for a long time ; there is a lock here, and also at Stratford, where a comely damsel handed on board a well-filled basket of flowers and fruit from Mr. Rowland Cobbold, of Dedham Lodge, who entertained the Club so hospitably some two or three years ago.

Landing at Dedham Lock (Mr. E. Clover's) a short time was spent in the town ; the picturesque "Sun Inn," with its quaint yard-gateway was seen ; and a visit made to Southfields, an interesting group of cottages, converted from an old

Bay and Say Mill, formerly the centre of an important industry of the place. Remarks on this were given by Mr. Benham. In the seventeenth century, Dedham was a noted seat of the once famous woollen trade, which, in spite of the attempt to maintain it by the *dernier ressort* of "burial in woollen," has now completely decayed. In the church are the memorials, merchant marks, etc., of Thomas and John Webbe, woollen manufacturers, who here carried on an extensive trade in their day, and in the chancel a quaint monument to "Roaring Rogers," a veritable Boanerges, who was such a noisy preacher he made the windows rattle, and his congregation adjourned to the churchyard to listen. A brief inspection of the church was made, with its fine tower, and the open porch (or galilee) at its base. Flatford Mill was the next halting-place, and in the lock there tea was partaken of; the miller, Mr. Benneworth, having kindly undertaken to provide hot water.



OLD BAY &
SAY MILL, DEDHAM.

At this point Mr. C. E. Benham pointed out some of the spots associated with Constable—the Mill house in which he lived, though he was not, as has often been stated, born there, but at East Bergholt. The thatched cottage, the little bridge, the scene of the "Barge Builders" picture, the Water Lane (scene of the "Haywain"), the lock, Willy Lott's house, and other places associated with the great painter were indicated, and it was remarked that while Suffolk might claim the honour of Constable's birth, it was towards Essex that he preferred to turn when painting, his choice being the effect of the southern sky in front. In one of his writings 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." And in another passage: "The landscape painter must walk in the field with an humble mind. No arrogant man was ever permitted to see Nature in all her beauty." With regard to many of his paintings it was shown that he so far made free in point of composition that often it was impossible to identify the exact

scene of his brush, the Church tower of Dedham, for instance, being introduced in impossible situations. As the barge went on, Mr. Benham read a brief paper on Constable:—

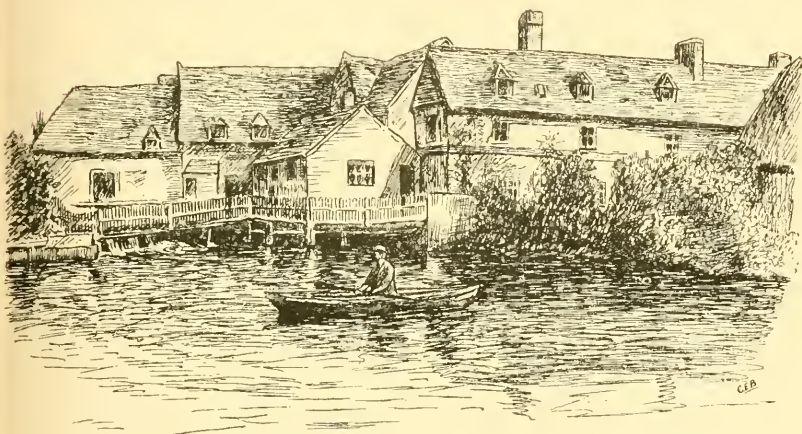
JOHN CONSTABLE AS A "NATURALIST."

BY CHARLES E. BENHAM.

"Full details of Constable's life have over and over again been published, and some outline of his career has already been given to the members of this Club. I will therefore endeavour to impart some novelty to the subject, after I have briefly recalled a few biographical details, by pointing out how essentially were his aims identical with those of the true naturalist. As a landscape painter his life's motto and the moral of his works may be said to be 'fidelity to nature'—a principle which the naturalist must approve. It was his determined devotion to nature, unadorned by conventional ideas, which caused his paintings to be so warmly appreciated after his death and so coldly unappreciated during the greater portion of his life.

"John Constable was born at East Bergholt, June, 1776. His father, Golding Constable, inherited considerable wealth, including Flatford Mill, Dedham Mill, and two windmills at East Bergholt. John was the second son in order of time, but, of course, the first in order of distinction. He was a puny infant and not expected to live, but it seemed as if the great Reaper caught a glimpse of his promising gleams of genius and drew back his sickle, for to the astonishment of his parents he not only survived his infancy, but developed into a stalwart and healthy youth. At seven years old he was sent to a school at Lavenham—not a very satisfactory school, for the master spent his time in love-making, and the usher spent most of his in flogging the boys, which evoked rather revolutionary feelings in the breast of Constable. From Lavenham he was removed to Dedham Grammar School. Here, though he distinguished himself but little except in penmanship, the master had a clear perception that his pupil was a genius. It was at this time that he first acquired the love of art, and he was much assisted and encouraged by a neighbour, the artist John Dunthorne, whose memory is none the less distinguished from the fact that he was actually Constable's first tutor in sketching and painting. Constable's parents were a little proud and a little ashamed of their son's tendencies towards the fine arts. In their narrow-minded simplicity they looked upon artists as people of questionable morals and doubtful respectability, as compared with those who adopted the more orthodox and highly lucrative profession of grinding corn. And yet his mother, with natural maternal pride, obtained through the Dowager Lady Beaumont, who lived at Dedham, an introduction to Sir G. Beaumont, who in that day was the leviathan of art critics—the authoritative autocrat on style and propriety in art. He was a pedantic old fellow, no doubt, but he had good sense enough to see great merit in Constable's efforts, and good nature enough to help him with advice and with studies for his guidance. This valuable patronage even induced his father, somewhat half-heartedly, to let the young man try his fortunes as an art student in London. There Constable made some valued friends and was getting on well, but circumstances necessitated his return to the uncongenial work of the mill at Flatford, to the great delight of his parents, who augured from the circumstance that there was, after all, a prospect of his ensuring respectability and comfort. A very few years later, however, his father was wise enough to realise that where the young man's heart was there his treasure was more likely to be also,

and in 1799 John returned to London, and devoted himself for life to the profession for which he was so evidently destined. He worked with great earnestness, for he possessed the rarely combined faculty of perseverance and natural talent. Plenty of men can fag, and plenty of men have natural gifts, but as a rule the fagging man has not the talent, and the talented man will not submit to the fagging. Constable, like most geniuses, was an example of both, and by dint of these two levers he so far succeeded that in 1802 he made his first exhibit at the Royal Academy, and from that date he exhibited every year, with one exception, till 1837, 134 of his paintings having been hung in that time. It is noteworthy that the Hanging Committee declined his Flatford Mill, to his great disappointment. It was, however, exhibited in 1812. It was in 1802 that Constable made the great resolve which was the secret of the charm of his landscapes. He determined thenceforward to follow nature uncompromisingly, and to pay no attention to artificial ideas about style. 'There is room,' he said, 'for a natural painter,'



CONSTABLE'S HOUSE, FLATFORD MILL.

Drawn by C. E. Benham.

and that title was thenceforward his goal. Landscape, however, was not his only theme. Sea pieces and portraits were also in his programme, and, though perhaps with less success, he by no means failed in his scriptural subjects. In 1809 he painted an altar piece for Nayland Church, 'Christ Blessing the Bread and Wine.' This painting suffered much from neglect, or, to put it euphemistically, from damp, and in 1880 it had to be sent to London to be restored. He also painted a picture which is in Branham Church, though unfortunately the name of the artist has been effaced from some singular 'religious' motive. After his father's death Constable married a Miss Bicknell, whom he had unsuccessfully courted long before, the obstacle having been his doubtful prospects of income. He was never in actual financial difficulties; though but for fortunate legacies which came to the lot of himself and his wife he probably would have been. Not till nearly the end of his life was he sufficiently recognised to be elected Royal Academician. About the same time he executed his work on

English Landscape, which summarises the secrets which he had wrested from his art by his life's labour. In the frontispiece of this work is a representation of the house at Bergholt where he was born (now pulled down). His death, which occurred in London suddenly, March 30, 1837, was undoubtedly the result of his constitution being thoroughly undermined by the intense application with which he pursued his labours.

"His principal pictures are too well known to need much comment, and I will only refer to one or two of his local ones. The Locks of the neighbourhood were, of course, favourite subjects of his brush. His 'Scene on the Stour,' was exhibited at the Academy in 1819. It is now known as the White Horse, from a white horse in a barge in the foreground. 'Stratford Mill,' Academy 1820; 'Dedham Vale,' 1811. These two pictures realised 100 guineas each, and here I may mention, by way of contrast, that on June 3rd, this year, his 'Hampstead Heath' fetched 2,550 guineas at the sale of Lord Revelstoke's pictures. 'The Haywain,' painted in 1821, was a scene at Flatford. This picture introduced Constable to France. It was bought by a Frenchman, and Constable was encouraged to visit Paris, where he was met with enthusiasm and great distinction at the Louvre Exhibitions. The 'Jumping Horse' was a picture well illustrating the nimble way in which the barge horses surmount the little barriers which do duty for gates on the towing-path. The famous 'Valley Farm' was painted in 1834. The house is called 'Willy Lott's house,' after an eccentric occupier, who, so it is said, for 80 years never left his house for four days. This picture is in the National Gallery, and also his local paintings, the 'Country Lane,' 'The Cornfield,' and 'The Haywain.' A large number of his other sketches have recently been added to the National Collection.

"Having dealt thus very cursorily with Constable's place in the history of his time, I should like to add a few words on his place in the history of art. 'I love,' he said, 'every stile, every stump, and lane in the village; as long as I am able to hold my brush I shall never cease to paint them.' It is true he altered the composition of his scenes so that it is impossible, sometimes, to identify them now, but, in another sense, he was Nature's most faithful slave, and as such the Field Club should especially honour his memory. This is best illustrated by realising the parallel between his work as an artist and that of Wordsworth and the Lake School as poets. The eighteenth century was a period of abnormal artificialness. In poetry there were certain forms of diction considered orthodox, and all outside this prescribed pale was not recognised as elegant, even though it might be true. Just as Wordsworth and his school of poets broke this literary conventionality and burst the bubble of diction, so Constable was the pioneer in exterminating a similar spirit of artificial conventionality in eighteenth century art. Among the art canons of his time were such ridiculous ideas as that 'A good picture, like a good fiddle, must be brown,' that every landscape must have its 'brown tree,' and that the merits of painting largely depended upon where the essential brown tree was placed. Constable went boldly in defiance of these autocratic decrees of fashion, confident that sooner or later truth to nature would triumph over the canons of bad taste. It may seem hard that for a great part of his life prejudice was too strong for his gospel to be generally accepted, but on the other hand it is a grand victory for his cause that within a century the genuine has superseded almost all the dictums and canons of an absurd period in art. The danger would appear now to be that painters, failing to appreciate Constable's mission, and yet recognising the

beauty of his work, should endeavour to imitate Constable's style and so build up for themselves a new conventionality actually based upon the very works intended to protest against such a principle. Constable, like every other man, must needs have shown his personal individuality and a certain amount of personal mannerism. To imitate these is to run counter to the very spirit which he pioneered, and to revive in a new and subtle form the anti-natural conventionality which he spent his life trying to break through."

The barge was finally moored near Brantham Lock instead of Manningtree Lock, as announced in the programme, which is within half a mile of Manningtree Station; but the visitors were able to reach the station in time, having half an hour to spare, and were ready to forgive the extra walk in view of the very pleasant outing which the directors, and Mr. Walter Crouch in particular, had so successfully organised in this charming district.

[We are much indebted to Messrs. Lawrence and Bullen, of Covent Garden, for the kind loan of the block of the Old Bay and Say Mill, from Mr. Barrett's "Essex Highways, Byways, and Waterways, 1892."]

ON THE GRAVELS NEAR BARKING SIDE, WANSTED AND WALTHAMSTOW, ESSEX.

By HORACE W. MONCKTON, F.L.S., F.G.S.

[*Read at the meeting at Barking Side, July 1st, 1893.*]

CARSWELL, the residence of Mr. Llewellyn Hatton, at which the following paper was read, is situated on the east of the River Roding, about a mile and a-half from Barking Side Church.

Its level is a little more than 50 feet above the sea, and from it the ground slopes gradually up to a level of 118 feet at Clayhall. The solid geology of the district is extremely simple. On the high ground to the N.E. at Lambourne End there is a small patch of Bagshot Sand and below it down to the Barking Reach of the River Thames there is a wide stretch of London Clay. Well sections tell us that below the London Clay are the clayey Woolwich and Reading Beds, the Thanet Sands and the Chalk, which last was reached by a well at the Britannia Works, Ilford, at a depth of 163½ feet (Whitaker, "Geol. of London," vol. ii., p. 23). Upon the London Clay are a variety of beds of Boulder Clay, Gravel and Sand which are not so easy to understand as the solid geology. The oldest of these Drifts in this neighbourhood is probably the patch of gravel at Lambourne End at a level of 335 feet O.D. I found a small section there in July, 1890, of which the following are the details:

- | | | |
|----------------|---|--|
| <i>Drift</i> | { | 1. Pebbles in patches up to 2 feet thick, mottled red and white in places. Two or three subangular flints, several small quartz pebbles up to $\frac{1}{2}$ inch longest diameter. |
| | | 2. Loamy reddish sand, 4 feet. |
| <i>Bagshot</i> | { | 3. Sand yellow with a layer of white clay 1 foot. |
| <i>Sand</i> | { | 4. Yellow sand, 2 feet. |

This section was on the patch mapped "Hill Gravel of doubtful age." I should be inclined to call it a Pre-Glacial Hill Gravel.¹

Patches of Boulder Clay and Loam belonging to the Glacial Formation are mapped at Chigwell Row (266 feet O.D.), and on the slopes of the hill below are some small patches of gravel.

Then we come to the large patch on which Barking Side stands. It is described by Mr. Whitaker (*op. cit.* p. 410) as one of several detached masses of a high terrace of River Drift "separated from the rather lower sheet to the south by an outcrop of London Clay, partly very narrow." He adds that this "large mass stretches irregularly eastward from near the Roding, opposite Wanstead, by Barking Side and Aldborough to the south-eastern part of what used to be Hainault Forest by Padnal Gate, and northward to Fairlop Plain. It seemed as if the London Clay came up through the gravel in places, as half-a-mile and more south-westward of Barking Side, between that village and Aldborough and round Aldborough Gate."

This gravel is mapped as extending from a level of about 120 down to 50 feet above the sea, and there is a gravel pit at Carswell at the lower end of the patch. The section shows some 15 feet of well stratified gravel and sand. Mr. Crouch tells me that the greatest thickness of gravel is 21 feet, and when Mr. T. V. Holmes and I visited the pit on June 15th last, he showed us a place where the London Clay was being dug into below the gravel. Patches and lines of sand, sometimes rather loamy, occur occasionally. Here and there the gravel is slightly contorted and in two or three places small faults, or more probably slips, are to be seen.

The gravel consists mainly of flint pebbles and subangular flints. I also noted a few fragments of Lower Greensand Chert, some, not very much, small quartz, and the following stones which are probably erratics derived from the Glacial Drift :

¹ See S. V. Wood, *Quart. Journ. Geol. Soc.* 1858, vol. xxiv, p. 466; Whitaker, *Geol. of Lond.* vol. i, p. 297.

Large flints, very little waterworn, from the Chalk.

Cherty looking stone, perhaps carboniferous.

Red very hard sandstone, and brown and grey sandstones.

Brown quartzite boulders—common.

Purplish-grey quartzite, somewhat glassy.

Large quartz pebbles or boulders, one measured $3 \times 1\frac{1}{2} \times 1\frac{1}{4}$ inches.

Conglomerate or coarse grit of quartz and felspar.

One pebble which I think is an igneous rock.

The Barking Side patch of gravel is one of several at about 100 feet level. It may well be of much the same age as the gravel at Hornchurch, which Mr. T. V. Holmes has described as overlying Boulder Clay (*ESSEX NAT.* vii., pp. 1-14). Below these gravel patches we find the great spread of Thames Gravel which underlies the brickearth, in which mammalian remains and shells have been found. One cannot depend on slight differences of altitude as a conclusive test of the age of river gravels, for a river will often cut a channel and then fill it up again to a greater or less extent. Thus at Dartford we find a great thickness of gravel underlying the gravel of Dartford Heath. A magnificent section showing this was recently visited by the Geologists' Association, but as I hope that Mr. F. C. J. Spurrell will soon publish a full account of it, I refrain from entering on any details now. Mr. B. B. Woodward has also pointed out that under certain circumstances the gravel at higher levels may be newer than the gravel at lower levels in a valley.² In the west Essex part of the Thames Valley, however, I am inclined to believe that the succession of the Drift formations is as follows, beginning with the oldest:—

1. The Pebbly Gravels of the Epping Ridge and Lambourne End.
2. The Gravel of Buckhurst Hill; a few patches of gravel near Loughton.
3. The Chalky Boulder-Clay.
4. The Gravel of Hornchurch overlying the Chalky Boulder-Clay and the gravels at about 100 feet O.D. of Romford and Barking Side.
5. The great sheet of gravel at Barking, Ilford, and Walthamstow, which is for the most part below 50 feet O.D.
6. The brickearth of Ilford, with mammalian remains, etc.³

² *Proc. Geol. Assoc.* 1889-90, vol. xi., p. 386.

³ See on this question T. V. Holmes, 1893, *ESSEX NAT.*, vol. vii. p. 1.

A very good section in a Gravel Pit at the Parish Sewage Farm south of Wanstead Park was shown to me by Mr. Crouch. It is composed of somewhat coarse material (flints, quartzites, Lower Greensand chert, sarsen, sandstone, quartz, etc.), and is roughly, but evenly, stratified. Its level is about 25 feet O.D.⁴

In a neighbouring mass of this low level gravel, which borders the marshes of the Lea from Leyton up to the reservoirs of the East London Waterworks near Walthamstow, a series of excellent sections have been opened up during the construction of the Tottenham and Forest Gate Railway. I have had the advantage of visiting these sections in company with Mr. Whitaker and Mr. T. V. Holmes, and also with the Geologists' Association, under the directorship of Mr. J. W. Gregory.⁵

The gravel is very like that at Wanstead Park, roughly stratified and coarse. Subangular flints and flint pebbles form the bulk of the gravel, but there is a great quantity of other material. I noted some pebbles which are probably sarsen stone, or sandstone from the Eocene beds, some fragments of Lower Greensand chert, a piece of iron grit probably from an older gravel, and much small quartz, and the following pebbles, which are probably erratics from the Glacial Drift :—

Large quartz pebbles.

Very hard, brown, close-grained sandstone.

Hard, light brown sandstone, with veins of quartz.

Dark red coarse-grained sandstone.

Brown and white soft sandstones, speckled with fragments which are probably mica.

White vitreous quartzite.

Two pebbles of igneous rock.

Besides these stones I have some specimens from Walthamstow which deserve special notice. The first are small quartzite pebbles of a purple-pink or mauve colour, sometimes not unlike that of the penny postage stamp now in use, and they are of interest because they can be matched by pebbles which I have collected from the Bunter Pebble Beds of Nottinghamshire, and I have no doubt they come from that formation. I have found similar pebbles in the Glacial Gravel of St. Alban's, Radlett, and Rainsford End near Chelmsford, in the Thames Gravels at Dawley near West Drayton,

⁴ See Whitaker, *op. cit.*, p. 409.

⁵ Proc. Geol. Assoc. 1892, vol. xii, p. 338; ESSEX NAT. 1892, vol. vi., p. 97.

and near South Ockenden, and in gravels south of the Thames at Tilehurst near Reading, on the hills above Bisham and Cookham, and on Dartford Heath.

The second is a fragment of a large pebble which was found by Mr. James Baker during the excursion of the Geologists' Association to Walthamstow on May 7th, 1892. It was in the gravel of the cutting on the railway at Stoneydown. On being broken up it was found to be composed of a very hard brownish-red quartzite, with scattered particles of a glistening mineral, probably mica, and to contain a number of casts and impressions of a small Brachiopod shell, *Orthis budleighensis* (Dav.).⁶ This shell is of Lower Silurian age. It is said to fill whole beds at May and other places in Normandy and to occur in Brittany. It has also been recorded from the quartzites near Gorran Haven, in Cornwall. It has been found in pebbles in the Triassic pebble bed of Budleigh Salterton on the south coast of Devonshire. The origin of these pebbles is doubtful, and the question has given rise to great discussion, but the best opinion seems to be that they were to a large extent derived from Cambrian and Silurian rocks which were destroyed during the formation of the English Channel.

Pebbles containing this shell have been found in the Bunter Pebble Beds of Staffordshire, and are recorded from the Drift near Birmingham, Warwick, Leicester, and Nottingham. Professor Bonney showed me one which he found in Staffordshire—a whitish quartzite, full of casts of the shell in question. The place from which these pebbles were derived is uncertain, but there can, I think, be little doubt that the Walthamstow pebble was derived from a northern source.⁷

Besides these pebbles of pink quartzite and brownish-red quartzite with fossils, which very probably are derived from the Bunter conglomerate, many of the other quartzite and quartz pebbles found in the Thames Gravels have probably come from the same source. As to the sandstone pebbles, it was suggested by Mr. J. W. Davis that they may very likely be Coal Measure sandstone.

The Lower Greensand chert, I believe, came originally from the south. The proportion varies a good deal in the different gravels.

⁶ See the report of the excursion by J. W. Gregory, F.G.S., Proc. Geol. Assoc., 1892, vol. xii., p. 338; and also ESSEX NAT., vol. vi., p. 97.

⁷ My authorities for the above are Davidson's "Brit. Foss. Brachiopoda," vol. iv., p. 317; Bonney, "Geol. Mag.," 1880, vol. vii., p. 404; H. B. Woodward, "Geol. of Eng. and Wales," 2nd edit., 1837, pp. 75, 225, etc.

When examining gravel pits and sections I have very frequently taken away with me a sample of the smaller stuff for examination at home, and I found the proportion of Lower Greensand chert in these samples was as follows :—

Glacial Gravel, Hendon, 6.5 %; the large pit at Gray's Brickfield, from a bed which, I believe, to be under the *Corbicula fluminatis* bed, 5.5 %; Westleton Shingle, Coopersale Common, 3.7 %; Thames Gravel, Upminster Railway, south of Back Lane Bridge, 2.9 %; Hornchurch Railway gravel above the Boulder Clay, 2.0 %; Glacial Gravel, Rolstons, near Writtle, 0.8 %; Thames Gravel, Walthamstow Railway, 0.6 %; Glacial Gravel, Greensted Church, 0.5 %.

These figures seem to show that in pre-glacial or early glacial times there was a considerable flow of water from the south towards the north, unless indeed it can be shown that this chert came from the Lower Greensand of the north.

I am not, however, at present able to find any record of such a rock occurring in the Lower Greensand north of London, but the matter requires further investigation.

TESTACELLA SCUTULUM, SOWERBY.

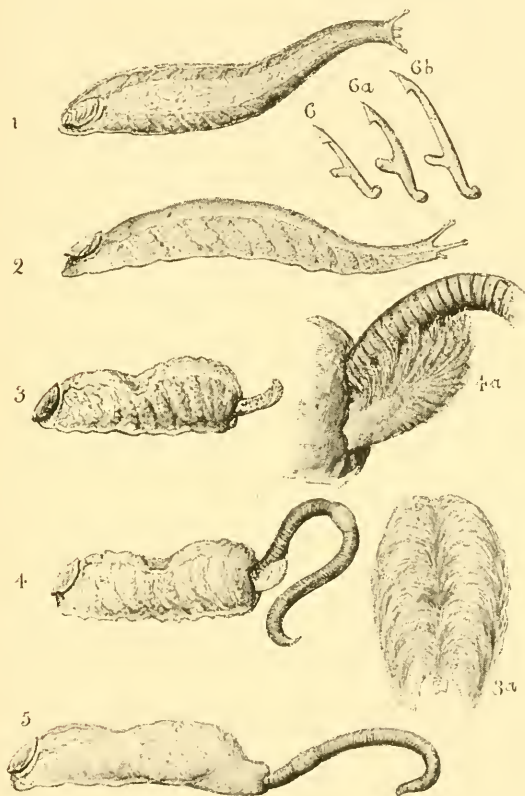
THE specimens of this worm-eating slug, recently exhibited at a meeting of the Essex Field Club,¹ have furnished the material for some experiments and called forth a paper in the "Zoologist" from our member, Mr. W. M. Webb, F.L.S.,² dealing with the way in which this highly specialised mollusc catches and swallows its prey.

The first part of the paper is taken up by a review of the previous accounts of the matter, which, however, tend to the formation of somewhat exaggerated and indefinite ideas on the subject. A description is then given of the writer's experiments; he found that certain stimuli, such as the touching of the retracted anterior end of the slug by a living earthworm, or with a camel's hair brush, or again with a drop of water in the case of *Testacella maugei*, Fer., gave rise

¹ ESSEX NATURALIST, vol. vii. (1893), p. 46.

² On the Manner of Feeding in *Testacella scutulum*, by Wilfred Mark Webb, F.L.S., Staff Demonstrator in Biology to the Essex County Council, "Zoologist," vol. xvii. (1893), pp. 251-259, plate 1.

to the sudden protrusion from the mouth, of the buccal cartilage, which carries the radula or lingual ribbon. The protrusible organ is milky-white, and the ribbon, studded with rows of barbed chitinous "teeth," follows the general spoon-shape of the supporting cartilage. As the latter becomes completely extended, the hollow



Testacella scutulum, SOWERBY—BUCKHURST HILL, ESSEX.

- Figure 1. The animal extended, seen from above.
 ,, 2. The same, but seen from the right side.
 ,, 3. The animal contracted, with the radula protruded.
 ,, 3a. View of the radula from above, enlarged.
 ,, 4. The same as figure 3, but the radula with an earthworm in its grip.
 ,, 4a. Enlarged side view of the radula, as seen in figure 4.
 ,, 5. The animal enveloping the earthworm by gradual extension.
 ,, 6. Tooth, from the side of the radula.
 ,, 6a. The same, from a point nearer the centre of the radula.
 ,, 6b. The same, from very near the centre of the radula.

in it is made more pronounced, and the ribbon being tightened the backwardly-pointing teeth on the outsides of the "spoon" stand upright, while the barbs of those on the opposite edges come nearer to one another with an action resembling that of a steel trap. Should an earthworm be near enough the barbs pierce and hold it, but the victim got away in some cases where its end was not entrapped; otherwise the slug extends itself once more, enveloping the worm completely, if its size allow. The general conclusions arrived at are, that *Testacella* does not necessarily feed only at night; that it is doubtful the slug stalks its prey at all, and that the strikingly rapid, but more or less automatic, protrusion of the radula has given rise to the fanciful stories of its crouching and springing. Again, the end of the worm must as a rule be seized, for apart from other considerations it is impossible for a large worm to be swallowed in any other way, as two thicknesses would have to be taken in together. A way, however, strikes one by which this last difficulty might be got over, and this is hinted at by one of the authors quoted from in the paper, namely, granting that a worm could be securely held by the middle it might well get broken in half, and one portion becoming free the other might be swallowed in the ordinary way; whether the second half would afterwards be attacked is a question. The results are summed up as follows:—

"It will be seen that *Testacella* is particularly well adapted for catching its prey should it meet them in the mouth or other portions of their tunnels. The slug on coming into contact with the head of an advancing earthworm, appearing above ground, or what not, would contract, and, shrinking back, would entirely block the way with its now swollen body. The worm in endeavouring to proceed would continue to irritate the surface of the slug, seeking the groove above the slug's mouth—in some cases small worms actually managed to force their prostomia into the oral aperture—and would be caught in the grip of the radula as it was shot out, and held securely, the slug maintaining, by its broadened body, a firm hold on the walls of the burrow. This method of procedure would not, of course, prevent the *Testacella* from attempting to secure worms in the open, its stealthy movements not alarming the latter in any way, but it would not be so certain of a meal, as the chances of a successful hit with the radula are by no means so great."

The paper winds up with some remarks as to the specific distinctness of *Testacella scutulium*, Sow., which, apparently owing to the

greater rarity of *Testacella haliotoidea*, Drap., has been confounded with this species for a long time, though Sowerby described it as distinct some seventy years ago. Much more recently, Mr. Charles Ashford and Mr. J. W. Taylor showed that the two species were distinct from an anatomical as well as an external point of view, but it was at the same time owned that the specimen of the first species was immature. This may have had something to do with the fact that the distinctiveness has not even yet been universally recognised, and the writer of the paper under consideration has thought it necessary to endorse Mr. Taylor's opinions with regard to *Testacella scutulium*, having examined a number of adult individuals of that species.³

The accompanying illustration is taken from the original drawings made from nature by Mr. W. J. Webb for the plate in the "Zoologist," the specimens having been taken at Buckhurst Hill by Mr. H. C. Snell.

NOTES—ORIGINAL AND SELECTED.

Otters Breeding in the open near Brightlingsea.—Mr. John Bateman, J.P., of Brightlingsea Hall, writes: "On August 23rd some scythemen were cutting reeds in a shallow pool, or rather low-lying marsh, artificially flooded, and planted with reeds, at the back of Brightlingsea Hall (the water having been let out on August 4th), when they laid bare an open nest made roughly of reeds and so placed as to be just above the water level when the pool was full. In it were several young otters about 9in. long, and quite blind, one of which they brought in. The colour was that of a young mouse, with nose and ears pink, and claws very sharp. We tried our best to keep it alive, but, in spite of warm milk given many times a day, it died on the 26th. I have known several cases (in Essex) of otters breeding in holes, but never in the open. The only fish supply at hand would be eels—unless the old otters visited a salt water creek, containing flat fish and smelts, about half a mile distant." In a subsequent letter Mr. Bateman says: "I think I saw the bitch otter, or her spouse, on the Sunday after the young one's death, but could not be quite sure. Anyhow, we have never re-discovered where she has laid the young up."—The editor of the "Field" states that, considering the situation and the materials, it seems likely that the old otter may have appropriated the nest of a moorhen.

³ In a note in the "Zoologist" for September, 1893, Mr. Webb gives some references not included in his paper, and mentions Mr. W. E. Collinge's paper "On the Generative System in the Genus *Testacella*," "Ann. Mag. N. H." vol. xii. (1893), p. 21, which bears out the statement as to the distribution of *Testacella scutulium*.

Otters near Brightlingsea.—It is recorded in "The Essex County Standard," that on September 25th "Master H. S. Dawson and his otter hounds had good 'sport' on the Colne. The meet was at L'Aurore, near Brightlingsea, and in the course of four and a-half hours' hunting the hounds killed a fine young dog otter, and had a good swim after another."

Reported Occurrence of a Seal (? sp.) at Walton-on-Naze.—It is constantly a matter of regret that the Club has not yet in many likely localities "recorders" capable of sending in authentic information for publication of natural-historical occurrences in their respective neighbourhoods. A newspaper note to the following effect is the only record we have of the capture of a seal at Walton:—"It was rumoured on Thursday last (September 7th) that a seal had been seen disporting in the Walleit. Like unto some other true rumours, it was pooh-poohed, but evidently there must have been something like a seal seen somewhere, for on Friday morning, as Mr. Dan Turpin was enjoying an early ramble at the Naze Point at the north side of Tamarisk Wall, he saw a grey [*sic*] seal lying quiet. The animal had recently been shot at. He returned to Walton for assistance, and the seal was secured and brought to a shed near the Pier. In weight it was about 60 lb. ; length, 4 feet 5 inches ; girth round the body, 3 feet. The seal was on exhibition during the day, and a great many viewed it." Unfortunately we have not heard that any competent naturalist was among the visitors, and we are consequently in doubt whether the animal was really a "grey seal" (*Halichorus gryphus*), as the newspaper has it, which would be a most interesting new record for the county, or only the common seal (*Phoca vitulina*), the more probable supposition. Dr. Laver, in reply to inquiry, writes that he has no information as to the occurrence.—ED.

Ornithological Notes from Mistley.—It may interest some of your readers to hear that I have had for some time this afternoon a Grey Wagtail (*Montacilla melanope*) under my observation. This is the second specimen only that I have observed in this district during some fifteen years. [Writing on September 21st Mr. Nichols says that "two more Grey Wagtails have appeared on the stream in my garden. The first one, which after writing to you I shot, was an immature bird. The other two are an adult and another bird of the year. I hope that they may stop through the winter with us. I find on referring to my notes that I have twice before observed the Grey Wagtail in this district, in 1889 and on November 4th, 1890, both in Lawford parish."]

On September 11th, I saw three Brent Geese (*Bernicla brenta*) fly up the river opposite here. Is not this early?

It may also be of interest to note that a Green Woodpecker nested and brought off her young within twenty yards of my house.

I saw on August 11th, three Cormorants fly over opposite Mistley, the first I have ever seen up the river. One of the local puntsmen says a pair were always up. This, however, must be an error.—WALTER B. NICHOLS, East Lodge, Mistley, Manningtree, September 18th, 1893.

The Brightlingsea Heronry.—It will be very gratifying to Essex ornithologists to know that the herons have re-established themselves at Brightlingsea. As detailed by Mr. Fitch in THE ESSEX NATURALIST (ii. pp. 179-81 and "Birds of Essex," pp. 183-84) the birds formerly bred in abundance in a secluded spot known as Heronry Wood on the Wyvenhoe side of the Twenty-seven Acre Grove,

On Mr. J. Bateman's estate, about a quarter of a mile west of Brightlingsea Church. There were forty years ago quite 100 nests, but the felling of the large trees, the shootings of a cantankerous tenant, and the ravages of the rooks, finally forced the herons to desert the Wood in 1872. Since that date Mr. Bateman has tried to encourage their return for many years fruitlessly, but we are now very glad to hear from him, in a letter dated September 13th, that his meritorious efforts have succeeded as they deserved. He writes: "It may interest you to know that in 1892, late in the season, the first pair of herons (for 21 years) bred in the Heronry Wood here, and hatched out four or five young in June. They chose an ash tree to build in. This year (1893) five pairs built at the usual time. Four nests were in one tall old bird-cherry and the fifth in a tall oak; both close to trees used by rooks. Some twenty young were hatched, and I have now no doubt that they have recovered confidence—never being shot at or bullied—and that they will, as of old, regularly nest at Brightlingsea." We hope that Mr. Bateman's anticipations will be realised and that the Heronry Wood will merit its name in the future as in the past. On the flat shores of Mersea this summer and autumn the sight of herons feeding has been a common and welcome experience with us; half-a-dozen or so can generally be seen with a glass, on the margins of the retreating tide.—ED.

Cormorant (*Phalacrocorax carbo*) at Brightlingsea.—Although by no means an uncommon bird on the Essex coast, particularly near Harwich, it may be worth noting that the "Essex County Standard" of August 12th records that "while duck shooting up the Brightlingsea Creek the other day, Messrs. Burckhardt, of Rydal Lodge, Clacton-on-Sea, shot a fine specimen of the Cormorant. It measures from beak to tail 33½ inches, the expanse of wings being four feet, and the weight five pounds. The gullet contained, when shot, several eels about a foot long, some being still alive, while others were partially digested. This bird is extremely difficult to shoot, owing to the swiftness of its flight and its habit of taking to the water on the least alarm. The last specimen shot in the locality was taken two years ago at Maldon. It is now in the hands of Mr. Coleman, of Holland Road, Clacton-on-Sea, for preservation."

Ruff (*Machetes pugnax*) near Thorrington.—A ruff in poor plumage was killed on August 6th, just over the boundary of Brightlingsea and Thorrington.—JOHN BATEMAN, Brightlingsea Hall, September 13th, 1893.

***Colias edusa*, etc., in South Devon.**—The editor having informed me that this butterfly, so common last season in Mersea, was not seen there this year, it may be of interest to record by way of comparison that at Budleigh Salterton in South Devon it was the prevailing diurnal lepidopterous insect from about the middle of August, and was still common at the time of my leaving that place on September 14th. The specimens first captured were in a perfect condition as though freshly emerged; later, of course, they became somewhat worn, but down to the time of leaving a few perfectly fresh specimens were to be seen on the wing. It appears to me that this observation indicates that the emergence of the butterfly extends over a period of some weeks; this carries with it the conclusion that the present brood at any rate did not consist of immigrants, but were true natives. I was informed by a collector that the species had been seen there in June; this earlier brood may or may not have consisted of immigrants, it is impossible to form any decisive opinion on the point without further information. I only saw

and took two of the pale forms, one a genuine *helice*, and the other intermediate between *helice* and the ordinary female. The butterfly did not appear to show any preference for locality, but was found in equal profusion along sunny lanes, over the swampy meadows bordering the river Otter, and over the grazing fields, reduced almost to dry stubble by the drought, high up on the new red sandstone cliffs. Although not an Essex observation, it may be useful also to note as one effect of this extraordinary season, that in a garden on the Exmouth road a laburnum tree was in full flower at the time of leaving on September 14th. The abnormal results of this season must surely have made themselves manifest in Essex, and it would be of interest if some of our own observers would record their experience. The humming-bird hawk-moth was fairly common at Budleigh Salterton, and, as I was informed by a friend, very common at Torquay. A few *Cynthia cardui* were seen; not a single specimen of *Vanessa io*, but *V. atalanta* and *V. urticae* were common.

May I in conclusion express the wish that Essex collectors would make THE ESSEX NATURALIST the regular medium of recording their captures? This course would very much facilitate the compilation of the insect fauna of the county, which we all hope to see at some future period among the special memoirs issued by the Club.—R. MELDOLA, F.R.S., September, 1893.

Entomological Notes from Mersea; Scarcity of Lepidoptera.—The magnificent weather of the spring and summer, and the abundance of many species of early larvæ, naturally led us to anticipate a goodly show of late summer and autumnal species. In this wish Essex entomologists have been woefully disappointed. The coast line and the clover fields at Mersea were continuously under the observation of my brothers, B. G. C. and H. A. C., and myself during August and the first half of September, and with the exception of one or two species, the dearth of butterflies was most marked. In places where last summer *Colias edusa*, *Vanessa io*, and *Cynthia cardui* were so common they were entirely absent;—indeed, we have not seen a single specimen of any of the three species in Essex this season. The only butterflies commonly seen were *Vanessa atalanta* and *Polyommatus phleas*, as well as *Chortobius pamphilus*, *Satyryus megera*, and *Lycæna icarus*. It is pleasant to observe that the two first-named beautiful species have taken a new lease of life in Essex; we quite feared, a few years ago, that *P. phleas* at least was becoming rare, if not entirely disappearing from our lanes and commons. It was a matter of wonder that we saw not a single specimen of *Satyryus tithonus*! Certainly the vagaries of butterflies are endless. The rarity of *C. edusa* this summer appears to be a general phenomenon all over England, with the exception, noted by Prof. Meldola above, of Budleigh Salterton, and yet countless thousands flew in the clover-fields last autumn.

Sugar was with us comparatively unproductive—the only “good” insects coming to it were *Agrotis saucia*, much less continuously than last season, and one *Zanthia gilvago*.

One startling capture was a *Metrocampa margaritaria* (a May or June insect) on September 2nd, in good condition!—W. COLE, Buckhurst Hill, September, 1893.

A Butterfly on the Warpath.—On a branch of one of the mighty oaks at Maundon one day this summer, I witnessed an interesting encounter between a large-tortoiseshell butterfly (*Vanessa polychloros*) and three or four wasps. The wasps had apparently found some luscious treasure on the branch and were busy

making the most of it, when the butterfly walked along the branch towards them and deliberately charged at the enemy. The wasps flew up and returned the attack, the butterfly beating a rapid retreat, walking backwards a few paces. As soon as the wasps settled back the Tortoise-shell charged again, and was again repulsed exactly as before. This was repeated over and over again. It struck me that the cool valour on the part of the butterfly against such formidable foes was remarkable.—CHARLES E. BENHAM, Colchester.

Geometra papilionaria in Epping Forest.—We were very pleased to find the curious and handsome "Large Emerald Moth" in the Forest—a reappearance, for it was one of the "plums" of the Forest collectors about twenty years ago. The first specimen was taken by H. A. Cole in Dr. Snell's garden, bordering on Lodge Bushes, on June 20th, and we subsequently took six other specimens at a light among the birches in the Bushes. Now that the birch is becoming one of the characteristic trees of the Forest in many parts, we may hope to see *Geometra papilionaria* and other birch-feeders more commonly.—W. COLE, Buckhurst Hill, August, 1893.

Abraxas ulmata and Brepheos parthenias in Epping Forest.—I took *A. ulmata* in Epping Forest, at rest on a blackthorn bush, on the 12th June. This is, I understand, the second specimen recorded for Essex; Mr. B. G. Cole took the first in Bury Wood, Epping Forest, in July, 1881 ("Proc. E.F.C.," vol. ii., p. lviii., and vol. iv., p. lxxxii). I may also mention that I took *Brepheos parthenias* at Theydon Bois on March 27th, and *Eutheonia russula* and *Tanagra cheroxyllata* at the same place on June 6th.—CHARLES OLDHAM, Woodford, July 1st, 1893.

Plusia moneta, Fab., at Woodford; a Noctua new to Essex.—As noticed in the report of the meeting at Wanstead (*ante*, p. 107) on July 1st, Mr. Charles Oldham exhibited a specimen of *Plusea moneta*, Fab., a moth not only new to our county, but only recently recognised as an inhabitant of (or immigrant to) the British Isles. The specimen was taken on June 2nd of the present year, as it was flying over honeysuckle in Mr. Oldham's garden at Chelmsford Road, South Woodford. *Moneta* is very distinct from any other British species of *Plusia*, and is widely distributed in Europe; it is double-brooded, and its natural food is said to be Monkshood (*Aconitum*), but Duponchel says that the larva will feed on sunflower and Jerusalem artichoke, burdock and cucumber. The larva may be easily noticed in May, as it spins the young shoots of the plants together, and later the yellow cocoon is very conspicuous on the underside of the leaf of the food-plant. It was first captured in England, at Dover, in 1890, but has since been taken (and bred) in several other places, and seems likely to become established. Herr Hoffmann has given some very interesting remarks on the geographical distribution of the moth in "The Entomologists' Monthly Magazine" for 1890. It was known as a common insect in S. and S.E. Germany, but until the year 1875 was not recorded from the N.W. nor from the Netherlands. In that year it invaded the above-named districts and many other places, and in 1887 was recorded from Breda, in Holland. Herr Hoffmann adds, "The tendency of the species to gain new ground was so intense that even the rough climate of our Hartz Mountains was not able to keep it back, for I found *moneta* in the moorland districts of the Brocken, at a height of about 800 metres. . . . Now, the species having crossed the Channel, it will probably spread

rapidly over England, as it has done over the N.W. of Germany and over Holland." Mr. Oldham's discovery of the species so near London as Woodford is especially interesting, and it is a most welcome addition to the already rich list of Epping Forest lepidoptera.—ED.

Lepidoptera at Woodford.—Mr. C. Oldham has sent us an interesting list of Moths frequenting "sugared" trees in his garden in the Chelmsford Road, South Woodford, in June, July, and August. Amongst the species were *Lucania conigera*, *Agrotis corticea*, *A. puta*, *A. saucia*, *Noctua C. nigrum*, *Cosmia affinis* and *C. diffinis*, and *Cucullia umbratica*. *Catocala nupta* came on July 7th, which Mr. Oldham thinks remarkably early.—ED.

Some Additions to the List of the Lepidoptera of the Epping Forest District.—On looking through a collection of moths taken at sugar, at Theydon Bois, by my nephew, Maurice Cohn, in 1892, I find a few not included in my previous list (ESSEX NATURALIST, vol. v, p. 153). The species to be added are: *Apamea gemina*, *Xylophasia rurea* and *X. hepatica*, and *Aplecta advena*. With respect to this last capture (one specimen) it is of interest to note that four out of the five British species of *Aplecta* are now recorded from the Epping Forest district. I may add that *Nemeophila russula*, which was exhibited by me as a Forest species at the meeting of the Club on December 29th, 1888 (ESSEX NATURALIST, vol. ii., p. 267), should also be included in the list.—R. MELDOLA, F.R.S., September, 1893.

Eucalyptus flourishing in the open in Essex.—The hardy Tasmanian Gum-trees (*Eucalyptus gunnii*) the seeds of which were imported by me in April, 1887, are now all heights from twelve to thirty feet, completely defying English winters, and flowering and seeding profusely. I have seen hundreds of young plants raised from Essex-grown seed.—JOHN BATEMAN, Brightlingsea Hall, September, 1893.

The "Canker-Bloom" of Shakespeare.—All the authorities to which I have access state that the Dog-rose was Shakespeare's "Canker-bloom," but nowhere can I find any reason given for the assertion. I dare not impugn the accuracy of the learned Shakespearean commentators, who seem all agreed upon the point, but I should like to know if any of your readers can tell me why so strange a name should be given to the flower. Is it only assumed that the poet meant *Rosa canina* because that meaning would fit in so admirably with the simile in the lines in the well-known sonnet? :—

"The canker-blooms have full as deep a dye
As the perfumed tincture of the roses,
Hang on such thorns, and play as wantonly,
When summer's breath their masked buds discloses."

It has always occurred to me that a more obvious meaning for the "canker-blooms" in this passage would be the red mossy galls (the "Bedeguars," produced by *Rhodites rosæ*, L.) which so often vie successfully with the brightest hues of the flower :

"But, for their virtue only is their show,
They live unwood'd and unrespected fade,
Die to themselves. Sweet roses do not so;
Of their sweet deaths are sweetest odours made."

There is another passage in which Shakespeare mentions the "canker," in "Much Ado about Nothing": "I had rather be a canker in the hedge, than a rose

in his grace." This passage might be construed as confirming the idea that the wild rose is intended, but the word was used in old English for a toad-stool, and with equal probability the despised dandelion, which in Dutch is called "*Canckerbloemen*," might have been meant.—C. E. B., Colchester.

Drift Rocks in Epping Forest.—On Strawberry Hill, about 500 yards north of the well-worked pits adjoining the Earl's Path, a new section has been opened this summer. Although the pit is small, it has furnished some valuable information as regards the Drift—as well rolled quartzites, limestone, and sandstone are very much in evidence; and amongst the flints is one well scratched, similar in colour and appearance to those found amongst the Boulder Clay, near Chelmsford—some of which we saw at the recent visit to Mr. Miller Christy's hospitable home near Bloomfield. I got one then almost identical to that above referred to. There are many very large flints in this gravel, resembling those found in neighbouring districts of Epping and Parnden, coloured as Drift in the geological maps.

In the tower of Great Parnden Church, near the Broad Arrow mark, several Drift rocks may be seen with the flint of which the tower is built, and these are similar to those in the Forest. I noticed in this tower some of the thin tiles (about half an inch) which I have often found in the Forest pits, and at Nazing I find the floor of the fine old wooden porch is apparently formed of these tiles placed on edge. Near both of the above churches there are very large boulders that at Parnden of puddingstone (Hertfordshire), and at Nazing, near the Rectory, apparently quartzite. A round stone, about $3\frac{1}{2}$ inches in diameter, which I got from the pit on Whitehall Plain, is pronounced by Mr. Welsh, of the Guildhall Museum, to be "a cannon ball."—T. HAY WILSON, Chingford, September, 1893.

Ancient Pottery at Clacton-on-Sea.—According to the "Essex County Standard" of May 13th, the workmen engaged in excavating for the basement of the Grand Hotel found on Thursday, May 4th, "two Roman Urns, one of which was unfortunately broken. The one preserved is an excellent specimen, about 6 inches in diameter and 7 inches in height. The shape is perfect, and the markings on the nearly black exterior are very regular. The thickness is about three-sixteenths of an inch. It was found embedded in the clay about 8 feet from the surface. During the past year specimens of early British pottery, now in the Colchester Museum, were found on Mr. P. Smith's land at Bull Hill, Great Clacton. These interesting discoveries—with coins, etc., found in the neighbourhood—lead to the supposition that Clacton was a place of some importance during the early Roman occupation. Mr. N. Demaid secured the urn and presented it to Mr. H. Grant, who will doubtless give it a prominent position in the Grand Hotel." At our request, our member, Mr. A. S. Wilson kindly examined the vessel, and has sent a sketch of it. He is somewhat doubtful of its age, but it resembles specimens commonly reputed to be Romano-British.

Romano-British Urn at Willingale-Doe.—Mr. E. Durrant records in the "Essex Review" the finding of a Cinerary Urn, about 3 feet from the surface, in a field known as "New Barn Field," in the parish of Willingale-Doe. It was broken into fragments, but had been partly full of ashes and burnt fragments. The fragments are now in the possession of the Rev. C. L. Payne, rector of Willingale-Spain. The surface of the land where the urn was found, shows a large circular depression about 80 yards across.

An Ancient Pit at Little Dunmow, Essex.—Referring to my note on an ancient pit at Coggeshall (ESSEX NATURALIST, vii., p. 68), Mr. Hastings Worrin, of Bourchiers, Little Dunmow, has been good enough to inform me that when land-draining in one of his fields some time ago the workmen dug through a number of black places in the clay containing a good deal of pottery in small fragments, and what appeared to be charred wood. The field is called Great Calthorps, and is numbered 107 on the Ordnance Survey (Sheet xxiv., 14). It slopes towards the Roman Road from Colchester to Bishop Stortford, but the pits were some distance from the road. In this field Mr. Worrin found, some years ago, a bronze fibula.—G. F. BEAUMONT, F.S.A., Coggeshall.

Chigwell Moat.—It has been suggested that the site of this moat is such as to render it improbable that it surrounded a dwelling-house of the ordinary character. If, however, the evidence of field-names counts for anything, it would seem that Chigwell Hall once stood there; for, in the Tithe Map of 1838—for an opportunity of studying which I am much indebted to the Vicar of Chigwell—the field in which the moat is, figures as “Little Hall Field,” while the two immediately abutting on it were known as “Great Hall Field” and “Park Meadow.” In later days, the house (now pulled down) just below the pleasant playing-fields of the Chigwell Grammar School, was known as Chigwell Hall; but the ancient “site of the manor” is probably to be sought within the moat.—W. C. WALLER, Loughton, September, 1893.

The Joslin Museum.—In continuation of the remarks in the present volume (*ante*, p. 69), we are very pleased to learn from a recent notice circulated by the Committee that this valuable collection will now be secured for the Colchester Museum. Mr. Joslin originally asked £2,000 for his treasures, but in the event of their being purchased for Colchester promised a donation of £300. He has since reduced his terms to £1,300 nett cash, and will hand over the collection to the Committee on payment of that sum, subject to a further £200 being paid in four years' time at the rate of £50 per annum. Of the amount immediately required upwards of £1,100 has already been promised, and as active measures are being taken to secure the balance the Committee expect to be in a position to complete the purchase within the year of office of the present Mayor, Mr. Gurney Benham, who has taken so active an interest in the effort to secure this magnificent addition to the treasures of the Castle Museum. We heartily congratulate the Committee on the approaching success of their labours. To adapt a journalistic phrase, “other towns in Essex, please copy”!—ED.

A Harmless Mnemonic.—A useful hint was given me by an esteemed botanist at a recent meeting of the Essex Field Club, and I think it would be well to publish the idea in THE ESSEX NATURALIST for the benefit of others. In common, no doubt with many, to whom natural history is an occasional rather than a constant study, I have found that the names of plants have an inconvenient way of being edged out of my brain by the crowd of everyday matters which have to do business in that centre. The suggestion made to me was that the best mnemonic was a study of the meanings of the names as far as possible. I have applied this principle with gratifying success, and find it of great assistance, while it also adds considerable interest to the study of botany and tends to prevent, moreover, those glaring “false quantities” and mispronunciations which even fairly good botanists sometimes let slip. Who, for example, could forget that

Cress is called *Nasturtium* when he has apprehended the *nasi lórtium*, or nose twisting, which its bitter flavour was supposed to excite? Who would go on talking about "*Clēnālis*," when he has once associated the plant with the "brush-wood" which the Greeks called *κληματίς*? And so on; for it would be easy to quote one example after another in which the dry bones of the dead languages may be revived in the memory of the botanical student, bringing with them interesting scraps of folk-lore, strange old herbalist notions, and quaint fragments of bygone superstition. With the aid of a Greek lexicon, a Latin dictionary, and a good etymological English one, I have simply disfigured the beautiful margins of Sowerby's useful "British Wild Flowers" with notes, in a way which I heartily recommend other students to adopt, and no doubt entomologists might find the hint worth while remembering in their departments also.—X. Y. Z.

ANCIENT ENTRENCHMENTS AT UPHALL, NEAR BARKING, ESSEX.

BY WALTER CROUCH, F.Z.S. (*Vice-President*).

[*Read on the top of Lavender Mount, April 29th, 1893.*]

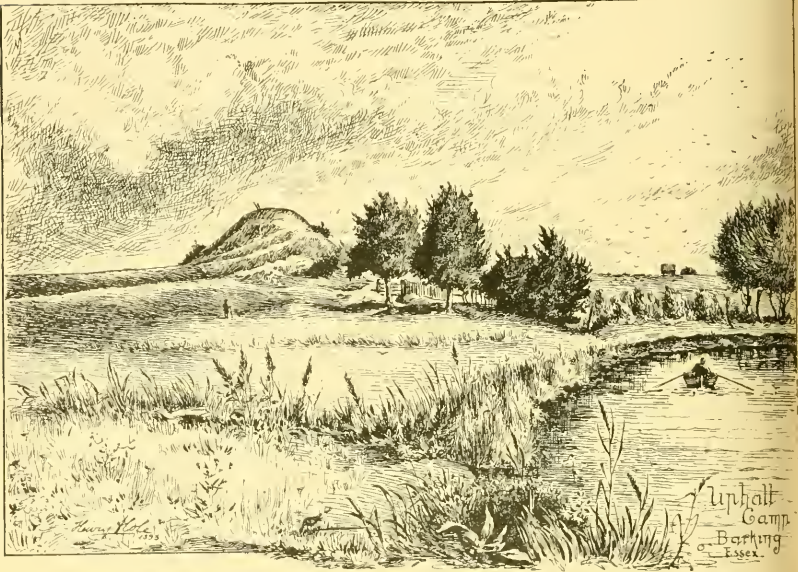
"I doe love these auncient ruynes :
We never tread upon them but we set
Oure foote upon some Reverend Historie."

THE earliest notice I have been able to find of these old earth-works is in the Rev. P. Morant's "History and Antiquities of Essex, 1768," Vol. I., p. 1-2, where he gives the following :

"BERKING.—Near the Road leading from Ilford to Berking, on the north west side of the Brook which runs across it, are the Remains of an ancient *Entrenchment* : one side of which is parallel with the lane that goes to a Farm called Uphall ; a second side is parallel with the Rodon, and lies near it ; the third side looks towards the Thames ; the side which runs parallel with the road itself has been almost destroyed by cultivation, though evident traces of it are still discernible. We do not hear, that any other Fortifications or remains of Antiquity, have been discovered here."

Although I have carefully examined the numerous MSS. of Jekyll and Holman, now in the British Museum, no mention of a camp here occurs in any of the seventeen volumes. They form, however, only a small portion of the materials for the history of Essex collected by those writers. Gough mentions over forty volumes of MSS. by Thomas Jekyll, of Bocking (1570-1653). William Holman, of Halstead (Ob. 1730), extracted largely from those in his possession, of which he made a catalogue in 1715, a

copy of which is in the British Museum (Egerton, 2382, f. 153). Some twenty to twenty-five volumes were given to the Corporation of Colchester by the Hill family, of Earls Colne, but in none of these is there any note of the camp.



MOUND AND RAMPART AT UPHALL, SEEN FROM THE RIVER Roding.

(Drawn by H. A. Cole, July, 1893.)

Morant mentions 400 volumes of MSS. by this writer, so it is just probable that he obtained his information from the Holman MSS.

It is certainly curious to find that the eminent Roman antiquary, Dr. Stukeley, whose great friend, the Rev. J. Sims, was vicar of the adjoining parish of East Ham, and who, by his own desire, was buried there,¹ does not appear, so far as his published works go, to have

¹ The following note of his burial-place was given by my friend, Mr. King, at the meeting of the Essex Arch. Soc., at East Ham, in 1859, but being accidentally omitted from their Report, has never hitherto been published. It is copied from his own MSS. in my copy of the Transactions.

"But in the churchyard lie the remains of one whose name will be held in higher veneration by ourselves as archaeologists than any of whom I have spoken, that distinguished antiquary, the Rev. Dr. Stukeley. He chose for the place of his interment this churchyard, selected the spot where his body should rest, and desired that no memorial should be erected, but that the turf should be smoothly spread over his grave. His request was complied with; but though no sepulchral memorial marks the spot, he has left an imperishable name, and a monument more enduring than either stone or brass.

Note of his burial in the Register:—

"1765, Mar. 9, Rev. Dr. Stukeley, late Rector of St. George, Queens Square."

He was buried on the north side of the church, and some years later (1776) the Rev. Joseph Sims was, by his own wish, buried close by the spot.

"H. W. KING, scripsit."

known of these earth-works, although he wrote of, amongst other Essex remains, the antiquities at Leyton, the Roman pavement discovered at Wanstead Park, and the Alate Temple of the Druids on Navestock Common; the latter visited by him in 1725, and again in 1749, whilst on a visit to Smart Lethieullier, of Aldersbrook, within a mile, and even in sight of the Uphall Mound.

No mention occurs either in his "Diaries and Letters," published by the Surtees Society, 1883; nor in "Magna Britannia," by Cox, 1720; Salmon's "History of Essex," 1740;² "Britannia Romana," by Horsley, 1732; nor in any *early* editions of Camden's "Britannia"; Grose's "Antiquities of England and Wales," 1773; "The Antiquarian Repertory," by Grose and Astle, 1809; nor are they shown on the large Map of Essex, by Chapman and André, 1777.

The Camp is, however, mentioned in "A new and Complete History of Essex, by a Gentleman" (P. Muilman), 1771; vol. iv., p. 271, evidently copied from Morant.

Again in the additions by Richard Gough, F.S.A. and F.R.S. 1789, to Camden's "Britannia," where at p. 51, speaking of the ancient entrenchments at Barking, he adds: "Whence the latter town undoubtedly had its name Berg-ing q. d. the Fortification in the Meadows. The north side of it is pretty entire—the side parallel with the road has been ploughed down."

The next reference is in "The Environs of London," by Rev. S. Lysons, 1796, vol. iv., p. 57, where he gives the following account, quoting from a MSS. History of Barking, written by Smart Lethieullier, of Aldersbrook, in Little Ilford, about 1750.³

"In the fields adjoining to a farm called Uphall, about a quarter of a mile to the north of Barking-Town, is a very remarkable ancient entrenchment: its form is not regular, but tending to a square; the circumference is 1792 yards (*i.e.* one mile and 32 yards), enclosing an area of forty-eight acres, one rood, and thirty-four perches. On the north, east, and south sides it is single trenched; on the north and east sides the ground is dry and level (being arable land), and the trench, from frequent ploughing, almost filled up; on the south side is a deep morass; on the west side, which runs parallel with

² He mentions that "the Rothing hitherto navigable but to Barking is lately made so to Ilford Bridge."

³ This MSS. History, from which Lysons quoted so freely, so far as the scope of his work extended, was at that time in the possession of Edward (afterwards Sir E.) Hulse, who had married Mr. S. Lethieullier's niece, Mary, the only daughter of his late brother Charles, who inherited her uncle's estates at Aldersbrook and elsewhere. This MSS. and others were subsequently removed to Breamore House, near Salisbury, the seat of the Hulse family, and were all unfortunately destroyed in the fire which occurred at that mansion in 1856. From this source, through Lyson's, we possess information of places in the Hundred of Becctree which is of the utmost value and interest. The remainder is now entirely lost.

the river Roding, and at a short distance from it, is a double trench and bank; at the north-west corner was an outlet to a very fine spring of water, which was guarded by an inner work, and a high keep or mound of earth. Mr. Lethieullier thinks that this entrenchment was too large for a camp; his opinion therefore is that it was the site of a Roman town. He confesses that no traces of buildings have been found on that spot, which he accounts for on the supposition that the materials were used for building Barking Abbey, and for repairing it after it was burnt by the Danes. As a confirmation of this opinion he relates that upon viewing the ruins of the Abbey Church in 1750 he found the foundations of one of the great pillars composed in part of Roman bricks. A coin of Magnentius was found also among the ruins."

This record is quoted in all later works, either in full or in a modified form, such as: "The Beauties of England and Wales," 1803; "The History of Essex," by Wright, 1831-5; "The People's History of Essex," by D. W. Collier, 1861, and many books of later date.

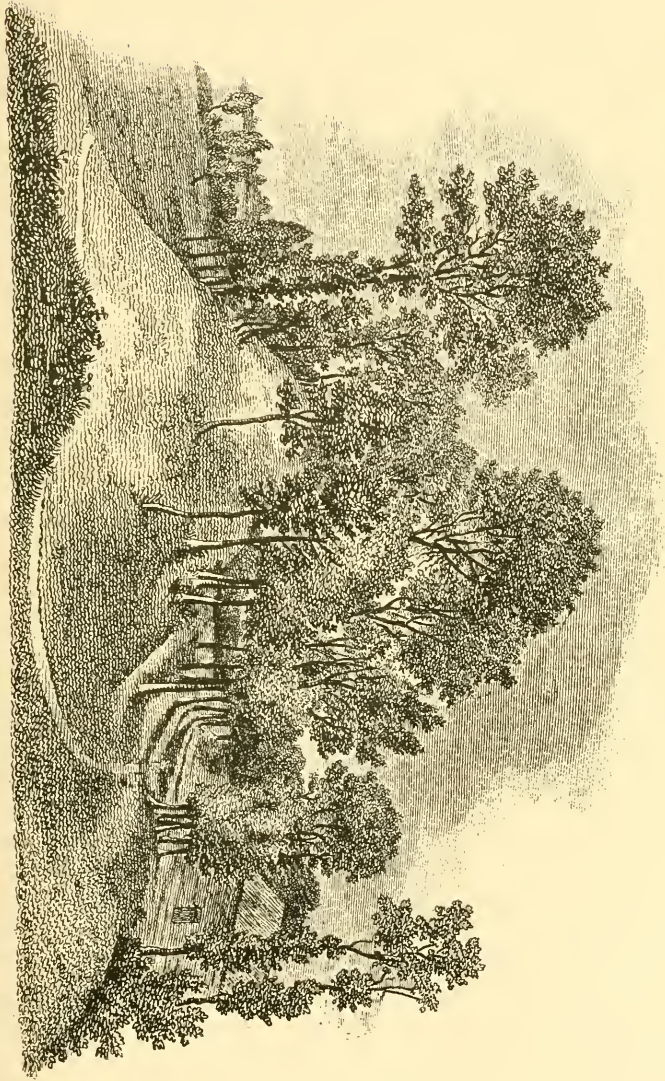
The only addition we find is in Mrs. E. Ogborne's "History of Essex" (1814). She says that the Mount was then "about 94 yards round the base, and about nine in height on the side of the river," and adds: "The extent and shape are nearly the same as that at Pleshy, in this county, which Mr. Strutt describes ("Strutt's Chron.," vol. i.), 'as a full mile in circumference not far wide of the long square, with the corners gently rounded off; and of this form are the greater part of the Roman Camps discovered in England.'"

On page 42 is the only view hitherto published, a pretty vignette of the Mound as it then appeared with trees growing upon it, which was drawn and engraved by her husband, John Ogborne. This is now reproduced as an illustration.

Coming down to recent times, I cannot find that any plan has ever been published, except those on the Ordnance Survey Maps, on which mine is based.

No investigation has ever been made, nor am I aware that any finds of pottery, coins, or implements of any kind have been found, or, at any rate, recorded, that would in any way furnish a distinct clue to its origin. Excavations would be necessary to determine this with any accuracy.

Although it was visited by the Essex Archæological Society on June 21st, 1859, no record is preserved in their Transactions, though incidentally it is mentioned as a *Roman Camp*. On that occasion



MOUND AT UPHALL CAMP. (J. Osborne Sculpsit, 1844.)

the members had a cold collation in a marquee erected in the field close by, by the kindness of my friend, the late Mrs. Hunsdon, of Manor House, Little Ilford. It was also visited by the Essex Field Club on April 18th, 1885, on their return drive from Barking and Eastbury House (*vide* Jour. of Proc., vol. iv., p. cxlviii.).

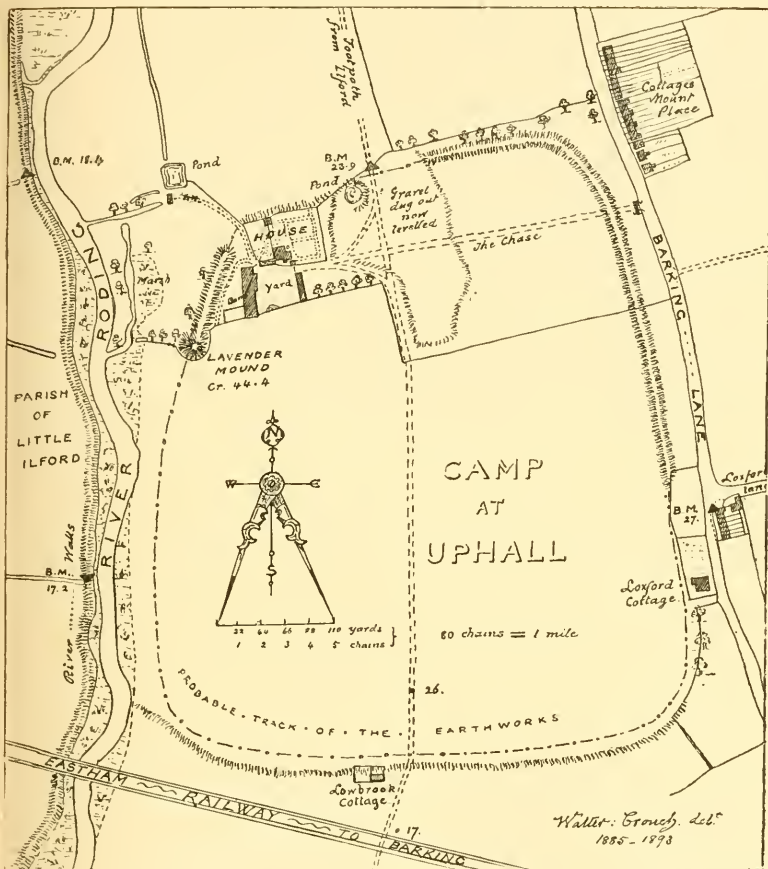
These earth-works have been familiar to me since the year 1860, and I may mention that I prepared a MS. account of this camp with a measured plan in the year 1868. The notes I took at that time in my perambulation have been of the greatest use in preparing the present paper.

The mound and rampart at the north-west corner are much in the same condition as then, being protected by a covering of grass, and are by far the best portion remaining. The height of the mound on the river side is about 28 feet. The continuation of the rampart has been cut away at some time, doubtless to allow access to the river. For the drawing of these as they now appear, taken from the north side, our best thanks are due to Mr. H. A. Cole, who made the sketch on July 25th, 1893.

For the last century or more this mound has been known as "Lavender Mount," from the name of one who occupied the holding *ante* 1809, when it was taken over by Mr. Hunsdon, who was born at Bennett's Castle.

Beyond the mound and ramparts on the north side, by the wall of the farm garden, traces may be seen up to the footpath stile, whereon is the Ordnance Bench mark, 28'9; close inside is the pond, which lies about 14 feet below.

The form of the rampart may also be seen farther along (eastward) gradually rising to the rounded corner, where the highest part is about 12 feet higher than the outer ground, with a slope of 4 feet on the inner. The continuation southward, down to the first hedge, cut only by the Chase leading to the Homestead, is traceable, but only some 18 or 20 inches above the level. Beyond the hedge, towards Loxford Cottage, it can just be discerned, but gradually levels down. This portion was much higher and more conspicuous until the last fifteen or twenty years, being preserved by the grass which covered it, but it is since under the plough, and becomes more indistinct each year. In a short time, in all probability, all traces will have entirely disappeared. The levelling has also been helped by the removal of soil to fill up the irregular ground marked on the plan, from which gravel had been taken.



The course of the rampart line on the south side, and continuation on the west up to the mound, had already disappeared before the time of Morant; but there can be little doubt of the track, as there is a trend of the land along the south side,⁴ varying from 3 to 5½ feet, which is shown on the plan I have drawn, a reduced copy of which illustrates this account. Near Lowbrook Cottage the ground slopes gently southward towards the railway and marsh.

The land at Uphall is naturally so much higher than on the other

⁴ This now forms the boundary line of the parishes of Barking and Great Ilford, which were divided by Act of Parliament on September 29th, 1888, the boundary stones (which were put up in March, 1890) on the east side being close by the lane a little south of Loxford Cottage, and on the west side near the river, about three chains north of the railway. I omitted to mark these boundaries on the plan.

side of the river, being some 20 feet above it, that no "wall" is needed; but the high tides are only prevented from flooding the west bank by a river wall or "innings" about 15 feet in height, thrown up to prevent the "drowning" of the Manor Farm meadows.⁵

From its general form and position, and by comparison with other early works, we may well conjecture that this Camp is of pre-historic origin, and was in all probability a British settlement, subsequently occupied by the Romans, who commonly adopted such sites for their own camps. The opinion has also been expressed that it owes its origin to the Norman Conqueror, who made the adjacent Abbey of Barking his residence until the conquered had quieted down, or the Tower of London had been built (or rebuilt); but this is, in the writer's opinion, extremely improbable, although he may have pitched the camp of his army during that period upon this ground.

In conclusion, I may be allowed to say a few words as an expression of the pleasure it gives me at all times to revisit this neighbourhood, having in past years spent so many happy days in the Manor House of Little Ilford across the river, and here also, after my friend's removal to the farmhouse within this Camp.

Hæc olim meminisse juvabit.—VIRGIL.

THE ESSEX FIELD CLUB.

JOINT VISIT OF THE CLUB AND "THE SETTE OF CHELMSFORD ODDE VOLUMES" TO CASTLE HEDINGHAM.

Wednesday, August 2nd, 1893.

AN exceedingly agreeable joint excursion was made on the above date to this interesting locality. The programme, or "index of proceedings" as it was termed, was divided into chapters, gastronomical, ecclesiastical, artistic, topographical, antiquarian, and botanical, and under these headings a fancifully worded description was given. The conductors or directors were, Messrs. Fred Chancellor, J.P., E. A. Fitch, F.L.S., J.P., Walter Crouch, F.Z.S., A. C. Freeman, W. Cole, F.E.S., and Mr. E. Durrant.

Leaving London by train at 11.7, and Chelmsford at 12.5, the company, which numbered between sixty and seventy, arrived at their destination shortly before two o'clock. They at once proceeded from Castle Hedingham railway station to the "Bell Hotel" in the village, for luncheon. Included in the bill of fare was

⁵ References to these "innings" may be seen in my paper on "Dagenham Breach," *ESSEX NAT.*, vol. vi., pp. 157-8.

the mysterious "Pâté Herrison," prepared by Mrs. Durrant, an "odd pye" made of the homely and succulent hedgehog (*Erinaceus*), which was partaken of by some of the party.

Luncheon over, the company proceeded to the lane near the Vicarage to inspect the Castle Hedingham pottery, where Mr Bingham and his son, working alone and unassisted by any other hands, have for many years turned out vases, puzzle-jugs, copies of antiques, plaques, models of the old Norman keep, etc., articles of beautiful and quaint design and of peculiar colouring that have attracted the sympathetic attention of collectors and connoisseurs, and other works of more general use. In one of the rooms of Mr. Bingham's house, "Volume xxxv." (Mr. A. C. Freeman) read a paper, which was at once witty and informational, upon art pottery, and Mr. Bingham himself gave a modest little sketch of the rise and progress of his business.

So much interest was manifested by the members present in the inspection of this little old-world-like factory that probably those who were absent will welcome the reproduction of the following narrative, worthy of permanent record, of a visit to the Pottery, copies of which, reprinted from the "Chelmsford Chronicle" of October 29th, 1886, were handed to the visitors:—

"CASTLE HEDINGHAM POTTERY.

"Many visitors doubtless come to Hedingham and go away again ignorant of the existence of one feature of interest which, though it cannot boast a place among the antiquities, is yet not unconnected with things antique. The Hedingham Pottery Works will amply repay a visit.

"Having determined to give the worthy proprietor a call, and to inspect the work carried on in this old-world little pottery, we enter the little gate in the lane near the Vicarage, and are immediately confronted by a small glass-fronted show case, in which are a few specimens of the articles produced in the works. We make our way along a path beneath well-laden fruit trees, and, stopping before the dwelling-house of the proprietor, ring a bell which we find outside. While waiting for the appearance of some member of the household we glance around, and on our left note an outhouse in which are specimens of the coarser kinds of ware; on our right, through an open door, we catch glimpses of pieces of ware of a superior order. A large garden surrounds the buildings, and on an eminence at the farther end we notice a collection of primitive looking buildings, which we surmise to be the sheds in which the work of the potters is carried on. But the bell has brought to our service a female member of the potter's family, who, in answer to our inquiry for Mr. Bingham, the proprietor, politely requests us to 'follow the path to the right' (words, we afterwards think, which seem to be the keynote of all that is attempted in the private and professional life of this family of potters). The path to the right leads to a long, low building, the door of which we open, and are almost rude enough to stand and gaze at the quaint picture that meets our eye before we return the courteous greeting of the proprietor, who is engaged in adding some chastely-moulded ornament to a vase standing before him. The walls of the shed and the beams seem every inch of them to be covered with texts of Scripture having reference to potters and pottery, and roughly written in chalk or on slips of paper; with sketches embracing specimens of pottery of all times and kinds; with copies of old and curious inscriptions. Several ancient engravings, dated 1610, of ancient Roman ware, catch the eye over a doorway leading towards the kiln. At a wheel near the entrance sits Mr.

Edward W. Bingham, the eldest son of the proprietor, who seems to have developed a natural aptitude for the finer and more artistic pottery work. A beautifully-formed ewer of blue Majolica ware nears completion under his careful treatment, and on a shelf behind him are finished specimens of a similar kind awaiting their transfer to the kiln. At another wheel a younger son, Richard, is forming various tiny vessels of many shapes, which he appropriately calls 'The Gem Ware,' and their use would seem to be to fill odd corners of *bric-à-brac* cabinets. These are the sole workers in clay in the Hedingham Pottery, all the processes being carried on by the Bingham family. Mr. Edward W. Bingham models all the articles here made, articles which vary in size from that of a child's thimble to substantial specimens of twenty or thirty inches in height or diameter. Almost everything is modelled by hand, moulds being only used for the cheaper kinds of ware. This necessarily makes the processes slow, but adds to the value of the objects so produced. We glance around at some of the quaint clay vessels that stand on the shelves. Here is a collection of vases and ewers, forms of which the eye would never tire, in Majolica ware. Hard by stands a specimen in imitation of the curious 'Puzzle Jugs' of 1670. A model of the celebrated Colchester Vase, the most perfect Roman vase known, is shown us. In close proximity are several objects of a different character, in terra-cotta. Among them is a plaque of original design, containing a representation of Hedingham Castle, surrounded by scroll work, on which are written a number of historical facts connected with the old Norman stronghold. The old 'slip work' prevails here too, and a number of incised terra-cotta specimens in two shades are worthy of notice. Here, again, is a solitary specimen of a recent development, original in design. This is what the proprietor terms 'The Essex Jug.' It is a study in itself, and has deservedly won the admiration of visitors and collectors. Having noted these and many other pieces of art pottery, we are invited to enter the next compartment of the building, used as a drying shed and as a sort of storeroom for the utensils and materials employed in the manufacture and burning of the vessels. Here, again, one is struck with the old-world appearance of everything about the place. The building is old; the implements, the tools, utensils, etc., if not old, have all an ancient appearance. Here stands a primitive-locking, but now rarely used, machine for forcing the clay into the form required in certain classes of work. An old-world light, too, seems to pervade the place. 'What a light for a Rembrandt!' as an artist visitor exclaimed on entering the building one day. Here is a pile of 'seggars,' or utensils of peculiar form, in which each object is carefully set when placed in the kiln. These 'seggars,' as well as their contents, are made on the premises. At the end of the shed we arrive at the kiln—a little erection of which the architect is the owner, he and his sons doing all themselves, and adopting, as far as in them lies, the styles and ideas of the Staffordshire Potteries. We are next directed to the show room which we passed on our way through the garden. Here are duplicates of the works which we noticed in their more crude state on shelves in the pottery. The specimens here, however, are in their finished state, glazed and coloured. On entering one's attention is instantly directed to a large plaque of some thirty inches in diameter, having on it the arms and badges of the De Veres, and which would have an imposing effect in a hall or library. Another style of large-sized plaque is one with flowers and foliage interspersed with small reptiles, insects, etc., all in high relief. Large and handsome ewers, shaped after Orazia Fontana's and other early Italian specimens, are prominent objects. Vases of rare old Babylonian shapes; quaint Egyptian, Greek, and

Roman jugs; plates from Palissy's designs; others from choice old stoneware patterns; more specimens of the original 'Essex Jug' which we have before referred to, and on which appear medallions of county scenes, representations of family and borough shields, natural productions, castles, and coins, all having reference to the county; specimens of a rich mottled blue ware, in which elegant ewers, etc., of old French and Venetian shapes are made; models and historical plaques of the Castle; a number of copies of old pottery in a rich mottled brown ware, originated by Mr. Bingham's father in 1822; various little articles in incised terra-cotta, of which the late Sir Henry Cole, of South Kensington, when on a visit to the little pottery, expressed his unqualified approval, and said it was 'refreshing to his eyes'; terra-cotta flower vases of various sizes and shapes, including one pattern of pretty trellis-work, with trailing hops and vines—these special pieces and many others have brought the Hedingham Pottery into much repute.

"While exploring and examining, under the courteous conduct of Mr. Bingham, 'the master potter,' we glean some interesting facts connected with the history of Hedingham and its Castle, for the potter has been a diligent student of history and matters antiquarian, and his little museum of old china, coins, books, etc., proclaim him to be, as he ever has been, a diligent searcher after knowledge. We learn, too, what is more to the point for this article, some facts in the history of Hedingham potters and pottery, as far as they relate to the Bingham family. The Pottery Works were taken by Mr. Bingham's father some fifty years ago for the manufacture of common earthenware. Mr. Bingham, sen., was an excellent workman, and being vigorous both in mind and body he made the native clays and their glazing his special study, with the result that he discovered some valuable secrets, which are now benefiting his posterity. These, with a few craft traditions he had long before acquired with great trouble from old Delft and German workmen at his uncle's works at Lambeth (and in those early days of trade jealousy and mystery this was no small matter to obtain, either by love or money), formed the stock of knowledge which led his son, the present head of the works, on to his earliest studies in art work. The Exhibition of 1851 gave a stimulus to the son, and he acquired ideas sufficiently definite to bring out his trellis work and other terra-cotta vases, which still hold their own and find a fair demand. Improving as years went on, and being about 1865 well patronised by the *élite* of the neighbourhood, many of them were good enough to lend Mr. Bingham quaint specimens of pottery and costly works of good authors. The lives of Palissy and Wedgwood, with their difficulties and successes, stimulated him afresh, and a few years as sub-postmaster afforded him (as some years before a boys' school had done) some spare time and cash for experiments. He soon obtained confidence for a restart, this time as a glazed ornamental-ware potter. This was in the year 1875. The material Mr. Bingham used in his manufacture was, as it now is, composed of Essex clays, deftly combined with other clays, metals, minerals, etc., in order to produce the blue and browns which have given the Hedingham productions a status. The potter's success was for a time but indifferent. Loss upon loss nearly disheartened him, until he was convinced that the hope of much of the profits he had looked forward to must be abandoned, and that he must provide materials without regard to expense. Results then gave satisfaction, but the manufacture became more select and unique, the output being confined to the works of himself and his family. Mr. Bingham soon found his wares contracting a peculiarity of style. This was traceable to the want of

capital, debarring the use of costly modern appliances, thus compelling him to use (as did the potters of old) his own natural resources. Thus Mr. Bingham and his family still dig and refine their own clay, mix their own colours, fire their own kilns, and do every necessary part of the work with their own hands. From these causes, and by imbibing ideas and styles of antiquity, the Pottery of Castle Hedingham seems to be a continuation of mediæval work, as formerly carried on for the Earls of Oxford in the demesne of Hedingham Castle, the keep of which generally appears on the ware manufactured at the Pottery as a kind of trade mark. There is a charm about the Hedingham Pottery from its originality and quaintness, and we bade farewell to its maker feeling that no collector's cabinet of pottery would be complete which did not contain specimens of Hedingham ware."

The fine Church was then visited, where they were very kindly received by the Rev. H. A. Lake, Vicar, who explained the features of principal interest. The chief portion of the Church is late Norman, or Transition, the carving being more elaborate than that at the Castle. The chancel arch especially is one of the finest pieces of work of the period to be found anywhere. The double hammer-beam roof is of much later date, and also the screen, which is an exquisite piece of carving. The fine tomb of De Vere, formerly in the centre of the chancel, is now on the north side; and also a stone (in a glass case) bearing what is said to be a portrait of Queen Maud, wife of Stephen, which was found in a niche on the north side of the Church. The Rev. J. Harvey Bloom, curate of Springfield, then described the sepulchral monuments and heraldry, and Mr. Walter Crouch added many interesting particulars, mentioning *inter alia*, that a shaft of stone, curiously carved, and supposed to be a portion of the ancient market cross at Castle Hedingham, had been found supporting a beam in the cellar of the Falcon Inn. The date is *circa* 1120-30, and Mr. Hayward, who had made a full-sized model of it, considered it was in all probability carved by the same artist who carved the door of the Church. This model will be exhibited at the next meeting of the Essex Arch. Soc. Some ingenious archæologist hazarded the opinion that the stoup for holy water in the Church had been hollowed out from a portion of the base of the same cross, and judging from the character of the carving such a supposition might be correct.

With the kind consent of Mr. and Mrs. Bevington, the present occupants, the party proceeded to the handsome modern residence near the Castle, where, although Mr. and Mrs. Bevington were away from home themselves, they had left instructions that every hospitality should be shown to the visitors, who were accordingly entertained to an excellent tea, Miss Lake and other ladies presiding at the tables.

Then the grand old Norman Keep, the ancient home of the De Veres, Earls of Oxford from 1100 to 1703, whose grey walls, built of Barnack stone, promise to "stand four-square to all the winds that blow" for centuries yet to come, was examined by the kind permission of the owner, Mr. Majendie, and the roof also, though somewhat insecure, was ascended.

In the chief apartment on the state floor, a noble room spanned by a huge arch, rising to a height of 21 feet, a meeting was held, when the Chairman, Mr. E. A. Fitch, gave an admirable description of the Castle and its present remains, and a short historical sketch of the family of De Vere. This was illustrated by a fine collection of engravings, plans, etc. The first De Vere in this country was Alberic, who came over with the Conqueror, "a man of good manors," no

doubt, for he had fourteen bestowed on him, including this at Hedingham, which he chose for his residence, and his descendants lived here for 558 years.

Some contributions were made also by other speakers, including Mr. Crouch, who gave some notes, by way of comparison, of the Keep here with the famous Keep of Bishop Gundulph at Rochester, which it closely resembles in style and size. He showed a large view of this, and remarked that Rochester Keep, being of Caen stone, is more weathered, and lying low on the Medway banks, is not so imposing in position as Hedingham. The interior of Rochester Keep was entirely dismantled 200 years ago, but here at Hedingham the floors are still remaining, and the windows glazed.

Among the exhibits, Mr. Crouch claimed to show the oldest "Volume" and "MSS." present. The former, a small quaint black-letter book, printed in Paris for the Carthusians in 1499, a fine specimen of very early printing, of the time of our Wynkyn de Worde, who was an assistant of Caxton and continued his printing; at the end of which is seven pages of small contemporary MSS. The other was a most interesting deed written in old Court hand, dated Xth July (1534) the 26th of Henry VIII., and signed by the last prioress "Mary Banbroke, by the sufferinge of God prioress of the howse and Church of our blessed Lady and the Holy Crosse of Hedynḡhm at Castell in the Counte of Essex, and the Convent of the same place." It is curious to note that her signature she writes as Prioress of Henygame, one of the common spellings of this place in the olden days. The seal, which is not quite perfect, is vesica-shaped and bears a double cross fleury voided, with delicate tree branches; of the inscription round the device, the only part remaining is 'hedyngham ad eas.'¹ The indenture relates to a lease of land in Stambourne called Takeleys, at £4 per annum, to Rob^t Furnmage, of Erlys Colne, Gentyman.

This Benedictine convent was built and endowed by the 1st Earl of Oxford and his Countess, and in all probability stood near the present Nunnery Street, N.W. of the town, leading to Crouch Green.

At the conclusion, votes of thanks were passed to all who had contributed to the day's pleasure or information.

Towards the close of the day the visitors walked over to Sible Hedingham Church, and afterwards, making for the station, left Hedingham station for home by special train at 8.30, well satisfied with their visit to this ancient spot.

VISIT TO THE DENEHOLES IN HANGMAN'S WOOD, NEAR GRAYS THURROCK, IN CONJUNCTION WITH THE GEOLOGISTS' ASSOCIATION,

Friday and Saturday, August 11th and 12th, 1893.

SEVERAL meetings of the Club have been held to examine the Deneholes, the last being on October 8th, 1887, at the close of the explorations carried on by the Club. A visit in conjunction with the Geologists' Association was held on May 9th, 1885, reports of which appeared in the "Proceedings of the Geologists' Association," vol. ix., p. 179, and Journal Proceedings, Essex Field Club, vol. iv. p. cl. Many new members of both Societies and others having expressed a desire to inspect the pits, the present meeting was arranged by Mr. T. V. Holmes, F.G.S., and Mr. W. Cole, *Hon. Secretary*, and carried out under their superintendence,

¹ In the enlarged Edition of Dugdale's "Monasticon" it is mentioned that no name of any Prioress is known since 1405; and that no seal had yet been met with.

with the able assistance of Mr. Crouch. The contractor for the work was, as on previous occasions, Mr. Shipman, of Grays, and the arrangements for the descent were the same as before. Captain Whitmore, the owner of the wood, again kindly gave permission to the Club to make the explorations. He was on the spot during the visit, and took great interest in the proceedings.

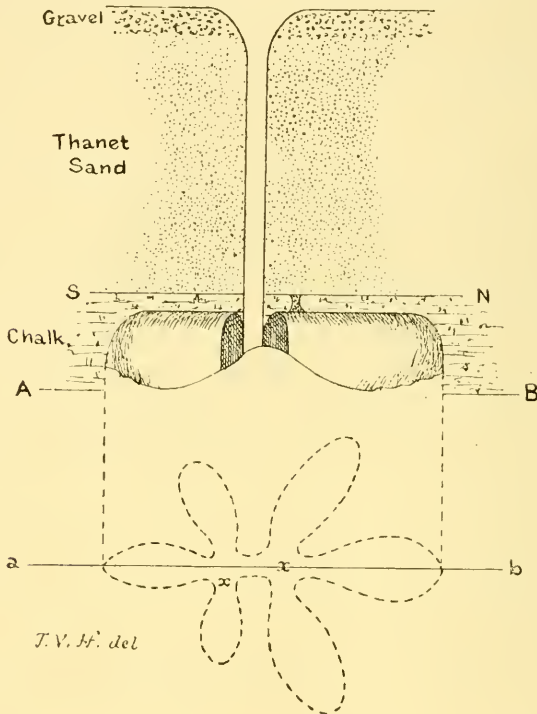


Fig. 1.—Hangman's Wood, No. 4 Pit. Scale 1 in. = 40 feet. Height of chambers 16 feet except the S.E. and S.W., which are 14 feet. *x* Position of "Pipes" in roof. Trans. E.F.C. vol. iv. p. 87.

In view of the many papers and reports relating to the deneholes already published in our Journal, more especially the elaborate report of the explorations carried on by Mr. Holmes and Mr. Cole for the Club in 1884 and 1887 (*ESSEX NATURALIST*, i., pp. 225-276), it is not necessary to again detail at any length the known facts regarding these mysterious excavations. The following summary may be usefully given for the information of those who have not seen the report, and two diagrams of deneholes in Hangman's Wood are repeated from the "Transactions" of the Club. They are not quite typical as regards symmetry, but will nevertheless give a good idea of the peculiarities of the pit:—

The deneholes in Hangman's Wood are more than fifty in number. They consist of narrow shafts about 80 feet deep, which give admission to the pits in the Chalk, which are from 14 to 20 feet high. The shaft is usually in or near

“SPECIAL MEMOIR” SERIES OF THE ESSEX
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PRELIMINARY ANNOUNCEMENT.

The Council intend to publish shortly, by Subscription, a work to be entitled

THE
MAMMALS, REPTILES, AND FISHES OF ESSEX :
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(*Forming Volume III. of the Special Memoirs of the Essex
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By HENRY LAVER, M.R.C.S., F.L.S., F.S.A., &c., *Vice-President
of the Essex Field Club.*

This work, in conjunction with Mr. Miller Christy's "Birds of Essex," issued in 1891, as Vol. II. of the "Special Memoirs," will afford a complete and valuable guide to the Vertebrate Fauna of the county.

The "Mammals, Reptiles, and Fishes of Essex" will be published in Demy 8vo. form (uniform with the other publications of the Club), well printed on superior paper, and handsomely bound in scarlet cloth. The price of the volume will probably be 7s. 6d. ; to Subscribers, 5s. ; and to Members of the Club, 4s. ; but these quotations are subject to revision.

Full particulars and Prospectuses will shortly be issued.

The "BIBLIOGRAPHY OF ESSEX," which will probably form Vol. IV. of the "Special Memoir" Series, is now in active preparation.

March, 1893.

THE ESSEX FIELD CLUB.

LOCAL (ESSEX) MUSEUM AND LIBRARY,

NEW LONDON ROAD, CHELMSFORD.

THE Establishment of a truly LOCAL MUSEUM has always been a leading idea with the Club, and towards that end many specimens have been collected. The Essex and Chelmsford Museum is now incorporated with the Club, and contains many specimens of considerable interest and value. The Museum has been in existence since 1828, and has done excellent work. The Club is, therefore, now in a position to establish a really useful Museum, to contain authentic collections to illustrate the Geology, Mineralogy, Botany, Zoology, Ethnology, Pre-historic Archæology and Technology, etc., 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.

Chelmsford has been chosen as the site of the principal Museum and Library, being the County Town and occupying a central position in Essex, but it is hoped that loan and temporary collections may be arranged for in other localities in the County. Funds are now being raised to build and fit up rooms worthy of the comprehensive scope of the Museum and Library.

DONATIONS OF SPECIMENS AND COLLECTIONS OF A LOCAL (ESSEX) CHARACTER are invited. They should be sent at present to Mr. W. Cole, *Hon. Sec. and Director*, care of Mr. Edmund Durrant, 90, High Street, Chelmsford. A letter should precede the donation, and the Council reserves to itself the right to refuse any unsuitable specimens.

The fullest details should be given of the locality, finder, and other precise information about each specimen, for insertion in the Register.

The Director will be glad to give any instructions in his power to those proposing to collect for the Museum.

The Club already possesses a very considerable LIBRARY, consisting of books, MSS., prints, photographs, etc., appertaining in any way to the County of Essex, and also of scientific, antiquarian, topographical, and other literature, and every effort is being made to enlarge it and increase its usefulness. The Library is for the use of the members only, and such visitors as may be admitted under the regulations of the Librarians.

DONATIONS OF BOOKS, prints, maps, etc., of the classes above indicated should be sent, at present, to either of the Librarians, Mr. Edmund Durrant, 90, High Street, Chelmsford, or to Mr. A. P. Wire, at the Quarters of the Club, 8, Knighton Villas, Buckhurst Hill, Essex.

The
Essex Naturalist:

BEING THE
JOURNAL
OF THE
ESSEX FIELD CLUB.

EDITED BY
WILLIAM COLE,
Honorary Secretary.

Contents.

	PAGE
The Essex Field Club. Visit to the Deneholes in Hangman's Wood, in conjunction with the Geologists' Association, August 11th and 12th (<i>concluded</i>), 145; Meeting at Boyles Court, South Weald, Warley and Brentwood, August 19th	148
Astronomy in Wanstead: A Chapter of its Past History. By WALTER CROUCH, F.Z.S. (<i>With illustration</i>)	151
Notes on the Conference of Delegates of the Corresponding Societies of the British Association held at Nottingham, 1893. By T. V. HOLMES, F.G.S.	164
The Fresh-water Algæ of Essex; a Preliminary List of Recorded Species. By M. C. COOKE, M.A., LL.D., A.L.S., etc.	170
The Essex Field Club. The Cryptogamic and Botanical Meeting and Ordinary Meeting, Saturday, November 4th, 1893; The 142nd Ordinary Meeting, Saturday, November 25th, 1893; The 143rd Ordinary Meeting, Saturday, December 16th, 1893	180
Notes on the Seasons of 1893, Principally in the Neighbourhood of Felstead. By J. FRENCH	188
The late Henry William King, of Leigh. By WALTER CROUCH, F.Z.S. (<i>With Portrait</i>)	195
"Locusts in Essex."	196
Notes—Original and Selected. Otters in Essex; Falconidæ in Essex; Aberrations of the Common Sparrow at Dagenham; Feeding the Birds (<i>with illustration</i>); Birdcatchers; Dannetts Hill; Stulpway	197

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

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

"THE ESSEX NATURALIST."

Edited by WILLIAM COLE.

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

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

[Continued on page 3.]

the centre of the pit, and from it, in most cases, three chambers branch out on one side and three on the other, in a kind of double-trefoil pattern. The largest chambers are those which are opposite the openings at the bottom of the shaft, and the greatest length of each cavern is that obtained by measuring the length of a straight line passing through the centre of the shaft to the ends of the opposite chambers. Originally separate, these deneholes are so close together that the thin chalk partition between two chambers in adjacent pits has sometimes been accidentally fractured. Though there are, as already stated, more than fifty separate deneholes in Hangman's Wood, only five shafts are now open, the rest having fallen in at various periods.

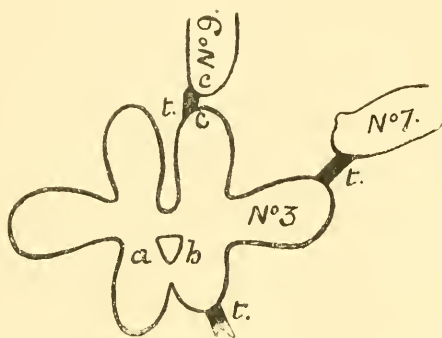


Fig. 2.—Ground-plan of Denehole No. 3, showing damage caused subsequent to explorations in 1887.

The shafts are narrow, and were originally less than three feet in diameter. The geological section of each varies only in the slightest degree. The chalk appears to be lying nearly flat, but the thickness of the old river gravel at the surface varies slightly, so does that of the chalk roof of the chambers; and the height of the caverns, as already mentioned, is somewhat variable. The shaft of the pit ("No. 3" on the plan published in the Report alluded to above) by which the descent was made at the present meeting presents the following section of strata traversed:—

Old river Gravel	...	...	...	...	...	ft. in.
Thanet Sand	...	...	...	...	...	6 6
Chalk, roof of pit	...	...	...	...	...	51 0
.. height of chambers	...	...	...	...	...	4 6
						18 0
						<hr/>
						80 0

The origin and *raison d'être* of these interesting pre-historic pits, which bear a general resemblance to those which occur at Crayford, Bexley, and other places on the Kentish side of the river Thames, is still to some extent a matter of conjecture, in spite of the extended work carried on at a great expense by the Club in 1884 and 1887, when the accumulations of Thanet sand, chalk, and general debris were carefully sifted to the level of some of the original floors; but they are undoubtedly of great age, and the general opinion is that they formed refuges, or

were used for the storage of food supplies in those early times when life and property were equally insecure, and our land was frequently invaded by foreign hordes. They were ancient in the time of Henry IV., and are mentioned and figured by Camden, Blaeu, and others, some 300 years ago; and at that time were considered of extreme antiquity. A copy of Camden's woodcut, 1610, roughly represents the plan of those at Tilbury, and appeared, with other views and coloured plans, in the Report of the Denehole Exploration.

The men were early on the ground on the Friday, but the day was largely occupied in erecting shears and tackle, and clearing out the shaft of one of the pits, marked No. 3 on the plan, which had been nearly choked by dead branches of trees, brushwood, and rubbish, during the thinning which has recently been made in the wood, the "roughs" from Grays and the neighbouring docks apparently finding special delight in casting down even tree trunks and branches into the shafts, and thus causing great trouble to the explorers and damage to the pits. In consequence of this senseless damage very considerable difficulty was experienced in entering "No. 3 pit," and when at last, by removal of rubbish and faggots, Mr. Shipman, Junr., and Mr. Cole were enabled to crawl down by the side of the timber obstructions into the pit itself, the destruction caused was only too apparent. During the explorations in 1884, the conical mound of earth in this pit had been removed, and the pit cleared (see Report, etc., *ESSEX NATURALIST*, i., pp. 235-36).¹ Now we found a heap of débris, mainly lumps of chalk, and faggots, reaching quite to the opening of the shaft, and evidence of serious and even dangerous damage to the roof of the pit. A diagram (fig. 2) will make this clearer. The symmetry of the pit is completely destroyed, and the whole of the mass of chalk between *a* and *b* broken down. Mr. Holmes suggested that the destruction occurred in some such way as this: "The throwing down of the tree trunks, which had damaged the Thanet-sand part of the shaft to some extent, must have knocked away many masses of chalk, and have suggested to some playful idiots who descended either by this or some other shaft the entire removal of the mass of chalk between *a* and *b* by the use of the tree trunks as battering rams. It is probable that the hole, about 3 feet by 2 feet, between *c* and *c*, was the result of the concussions attending the destruction of the pillar of chalk between *a* and *b*. It shows how easily similar holes elsewhere may have been formed centuries after the disuse of the pits." It may be that the vibration caused by the forcible descent of the tree trunks may have caused the whole damage—the wilful battering down of the chalk by intruders in the pit would have been a very dangerous piece of mischief. The directors fear that No. 3 pit will not be a safe one to descend in the future. Captain Whitmore saw the damage that had been done, and expressed his intention of checking the descents of unauthorised persons in the future, and if possible of securing the open pits against wilful injury by fencing them in. Mr. Cole and Mr. Holmes were pleased to find that the other pits had not been damaged, and were in much the same condition as when left at the termination of the explorations in 1887. It was very satisfactory to observe that the Thanet Sand everywhere stood well, and was unchanged, even in the shaft of "No. 11" pit, where the chalk is very much shattered and full of cracks. And the unchanged state of the chalk in that and some other pits suggests that in places where the chalk seems to have flaked away considerably (as in the tunnel between Nos. 3 and 2 pits) the result may be

¹ A diagram and section of this pit (one of the best examples known) will be found on Plate I., vol. iii. of *Trans. Essex Field Club*.

mainly due to the agency of man, who so freely exercised his destructive powers close by

On making a circuit of the workings Mr. Cole was startled at finding, coiled up at the foot of the shaft in "No. 2" pit, (Fig. 3) a poor dog in almost the last stages of starvation. It was carefully tended and brought to the surface, and fed cautiously, and is now recovered. Curiously enough, it was not thirsty; it must have obtained water either from rain trickling down the shaft or by licking the moist surfaces of the chalk.

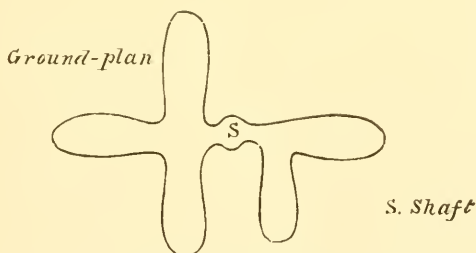
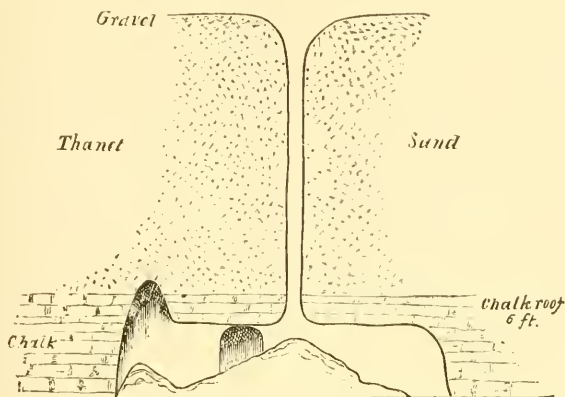


Fig. 3.—Denehole ("No. 2") in Hangman's Wood, Essex. See Trans. E.F.C., vol. iii., p. 54, and Proc. iii., p. xxxvi. S, Shaft. Scale 40 feet to an inch.

But few members came down on the Friday, and after a hard day's work in clearing the shaft of No. 3 and making a landing-stage in that pit, the works were left for the night.

Early on Saturday the pits were lighted up by candles, and cards numbered according to the plan were prepared and placed in the various pits by Mr. Crouch and Mr. Sheldon. A liberal supply of magnesium wire was also provided for better showing up the more interesting features of the chambers, the various details of which were explained to the visitors by one or other of the directors throughout the day. Mr. Wire took some photographs of the best pits,

and the work of the men and the superintendents was by no means light, as quite eighty persons descended the pits and were conducted through the workings. Our President, Mr. Chancellor, was one of the visitors, and Professor Blake, Vice-President of the Geologists' Association, was present, but did not descend. The day being exceedingly fine, it was indeed pleasant to ramble about the wood, to eat one's *al fresco* lunch among the hollows made by the caved-in deneholes, and to watch the birds and butterflies which here abound. The difference of temperature above and below was very evident on coming up from the pits. The Rev. Linton Wilson noted as much as twenty-three degrees difference in the readings of his thermometer above and below.

Many of those who descended for the first time expressed surprise at the extent of the workings and the size of the pits. A general desire was expressed that further explorations should be undertaken by the Club, and more of the old closed pits examined. But it would be costly work, as it would be necessary to unstop from above one or more shafts in order to allow of further subterranean galleries being made. It would not be safe to extend the workings beyond their present range, unless further means of descent and ascent were provided.

About seven, as the evening shadows lengthened, the pits were searched and abandoned, the last light put out, and the last man emerged from the shaft. In a few moments more the shears were lowered to the ground, the big rope unshipped from the pulley and crab, the platform alone remaining for later removal. A sound as of "largesse" was heard among the men. The last of the company, with the directors, wended their way by the old British trackway to the big barn with its stone-cut crest of cockatrice and ducal coronet, and quaffed the clear icy water of the deep chalk well, and then, well pleased with the day's work, a start was made back to Grays to the Queen's Hotel, where tea and other welcome refreshments were eagerly partaken of before the return home.

MEETING AT BOYLES COURT, SOUTH WEALD, WARLEY, AND BRENTWOOD.

Saturday, August 19th, 1893.

By the courtesy of Mr. J. F. Lescher, J.P., over forty members of the Club visited Boyles Court, near Brentwood, on this day, for the purpose of inspecting the interesting and valuable Hoy Collection of British Birds. The party—which included several ladies—met at Harold Wood Railway Station. The directors were Mr. J. E. Harting, F.L.S., Mr. Miller Christy, F.L.S., and Mr. Walter Crouch. The walk to Boyles Court is about two miles. It was a delightful ramble, and the party were able to saunter along in comparative coolness, and admire the charming scenery through which they passed. Over Tyler's Common they wended their way, a brief halt being made to inspect the famed mineral spring which was visited by the Club three years ago (*vide* report in *THE ESSEX NATURALIST* for 1890, vol. iv. p. 194, where a full account of the well is given). Growing abundantly in the well was a species of *Chara*. It was a matter of remark that but few butterflies could be seen, the only one worth mentioning was the "Small Copper Butterfly" (*Polyommatus phleas*), which we welcomed as becoming commoner in Essex. A few years ago it was scarce. Leaving the spring, the party were taken through the fields, and arrived at their destination at about 3.30.

Boyles Court is a comparatively modern mansion with recent additions, pleasantly situated, with charming views across the valley of the Weald Brook to Weald Park, Rochetts, and Dagnams. Here they were most cordially received by Mr. and Mrs. Lescher, who had kindly provided light refreshments, which were very welcome; and claret cup, tea, fruit, etc., were well discussed, before the more scientific work was commenced.



MINERAL SPRING ON TYLER'S COMMON. From a Drawing by H. A. Cole, June 21st, 1890.

Passing up into the Museum, where the collection is now very nicely displayed, an inspection of the birds was made, and then Mr. J. E. Harting, F.L.S., editor of the "Zoologist," gave a short account of the late Mr. Hoy, and, walking round the cases, pointed out the more interesting specimens, making observations upon them and their habits.

Mr. J. D. Hoy, by whom this very fine and interesting collection of birds was formed, was born in 1797, and resided at Stoke Priory, Stoke-by-Nayland, which (though close to the Essex border) is in Suffolk. He was a first-rate shot and a skilled bird-preserved. Dr. Bree has declared that "as a working naturalist he was almost unequalled in his day in this country." He collected chiefly upon the coasts of Norfolk and Suffolk, and his collection therefore contains few or no Essex specimens of importance. During the latter part of his life he paid many visits to Holland and Germany. It was during one of these expeditions, when collecting mainly among swamps and marshes, that he laid the foundation of the illness of which, at the early age of forty-two, he died on October 15th, 1839. He published little beyond a few notes in various natural history periodicals, but Hewison, Yarrell, and other writers in the early part of the century received much valuable assistance from him. On his death his collection passed into the possession of his sister, the late Mrs. Lescher, of Boyles Court, mother of Mr. J. F. Lescher. It is contained in 269 separate cases, which were in the entrance hall, but have been re-arranged this year in the museum on the first floor, opening into the conservatory.

Although very few of the specimens are local, many of them are of considerable historic interest. The gem of the collection is, of course, the Great Auk, one of the seventy-nine specimens known to exist, of which only twenty-two are

in the British Isles (see Symington Grieve's "Great Auk," p. 77).¹ The note made by Dr. Bree on this bird is, "a fine specimen well set up, and in good condition. I had it removed and examined. The only marks upon it were No. $\frac{2}{32}$ in red ink on the back. Prof. Newton thinks it probable it was obtained from a dealer in Hamburg, who was the last of his trade known to have sold specimens." The measurements of the Hoy specimen, taken outside the glass case, are as follows:—

Length	...	...	...	...	...	...	26½ inches.
{ Length of beak	...	...	...	...	...	...	2¼ "
{ Greatest breadth	...	...	...	...	...	...	2½ "
Tarsi	...	...	...	...	...	about	2 "
Toes	...	...	...	...	...	...	2 "
Carpus, to tip of wing	...	...	...	...	...	...	6½ "
Humeral portion of ditto	...	...	...	...	...	...	3 "

One of the members present at the meeting, Mr. Murray Tuke, of Saffron Walden, is the possessor of an egg of the Great Auk, a specimen mentioned first by Hewitson in his "Coloured Illustrations of the Eggs of British Birds" (1846) Grieve says that it was purchased from Reid of Doncaster, who bought it from F. Schulz, of Dresden, for £2 6s. The value of the eggs have immensely increased, of late years. No recent sales of the bird itself have occurred, but in December, 1887, an egg belonging to the Rev. H. Burney, of Woburn, Bedfordshire, was sold in Stevens' rooms to Mr. L. Field for £168. This specimen was one of four duplicates sold in the same rooms in 1865 by the Council of the Royal College of Surgeons, and for which Mr. Burney gave £31 10s. But these prices were soon much exceeded. On March 12th, 1888, an egg belonging to Mrs. Wise (inherited from her father, Mr. Holland, who had purchased it in 1851 for £18 from Williams, of Vere Street, the egg coming originally from Lefevre, of Paris) was sold by Mr. Stevens to Mr. J. Gardner, of Oxford Street, acting on behalf of a collector, for the astonishing sum of £225. Mr. Gardner still has a coloured drawing of this egg. From these prices of the eggs some idea may be formed of the probable sale value of a good specimen of the bird should one ever come into the market.

Another very interesting bird in the collection is the first British-killed specimen of the Pectoral Sandpiper (*Fringa pectoralis*) which was shot on Breydon Broad on October 17th, 1830, and recorded by Mr. Hoy in the "Magazine of Natural History" for 1837 (N.S., vol. i., p. 116). See Stevens' "Birds of Norfolk," vol. ii., p. 367, and Babington's "Birds of Suffolk," p. 24c, where the specimen is figured.

Among the rarer birds are two Ospreys, a pair of Common Kites, a Swallow-tailed Kite, a Cream-coloured Courser, and the Great Bustard (male and female) which Mr. Lescher informed us were from Wiltshire.²

¹ "The Great Auk or Garefowl (*Alca impennis*, L.). Its History, Archæology, and Remains." By Symington Grieve. (London, 1835.)

² Mr. Harting has called attention to a curious passage in Dr. Muffett's "Health's Improvement" (4to, 1655, p. 91), which has been generally overlooked by writers on British birds, but which testifies to the abundance of the Bustard in Wilts in the time of Queen Elizabeth. Dr. Muffett, whose book was published long after his death (he died in 1590), was a pensioner of the Earl of Wilton, and lived at Bulbridge, in Wiltshire. He wrote of the Bustard, in the passage alluded to above: "In the summer, towards the ripening of corn, I have seen half a dozen of them lie in a wheatfield fattening themselves (as a deer will doe) with ease and eating, whereupon they grow sometimes to such a bigness, that one of them weighed almost fourteen pound."—Ed.

Fuller notices of this important collection may be found in Christy's "Birds of Essex," pp. 23 and 36, and in a series of articles by Dr. Bree in the "Field," from September 28th to December 14th, 1867.

Mr. Miller Christy then made a few remarks on the collection, and asked the members present to join in a very cordial vote of thanks to Mr. and Mrs. Lescher for their kind reception, which was enthusiastically given, and responded to by Mr. Lescher.

After a long examination of this fine collection, the party left the hospitable mansion about half-past six, the walk being continued by some over Warley Common through the woods and along Thorndon Park into Brentwood, while others rambled by Warley Gap, from which a remarkably fine view (certainly one of the finest in Essex) was enjoyed over the Thames Valley and the Kentish Hills.

The rendezvous at Brentwood was the "White Hart" Hotel, where tea was taken. This old inn is a very interesting example of an ancient hostelry, and is mentioned in Miller Christy's "Trade Signs of Essex," p. 52; and two interesting sketches of the courtyard and corridor were published in a series of views of old Brentwood, by A. B. Bamford, in 1892.

Special thanks were voted to Mr. Harting for his kind and interesting expositions during the afternoon, and the meeting dispersed.

ASTRONOMY IN WANSTEAD:

A CHAPTER OF ITS PAST HISTORY.

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

(*Read 16th December, 1893.*)

THERE was a period in the past history of Essex when the study of astronomy was sedulously pursued by at least two competent observers, and the researches then made attracted the attention of all who were interested in the progress of that science.

One of these observers was the Rev. William Derham, D.D., F.R.S., Rector of Upminster from 1689 to 1735, and Canon of Windsor, who even erected a platform on the tower of his church (the door leading on to which may still be discerned) to enable him to gain a more extended view whilst using his instruments. (*Ibid* ESSEX NATURALIST, vol. ii., p. 133.)

But by far the more important results were obtained in "Wanstead Town" (as it is frequently called in old references), some nine and a quarter miles away from Upminster as the crow flies, and these form an interesting chapter of local and scientific value.

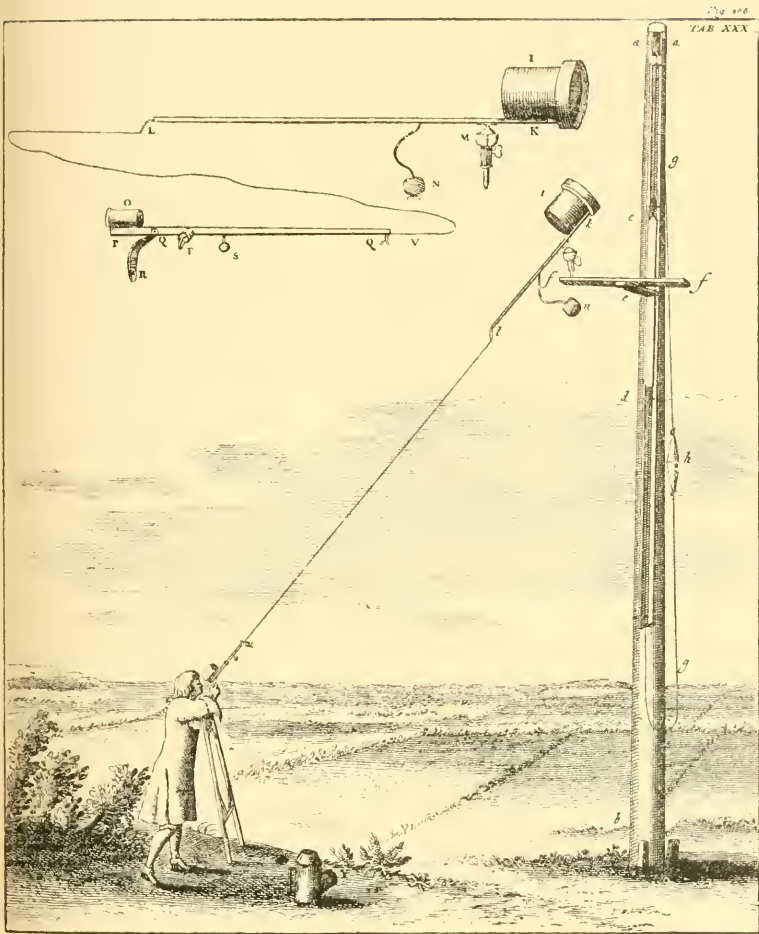
Having long ago gathered together a considerable amount of

material and references on this subject, I was lately induced to give an outline of this chapter in our "Wanstead Parish Magazine," recounting the fortunes of the astronomers of Wanstead, and the famous Telescope and Maypole. I have since enlarged this account, trusting it may be worthy of preservation in a more permanent form.

The period in which this quiet rural village attained its scientific zenith was from the year 1707 to 1749. In the former year Dr. James Pound, F.R.S., had been presented to the rectorate by Sir Richard Child, Bart., of Wanstead House. Dr. Pound was born at Bishop's Canning, in Wilts, 1669. In 1687 he went to St. Mary's Hall, Oxford, and in February, 1694, was at Hart Hall, and took his first degree, passing to M.A. on 6th June the same year. He subsequently studied at Gloucester Hall, and in 1697 took the degree of B.M. with a licence to practise medicine. Then he was ordained, and went out as chaplain to the settlement in Pulo Condore about 1700. In a letter of Bishop Tanner's, dated September, 1704, in the Bodleian Library, we find: "My brother Moore has come home from the East Indies; left our honest countryman, Dr. Pound, well . . . he has a mind to come home, but the Governor tells him that if the Doctor goes, he and the rest of the company will not stay behind." By the rising of the Indians in 1705 the settlement was destroyed, and Dr. Pound was one of the very few who escaped, returning to England in 1706: and in July of the next year was appointed rector of Wanstead. Here he lived the remainder of his life, and became well known as a naturalist, and a most competent and accurate astronomer.

Among the instruments used by him was one of the large telescopes constructed by the learned philosopher of the Hague, Christian Huygens, of Zulichem, who was one of the first elected foreign members of the Royal Society of London in 1663, and had presented this telescope to the Society in 1691.

The general form of this instrument, which was designed to be used without the aid of a tube, is fully described and figured in his "Astroscopia Compendiaria," quarto, The Hague, 1684. The construction (in brief) was thus: The object glass (which in the present case has a focal length of 122 feet), was fixed in a tube attached to a rod, to this rod a stout cord was fixed, the other end of which was attached to another rod with a winch to wind up the cord, and to the end of this rod the eyepiece was fixed. This eyepiece consisted



HUYGENS' TELESCOPE. 1634.

EXPLANATION — *a b*. The pole or mast. *a*. Pulley at top of pole. *c d*. Upright carrier running in a slot bearing. *e*. An arm at right angles, to which is attached *f f*. A platform. *g g*. Rope attached to each end of the carrier. *h*. Leaden weight to balance. *I*. Cylinder containing the object-glass. *K L*. Rod affixed to cylinder. *M*. Brass 'cup-and-ball' joint: the end of the cup to be placed in a hole in the platform; the ball is attached to the rod *K*. *N*. Leaden weight, to which is attached a copper wire running to, *L*. End of wire, to which the cord is affixed. *O*. Tube containing the eye-piece, attached to *P Q*. A jointed rod. *R*. Handle held by observer. *S*. Small leaden weight. *T*. A winch for winding the lower end of cord. *u*. A rimmer with notch for the cord. *V L*. The (thin silk) cord "filum tenue bombycinum." *X*. Rest used to steady the observer's hands. *Y*. Lantem.

of two lenses—a form which is still in use, and known as the Huygenian eyepiece.

To erect this “Aerial Telescope” (as it was termed) a long pole was required. At the top of this a pulley was fixed, over which a rope was carried; to one end of this was attached a small travelling platform, balanced on the other side by a leaden weight, the rope being continued round to the lower end of the platform. The rod bearing the object glass was fitted with a “cup and ball” joint, the end of which was, when in use, inserted in a slot in the platform, which was then hauled up to any height required. Then the observer, holding the eyepiece by a jointed handle, pulled the long connecting cord of the object glass taut, using a small winder attached till the telescope was in focus, steadied his arms on a wooden rest, and was then ready to make observations.

The illustration of Huygens’ Telescope here given is a reduced copy of the plate in “Christiani Hugenii Zulichemii, Opera Varia 1728,” p. 268, which is identical with the plate in his “Astroscopia Compendiaria,” 1684. For the loan of the book from the Library of the Royal Astronomical Society, I am indebted to Prof. Meldola, F.R.S.

Such a telescope was a marvellous instrument indeed by comparison with those in use at that period, but being of so great a length was somewhat difficult of management; and we cannot but admire the patience and skill required in its manipulation, and the discoveries thereby accruing to the science.

This instrument was lent for some time to Dr. Derham, at Upminster, and in his preface to the 1st edition of “Astro-Theology,” 8vo, 1715, he frequently makes mention of Mr. Huygens’ glass, which he had discovered to be “an excellent glass,”¹ and regrets “the want of a long pole to manage it.” In the 3rd edition, 1719, he also mentions the return of the Huygens’ glass to the Royal Society, alluding “particularly to the diligence and accuracy of my very ingenious friend the Rev. Mr. Pound, into whose hands the Royal Society have put their noble bequest (*sic*) of Mr. Huygens, and who is so well accommodated for raising and using that glass as to have seen (among other considerable things) the five satellites of Saturn.”

Strangely enough, however, no record exists or entry of the date when the Royal Society lent the telescope to Dr. Pound.

¹ *Vide* page 162, for his Latin inscription, with signature, scratched on the object-glass.

Dr. Derham also mentions that the May Pole in the Strand² was offered to him, but his "incapacity of accepting the favour . . . hath been the occasion of that excellent glass being put into better hands."

This historic May Pole, about 100 ft. in height, was taken down in 1717, bought by Sir Isaac Newton, Kt., and presented to Dr. Pound. It was brought down on a carriage into Wanstead in April, 1718, and set up in the Park not far from the Rectory. The exact position is now unknown, but, in my opinion, it was probably on the higher and more open ground between the Rectory and the Church.

In the enlarged edition of Stow's "Survey of London," 1720, by Rev. John Strype, Vicar of Low Leyton, we are informed, "It had not long been set up there (in Wanstead) but these witty verses were fastened upon it by an unknown hand :—

" Once I adorn'd the Strand,
But now have found
My way to POUND,
In Baron Newton's land.

Where my aspiring Head aloft is rear'd,
T' observe the Motions of the Æthereal Herd,
Here sometimes rais'd a Machine by my side,
Thro' which is seen the sparkling Milky Tide :
Here oft I'm scented with a balmy Dew,
A pleasing Blessing which the Strand ne'er knew.
There stood I only to receive Abuse,
But here converted to a nobler Use ;
So that with me all Passengers will say,
I'm better far than when the Pole of May."

In the account book of Dr. Pound mentioned and quoted by Prof. Rigaud,³ "Miscellaneous Works, &c., of Dr. James Bradley," Oxford qto., 1832, we find mention of the cost of raising this pole, etc. :—

			£	s.	d.
1717.	Sept. 18.	Tin and brass work for Hugen's telescope .	0	4	6
1718.	April 25.	By an eye-glass for the long telescope .	0	2	6
	„ May 13.	By drink for men who raised the pole .	2	0	0
	„ May 16.	By several men, paid them ½ day's work for assisting in raising the pole . . .	0	17	0

² This new Maypole, replacing one which had been erected after the Restoration, had only been set up in 1713, with two gilt balls and a vane on the top. It stood opposite Somerset House, and is supposed to have been pulled down from being in the way of the new church, St. Mary-le-Strand, then in course of erection. The races in the "Dunciad" took place—

"Where the tall Maypole overlooked the Strand."

It is also mentioned by Bramston in his "Art of Politicks," 8vo, 1731,—

"What's not destroy'd by Time's devouring Hand?
Where's Troy, and where's the Maypole in the Strand?"

³ This account book was then in the possession of the Rev. Daniel Lysons, whose uncle the Rev. Samuel Peach, married Dr. Bradley's only daughter.

We learn incidentally from Dr. Bradley, who was the nephew of Dr. Pound, that in 1728 this Maypole was broken and useless, and can only conclude that it shared the fate of many a good staff—was chopped up for firewood.

Dr. Pound married on February 14th, 1710, Sarah, the widow of Edward Farmer, Esq., of the Manor of Canons (now Cann Hall), who died in 1715, leaving one daughter, Sarah, not two years old, who died unmarried at Greenwich, 1747. In October, 1722, he again married, Elizabeth, the sister of Matthew Wymondesold, the owner of The Grove, who survived him.

He was elected Fellow of the Royal Society on 30th November, 1699; but strangely enough did not go up for admittance till 30th July, 1713.

With ample time, in the calm seclusion which then pervaded our village, Dr. Pound, "one of the best observers in England," became known far and wide. His observatory was furnished with a transit instrument, years before the Royal Observatory possessed one. The great Halley, who became Astronomer-Royal on the death of Flamsteed, used to apply to him for assistance; and his friend, Sir Isaac Newton, was in constant correspondence, suggesting observations, and made use of the corrections he gave for determining the places of the comet of 1680. In the preface of his "Principia Mathematica," he mentions both Pound and Bradley. In the 3rd Book, in Phenomena, Pound on the Satellites and diameter of Jupiter, and in Section V., on comets, he gives among his examples, Dr. Pound's tables and observations.

In this connection, we may here note two entries in Pound's account book:—

		£	s.	d.
1719.	July 13.	To a free gift recd. from Sir I. Newton	52	10 0
1720.	April 28.	To a gift recd. of Sir I. Newton	52	10 0

Newton was a wealthy man, known for his liberality in the cause of science, and these gifts were probably made as an acknowledgment of the valuable services rendered to him by Dr. Pound.

To Dr. Pound is also due the cultivation of the extraordinary skill and attainments of his nephew.

In January, 1720, Dr. Pound was presented by Lord Chancellor Parker (afterwards Earl of Macclesfield) to another living, the rectory of Burstow, in Surrey, then vacant by the death of Flamsteed, the first Astronomer-Royal; but he still continued to reside in Wanstead, working at his astronomical observations.

In token of the high esteem and honour in which he was held, we find that in August, 1721, when the Savilian Professorship of Astronomy in the University of Oxford became vacant by the death of Dr. Keill, Lord Chancellor Parker was desirous of appointing Dr. Pound, considering him "the fittest man perhaps in Europe," but the offer was declined by the doctor, as it would have involved the giving up of his quiet life and Church preferment.

Though other applicants came forward, the Rev. James Bradley, his sister's child, was ultimately appointed Professor. He, for some years, had been helping his uncle in observations, had caught his enthusiasm, and spent most of his time at Wanstead; helping even in clerical work, so as to be resident here. No doubt his appointment was greatly helped by a letter of Martin Foulkes (afterwards President of the Royal Society) to Archbishop Wake, dated 4th September, 1721, in which he says: "He has lived for some years with his uncle, Mr. Pound, of Wanstead, where he has had great opportunities of joining to his theory the practical part of astronomy, in which he has made himself very eminent, having prepared for the press accurate tables of the satellites of Jupiter, with some other curious pieces: and I am satisfied his being Professor will do honour and service to the science. I shall only take the liberty of adding, that he is perfectly approved, and will be entirely recommended by Sir Isaac Newton, whom your Grace knows for the great judge of this sort of learning."

The Bradleys came of an old family, settled as far back as the fourteenth century at Bradley Castle, Durham. A branch of these settled near Cirencester; one of the descendants, William Bradley, was married in 1678 to Jane Pound, and James Bradley, namesake of his uncle, was their third son. He was born at Sherbourne, Gloucester, about 1692. After instruction at the Northleach Grammar School, he went to Balliol College, Oxford, 15th March, 1710-11, being then (according to the matriculation books) in his eighteenth year. He became B.A. in 1714, and M.A. 1717. In his year he caught the small-pox, and it was Dr. Pound who then took care of him.

The earliest of Bradley's recorded observations are dated 1715 (age twenty-three), and in the *Phil. Trans.*, xxx, Halley published two of Bradley's, made in 1717 and 1718. He then describes him (p. 853) as "eruditus juvenis, qui simul ingenio et industria pollens his studiis promovendis aptissimus natus est"; and again in the vol.

xxxi., mentions "the exactness of Dr. Pound and his nephew, Mr. Bradley." He thus rapidly attained eminence; became justly esteemed by men of science; and was elected Fellow of R.S., 6th November, 1718. Entering into holy orders, 1719, he was ordained priest in 1720, and but two days afterwards presented to the Vicarage of Bridstow, Monmouth; probably a sinecure.

Having already mentioned his appointment as Savilian Professor, it may be well to give the exact dates. He was elected 31st October, 1721, admitted to the office 18th December, and read his inaugural lecture 26th April, 1722.

In Dr. Pound's account-book previously referred to, we find the following entries in this connection:

1721.	Sept. 2.	By coach hire, pocket expenses, &c., about the Oxford professorship	£2 12 0
"	Oct. 31.	By cousin Bradley, lent him	4 4 0
"	" "	By pocket expenses in London	0 11 3

From another part of the book we find that the four guineas were supplied to give to the doorkeepers of the House of Lords on the day of election.

When John Hadley, the inventor or improver of the sextant, had solved the difficulty of perfecting mirrors for reflecting telescopes, and gave an account of his methods to the Royal Society in 1723, he presented them with one of his instruments, of Newtonian construction, with a metal speculum of 6-inch aperture. This was sent down to Dr. Pound to compare with the large Huygenian refractor, and he reported "that though the focal length of the object-metal was not quite $5\frac{1}{4}$ feet, it bore an equal magnifying power (about 230 diameters), and represented an object as distinctly as the refractor, though not altogether so clearly and bright." Bradley assisted him in making this comparison, and subsequently set to work on the grinding of metallic mirrors (specula).

Dr. Pound died on the 16th November, 1724, and his nephew thus refers to his loss: "A relation to whom he was dear even more than by the ties of blood." He was buried in the chancel of the old church, in front of the communion rails. The flat stone and inscription, now in the open, may yet be seen on the old church site.

The various communications he made to the Royal Society, *inter alia*, "Astronomical observations made at Wanstead," "A rectification of the motion of the five satellites of Saturn," "Observations of the transit of the body and shade of Jupiter's fourth satellite over

the disc of the planet," "Observations made with Mr. Hadley's reflecting Telescope," etc., etc., may be found in the *Phil. Trans.*, vols. xxix. to xxxii.

His collections of Natural History were presented to the Ashmolean Museum, Oxford.

After the death of Dr. Pound, his widow left the rectory, removing to a small house on her brother's estate, The Grove. The house adjoined the stables, and was just behind the Clock House (Capt. Kindersley's).

Here, when free from his studies at Oxford, Dr. Bradley resided, and "observed at his Aunt Pound's house in Wanstead Town," beginning in July, 1725. He tells us "the house was small, the ground room only $7\frac{1}{2}$ feet high, with a loft or garret over it."

It was in the upper part of this house he had on the 19th August, 1727, a zenith sector, of $12\frac{1}{2}$ feet radius and $12\frac{1}{2}^\circ$ range, mounted for him by Graham; even the Observatory at Greenwich did not possess one till Bradley's was removed there in 1749.

In January, 1730, he propounded his theory of the aberration of the fixed stars, containing the important discovery of the aberration of light. He is said to have been led to this, when sailing on the Thames, by remarking "that every time the boat put about, the vane at the top of the boat's mast shifted a little, as if there had been a slight change in the direction of the wind. He observed this three or four times without speaking; at last he mentioned it to the sailors, and expressed surprise that the wind should shift so regularly every time they put about. The sailors told him the wind had not shifted, but that the apparent change was owing to the change in the direction of the boat, and that the same thing invariably happened." (Thomson, "History of the Royal Society.")

From this he inferred that the direction in which we see a star, is not that in which it actually lies, but is inclined to it by an angle depending on the direction of the earth's motion round the sun at the time, and the ratio of its velocity to that of light.

For this discovery he was complimented by the Royal Society, who discharged him from all future payments.

In the year 1732 his aunt removed with him to Oxford, and he transferred most of his instruments, leaving, however, the zenith sector, as he was then engaged in making an extended investigation, and for the next fifteen years frequently visited Wanstead for the purpose. The result was his great discovery—a discovery which

marked an epoch in astronomy--that the inclination of the earth's axis to the ecliptic is not constant : thus explaining the precession of the equinoxes, and the nutation of the axis of our earth. In his paper on Nutation, 1748, *Phil. Trans.*, vol. xlv., he mentions : "I have continued to make observations at Wanstead, for, by the favour of my very kind and worthy friend, Matthew Wymondesold, my instrument has remained where it was first erected, so that I have been able . . . [to take] . . . observations for the space of twenty years." For this discovery the Copley Medal was awarded him.

The famous zenith sector was subsequently removed from Wanstead to Greenwich, in July, 1749, and for it the sum of £45 was allowed to Dr. Bradley.

His Aunt Pound died at Oxford, 10th September, 1740, and was buried with her husband in Wanstead Church.

On the death of Halley, Bradley was appointed Astronomer Royal by Sir Robert Walpole, on the 3rd of February, 1742, with a salary of £100 a year ; and was, perhaps, the very ablest of all who have held that office. He then removed to Greenwich, and soon after received the degree of D.D. The living of this parish was offered to him when vacant, but this he declined, as it would have interfered with his scientific work.

It is curious to note that during the life of Flamsteed no instruments were provided at Greenwich ; those used by him being either lent, or his own brought from Derby. At his death they were all removed ; but soon after the appointment of Halley the Board of Ordnance were induced to allow £500 for the purchase of necessary appliances ; and no observations were made before the 1st October, 1721, when the first transit instrument was erected.

Under Dr. Bradley, in 1748, a sum of £1,000 was obtained for a new instrumental outfit.

During his residence at the Observatory, the alteration of style took place, in 1752, when eleven days were omitted from the calendar⁴ in the month of September (the 3rd to the 13th), and for his share in this "impious undertaking" his sufferings, some ten years later, were attributed by many common people as a judgment from heaven.

He was elected a member of nearly all the leading scientific

⁴ The writer is indebted to the thoughtful care of his great-grandfather for the preservation of the rare almanack of this year, showing the alteration in style. It was printed by the Company of Stationers, on a single sheet, quarto size, and bears a small view of Lambeth Palace.

societies in Europe ; and a Crown grant of £250 a year was made to him in 1752 for the important services he had rendered to navigation.

He married a daughter of Samuel Peach, of Chalford, Gloucester, and had one daughter, Susannah, who married her cousin, the Rev. Samuel Peach, after her father's death. This daughter survived her husband, and, after his death, returned to Greenwich with her only child, a daughter, who was married to a surgeon at Greenwich, and, as they died without children, there is no lineal descendant of Dr. Bradley now living. He died at the age of seventy, on the 13th July, 1762, after much suffering from an internal complaint, in the house of his wife's brother at Chalford, and was buried in the churchyard of Minchinhampton, in the same county, with his wife and mother. An oval brass plate with Latin inscription was affixed to the altar-tomb. This was subsequently removed after an attempt had been made to steal it, and was then fixed upon the chancel wall. He is described as of gentle and unassuming manners, and very liberal. His portrait by Richardson was given by the Rev. J. Dallaway to the Royal Society, where it hangs in the library. His daughter presented the portrait by Hudson to Oxford University in 1769, and of this a mezzotint was engraved by Faber. This plate was cut to quarto size, as a frontispiece to Professor Rigaud's edition of his works, 1832.

After his uncle's death, Dr. Bradley's observations were probably made with reflecting telescopes, to the construction of which he had turned his attention, they being so much shorter and more easily manipulated. The coincidence of the death of Dr. Pound with the practical disuse of the long refractor in England is the more marked, as it was he who possessed the greatest skill and patience in its use. Although the Huygens Telescope was kept at Wanstead till some four years later, there is no observation recorded with it, and in the Journal of the Royal Society the following note of its return is made :

" June 20th, 1728. The Rev. Mr. Bradley, Savilian Professor of Astronomy at Oxford, delivered to the Society the glass and old furniture of Mr. Huygens' large telescope, which had been repositied for some years in the hands of his uncle, the late Mr. Pound, for making Celestial observations. At the same time he acquainted the Society that, there being no conveniency for his using it since the pole upon which the glass was erected has been broken, he thought fit to return it into the hands of the Society, and withal desired the Society to accept of such new conditions and improvements which his uncle had made to the furniture

and the apparatus whilst he was using it, viz., a curious micrometer contrived and made by Mr. Graham, a new eye-glass, a new director to the sight, and a new tin tube to carry the object-glass."

The various parts of this renowned telescope are still preserved in the Royal Society's instrument room, where I have had an opportunity of inspecting them. In their catalogue it is thus described :

No. 22. Huygens' Aerial Telescope.

- | | | |
|-----------|---|---|
| 12 parts. | { | 1.—An object-glass of 122 ft. focal length, with an eye-glass of 6 inches, and original apparatus for adjustment, made by Huygens, and presented by him to the Royal Society in 1691. |
| | | 2.—The apparatus for using Huygens' object-glass, constructed by Hooke. |
| | | 3.—Additional apparatus by Dr. Pound, presented by Dr. Bradley. |
| | | 4.—Ditto by Mr. Cavendish. |

Having carefully examined and measured this object-glass, I am able to give the following notes :

It is $7\frac{1}{2}$ inches in diameter, and on the side, scratched with a diamond point in his own handwriting, is the maker's name and date, "4 Jany. 1686, C. Huygens" and further round, in the writing of Dr. Derham, is the inscription, "Vitrum præstantissimum, W. Derham."

This glass has been mounted in wood and placed in a case by Dollond in 1856, under the direction of Dr. Warren De la Rue, F.R.S.

They also possess two other object-glasses by Huygens, mounted in a similar manner :

No. 23.—170 ft. focal length. Presented by Sir Isaac Newton, P.R.S. Inscription, "C. Huygens 26 Jan, 1686." This is of 8 inches diameter.

No. 24.—An object-glass, with two eye-glasses by Scarlet, for a telescope of 210 ft. Presented by the Rev. Gilbert Burnet, M.A., F.R.S., in 1724. Inscription, "C. Huygens, 23 Jul, 1686."

The latter is interesting, for we find in a paper by Dr. Bradley that on the 27th December, 1722, he measured the diameter of Venus with a Huygenian telescope of $212\frac{1}{4}$ ft. This must have been the object-glass he used in making the measurements.

Although these long refracting telescopes have, for so extended a period, been superseded by reflectors, it is interesting to know that those in the possession of the Royal Society were some years ago (1856?) erected on a special stage or tower near the observatory at Kew, and that Dr. De la Rue then found that the figure (definition) was absolutely perfect.

This telescope and the other Huygenian object-glasses were

exhibited by the Society at the Special Loan Collection of Scientific Apparatus, held at South Kensington in 1876, together with a wooden model of the stage, designed by Dr. De la Rue in 1855.

Amongst other early telescopes then on loan were two small ones constructed by Galileo in 1609, with object-glasses respectively of 40 and 50 mm. in diameter. With these he made his most important discoveries. They were lent for the occasion by the Royal Institute of Florence.

Another interesting exhibit was the first reflecting telescope, designed and made by Sir Isaac Newton in 1671, who subsequently presented it to the Royal Society. It is a tiny instrument with a cardboard tube, about seven inches in length, and an ebony eye-piece. It has a focal length of $6\frac{1}{2}$ inches, and a magnifying power of only 38 diameters.

[The Rev. W. C. Howell, M.A., has communicated a copy of the note of the observation of γ *Draconis*, made by Bradley at Kew, with the Zenith Sector of Molyneux, on the 21st of December, 1725; the discordance of which with the results of previous observations revealed to him the first glimpse of his immortal discovery of the Aberration of Light, alluded to by Mr. Crouch in the above paper. This note was found by the late Prof. Rigaud among the MSS. of Bradley, written upon a loose piece of paper :—

“Dec 21st Tuesday 5^h 40' sider time
 Adjusted y^e mark to y^e Plumb line
 & then y^e Index stood at 8
 5h 48' 22" y^e star entred
 49 52 $\frac{1}{2}$ Star at y^e Cross
 51 24 Star went out
 could
 As soon as I let go y^e course
 screw I perceived y^e star too
 much to y^e right hand &
 so it continued till it passed
 y^e Cross thread and within a quarter
 was
 of a minute after it had passed
 graduat
 I turned y^e fine screw till I saw
 y^e light of y^e star perfectly
 bisected and after y^e obser-
 vation I found y^e index
 at 11 $\frac{3}{4}$, so that by this
 observation y^e
 mark is about 3 $\frac{3}{4}$ "
 too much south
 but adjusting
 y^e mark and plumb line
 I found y^e index at 8 $\frac{1}{2}$ ”]

[With reference to the above note by Mr. Howell, Mr. Crouch has added the following to the proof :—

It is true that Dr. Bradley's attention was attracted to these differences in 1725, when observing with his friend, Mr. Molyneux' instrument at Kew; and it was in consequence of this that he had a larger Zenith Sector, with an object-glass of 2.85 inches, constructed by Graham, and set up in Wanstead (Lat. $51^{\circ} 34\frac{1}{2}'$) on the 19 August, 1727. On this date he records: "Mr. Molyneux and Mr. Graham came to Wanstead and we fixed it up." All the observations which led to his two notable discoveries were actually made in Wanstead, as recorded not only by Dr. Bradley, but also by Dr. Maskelyne, who had worked with him at Greenwich, and was appointed Astronomer Royal in 1765.

The latter in his Preface to the 1st volume of "Greenwich Observations," thus records:—

"This instrument, constructed by that excellent artist, Mr. Graham, with his peculiar elegance and accuracy, was fixed up at Wanstead in the year 1727, for the use of that great astronomer, Dr. Bradley; who, from his first year's observations with it, discovered the apparent motion of the fixed stars, which he called the aberration of light, and settled the laws of it; and from the same observations continued for a course of twenty years, discovered the nutation of the Earth's axis: two discoveries so profound, and at the same time, so useful and necessary to the improvement of astronomy, that they will ever do him honour, while accurate observations and astronomical speculations are held in estimation."]

NOTES ON THE CONFERENCE OF DELEGATES OF THE CORRESPONDING SOCIETIES OF THE BRITISH ASSOCIATION, HELD AT NOTTINGHAM, 1893.

LAST autumn, as Delegate of the Club, I sent some notes to THE ESSEX NATURALIST on the Conference of Delegates of the Corresponding Societies which had been held at Edinburgh (E. N., vol. vi., pp. 175-179). This year I forward some notes on the Conference which took place last September during the meeting of the British Association at Nottingham.

The first Conference was on September 14th, at University College, Nottingham. Professor Meldola being unavoidably absent, the chair was taken by Dr. Garson, who has always shown much interest in the work of the Corresponding Societies Committee, and in promoting increased co-operation between the Corresponding Societies and the various committees of the British Association which need their assistance. He remarked on the increased number of Corresponding Societies since the year 1885, when they were first enrolled, but he thought that they did not always sufficiently appreciate their advantages. Out of more than sixty societies on the list only forty-two had nominated delegates, though, considering the privilege enjoyed by a delegate of being *ex-officio* a member of the General Committee of the British Association, it could hardly be

difficult to obtain members able and willing to serve. And it was a great advantage, he added, to the local workers to have their papers catalogued in the Annual Report of the British Association and preserved at the office of the Association, where they might be consulted by many who would otherwise remain ignorant of their existence. Each Corresponding Society, also, had the Report of the British Association presented to it in exchange for its own Proceedings. He regretted that the Association had not been able to obtain greater facilities from the railway companies for members travelling to and from meetings of the Association, and remarked, in conclusion, that the local authorities had placed the room in which they were then meeting at the disposal of the delegates, as a place in which they might meet for talk or discussion at any time.

Among the committees of the British Association is one to consider "The Application of Photography to the Elucidation of Meteorological Phenomena." Mr. Symons, Chairman of this Committee, remarked that 467 photographs had been sent in. On this account he did not press for more, but the Committee would be glad to have additional photographs of lightning.

Mr. A. S. Reid, a member of the "Committee for the Collection, Preservation, and Systematic Registration of Photographs of Geological Interest," said that they had received more than forty new photographs during the past year, making the total collection 846; they were all British. The appeal to the Corresponding Societies had been more successful than in any previous year. He had, however, to report that unfortunately many prints had been sent in without the names of the Societies sending them, that of the photographer, or of the place photographed.

Mr. P. F. Kendall, Secretary to the "Committee for Recording the Position, etc., of the Erratic Blocks of England, Wales, and Ireland," remarked that very few of the Corresponding Societies had sent any information. The Committee had been in existence twenty-one years, but there were whole counties abounding in erratic blocks from which not a single report had ever been sent. There were thus great gaps in their information which could only be filled by photographs and reports from quarters which had not hitherto responded to their appeal.

There must be many unrecorded blocks in Essex, the nature and position of which should be carefully noted by our local observers and the result sent to Mr. Kendall.

It was announced by Mr. A. S. Reid, on behalf of the Committee of Section C (Geology), that the Underground Waters Committee would present their final Report next year, and would be glad to receive further information up to the date of publication. Also that the Coast Erosion Committee had not sent in a Report, though they had plenty of material in hand.

Mr. Symons, chairman of the "Earth Tremors Committee," announced that its work was going on under the care of Mr. Davison (Secretary). He added that he should like to hold its Report in suspense for a while, in the hope of future co-operation with some of the Corresponding Societies.

The Chairman announced that the "Committee to Consider Proposals for the Legislative Protection of Wild Birds' Eggs," had been reappointed, and that the delegates would in due time receive a final communication on the question. The usual discussion on this subject took place; some delegates being more inclined to blame boys, others to think that collectors were the most destructive influences. There was, however, a general agreement that moral pressure brought to bear upon boys and collectors was likely to prove more efficacious than legislation; and that rare birds might become extinct before legislation could protect their eggs. Mr. C. H. Torr, one of the Nottingham delegates, said that he could undertake that the matter should be brought before the local School Board; an example that might well be followed by the naturalists of other counties.

The Chairman in his introductory remarks, and in others which he made as representative of Section H (Anthropology), spoke of the Ethnographical Survey of the United Kingdom, which is being organised by a Committee of the British Association, as a matter in which the assistance of the Corresponding Societies was especially needed. And Mr. Brabrook, the Chairman of the Committee, distributed copies of its first Report among the delegates. The Committee had, he said, obtained, by communication with the Corresponding Societies, a list of nearly 300 villages, with some account of their leading features and peculiarities, all of which were worthy of special examination by the Committee. For this result, which was much beyond their anticipations, the Ethnographical Committee gave its most hearty thanks to the members of the Corresponding Societies who had helped them so efficiently. The next step taken by the Committee had been to draw up a brief code

of directions for the guidance of those who had been kind enough to offer assistance. This code would be found at the end of their Report.

It may be useful to add that the Ethnographical Survey includes observations on (1) the physical types of the inhabitants, to be ascertained by photographing and recording the characters and measurements of the people; (2) folklore; (3) peculiarities of dialect; (4) monuments and other remains of ancient culture; (5) historical evidence as to continuity of race.

Dr. Garson also brought before the Conference a resolution which had been passed by the Committee of Section H on the Exploration of Ancient Remains, to which they desired the attention of the Corresponding Societies to be drawn. It ran thus:—

“That in the opinion of this Section it is desirable that the attention of archaeologists and others be particularly called to the great importance of preserving with the utmost care all human remains found in ancient dwellings, graves, tumuli, and other burial places. It is equally as important to preserve the limb-bones and pelvis as the skull. The information yielded by human and animal remains is equally as important as that derived from pottery, implements, coins, etc. When any difficulty occurs in obtaining competent aid in examining such remains, explorers are requested to communicate with the Secretary, Anthropological Institute, 3, Hanover Square, London, W.”

And in connection with the preservation of ancient remains, it is worth noting that in a discussion on the teaching of Geography and on Ordnance Maps Mr. Andrews remarked that the archaeologists of Warwickshire, acting on the advice of Mr. Whitaker, forwarded a list of thirteen ancient earthworks to the Ordnance Survey Office, Southampton, ten of which had since been inserted in the map. Probably residents in Essex may be able to rectify similar omissions in that county.

There is a British Association Committee, of which our esteemed honorary member, Dr. H. Woodward, is chairman, “to Consider the Best Methods for the Registration of all Type Specimens of Fossils in the British Isles, and to report on the same.” Of the work of this Committee Mr. A. S. Reid remarked (as a delegate from Section C) that they were making arrangements for the registration of such specimens, and that information was required as to where they were housed.

On the maintenance of local museums, the Secretary read a letter from Mr. W. Cole, *Hon. Sec.* Essex Field Club. Mr. Cole thought that if an annual sum for the maintenance of local museums could be obtained from the Technical Educational Grants in each county there would be no great difficulty in obtaining substantial sums towards buildings and fittings. The fear that a museum might not be permanent often kept back subscriptions. Donations, both of money and of specimens, would rapidly come in when once the public felt that the museum would be permanent; and in no way could a portion of the Technical Educational Grant be better expended than in placing on a satisfactory footing the local museum of the county.

Mr. Symons thought the idea of getting a grant from the source suggested a very good one.

It is certainly obvious that no Field Club or Clubs can be relied upon for the *permanent* maintenance of a museum. This subject will be more fully discussed at the Oxford meeting of the British Association next year.

T. V. HOLMES,

*Hon. Secretary Corresponding Societies Committee ;
Delegate, Essex Field Club.*

I add a list of those British Association Committees of whose existence the Corresponding Societies should be more especially aware. As all the members of the various Committees are members of the British Association, their addresses may always be obtained by consulting the list of members of that body:—

Corresponding Societies Committee. *Chairman*—Professor R. Meldola. *Secretary*—Mr. T. V. Holmes. Mr. Francis Galton, Sir Douglas Galton, Sir Rawson Rawson, Mr. G. J. Symons, Dr. J. G. Garson, Sir John Evans, Mr. J. Hopkinson, Professor T. G. Bonney, Mr. W. Whitaker, Mr. W. Topley, Mr. E. B. Poulton, Mr. Cuthbert Peck, and Rev. Canon H. B. Tristram.

To organise an Ethnographical Survey of the United Kingdom. *Chairman*—Mr. E. W. Brabrook. *Secretary*—Mr. G. W. Bloxam. Mr. Francis Galton, Dr. J. G. Garson, Professor A. C. Haddon, Dr. Joseph Anderson, Mr. J. Romilly Allen, Dr. J. Beddoe, Professor D. J. Cunningham, Professor W. Boyd Dawkins, Mr. Arthur Evans, Mr. E. Sidney Hartland, Sir H. Howorth, Professor R. Meldola, General Pitt-Rivers, and Mr. E. G. Ravenstein.

Ascertaining and recording the Localities in the British Islands in which evidence of the existence of Prehistoric Inhabitants of the Country are found. *Chairman*—Sir John Lubbock. *Secretary*—Mr. J. W. Davis. Sir John Evans, Professor Boyd Dawkins, Dr. R. Munro, Mr. Pengelly, Dr. Hicks, and Professor R. Meldola.

To consider proposals for the Legislative Protection of Wild Birds'

Eggs. *Chairman*.—Sir John Lubbock. *Secretary*.—Mr. H. E. Dresser. Mr. John Cordeaux, Mr. W. H. Hudson, Professor A. Newton. Mr. Howard Saunders, Mr. Thomas Henry Thomas, Canon Tristram, and Dr. C. T. Vachell.

Recording the Position, Height above the Sea, Lithological Characters, Size, and Origin of the Erratic Blocks of England, Wales, and Ireland, reporting other matters of Interest connected with the same, and taking measures for their preservation. *Chairman*.—Professor E. Hull. *Secretary*.—Mr. P. F. Kendall. Professors W. Boyd Dawkins, T. McK. Hughes, T. G. Bonney, and J. Prestwich, and Messrs. C. E. De Rance, R. H. Tiddeman, J. W. Woodall, and Prof. L. C. Miall.

The Rate of Erosion of the Sea-coasts of England and Wales, and the Influence of the Artificial Abstraction of Shingle or other material in that action. *Chairman*.—Mr. W. Whitaker. *Secretaries*.—Messrs. C. E. De Rance and W. Topley. Messrs. J. B. Redman and J. W. Woodall, Maj. Gen. Sir A. Clarke, Admiral Sir E. Ommanney, Capt. Sir G. Nares, Capt. J. Parsons, Capt. W. J. L. Wharton, Professor J. Prestwich, and Messrs. E. Easton and J. S. Valentine, and Professor L. F. Vernon Harcourt.

The Circulation of the Underground Waters in the Permeable Formations of England, and the Quality and Quantity of the Waters supplied to various Towns and Districts from these Formations. And that a Digest of the eighteen Reports should be prepared by the Committee, and sold in a separate form. *Chairman*.—Professor E. Hull. *Secretary*.—Mr. C. E. De Rance. Dr. H. W. Crosskey, Sir D. Galton, Professor J. Prestwich, and Messrs. J. Glaisher, P. Kendall, E. B. Marten, G. H. Morton, W. Pengelly, J. Plant, I. Roberts, T. S. Stooke, G. J. Symons, W. Topley, Tylden-Wright, E. Wethered, and W. Whitaker.

The Rate of Increase of Underground Temperature downwards in various Localities on dry Land and under Water. *Chairman*.—Professor Everett. *Secretary*.—Professor Everett. Professor Lord Kelvin, Mr. G. J. Symons, Sir A. Geikie, Mr. J. Glaisher, Mr. Pengelly, Professor Edward Hull, Professor Prestwich, Dr. C. Le Neve Foster, Professor A. S. Herschell, Professor G. A. Lebour, Mr. A. B. Wynne, Mr. Galloway, Mr. Joseph Dickinson, Mr. G. F. Deacon, Mr. E. Wethered, Mr. A. Strahan, and Professor Michie Smith.

Considering the advisability and possibility of establishing in other parts of the country Observations upon the Prevalence of Earth Tremors similar to those now being made in Durham in connection with coal mine explosions. *Chairman*.—Mr. G. J. Symons. *Secretary*.—Mr. C. Davison. Sir F. J. Bramwell, Mr. E. A. Cowper, Professor G. H. Darwin, Professor J. A. Ewing, Mr. Isaac Roberts, Mr. Thomas Gray. Sir John Evans, Professor J. Prestwich, Professor E. Hull, Professor G. A. Lebour, Professor R. Meldola, Professor J. W. Judd, Mr. M. Walton Brown, Mr. J. Glaisher, Professor C. G. Knott, Professor J. H. Poynting, and Mr. Horace Darwin.

The Collection, Preservation, and Systematic Registration of Photographs of Geological Interest. *Chairman*.—Professor J. Geikie. *Secretary*.—Mr. O. W. Jeffs. Professors Bonney and Boyd Dawkins, Drs. V. Ball and T. Anderson, and Messrs. A. S. Reid, E. J. Garwood, W. Gray, H. B. Woodward, J. E. Bedford, R. Kidston, W. W. Watts, J. W. Davis, R. H. Tiddeman, J. J. H. Teall, and H. B. Woodward.

The Application of Photography to the Elucidation of Meteorolo-

logical Phenomena. *Chairman*.—Mr. G. J. Symons. *Secretary*.—Mr. A. W. Clayden. Professor R. Meldola, and Mr. John Hopkinson.

To consider the best Methods for the Registration of all Type Specimens of Fossils in the British Isles, and to report on the same. *Chairman*.—Dr. H. Woodward. *Secretary*.—Mr. A. Smith Woodward. Rev. G. F. Whidborne, Mr. R. Kidston, and Mr. J. E. Marr.

THE FRESH-WATER ALGÆ OF ESSEX; A PRELIMINARY LIST OF RECORDED SPECIES.

By M. C. COOKE, M.A., LL.D., A.L.S., &c.

[*Read November 4th, 1893.*]

[THE following list of the species of Fresh-water Algæ (excluding the Diatomaceæ) hitherto recorded for Essex, has been kindly compiled by Dr. Cooke for the purpose of establishing a starting-point for future recorders, in the hope that botanists will speedily add new species to the catalogue. The few short lists published in our "Journal of Proceedings" have been collated and incorporated, as well as the Algæ recorded by the late Mr. E. G. Varenne in THE ESSEX NATURALIST (vol. v., pp. 25-30). In the list the initials, following the localities, are indications of the authority for the record, thus:—

- A.H.H.* Dr. A. H. Hassall, author of "Fresh-Water Algæ."
E.G.V. The late Mr. E. G. Varenne, of Kelvedon.
Q.M.C. Excursion lists of Quekett Microscopical Club in the "Journal" of the Club.
G.E.M. Mr. G. E. Mainland.

The references to figures of the various species are made to Cooke's "British Fresh-Water Algæ," and Cooke's "British Desmids," with coloured plates, in which two works all the species are figured. The number of species here recorded is 170 with 15 "varieties."

The Diatomaceæ have been wholly excluded, and require special investigation.]

PALMELLACEÆ.

Pleurococcus vulgaris, Men. Cooke, t. 2, f. 1. On trunks, Epping; Kelvedon (E.G.V.).

Palmella hyalina, Breb. Cooke, t. 5, f. 3. In bogs, etc., Kelvedon (E.G.V.).

P. mooreana, Harv. Cooke, t. 5, f. 4. In bogs, etc., Kelvedon (E.G.V.).

Porphyridium cruentum, Nag. Cooke, t. 5, f. 6. On walls, etc., Kelvedon (E.G.V.).

Tetraspora bullosa, Ag. Cooke, t. 6, f. 1. In pools, Messing (E.G.V.).

T. lubrica, Roth. Cooke, t. 6, f. 3. In ditches, Kelvedon; Rivenhall (E.G.V.).

T. gelatinosa, Vauch. Cooke, t. 6, f. 2. In ditches, Kelvedon (E.G.V.).

Apiocystis brauniana, Nag. Cooke, t. 7, f. 1. In ditches, etc., Snaresbrook.

Rhaphidium falcatum, Corda. Cooke, t. 8, f. 4. In pools, Snaresbrook.

PROTOCOCCACEÆ.

Protococcus viridis, Ag. Cooke, t. 12, f. 1. On trunks, etc., Epping.

Chlorococcum gigas, Green. Cooke, t. 12, f. 3. In pools, Walthamstow.

Scenedesmus obtusus, Mey. Cooke, t. 13, f. 5. In boggy pools, Snaresbrook.

S. acutus, Mey. Kelvedon (E.G.V.). Var. *obliquus*. Cooke, t. 13, f. 6c. In pools, Snaresbrook.

S. quadricauda, Breb. Cooke, t. 13, f. 8. In standing water, Snaresbrook.

Hydrodictyon utriculatum, Roth. Cooke, t. 14, f. 1. In clear water, Kelvedon (E.G.V.).

Pediastrum boryanum, Turp. Cooke, t. 16, f. 11. In pools, Loughton (Q.M.C.).

P. rotula, Ehr. Cooke, t. 18, f. 2. In pools, Snaresbrook.

Hydrianum heteromorphum, Rein. Cooke, t. 19, f. 6. Attached to Algæ, Snaresbrook.

VOLVOCINEÆ.

Chlamydococcus nivalis, Br. Cooke, t. 21, f. 2. On snow, Forest Hill ("Daily News," Mar. 14, 1876) [? Essex.—ED.]

Volvox globator, Linn. Cooke, t. 22, 23. In ponds, Epping; Loughton; Snaresbrook.

V. minor, Stein. Cooke, t. 25. In ponds, Epping (Q.M.C.).

Gonium pectorale, Mull. Cooke, t. 27, f. 1. In pools, Loughton; Snaresbrook.

Eudorina elegans, Ehr. Cooke, t. 26. In ditches, Abridge.

DESMIDIEÆ.

Sphærozosma secedens, D. By. Cooke, Desm., t. 2, f. 3. In pools, Snaresbrook.

Hyalotheca dissiliens, Sm. Cooke, t. 3, f. 1. In ponds, High Beach (A.H.H.); Snaresbrook.

H. mucosa, Mert. Cooke, Desm., t. 3, f. 2. In pools, High Beach (A.H.H.); Feering (E.G.V.).

Desmidium swartzii, Ag. Cooke, Desm., t. 5, f. 2. In pools, High Beach (A.H.H.); Loughton (Q.M.C.).

Docidium ehrenbergii, Ralfs. Cooke, Desm., t. 6, f. 1. In pools, Snaresbrook.

D. nodulosum, Breb. Cooke, Desm., t. 6, f. 3. In pools, Loughton (Q.M.C.).

D. baculum, Breb. Cooke, Desm., t. 7, f. 4. In ponds, Snaresbrook.

Closterium lunula, Ehr. Cooke, Desm., t. 8, f. 4. In ponds, High Beach (A.H.H.); Kelvedon (E.G.V.).

C. acerosum, Ehr. Cooke, Desm., t. 9, f. 1. In ponds, Kelvedon (E.G.V.); Epping; Snaresbrook.

C. gracile, Breb. Cooke, Desm., t. 13, f. 8. In ponds, High Beach.

C. ehrenbergii, Men. Cooke, Desm., t. 12, f. 2. In ponds, Chingford; Kelvedon (E.G.V.).

C. moniliferum, Ehr. Cooke, Desm., t. 12, f. 3. In ponds, Kelvedon (E.G.V.).

C. jenneri, Ralfs. Cooke, Desm., t. 13, f. 4. In ponds, Loughton (Q.M.C.); Snaresbrook.

C. leibleinii, Kutz. Cooke, Desm., t. 13, f. 1. In ponds, High Beach; Walthamstow.

C. dianæ, Ehr. Cooke, Desm., t. 13, f. 3. In ponds, High Beach; Walthamstow.

C. striolatum, Ehr. Cooke, Desm., t. 11, f. 1. In ponds, Loughton.

C. intermedium, Ralfs. Cooke, Desm., t. 11, f. 2. In ponds, Snaresbrook.

C. lineatum, Ehr. Cooke, Desm., t. 12, f. 1. In ponds, Walthamstow.

C. rostratum, Ehr. Cooke, Desm., t. 14, f. 3. In ponds, High Beach (A.H.H.); Kelvedon (E.G.V.).

C. setaceum, Ehr. Cooke, Desm., t. 14, f. 4. In ponds, Chingford (Q.M.C.).

C. linea, Perty. Cooke, Desm., t. 15, f. 2. In ponds, Snaresbrook.

Penium margaritaceum, Breb. Cooke, Desm., t. 17, f. 1.
In pools, Chingford.

P. digitus, Breb. Cooke, Desm., t. 16, f. 1. In pools,
Loughton; Walthamstow.

P. closteroides, Ralfs. Cooke, Desm., t. 16, f. 3. In ponds,
Chingford (Q.M.C.).

P. brebissonii, Ralfs. Cooke, Desm., t. 17, f. 3. In pools,
High Beach (A.H.H.); Wood Street, Walthamstow (Q.M.C.).

Mesotæmium braunii, D. By. In pools, Kelvedon (E.G.V.).

Tetmemorus brebissonii, Ralfs. Cooke, Desm., t. 18, f. 7.
In pools, High Beach (A.H.H.); Snaresbrook.

T. granulatus, Ralfs. Cooke, Desm., t. 18, f. 8. In pools,
High Beach (A.H.H.).

Spirotænia condensata, Breb. Cooke, Desm., t. 19, f. 3.
In boggy pools, Wood Street, Walthamstow (Q.M.C.); High
Beach.

Micrasterias denticulata, Breb. Cooke, Desm., t. 22. In
bog pools, Epping Forest.

M. rotata, Grev. Cooke, Desm., t. 24. In pools, Chingford
(Q.M.C.); Snaresbrook.

Euastrum oblongum, Grev. Cooke, Desm., t. 31, f. 2. In
pools, High Beach (A.H.H.).

E. crassum, Kutz. Cooke, Desm., t. 32, f. 1. In pools,
High Beach (A.H.H.).

E. affine, Ralfs. Cooke, Desm., t. 33, f. 2. In pools, High
Beach (A.H.H.).

E. ansatum, Ehr. Cooke, Desm., t. 33, f. 5. In ponds,
Loughton; Snaresbrook.

E. circulare, Hass. Cooke, Desm., t. 34, f. 2. In pools,
High Beach (A.H.H.).

E. elegans, Breb. Cooke, Desm., t. 35, f. 5. In pools,
Snaresbrook.

E. inerme, Lund. Cooke, Desm., t. 35, f. 4. In pools,
Snaresbrook.

Cosmarium cucumis, Corda. Cooke, Desm., t. 36, f. 11.
In pools, High Beach.

C. meneghinii, Breb. Cooke, Desm., t. 37, f. 11. In pools,
Loughton Side; Walthamstow.

C. brebissonii, Men. Cooke, Desm., t. 38, f. 2. In pools,
Loughton (Q.M.C.).

C. margaritifera, Turp. Cooke, Desm., t. 39, f. 2. In ponds, Wood Street, Walthamstow (Q.M.C.).

C. botrytis, Men. Cooke, Desm., t. 39, f. 4. In pools, High Beach (A.H.H.); Snaresbrook.

Xanthidium armatum, Breb. Cooke, Desm., t. 45, f. 1. In ponds, High Beach (A.H.H.).

Arthrodesmus octocornis, Ehr. Cooke, Desm., t. 47, f. 2. In ponds, Snaresbrook.

A. incus, Hass. Cooke, Desm., t. 47, f. 4. In ponds, Snaresbrook.

A. convergens, Ehr. Cooke, Desm., t. 47, f. 1. In ponds, Chingford; Snaresbrook.

Staurostrum dejectum, Breb. Cooke, Desm., t. 49, f. 1. In ponds, Snaresbrook.

S. cuspidatum, Breb. Cooke, Desm., t. 49, f. 5. In ponds, Snaresbrook.

S. orbiculare, Ralfs. Cooke, Desm., t. 51, f. 7. In ponds, Loughton.

S. muricatum, Breb. Cooke, Desm., t. 54, f. 5. In pools, High Beach.

S. punctulatum, Breb. Cooke, Desm., t. 54, f. 6. In ponds, Chingford; Snaresbrook.

S. alternans, Breb. Cooke, Desm., t. 54, f. 7. In ponds, Snaresbrook; High Beach (A.H.H.).

S. polymorphum, Breb. Cooke, Desm., t. 58, f. 4. In ponds, Chingford.

S. arachne, Ralfs. Cooke, Desm., t. 63, f. 4. In ponds, Snaresbrook.

ZYGNEMACEÆ.

Zygnema cruciatum, Vauch. Cooke, t. 30, f. 1. In ditches, Snaresbrook; High Beach.

Z. vaucherii v. *stagnale*, Hass. Cooke, t. 30, f. 5. In pools, High Beach.

Z. anomalum, Hass. Cooke, t. 31, f. 1. In pools, High Beach (A.H.H.); Easthorpe (E.G.V.). Var. *lutescens*, Hass. In pools, West Bergholt Heath (E.G.V.).

Spirogyra crassa, Kutz. Cooke, t. 32, f. 1. In pools, Colne (E.G.V.).

S. nitida, Dill. Cooke, t. 33, f. 1. In ponds, Kelvedon (E.G.V.); Snaresbrook.

S. orthospira, Nag. Cooke, t. 33, f. 2. In pools, Troyes Wood, near Witham (E.G.V.).

S. orbicularis, Hass. Cooke, t. 34, f. 1. In ponds, Kelvedon; Maldon (E.G.V.).

S. bellis, Hass. Cooke, t. 34, f. 2. In ponds, Kelvedon; Braxted (E.G.V.). Var. *neglectum*, Hass. In ponds, Feering (E.G.V.).

S. porticalis, Vauch. Cooke, t. 35. Var. *quinina*, Hass. In ponds, Kelvedon (E.G.V.); Epping. Var. *decimina*, Hass. In ponds, Rivenhall (E.G.V.); Epping.

S. condensata, Vauch. Cooke, t. 36, f. 1. In pools, Kelvedon (E.G.V.).

S. longata, Vauch. Cooke, t. 36, f. 2. Var. *communis*, Hass. In ditches, High Beach (A.H.H.); Kelvedon; Easthorpe (E.G.V.); Walthamstow; Snaresbrook. Var. *turpis*, Kutz. In ditches, Kelvedon (E.G.V.); High Beach.

S. flavescens, Hass. Cooke, t. 37, f. 1. In pools, High Beach (A.H.H.); Massing Heath (E.G.V.). Var. *gracilis*, Hass. In pools, Wanstead Flats (A.H.H.); Kelvedon (E.G.V.).

S. insignis, Hass. Cooke, t. 38, f. 1. In streams, Kelvedon (E.G.V.).

S. quadrata, Hass. Cooke, t. 39, f. 1. In pools, Kelvedon (E.G.V.).

S. weberi, Kutz. Cooke, t. 39, f. 2. Var. *inæqualis*, Hass. In pools, High Beach (A.H.H.); Walthamstow.

S. tenuissima, Hass. Cooke, t. 39, f. 3. In pools, High Beach; Walthamstow; Kelvedon (E.G.V.).

Zygonium ericetorum, D. By. Cooke, t. 42, f. 2. On heaths, Tiptree Heath (E.G.V.).

Mesocarpus parvulus, Hass. Cooke, t. 42, f. 3. In ponds, Epping (A.H.H.); Kelvedon (E.G.V.).

M. scalaris, Hass. Cooke, t. 42, f. 1. In ditches, Abridge; Kelvedon (E.G.V.).

M. pleurocarpus, D. By. Cooke, t. 43, f. 1. In pools, Feering (E.G.V.); Walthamstow.

Staurospermum gracillimum, Hass. Cooke, t. 43, f. 3. In bog pools, High Beach (A.H.H.); Snaresbrook.

S. capucinum, Kutz. Cooke, t. 44, f. 1. In ponds, High Beach (A.H.H.); Snaresbrook.

S. viride, Kutz. Cooke, t. 44, f. 2. In ditches, etc., Royden (A.H.H.).

BOTRYDIACEÆ.

Botrydium granulatum, Linn. Cooke, t. 65. In swampy places, Kelvedon (E.G.V.).

VAUCHERiaceÆ.

Vaucheria aversa, Hass. Cooke, t. 47, f. 1. In ditches, Kelvedon (E.G.V.).

V. sericea, Syngb. Cooke, t. 47, f. 4. In pond, Messing (E.G.V.).

V. dillwynii, Ag. Cooke, t. 47, f. 9, 10. On the ground, Kelvedon (E.G.V.).

V. sessilis, Vauch. Cooke, t. 48, f. 1. Var. *ornithocephala*, Hass. In stagnant water, Kelvedon (E.G.V.). Var. *repens*, Hass. On the ground, Royston (A.H.H.); Kelvedon (E.G.V.).

V. geminata, Vauch. Cooke, t. 48, f. 6, 7. In ponds, Kelvedon (E.G.V.). Var. *racemosa*, Vauch. In ditches, Kelvedon (E.G.V.). Var. *ovoides*, Hass. In ditches, Kelvedon (E.G.V.).

V. hamata, Vauch. Cooke, t. 48, f. 10, 11. In ditches, Kelvedon (E.G.V.).

V. terrestris, Vauch. Cooke, t. 49, f. 1, 2. On damp soil, Kelvedon (E.G.V.).

ULVACEÆ.

Prasiola crispa, Kutz. Cooke, t. 50, f. 1. On damp ground, Kelvedon (E.G.V.).

Enteromorpha intestinalis, Linn. Cooke, t. 51, f. 1, 2. In ditches, Kelvedon (E.G.V.); Walthamstow.

CONFERVACEÆ.

Microspora floccosa, Ag. Cooke, t. 53, f. 3. In stagnant water, Birch Holt; Messing; Feering; Kelvedon (E.G.V.).

M. vulgaris, Rabh. Cooke, t. 53, f. 2. In ditches, Snaresbrook.

M. fugacissima, Ag. Cooke, t. 53, f. 1. In ditches, Walthamstow.

Chætomorpha linum, Roth. Cooke, t. 54, f. 2. In ditch, Dovercourt (E.G.V.).

Conferva bombycina, Ag. Cooke, t. 53, f. 4. In ditches, Snaresbrook.

Cladophora crispata, Roth. Cooke, t. 55, f. 3. In pools, Kelvedon (E.G.V.).

C. glomerata, Linn. Cooke, t. 56, f. 1. In streams, Kelvedon (E.G.V.); Walthamstow.

C. flavescens, Ag. Cooke, t. 55, f. 5. In ditches, Epping.

C. fracta, Dillw. Cooke, t. 55, f. 1. In ditches, High Beach.

CEDOGONIACEÆ.

Cedogonium vernale, Hass. Cooke, t. 58, f. 6. In ponds, Waltham Abbey; High Beach (A.H.H.).

Æ. paludosum, Hass. Cooke, t. 59, f. 2. In bogs, Kelvedon (E.G.V.).

Æ. rothii, Le Clerc. Cooke, t. 59, f. 6. In ponds, Kelvedon (E.G.V.).

Æ. pluviale, Nord. Cooke, t. 59, f. 8. In pools, Walthamstow.

Æ. flavescens, Hass. Cooke, t. 60, f. 2. In ponds, Rivenhall (E.G.V.).

Æ. crassiusculum, Wittr. Cooke, t. 60, f. 5. In pools, Epping Forest, Loughton Side.

Æ. capillare, Linn. Cooke, t. 62, f. 3. In pools, Walthamstow.

Æ. boscii, Clerc. Cooke, t. 63, f. 4. In pools, Walthamstow.

Æ. hexagonum, Kutz. Cooke, t. 66, f. 8. In ponds, etc., Kelvedon; Tiptree (E.G.V.).

Æ. fasciatum, Kutz. Cooke, t. 66, f. 2. In streams, Kelvedon (E.G.V.).

Æ. longatum, Kutz. Cooke, t. 64, f. 4. Parasitic on other species, Epping Forest.

Æ. sphæricum, Hass., t. 53, f. 5. In pools, Kelvedon (E.G.V.).

Bulbochæte setigera, Ag. Cooke, t. 48, f. 1. In ponds, Kelvedon (E.G.V.); Snaresbrook.

[*Vesiculifera mulleri*, Hass., t. 53, f. 10. In pools, Kelvedon (E.G.V.).]

ULOTRICHACEÆ.

Hormiscia zonata, W. and M. Cooke, t. 69. In ditches, Braxted (E.G.V.); Walthamstow.

Ulothrix tenuis, Kutz. Cooke, t. 70, f. 6. In ditches, Snaresbrook.

U. tenerrima, Kutz. Cooke, t. 70, f. 5. In ditches, Snaresbrook.

U. radicans, Kutz. Cooke, t. 71, f. 1. On the ground, Kelvedon (E.G.V.).

CHROOLEPIDÆ.

Chroolepus aureus, Linn. Cooke, t. 72, f. 1. On trunks, Epping Forest.

CHÆTOPHORACEÆ.

Stigeoclonium thermale, Br. Cooke, t. 73, f. 2. In springs, etc., Easthorpe (E.G.V.); Snaresbrook.

S. nanum, Dill. Cooke, t. 74, f. 2. In streams, Braxted (E.G.V.).

Draparnaldia glomerata, Ag. Cooke, t. 75, f. 1. In pools, Kelvedon (E.G.V.); Loughton.

D. plumosa, Vauch. Cooke, t. 76, f. 1. In pools, Kelvedon (E.G.V.); Snaresbrook.

Chætophora pisiformis, Roth. Cooke, t. 77, f. 1. On submerged plants, Easthorpe (E.G.V.); Walthamstow.

C. tuberculosa, Roth. Cooke, t. 78, f. 1. In pools, Rivenhall; Coggeshall; Kelvedon (E.G.V.).

C. elegans, Roth. Cooke, t. 77, f. 2. On submerged plants, Feering; Kelvedon (E.G.V.); Snaresbrook.

C. endivæfolia, Ag. Cooke, t. 78, f. 2. In ditches. Rivenhall; Kelvedon (E.G.V.).

Colæochæte scutata, Breb. Cooke, t. 79. On *Hypnum*, Kelvedon (E.G.V.).

The species of Chytridiæ have latterly been removed from the Algæ, and placed in closer relation to the Fungi.

CHROOCOCCACEÆ.

Aphanothece prasina, Br. Cooke, t. 5, f. 4. In ditches, bogs, etc., Kelvedon (E.G.V.).

This seems to be the same as *Palmella mooreana*.

NOSTOCHINEÆ.

Nostoc commune, Vauch. Cooke, t. 91, f. 4. On the ground, Kelvedon (E.G.V.).

Anabaena hassallii, Nord. Cooke, t. 93, f. 3. In ditches, Kelvedon (E.G.V.).

Cylindrospermum macrospermum, Kutz. Cooke, t. 95, f. 1. In ditches, Kelvedon; Yeldham (E.G.V.).

LYNGBYÆ.

Spirulina jenniferi, Kutz. Cooke, t. 96, f. 1. In stagnant water, Kelvedon; Easthorpe (E.G.V.)

S. oscillarioides, Turp. Cooke, t. 96, f. 3. In ditches, Epping (G.E.M.).

Oscillaria tenerrima, Kutz. Cooke, t. 96, f. 4. In ditches, Chingford.

O. tenuis, Ag. Cooke, t. 96, f. 8. In ditches, Kelvedon (E.G.V.); Chingford.

O. muscorum, Carm. Cooke, t. 98, f. 8. On *Hypnum*, Kelvedon (E.G.V.).

O. limosa, Ag. Cooke, t. 97, f. 3. In ditches, Kelvedon (E.G.V.).

O. nigra, Vauch. Cooke, t. 97, f. 6. In ditches, Kelvedon (E.G.V.).

Microcoleus terrestris, Desm. Cooke, t. 99, f. 2. On the ground, Kelvedon (E.G.V.).

Lyngbya vulgaris, Kirsch. Cooke, t. 102, f. 5. On the ground, Kelvedon (E.G.V.).

Gloiostrichia natans, Thur. Cooke, t. 116, f. 1. In ditches, Feering (E.G.V.).

G. pisum, Ag. Cooke, t. 116, f. 2. In ditches, Epping (G.E.M.).

BATRACHOSPERMÆ.

Batrachospermum moniliforme, Roth. Cooke, t. 120. In ditches, Kelvedon; Rivenhall (E.G.V.) Var. *confusum*, Hass. Cooke, t. 123. Feering; Coggeshall; Kelvedon (E.G.V.). Var. *stagnale*, Ag. Kelvedon; Coggeshall (E.G.V.).

B. vagum, Roth. Cooke, t. 125. In ditches, Rivenhall (E.G.V.).

B. atrum, Harv. Cooke, t. 126, f. 1. In ditches, Kelvedon (E.G.V.).

DOUBTFUL SPECIES.

Lyngbya thompsoni, Harv. Hass., p. 222. On stick in a pond, Kelvedon (E.G.V.).

L. punctalis, Hass. Hass., t. 60, f. 4. In an aquarium, Kelvedon; Felix Hall (E.G.V.).

L. vermicularis. Hass., t. 60, f. 5. In ditch, Feering; Tip-tree Heath (E.G.V.).

L. cinerea (*Oscillatoria*, Hass.). In ditch, Kelvedon (E.G.V.).

THE ESSEX FIELD CLUB.

THE CRYPTOGAMIC AND BOTANICAL MEETING AND ORDINARY MEETING.
Saturday, November 4th, 1893.

THE usual "Fungus Foray" of the Club was held on this day, the headquarters being the saloon at the King's Head Hotel, High Beach, Epping Forest.

The Hon. Secretaries were early on the ground, and met Dr. Cooke at the Chingford Station at 11 o'clock. The weather was changeable, although fine in the afternoon. Members and friends were met with a two-horse drag on arrival of the trains at Loughton, and specimens and microscopes were taken up to the inn. Probably fifty members and friends attended the meeting. The saloon formed an excellent exhibition room, and the tables were well filled with interesting specimens. But fungi were exceedingly scarce, and the exertions of the numerous collectors furnished but few specimens of fresh fungi for exhibition. The late droughts and some recent sharp frosts had been most detrimental to the growth and development of these delicate plants. But very few species of interest were obtained, the credit of the day being only saved by the discovery by Dr. Cooke of one species new to the Forest list, viz., *Agaricus corticola*, which occurred on trunks of trees in Monk's Wood. Mr. Barnard, of Woodford, brought up a species found growing on rotten wood at that place, which Dr. Cooke subsequently identified as *Formes roseus*, Fr., a plant not only new to the Forest but to *Britain*. Other species observed hardly call for special notice, and the specimens were in most cases badly grown and damaged by the frosts. By persistent exertions, however, the numerous collecting parties working in Woodford, Fair Mead, High Beach, Loughton Woods, Monk Woods, etc., gathered a sufficient number of species to form a fair show, and Dr. Cooke, Dr. Wharton, and other fungologists present gave much information to those willing to learn.

Several large tables were well filled with specimens of botanical interest. Among them may be noticed the following:—

Messrs. H. and J. Groves showed a series of dried specimens of British Umbellifereæ; a noticeable feature was the way in which the larger specimens were mounted on two or more ordinary herbarium sheets so as to piece together into one, and thus give an adequate idea of the plants. The Essex rarities were conspicuous—*Bupleurum falcatum*, *Peucedanum officinale*, and *Tordylium maximum*.

The very fine Herbarium of Marine Algæ of the Harwich district, presented to the Club by *Mr. G. P. Hope*, of Upminster Hall.

Mr. J. T. Powell—His herbarium of species of Rubi or Brambles, from Epping Forest

Dr. M. C. Cooke—Original drawings, by himself, of the British Desmids, afterwards altered in size and arrangement and published in Cooke's "British Desmids"; also a set of coloured plates illustrative of Cooke's "British Fresh-water Algæ."

Mr. W. Cole—Specimens of some of the more uncommon plants of Essex, presented many years ago to the Museum by the late G. S. Gibson, author of the "Flora of Essex"; also several small old herbaria from the Museum, containing many rare species of British plants.

Examples of the methods of putting up type-specimens of plants and animals for instruction in village classes and for the educational series in the Club's Museum. Prepared under the direction of *Mr. David Houston*, F.L.S.

Mr. Sauzè and *Mr. Oldham* showed several cases of Insects of various orders, many from the Forest districts.

Mr. St. John Parker and Mr. Ed. Dadswell exhibited under the microscope many interesting forms of life, including *Cristatella mucedo* from Epping Forest, and many prepared botanical specimens were also shown by means of the numerous microscopes brought to the meeting.

Tea was taken about 5 o'clock, and afterwards an Ordinary Meeting (the 141st) was held in the saloon, Mr. T. V. Holmes, *Vice-President*, in the chair.

The following were elected members of the Club:—Captain T. C. D. Whitmore, Messrs E. W. J. Arman and Walter Withall.

Mr. W. Cole announced that Mr. G. P. Hope had presented to the Museum of the Club his fine Herbarium of Marine Algæ from the Harwich district, which was exhibited that evening, as well as some fossils from Walton-Naze, and bronze Celts from Havering. A special vote of thanks was passed to Mr. Hope for his valuable donation.

Prof. Boulger sent for exhibition an abnormal specimen of *Polyperus lucidus* with no terminal pileus. It was found growing from timbers at the bottom of the (nearly dry) well at Epsom College, October, 1893.

Mr. Mothersole, the Assistant at the Museum, sent for exhibition and presentation to the Club a very peculiar double abnormal fruit of the Medlar, from a garden at Chelmsford, 1893.

Dr. Cooke then reported on the botanical observations of the day, describing the season as the worst for many years in his experience for the growth of fungi. Dr. Cooke also read a "Preliminary List of the Fresh-water Algæ of Essex," see pp. 170-179. This paper, he said, was simply intended as a starting-point, so that observers might know the species already recorded for the county. He hoped that numerous additions to the list would speedily be made, so that they might get to know the richness of Essex in this tribe of plants.

Dr. Cooke also alluded to Mr. Hope's fine collection, and hoped that it would be used as the foundation for a list of the marine algæ of Essex.

The Secretary said that it was intended to submit the herbarium to a well-known algologist, for examination and cataloguing.

During the evening an interesting discussion took place on the culture of the mushroom in the open, as an industry in Essex and Herts.

Cordial votes of thanks to Dr. Cooke for his paper, and to him and Dr. Wharton as conductors were passed, and also to those members and friends who had kindly brought or sent exhibits for the meeting.

The remainder of the evening was passed in examining the numerous exhibits, and about 9 o'clock the members were driven to Chingford and Loughton for home. A word of thanks is due to the landlord of the hotel, Mr. Gumpracht, for his care and attention, and arrangement of the room, so admirably adapted for the purposes of our meeting.

THE 142ND ORDINARY MEETING.

Saturday, November 25th, 1893.

THE 142nd Ordinary Meeting of the Club was held in the Vestry Hall, Chelmsford at 6.30 o'clock, Prof. R. Meldola, F.R.S., *Vice-President*, in the chair.

Mr. Chancellor sent a letter of regret that indisposition prevented his taking the chair as President that evening.

Mr. Thomas Thompson, editor of "The Essex County Chronicle," said he had brought one of a large number of locusts which had been found in foreign

hay at Ongar. There was some apprehension in that district as to whether there was any possibility of a locust plague arising there next year. He did not suppose, however, that the locust was likely to breed and thrive in a climate like ours. He had suggested to Mr. Mugleston, farmer, of East Hanningfield, who was in possession of a number of locusts, that he should send them to Mr. Cole—not with a view of having the Secretary eaten up by these voracious insects next season [laughter]—but in order that all that was possible might be found out about them.

Mr. E. A. Fitch thought that there need be no apprehension of a locust plague in Essex. The specimen produced was a mature locust, and, remembering an "exhibit" (in the medical sense) of dried edible locusts at the Entomological Society some years ago, in which he and Mr. Cole participated, he rather thought the Secretary would eat the locusts, instead of the locusts eating the Secretary [laughter].

Professor Meldola said it was encouraging to know that the locust was not likely to become an additional cause of agricultural depression.

[These specimens of locusts are referred to in a note in the present number, see p. 196.]

Rev. W. Linton Wilson exhibited specimens of the "cherry-gall" of the oak, *Dryophanta scutellaris*, from Epping Forest.

Mr. J. T. Cunningham, M.A., of the Marine Biological Laboratory, Plymouth, and Lecturer on Fisheries and Oyster Culture to the Essex County Council, then delivered a very able and interesting discourse on the transformations of marine animals. The lecture was illustrated by many beautiful and original slides, shown by the oxy-hydrogen lantern. Mr. Cunningham first dealt with the transformations of Jelly-fishes, and the phenomena called "Alternation of Generations," or Metagenesis. He then treated of the main facts in the development of the Echinodermata—Starfishes, Sea-Urchins, and Feather-Stars (Crinodea). The transformations among the Crustacea were next described, the Zoea stages, and the remarkable "retrograde development" of the "Barnacles" and "Acorn-Shells" (Cirripedia) as studied by Darwin.

The lecturer then dealt with the transformations among fishes, showing the remarkable differences in the development of the various species of flat fish, and followed with a lucid explanation of the theory of evolution among fishes, and the causes of their hereditary modification. He also alluded to the great problem of modern biology raised by the German *savant* Weismann, who holds that there is no transmission of acquired characters. The lecturer thought that the facts of metamorphosis and recapitulation could not be explained logically on this assumption. He said: We could not at present form any conception of the manner in which changes produced in the body by the conditions of life could affect the properties of the germ cells in such a way as to reproduce those changes in the offspring. For instance, the asymmetry of the eyes in the flat fish might be caused in individuals by the strains and pressures due to the new horizontal position of the fish on the sea-bottom; but we cannot understand how the asymmetry so produced could become hereditary, how the change in the structure of the head could have any effect on the eggs and sperms. On the other hand, on the hypothesis that all hereditary changes have originated in the germ-cells, there is no reason why the older history of the race should be recapitulated in the development of the individual. On this hypothesis, the egg of the flat fish ought to

develop into a flat fish at once and directly, not into an upright symmetrical fish which afterwards changes into a flat fish. On the supposition that in some way or other the history of the individual does affect the germ-cells in such a way that they must repeat that history in the next generation, the facts of recapitulation and metamorphosis are intelligible. On the more strictly logical hypothesis that the hereditary properties of the germ-cells are entirely independent of the fate of the soma, we can make adaptation intelligible, but not the recapitulation of previous adaptations. Mr. Cunningham said that thus we had a logical hypothesis which could not explain the facts, and, on the other hand, an explanation of the facts which could not be deduced from any conceivable hypothesis.

Prof. Meldola, in proposing a vote of thanks to Mr. Cunningham, said that the lecture to which they had just listened was, in his opinion, a most admirable illustration of scientific method, beginning as it did with the detailed and accurate record of observation, and leading up by wider and wider generalisations till they had been finally brought face to face with some of the fundamental problems of modern biology. One great feature which had struck him in listening to the lecturer's remarks was that they were being addressed by an observer of nature at first hand; not a mere compiler from books. There was, unfortunately, much book-learning being distributed as real knowledge at the present time. With reference to the lecture itself, Prof. Meldola regretted that the lateness of the hour precluded adequate discussion of some of the very interesting and important points raised, especially towards the conclusion, when Mr. Cunningham had referred to the fundamental question of the inheritance of "acquired characters." He was glad to think that he (Prof. Meldola) had been the means of first bringing prominently under the notice of English naturalists the work of the eminent German biologist who had been a strong champion of the view that such characters were not transmitted—he referred to Prof. August Weismann, of Freiburg, whose latest utterances were embodied in a work recently published under the title of "The Germ-Plasm." Prof. Meldola thought that some of the difficulties raised by Mr. Cunningham—not against evolution as a principle, for the lecturer had unhesitatingly declared himself to be an evolutionist—but against the special Darwinian form of the theory, were more apparent than real. He thought, for instance, that the young flat fish had to pass through the ancestral phase of having eyes on each side of the head, because, at that early stage of life it was a distinct advantage for the young to lead the life of an ordinary fish, so as to become dispersed over a wide area as soon as possible after leaving the egg. For this purpose ordinary habits, entailing bilateral symmetry in the arrangement of the eyes, would be advantageous, and would therefore be retained by natural selection as an extension of an embryonic phase. When the adult settled down to a more sedentary life on the sea bottom, the present arrangement of the two eyes on the same side of the head would be more advantageous than the older arrangement. He did not feel called upon to make a confession of faith with respect to a theory which was still on its trial, and of which the confirmation or refutation was confessedly a problem surrounded by enormous practical difficulties. Prof. Meldola stated in conclusion that, as far as his own opinions went, he was inclined to take an opposite view to that held by their able lecturer, and to consider that the balance of evidence was turning in favour of Weismann's doctrine that "acquired," as distinguished from congenital, characters were *not* transmitted from parent to offspring.

Some discussion ensued, and remarks upon points in the lecture were made by Prof. Boulger. Mr. Cunningham also replied, and a cordial vote of thanks was accorded to him for his lecture.

Some microscopical preparations were exhibited by Mr. Houston and others, and Mr. Webb showed specimens and the original drawings by Mr. W. J. Webb, of *Testacella scutulium* used in illustrating the remarks on this species in the last number of THE ESSEX NATURALIST, (*ante*, p. 121).

During the afternoon a Council Meeting was held in the Museum in Duke Street, for the purpose of inspecting the Museum in the state in which it came into the charge of the Director, and to settle plans for its reorganisation and the cleaning and decoration of the rooms.

THE 143RD ORDINARY MEETING.

Saturday, December 16th, 1893.

THE 143rd Ordinary Meeting of the Club was held in the Public Hall, Loughton, at 6.30 p.m., Mr. T. V. Holmes, F.G.S., *Vice-President*, in the chair.

Messrs. G. A. Barraclough and James Forfar Dott were elected members of the Club.

The Librarian read a long list of donations to the Library, and thanks were passed to the donors.

The Hon. Secretary said that Mr. Batters, an acknowledged authority on the Algae, and who was preparing a list of the Marine Algae of Britain for the Trustees of the British Museum, had kindly offered to examine and catalogue the Hope Collection of Marine Algae from Harwich, the presentation of which was announced at the Fungus Meeting on November 4th. The herbarium was then in Mr. Batters' hands for that purpose.

The Secretary also announced that Mr. Holmes had prepared a report, as Delegate of the Club, of the proceedings at the Conference of Delegates of Corresponding Societies of the British Association at Nottingham. This report would be printed in full in THE ESSEX NATURALIST (see pp. 164-170).

Mr. I. Chalkley Gould said that he had the pleasure of exhibiting a number of specimens of Woods grown in the Forest district. Mr. Gould continued: "I need say little about them, as they speak for themselves, but I may mention that they were collected for me many years since by the late Mr. Thomas Forster (a builder in Loughton) and his son, Mr. George Forster. Most of them were obtained from the woods and plantations around Copt Hall. The specimens are not labelled scientifically, simply the common appellation being given, but proper botanical description can easily be added. The blocks are not cut to uniform size, but they are approximate enough to compare the weight of the specimens in each series. The laburnum is the heaviest wood shown. The oak, ash, and beech are of nearly uniform weight; the Spanish chestnut is somewhat lighter. The specimen of box wood is a small block, or it would rank high in weight.

"The grain and general appearance of the oak and Spanish chestnut being so similar, it is not surprising that architects differ as to whether the trunks of trees forming the walls of the nave of Greensted Church are of one or of the other wood. The same question has arisen as to the material of some of the grand fifteenth century roof-timbers of various churches of our county.

"I may take this opportunity to suggest that when our Local Natural History Museum is formed it would be well to devote some space in wall cases or cabinet

drawers to each of the principal timber trees. The compartment for *each* tree might be about a foot square, and should contain specimens of :

" *The heart-wood*, such as these blocks, or, better still, a proper transverse and vertical section.

" *The trunk bark*, showing its typical form.

" *The branch wood*, showing the bark in its youthful appearance.

" *The twigs*, showing the bud forms.

" *The leaf*, of course.

" *The fruit*, or seed vessels.

" In the case of some trees other points should be shown, such as the beautiful inflorescence of the elm, the flexible inner bark of the lime, known to commerce as "bass," and so on.

" I felt much hesitation in bringing such an unscientific collection before the Club, but I was re-assured by Mr. Cole ; and if your Hon. Sec. and Council think the blocks exhibited will be of use, till better sections can be procured, I shall be happy to present them to the Essex Field Club Museum."

The Chairman said that they were much obliged to Mr. Gould for bringing his interesting exhibit, and he was sure that the Council and Curator would receive his donation with pleasure.

Mr. Elliott exhibited some spikes of maize which had ripened that season in his garden at Woodford. It was but seldom that maize could be successfully grown in average seasons, but the prolonged hot weather of last summer had been very suitable for the plant.

Mr. Cole said that maize was grown in some quantity at West Mersea, and in some seasons the yield was good.

Mr. Oldham exhibited some specimens of Lepidoptera from the Epping Forest district, including *Corycia tenerata*, *Platypteryx lacertula* and other species.

Mr. Cole exhibited, on behalf of our member, Mr. Wm. White, Curator of the Ruskin Museum, Sheffield, two splendidly illustrated botanical works, viz., William Curtis's "Flora Londinensis : or, Plates and Descriptions of such Plants as grow wild in the Environs of London," etc. London ; folio ; 1777 ; and Moore's Nature-printed "Ferns of Great Britain and Ireland," Folio ; London, 1857.

These books had been sent by Mr. White for exhibition at the Fungus Meeting, but unfortunately they had not arrived in time.

Mr. Crouch brought up a portrait of the late Mr. H. W. King, *Hon. Sec.* to the Essex Archeological Society, whose recent death they all deplored, and made a few remarks on the life work of his old friend (see notice on p. 195).

Mr. Walter Crouch read extracts from his paper "Astronomy in Wanstead : A Chapter of its past History" (printed in the present number, see pp. 151-163).

The Rev. W. C. Howell made some remarks on subjects suggested by Mr. Crouch's paper, and exhibited an interesting old telescope of Gregorian construction in his possession, made by James Short, who was commissioned by Bradley to make a telescope. It is $12\frac{1}{2}$ inches long. The principal mirror is 2 inches in diameter, and the second one, $\frac{3}{4}$ inch diameter. The name of the maker "James Short" is engraved at the eye end of the tube, together with the formula " $\frac{1}{10\frac{1}{2}}-7$," referring to the focal length, etc., of the mirrors. The eye-piece is Huygenian. The mirrors still retain their exquisite polish, and the definition of the telescope is sharp, and Mr. Howell has recently tried it on Venus and the moon. It is

mounted on a single leg, with vertical and horizontal movements. The maker, James Short, was born in 1710, and originally educated for the Church. He attracted the attention of Maclaurin, who permitted him, about 1732, to make use of his rooms in College Buildings for experiments in the construction of telescopes. In Short's first telescopes the specula were of glass as suggested by Gregory, but he afterwards used metallic specula only, and succeeded in giving them true parabolic and elliptic figures. All Short's telescopes were of the Gregorian form. He died in London in 1768. Short had solved the problem of giving to metallic surfaces a perfect parabolic figure; but so jealous was he of his secret that he caused all his tools to be burnt before his death.¹

Mr. Howell spoke of the invention of the achromatic combination, generally attributed to Dollond, but which he believed was really devised by Chester Hall, an Essex man.

He also mentioned that Bradley was closely connected with Gloucestershire, his own native place, having been born at Sherbourne, at school at Northleach, and buried at Chalford, in the wide parish of Minchinhampton, celebrated in the following doggerel lines:

"Beggary Bisley, strutting Stroud,
Mincinghampton and Painswick proud."

In reply, Mr. Crouch mentioned that he also had an old Gregorian of similar construction, but larger, which had been in his family for over 150 years. The definition is sharp and perfect, the metal mirrors still retaining their original high polish. The instrument is mounted with horizontal rotary, and vertical movement on a tripod brass stand, the length of the tubes being over 22 inches. The small speculum measures $\frac{7}{8}$ inch in diameter, and the large 3 inches, with a perforation of $\frac{3}{4}$ inch. He remarked that it was a well-established fact that the invention of the achromatic lens was made by Chester Moor Hall, of New House, Sutton, Essex, in 1733, who had several telescopes made, but never published his discovery. In 1757 John Dollond, F.R.S., arrived, quite independently, at the same discovery for the correction of chromatic aberration, and put it to a practical use, secured by patent. In a subsequent trial, "Dollond *v.* Champness," for infringement of this patent, Mr. Hall appears to have been quite indifferent, and took no part in the action; but on certain evidence given the priority of invention was acknowledged, and accorded to him by the judge, Lord Mansfield. The earlier eye-piece of Huygens, from its construction, was to a large extent achromatic.

On the motion of the Chairman, a vote of thanks was passed to Mr. Crouch for his paper.

Mr. John Spiller, F.I.C., F.C.S., then delivered a lecture, entitled:

"A FEW FACTS ABOUT COLOUR-BLINDNESS."

[Abstract.]

The structure of the eye, with its sensitive retina and "blind spot," was briefly described; likewise the nature of white light and its resolution by the prism into a band of many coloured rays, known as the solar spectrum. Normal vision enables us accurately to identify the various tints composing this series; but a small proportion of mankind—usually about 4 per cent. in males—is unable to appreciate nice distinctions of colour, or even to see certain well-marked

¹ For the foregoing I am indebted to Miss Clerke's "History of Astronomy"; and to an article by David Gill, our present Astronomer at the Cape of Good Hope.—W. C. H.

rays : so that it is customary to speak of them as being "colour-blind." Typical cases are recorded, as those of Dr. John Dalton, of Manchester, the founder of the atomic theory in chemistry ; Professor William Pole, F.R.S., the eminent engineer, who, as a scientific man, took pains to compare his colour sensations with other persons possessing normal sight, and described his own case in a most instructive paper communicated, April, 1859, to the Royal Society.

The speaker produced his own certificate : "Colour Vision, Normal"—given him after going through the tests applied in the Anthropometric Laboratory, at the recent meeting of the British Association in Nottingham. This, together with the fact that for twenty years he had been engaged in a colour factory without challenge of his capability of matching tints, proved his capacity for undertaking the examination of others, and for many years he had been in the habit of so doing when opportunities were presented. He knew a score or more of well-pronounced cases amongst his male friends, but confessed that hitherto he had failed in finding a single instance of colour blindness in woman, and it was here that he desired the aid of his lady friends to search for this defect amongst their acquaintances. The published statistics proved its rarity—only about four in a thousand—but he would like to hear of a genuine case, and said that no names need be mentioned.

Railway guards, engine drivers, firemen and signalmen were now periodically examined, and no officer in the Royal Navy or Mercantile Marine was appointed or promoted until he had satisfactorily undergone the imposed tests. The nature of these tests was then described :—Holmgren's wool test applied in two ways : First, the patient is requested to *select out*, say, all the greens from a mixed pile of coloured hanks ; then to *match* one or more samples given as patterns. Railway and nautical men were tried with lanterns and shining glasses at various distances. Dr. George Wilson, of Edinburgh, whose treatise on "Colour-Blindness," 1855, first awakened public attention to the necessity for such tests, used a multi-coloured fan or bundle of dyed plumes. Clerk Maxwell's colour top had been used to measure the extent of defects. Dr. Jeaffreson's rotating disc was used to match an indicated sample ; the polariscope and spectroscope were sometimes employed, and other expedients enumerated in the Royal Society's 1892 "Report of the Committee on Colour-Vision." It was not always safe to rely upon a system of *naming* colours, for everybody did not know terra cotta, turquoise, purple, russet, or lavender, nor the best of us where blue ends and violet begins. The lecturer found a pair of silk tassels, one of iron grey and the other bright green, very useful as a preliminary test. Most colour-blind persons hesitated immediately, seeing no difference. The iron grey was sometimes called "crimson," and Professor Pole's experience helped us with an explanation, for he always saw the extreme red, or crimson, band of the solar spectrum as a neutral grey. Dr. J. H. Gladstone had published the fact that he could not distinguish certain shades of blue and green. The speaker knew a person to whom red and black were alike ; another who could not see berries on the holly, or any difference, even, between a grass lawn and gravel path ; a bookbinder, who often had bound in violet to match a series in brown ; an artist, who was obliged to have his paints mixed for him, or take particular notice of the labels on his colour capsules. The late J. R. Herbert, R.A., as well as Mulready, were known to be colour-blind late in life, probably by the lenses or humours of the eye becoming yellow by age, and misleading them on to excessive indulgence in blue. Instances might be multiplied ; but the fact

that concussion of the brain or any violent shock to the nervous system, jaundice, and other maladies, or over-indulgence in tobacco impaired the colour-vision was undisputed, so that both congenital and contracted defects must be inquired into wherever important consequences were involved. Certain drugs, santonine and quinine, temporarily affected the sight, and the lecturer related his experiences after taking a small dose of the first-named to try whether, under its influence, he could see the neutral grey bands of Professor Pole. The results were that all objects appeared green, or suffused with that colour, as though he looked through a pair of green spectacles, but there was no break in the solar spectrum, nor any grey bands. He warned his hearers against repeating the experiment, on account of the extremely depressing action of the drug upon the nervous system. For published details, see Rep. Brit. Assoc., 1889, p. 518, and "Photographic News," Sept. 20, 1889.

As to the possibilities of relief and cure, the lecturer stated that the "tiring" of the eyes for red, by a few minutes' contemplation of a broad surface of scarlet cloth, permitted his colour-blind friends to perceive at once a difference between grey and green. This was to be expected, but the relief was only temporary, and Dr. Edridge Green's trial of red spectacles afforded no permanent relief. The contracted disorder could be dealt with, and disappeared with the removal of the irritant cause, but congenital colour-blindness was, so far as we know at present, quite incurable. In a certain sense we could all be made to realise the disadvantages of colour-blindness, for when objects were illuminated by a salt and spirit flame (Brewster's mono-chromatic lamp) they all appeared in shades of grey, so that paintings appeared like engravings. This was illustrated by a final experiment, throwing the yellow light upon a varied selection of coloured prints, dyed patterns, and highly-coloured objects, and then suddenly illuminating them, for contrast, by the light from a burning magnesium ribbon.

Mr. Spiller was cordially thanked for his interesting lecture and demonstrations, and the meeting resolved itself into the customary *conversazione*, at which tea and coffee were served.

NOTES ON THE SEASONS OF 1893, PRINCIPALLY IN THE NEIGHBOURHOOD OF FELSTEAD.

By J. FRENCH.

THE year 1893 will long be remembered for its remarkable character. In loose parlance it will, perhaps, be called "the summer without a spring": the year in which the spring and autumn partially interchanged, or the "year of perpetual summer." Nature has here performed an experiment which we can hardly hope to have repeated, and any notes of which should therefore be placed upon record.

The long-continued drought and the absence of cloud had peculiar effect upon plants and animals, both directly and indirectly, and although many of the phenomena are to be accounted for, there

are some which will not readily admit of an explanation. An opportunity, too, has been afforded for watching the effect of drought upon springs, and for other observations connected with the underground circulation of water.

The rainy season closed generally throughout Essex in the end of February. At Felstead the last rain fell in the early days of March, and from then till the end of June the rainfall here did not reach two inches. From observations made at Felstead School (kindly supplied by the Rev. E. Gepp), the total for this period was 1.98 inches. This prolonged drought, lasting through the spring, determined in great part the produce of plants for the whole year: for although the autumnal summer did somewhat to redeem the losses where the drought acted adversely, in other cases it merely accentuated the favourable effect of that early spell of dry weather. As a consequence of this we have two separate sets of phenomena, one in which there is a scarcity of produce, and the other in which the produce is much in excess. The like phenomena are observable in birds and insects, but to what extent we have no means of judging. For instance, it was noticed that the cuckoo and nightingale did not stay for their full season, and moreover the cuckoo, during the whole length of its sojourn, could scarcely make a clear note. If shortness of food was the cause, the nightingale most likely participated in the scarcity. In both cases the drought undoubtedly acted adversely.

The contrary seems to be the case with game fowls—partridges, etc. They are described, generally, as being in excess.

Although it is not possible to go much into detail, yet so many observations were noted of the peculiar behaviour of birds that we cannot but think that the effects of the season may have some temporary effect upon their distribution and numbers. We should, perhaps, not be far wrong in attributing their peculiar behaviour in some cases to some misleading phenomena which delayed or provoked the nesting-time. The case of larks may be cited as an instance. Nesting with them came late, probably in consequence of the scarcity of cover, there being but little grass. The larks sang vigorously in the last days of July, which is an exceptional occurrence.

In other cases the scarcity of provision caused by the drought may have acted, as the shifts made for food by birds during early summer attracted much attention. Many species were attracted to garden produce which do not ordinarily trouble the gardener.

With regard to insects, we are only in a position to discuss a very few species, because the habits of so few forms have been studied with sufficient care from year to year to enable us to institute a comparison. Bees stand out as an exception, and the season has left its impress upon that exception. It may be summed up by saying that no "swarming" occurred. The wherefore of this is not known. We can only say that for some reason the queens were not prolific, and as food is known to affect the entire organism of the queen, it is probable that a scarcity of certain food brought about that untoward result. We have here a case in which local extinction might have occurred had it not been for artificial care, and some experienced bee-keepers are even now fearing the results of wintering their stocks, which are known to be weak.

Wasps, on the other hand, multiplied to such an extent as to have been aptly described as a plague. The reason undoubtedly was due to the fair weather in the spring allowing almost every mother-wasp to rear a progeny. These stand on a very different footing to bees, for every mother or queen-wasp is the equivalent, in the spring, of a whole hive or stock of bees, and has to perform in her own person the functions of that entire colony. The mother-wasp may have been more or even less prolific than ordinary, but no observations have, so far as we know, been made.

Hot and prolonged summers are generally looked upon as being the nursing mothers of vast swarms of aphides and other insects of an Egyptian plague character; but it is perhaps worth remarking that nothing much above the normal appears to have been noticed except in the case of wasps, and even they were local.

The extreme dry weather most certainly affected a part of the molluscan fauna in a peculiar manner. In the case of land-shells the period of enforced rest was much prolonged, there being no dews at night. Whether this had a deleterious effect we do not know. Some fresh-water molluscs must have suffered a serious diminution in numbers where the ditches and ponds dried up. I watched with particular care a very small colony of Limneids (*Lymnæa palustris* var. *corvus*), which had during the past few years dwindled down to probably less than a dozen individuals. Three of these, which was all I could find, I carried to deeper water, or otherwise I feel quite sure the colony must have perished. I may mention that I saw one of these in the act of pairing with an individual of the normal type of *L. palustris*. This I think is a

sufficient proof of the paucity of individuals in that colony. I feel also confident in speaking of the effects in a much wider field (say Essex generally) of the drought on the above-named species of *L. palustris*. This mollusc is a lover of very shallow water, and is now getting very restricted and rare in many places. The conditions for keeping areas of bog and marsh in Essex are becoming yearly more difficult. Starting early in March with a limited area of this kind, that area had shrunk materially by the time September was reached, and it is very problematical whether any species that might have inhabited that margin of shrinkage escaped. In ordinary years, or even in moderate droughts, the mud remains moist and protects the organisms, but this resort here failed. A land species in my neighbourhood, *Helix arbustorum*, requires very much the same kind of habitat, and is in a similar condition. Of three small colonies observed, one has totally failed, and a second thought to have failed in consequence of the drought. The other, though small, has resources which were denied to the others, and will probably live on.

We will now turn to plant organisms, or rather to flowering plants in particular, dividing even these for the purposes of our notes into trees and herbs.

In treating of both we may remark that they furnish a kind of index as to the state of the underground circulation of water and to the depth to which the drought extended. Thus, so far as trees go, there is reason to believe that they knew nothing of the lack of water at the roots, and were probably benefited by a dry atmosphere. In some meadows a very curious effect was observable. Where the land was undrained and moist the grass kept green, and contrasted strangely with the drier parts of the meadow. In one meadow at Leighs Priory so much of the grass died as to reveal the contour of some old foundations on which the original Priory was built. This I think proves that all the moisture obtained by grass and the smaller vegetation in general was obtained by an upward circulation of water acting perhaps by capillary attraction. Where there was a possibility of cutting off this upward circulation, as in the case of the buried foundations, the plants died.

The cereal crops in those districts in which the drought was greatest have signally failed. This failure is not so well understood in the case of wheat, as it is proverbial that dry weather suits that crop, and moreover it is known that wheat strikes some of its roots

beyond the reach of any drought. It may, however, be safely implied that the lateral roots require a certain amount of moisture during the growth of the plant.

We have mentioned that trees did not appear to suffer. In very many cases there was a decided benefit in that an enormous crop of fruit was realized. Apple-trees were very prolific—a tree at Pleshey yielded 36 bushels.

Wild fruit was also exceedingly plentiful, among which acorns were conspicuous. In all these cases of excessive yield there was some probable forecasting at the time of bloom.

Oaks and elms adorned the landscape in the spring in a manner that will not be soon forgotten. The elms so far departed from the normal as to become conspicuous at a distance. These trees, however, or at any rate *Ulmus campestris*, never ripen their fruit in England. In the uncertainty of our seasons it is interesting to inquire to what element of constancy we are indebted for the successful ripening of the other fruits to which we have called attention. The cause must lie with the atmosphere in the first event, that is, during the blooming time, for the soil then had not been appreciably affected. The visits of insects to the flowers I do not think can be taken into account, because in most years they find opportunity to pay those visits. The extreme and continued dryness of the atmosphere is, however, with us a unique phenomenon. There were no dews to spoil the pollen and no moisture to creep into the delicate mechanism of the flower so as to form a nidus on which small frosts could act. This was probably helpful in the early stage, but it is to the genial influence of the sun that we must attribute the growth of the fruit. It seems to be indeed probable that the sun's heat penetrated sufficiently deep to stimulate the roots. Certain it is that the amount of sunshine received by the trees was far above the average. Some abnormal cases quoted in newspapers of very large apples and pears and tubers (potatoes) can hardly be accounted for except by the supposition of increased bottom heat—in the case of the potatoes in particular.

We pass now to notice the weeds. These did poorly throughout the summer, and it was not until September that the seeds germinated, and the great army came on. They appeared, however, too late in many cases to ripen their seeds. We are generally more concerned with the local origin of the various species of weeds than with the causes which help local extinction, but it is worth noting

that two or three droughts spread over consecutive summers might completely extinguish certain forms.

The absence of spring characters in 1893 was greatly due to the lack of weeds. There were but few buttercups and scarcely any daisies to enrich the brownish green tint that prevailed in the meadows. The weeds, in fact, were relegated to more congenial times. This brings us to notice more particularly how much is involved in that word "relegated." The most casual observer would have noticed in the September month a number of species that had struggled into bloom about four months after date, and he would probably have noticed that some were blooming for the second time. This means that the roots of many plants had been subjected to a great strain, and if that strain had been much intensified only the hardier ones would have survived; or, to express its equivalent in other terms, it might be said that the tendency of the season was to convert biennials into annuals, and all plants into perennials.

Meteorologists, I believe, know of no reason why the next summer should not imitate its predecessor; and, indeed, why anti-cyclonal conditions should not prevail for several successive summers. If such were to be the case, we should have a lesson taught to us on the flexibility of organisms. It would then become evident to all that a change of conditions involved changes of habits of plants, to say nothing else. It is these abnormal seasons that to the careful observer are the best exponents of the doctrine of specific change. In fact, one has only to take a standpoint sufficiently high, and to convert years into centuries or ages, to see that all specific and generic changes are the prototypes of protoplasmic change; and when we can forecast the rest or direction of the one, we shall be in a position to say something of the other. These great problems are controlled or affected by the passing seasons that slip by without our notice, and die and seldom give a sign.

The summer, not generally being a season of great rainfall with us, it might be surmised that the springs would not be affected much above the ordinary, and where the water-bearing stratum was of sufficient depth there appears to have been but little scarcity. The rains of summer, however, in an ordinary course keep the surface moist and the air heavily-laden with aqueous vapour—witness the dews of spring and autumn. This quantity of moisture was almost wholly abstracted this summer, and so the ground at and near the

surface became much drier and hotter than usual. On very fleet springs this had a decided effect. In my own neighbourhood (Felstead) our springs circulate at a depth of about twenty to forty feet, and as the quantity of water in the river, which might be described as wholly derived from the springs, remained constant (with one exception, to be presently noticed), we could not observe that the springs were affected. The time of greatest scarcity of river water is usually October and November, but this year no scarcity has been noticed. We therefore conclude that the present supply is due to rains preceding the drought, that is, not later than February, and we also infer that the summer rains do not materially affect these deeply-seated springs.

The one exception to the normal flow of the river was due to the hot days of August. I am indebted to the miller at Felstead for the following observation : Immediately upon the advent of those few hot days there was a marked diminution in the river supply, the "head" being exhausted in about three-quarters of its ordinary time ; but on the arrival of cooler weather the full supply again returned, and this without any rain having fallen, so far as is known, within the area of drainage. This phenomenon could only have been due to the excessive evaporation caused by the sun. It is certainly very unusual to have the opportunity afforded in Essex of getting a direct measure of the influence of the sun's rays in causing evaporation. It may be here obtained to a near approximation, because the daily quantity of water passing the mill is well known, and a loss of a quarter of that quantity represents the total loss on the whole surface of the stream up to its source. This bearing but a very small proportion to the drainage area, it becomes apparent that the force of the sun's rays in causing evaporation must be very great indeed ; and it moreover shows that the quantity of water discharged by the leaves of plants must be considerable in volume. This great volume of water (escaping as vapour) and the flow of the river throughout the summer is the measure of the demand, less a small portion of the rainfall, which has been made upon the spring since last February. We are not concerned to go further into the subject here ; we have only noted the good opportunity afforded by the season to deal with some approximation with that subject.

It remains to consider whether any permanent effects may result from this extraordinary summer.

Our experience of the past leads us to suppose that there will be

no probability of a repetition, and as repetition is a condition of permanent effect the question is easily answered. A few points, however, may be noted for subsequent observation. These are chiefly connected with deciduous trees. The great strain put upon fruit-bearing trees affected them, as we have seen, abnormally, but whether beneficially or otherwise it is hard to say. The fall of the leaf was retarded till the middle of November in many cases, and this looks as though the growth of the root had proceeded in proportion to the demands made upon it. The observations of next year, however, in that as in many cases affecting agricultural crops, will be the best exponent of the effects of the summer's drought of 1893.



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[Essex Arch. Soc.]

THE LATE HENRY WILLIAM KING, OF LEIGH.

IT is with sorrow we have to record the death of the above gentleman, which occurred on the 15th November last, in his 78th year. Although not a member of the Essex Field Club, he was in sympathy with our work and aims and was so well known to many of our members, that a brief notice of him can scarcely be considered as out of place.

He was one of the founders of the Essex Archaeological Society in 1852, and was secretary for the Mediæval period from that time till 1866, when he was elected hon. secretary and editor, a position he most ably and faithfully filled to his life's end.

He was descended from a good Essex family; was possessed of untiring industry, patience, and accuracy, and became a most competent and learned archæologist and herald, especially devoted to Roman and Mediæval antiquities.

The wanton destruction of sepulchral monuments which took place in the earlier years of Church restoration, at Leigh and other places in Essex, raised his indignation; and in consequence he determined to visit and describe all the churches in the county. After over forty years' work, the results are embodied in five folio volumes of MS., with all the armorial bearings coloured, and this work, with an illustrated copy of Morant's Essex, containing many hundreds of his pen and ink drawings, and extra prints, are, with other valuable MS. collections, bequeathed by him to the Essex Archæological Society. To the "Transactions" of this Society he contributed nearly fifty papers, besides plates and etchings.

For several years he was hon. secretary to the Antiquarian Etching Club, which existed from 1849 to 1853, and for this work alone he etched thirty-nine copper plates. He was also a constant contributor of etchings to Mr. Roach-Smith's "Collectanea Antiqua." He wrote numerous articles for "The East Anglian," and other magazines and newspapers. He was also well-known as a staunch churchman, a lecturer on Ecclesiastical Art and Antiquities; and was a fair Welsh scholar, and an enthusiastic admirer of the wild romantic scenery of Wales.

For forty years he occupied a position in the Bank of England, retiring in 1877, when he returned to Leigh.

His wife, who was the daughter of Mr. Jonathan Wood, of Hadleigh Castle, to whom he had been married for forty-seven years, died in 1884, and was buried in the "God's acre" of Hadleigh church. The great interest they ever took in this Early Norman church is evidenced by several beautiful stained glass windows, which were placed therein in memory of Mrs. King's parents, herself, and the wife of her eldest son. Here also the remains of Mr. King were laid to rest on the 20th of November last.

WALTER CROUCH.

"LOCUSTS IN ESSEX."

A NEWSPAPER scare has recently been in circulation consequent upon the discovery of considerable numbers of dead locusts in some foreign hay imported into the Ongar and other districts in Essex, and the subject was deemed of sufficient importance to justify a question by Major Rasch in Parliament. Mr. Thompson, Editor of the "Essex County Chronicle," brought the matter forward at a meeting of the Essex Field Club on November 25th (p. 181), and subsequently I received a letter, accompanied with specimens, from Mr. R. H. Muglestone, of "Little Clayden's Farm," East Hanningfield. There was some doubt as to the country from which the hay was exported; it was at first stated to come from Russia, but, subsequently, Mr. Herbert Gladstone mentioned in Parliament that the Agricultural Department had received no information of the "importation of locusts in Russian hay, and inquiry had led the President of the Board of Trade to think that the paragraphs which had recently appeared in the newspapers were based on the fact that Argentina hay frequently contained a large number of dead locusts."

I submitted specimens, kindly sent to me by Mr. Muglestone, to Mr. W.

F. Kirby, of the Entomological Department, British Museum, and he is of opinion that they agree with *Cyrtacanthus americana* (Drury, illustrations 1, t. 46, f. 2), a Southern States of America species, which determination coincides with Mr. H. Gladstone's statement as to the source of the hay. It is extremely unlikely that any such insect would effect a permanent lodgment in this country, even supposing the specimens contained eggs, and that these eggs would hatch unless naturally laid in crevices in the soil by the female locusts—a most gratuitous supposition. Miss E. A. Ormerod in the following extract from her article upon "Insect Attacks in 1893," speaks of *living* insects, but I have not heard of any being found in the hay sold in Essex.

"The imported locust appearances, so far as specimens have reached me alive, would be of no importance, as these proved to be of a South European species, which is not gregarious, and in its own country, though of large size, is known to do no appreciable damage. From the climatic requirements of locusts, and also from recorded experience, there does not appear to be any reason to fear even a possibility of locusts effecting a settlement in this country, but in case of their being introduced dead in very large numbers in fodder, to a greater amount than those from Buenos Ayres, of which specimens were sent me early in February, it would probably be desirable to consider what the effect of the hard, long, spiny shanks of the leaping legs might be on cattle. At present the largest estimate of amount I have received is one locust to each pound of lucerne hay examined, which would equal 2,240 locusts to the ton of fodder, and in another case not less than 200 locusts in one truss of hay. This amount is probably harmless, but in great quantities (although animals will consume locusts in the live state greedily) their presence might cause bad effect in the case of long feeding on much infested fodder."

It is well known that besides the Great Green Grasshopper (*Locusta viridissima*), often mistaken for a foreign locust by newspaper writers, two species of true migratory locusts have been occasionally noticed in Essex—viz., *Pachytylus migratorius* and *P. cinerascens*—but these are far too rare to do any damage to agricultural crops, and are probably only sporadic immigrants. The species under consideration (*Cyrtacanthus americana*) is not known as being specially destructive; if the exportation of hay to England should spread to North America, far more risk of danger would arise from the possible importation of the terribly destructive "Rocky Mountain Locust" (*Caloptenus spretus*), but whether this would ever breed in our country, even if introduced in a living state, is an exceedingly doubtful point.

WILLIAM COLE.

NOTES—ORIGINAL AND SELECTED.

Otters in Essex.—In continuation of the records of the capture of these interesting animals, we may note the following:—

Southminster. "A fine male otter was killed on Sunday morning, October 29th, at the Hurdles, on North Wick Farm, through which an irregular brook or watercourse, varying from twenty to thirty feet in width, passes. Thomas Wright, a young labourer, of Asheldham, was 'eeling,' and, catching sight of the creature sitting on the bank, he pursued it and struck it on the back with his eel spear, the blow breaking the animal's vertebræ. It was 3 ft. 11 in. long, and weighed 22½ lbs. Mr. Alderton, taxidermist, of North Street, has it in hand for preservation for Mr. W. A. Hurrell. The old men of the district cannot remember an otter having been seen in the Dengie Hundred before. It is

assumed that it must have travelled overland to the spot where it was found—probably from the Blackwater beyond Maldon.”—“Essex Weekly News,” Nov. 3rd, 1893.

Earls Colne. “On Friday afternoon, December 22nd, a female otter, weighing 9 lbs., was caught in the river Colne, near the station, by Mr. J. Clark’s dog.”—“Essex County Standard,” Dec. 23rd, 1893.

In a paper in the current number of the “Zoologist” (vol. xviii. [3rd ser.], pp. 1-10), by Mr. J. E. Harting, many facts are given, tending to confirm the opinion long held by good observers, that otters are really the friends of the angler, and should be preserved rather than exterminated. For instance, Mr. F. H. Salvin, of Guildford, maintains that otters “kill those fish which destroy spawn and young fry, and their presence really indicates an increase of the best fish, such as trout, grayling, and salmon.” Mr. S. J. Hurley, of Killaloe, writes: “Many people are hard on the otter on account of its fish-killing propensities; but, from long experience, I maintain that they do comparatively little harm in a mighty river like the Shannon. During the last twenty-five years I have heard of only one instance of a spring or summer salmon having been killed by otters—I admit that they will sometimes kill a spawned salmon or well-mended kelt in winter or spring; but what of that? I have many times seen my otters fish in parts of the river that were full of salmon and trout, and yet they would be satisfied with an eel.” Mr. Harting sums up the matter in the opening paragraph of his paper: “Few animals are more maligned than the otter, or more misunderstood. The majority of people know little or nothing of its habits from personal observation, and are under the impression that, as it is a great destroyer of fish, its presence in a trout stream or salmon river is on no account to be tolerated. But ‘live and let live,’ is a very wholesome motto, and we shall always maintain that, so long as the fishery laws of this country are respected, and illegal netting is prevented, there will be always enough fish in our rivers for anglers and otters too.”

Falconidæ in Essex.—The newspapers of November 17th reported that: “Considerable excitement has been caused at Harold Wood by the reported appearance of a very large eagle on the banks of the Ingrebourne stream. Several local sportsmen have endeavoured to secure the bird.” If this was really an eagle, it was probably a White-tailed Eagle, which has often occurred in Essex, although usually on or near the coast. On December 8th, the “Essex Weekly News” recorded, under the heading, “Peregrine Falcon,” that, “a few days ago a very fine species of falcon was found floating in the Crouch. The bird, a hen, measured 17 inches in length, and had been shot just above the leg—doubtless by some sportsman who was unconscious of his success. The bird is now being set up for preservation.”

We cannot hear that either of the above birds was seen by any competent ornithologist.

Aberrations of the Common Sparrow at Dagenham.—“A white sparrow had been noticed in the district, and at about the same time a black one was seen. Mr. Bowman shot the white one, and added to his collection of stuffed birds; last Thursday he brought down the black one also.”—“Essex Times,” Dec. 16th, 1893.

Feeding the Birds.—During the late inclement weather we have derived much amusement by adopting (in addition to our usual devices for bird-feeding)

the plan advocated in the following note in "Peter Lombard's" admirable columns in "The Church Times." The writer says: "I have found that a coconut sawn in half and hung in a tree is an unfailing source of amusement to the various 'tits' in hard weather. I always hang one in a tree just outside my nursery window, and thus provide pleasure both inside and outside the house. Last winter, I think, altogether we put out three coconuts, which were cleaned out as if they had been scraped with a knife. We used to have a constant succession of tits, ox-eyes, tom tits, blue-tits, coletits, and when the weather was very hard we had long tail-tits, and a pretty little grey bird with a black head, which I suppose was a stone-chat [probably the marsh-tit]. The robins were not above having a taste when the supply of bread, bacon, and porridge, which I used to put out, was finished. I found thrushes and blackbirds used to eat the porridge while it was warm, but very soon it used to get frozen quite hard. Bones hung up in a tree are very attractive to tits, but I think they preferred the coconut. I saw one end off, make a hole with a hot wire, and thread a piece of string through the hole and fasten it to the top of a thorn tree. I have already put one out, and it was visited yesterday by a blue-tit. They take a day or two to gain courage to settle on it, but when once they get used to it it is rarely without an occupant."

A "Hedge Priest" writes to a subsequent issue: "What would your correspondent about the tits think of a coconut in constant occupation, and lasting no longer than a week? I always have one suspended by a string from a yew tree just outside my dining-room window, and in hard weather not only is it incessantly tenanted, but sometimes three or four other tits are hanging on the string waiting their turn, and though the coconut spins round at a rapid pace, it does not seem in the least to diminish their appetite for breakfast. One little rascal turns another out in rapid succession, only to be chucked out by another whose impatience gets the mastery over his manners. Close by the yew tree a couple of large stakes are driven into the lawn, upon each of which is suspended a common soap-box containing a handful of maize, and the bustle and scurry can only be likened to a railway station on a Bank Holiday, as tits of all kinds come and go in their eagerness to carry off the largest grains, while humble sparrows, quite depressed in spirits as they watch the fuss, hop about on the grass waiting for bits to be dropped.

"My most frequent visitants are the ox-eye (called by my little girl 'Mr. Gladstone,' on account of his big white collar), the blue-tit, the marsh-tit, and the coletit, and very occasionally a rarer kind comes also. I had a third soap-box, which gives great

amusement, filled with Barcelona nuts for the nut-hatches, which they split with one dab of their bill in the most ingenious manner. I put a Brazil nut in amongst the small ones the other day, but they would have nothing



A CHRISTMAS PARTY

to say to it; it was, I suppose, veritably a too hard nut to crack. I ought to say that the coconut and the boxes are only about four paces from the window, which is constantly occupied by children, both of a younger and older growth, but none of the birds mind breakfasting in public. As my garden runs alongside a park, perhaps I may have a greater number of 'feathered friends' than most people."

My brother has handed me a rapid sketch of one of our happy "assemblies" in the garden rose-bush, as watched from his study window, and I can heartily recommend members of the Club to follow our example, and to secure the pleasure of a constant succession of Christmas parties, far merrier and less costly than the usual run of such entertainments.—WILLIAM COLE, Buckhurst Hill.

Birdcatchers.—A hint from Russia appears in a late number of the "Athenæum":—"The police of Kiew found some birdcatchers, who were on their way to Moscow with six hundred nightingales in cages. The birdcatchers were captured and fined, and their little victims were taken to the Botanic Gardens and released. It is said they rose in the air in song, which was responded to by the other birds around." It would be well if the bird-catching propensities of the Whitechapel visitors to the Epping Forest district could be checked in the same manner.—I. C. GOULD, Loughton.

Dannetts Hill (See ESSEX NATURALIST, *supra*, p. 86).—This name, under a slightly different form, occurs in a document of 1617 (Excheq. B. and A.; Jac. I., Essex, No. 252). The king at the time was setting up a "fishing" claim to various estates within the Forest, and, among them, to those of Thomas Botheby and Robert Lee [Leigh], claiming to be owners in Chingford. Many place-names are given, including "Dannyor Hill *alias* Chingford Common *alias* Chingford Waste"; and "Chingford Halke *alias* Chingford Common or Waste." Elsewhere, under date Feb. 13, 1620-1, we learn that three acres on Dannetts Hill had recently been enclosed (Lett. Pat., 18 Jac. I.) Half a century later, Lady Elizabeth Botheby, widow, of Friday Hill, claimed to appoint a sworn woodward of all her woods called Larks and Danhurst Hill, within the manor and Forest, and thereof showed a charter; she also claimed assize of bread and beer and free-warren at Danhurst Hill and Dovehouse field—a somewhat curious limitation of her right, and one possibly due to careless drafting (Excheq. Plac. Forestae, Tr. Rec., No. 6—Regard Roll).—W. C. WALLER, Loughton.

Stulpway.—The question was raised by Mr. W. C. Waller, in ESSEX NATURALIST, vol. vi., p. 207, what was a "stulpway"? In Harrod's "Report on the Records of the Borough of Colchester" (1865) I find:

"In the 3rd and 4th year of Richard II. a sufficient piece of land is granted to place three stulps, which are Anglicised "spores," for "spars" or "posts," to support a certain vine . . ."

The same word appears in 4th and 5th of Edward II.:

"Hugh de Stowe raised two stulps under his vine."

Taking "stulp" as equivalent to post, it is an open question whether "stulpway" refers to a road made corduroy fashion, that is, with trunks laid across the track, or to a road marked out by posts, or possibly raised above the surrounding soil, and supported by trunks of trees at the sides.

Compare "stump-road," such as that ancient way from Coopersale to Thornwood Gate, which was part of the old road to Newmarket in pre-coach days.—I. C. GOULD, Traps Hill, Loughton.

"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
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Nature, January 21st. 1886.

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A work on "The Mammals, Reptiles, and Fishes of Essex" by HENRY LAVER, M.R.C.S., F.L.S., &c., *Vice-President* E.F.C., will form Vol. III. of the "Special Memoir" series.

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