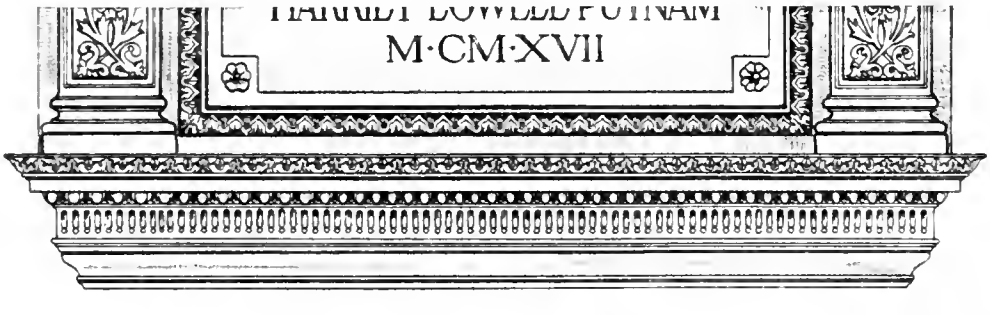

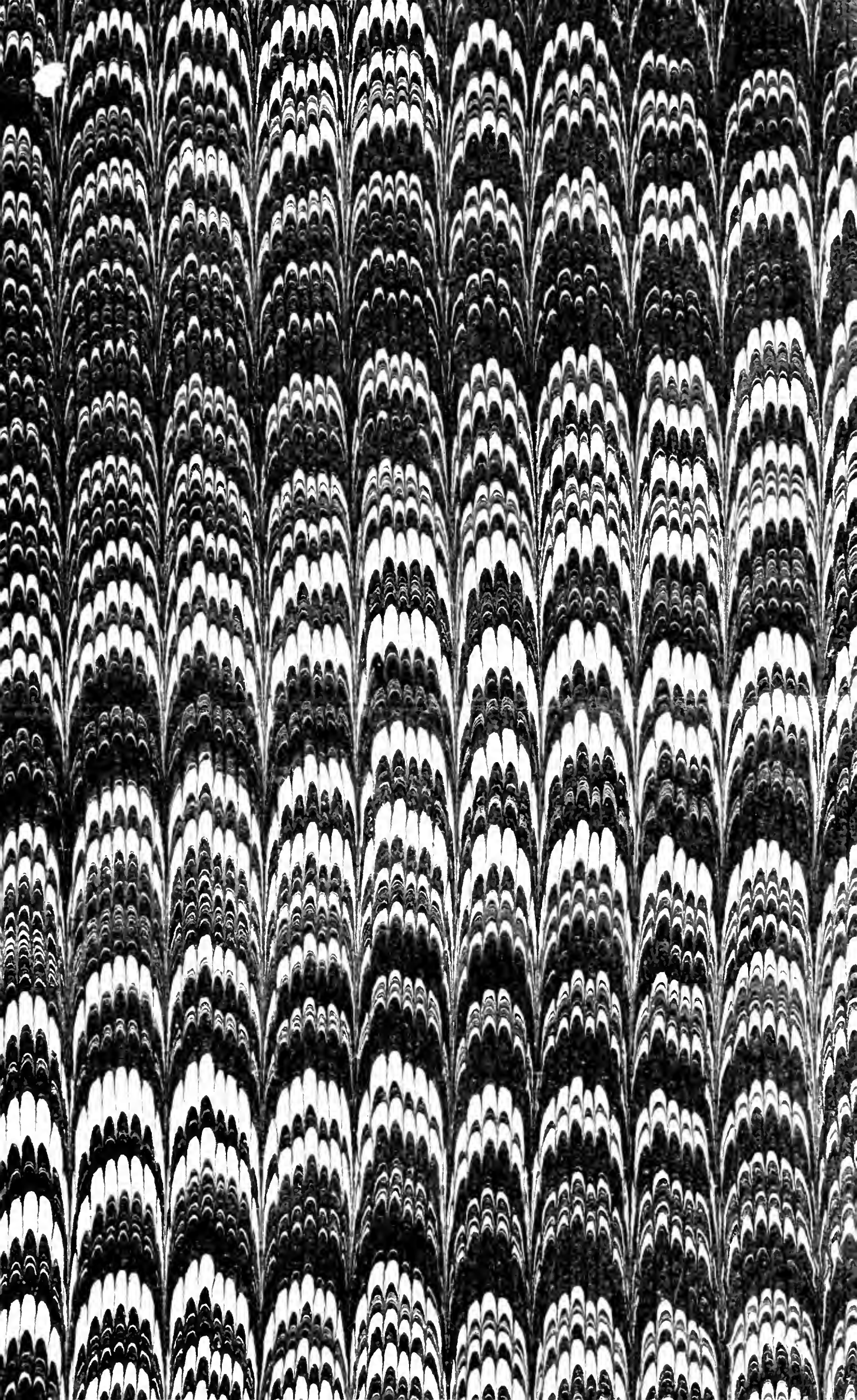

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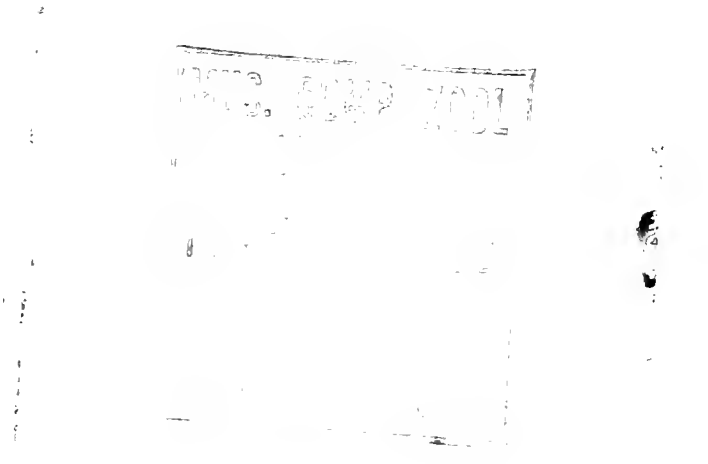

TRANSACTIONS

OF THE

Epping Forest and County of Essex

NATURALISTS' FIELD CLUB.

VOLUME I.

(January 10th, 1880, to January 22nd, 1881.)

(The Authors only are responsible for the statements and opinions contained in their respective papers.)

PUBLISHED BY THE CLUB.

BUCKHURST HILL, ESSEX.

1881.

PRINTED BY
James Jones, "Woodford Times" Office.

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THE EPPING FOREST AND COUNTY OF ESSEX

NATURALISTS' FIELD CLUB.

RULES.

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Objects.

I.—The Society shall be called "THE EPPING FOREST AND COUNTY OF ESSEX NATURALISTS' FIELD CLUB;" its Head-quarters shall be at Buckhurst Hill, in the County of Essex; and its objects shall be the study and investigation of the Natural History, Geology, and Archæology of the COUNTY OF ESSEX (special attention being given to the Fauna, Flora, Geology, and Antiquities of EPPING FOREST); the publication of the results of such investigations; the formation of a Library of Works of Local Interest and other publications; the formation of a Museum; and the dissemination of information on Natural Science and Antiquities.

Constitution.

II.—The Club shall consist of Ordinary and Honorary Members, including Ladies; the number of Ordinary Members being unlimited, and the number of Honorary Members being limited to twenty.

Management.

III.—The management of the Club shall be vested in a Council, consisting of a President, Treasurer, Secretary,

Librarian, and twenty-five other Members, all of whom must be Ordinary Members of the Club; seven to form a quorum. The President shall nominate four Members of the Council to act as Vice-Presidents during his year of office. The President, Treasurer, Secretary, Librarian, and those four of the other Members of the Council who shall have been longest in office (reckoning from their original appointment or election if they shall not have been re-elected, or from their last re-election when they shall have been re-elected) shall retire annually, but shall be eligible for re-election. If, in consequence of several Members having been elected or appointed at the same time, there shall be any difficulty in determining which four Members ought to retire under this rule, those Members who have been elected or appointed at the same time shall decide such question by mutual arrangement between themselves, or, in default of such arrangement, by lot.

Retirement of Officers.

Nomination of Officers.

IV.—At the Ordinary Meeting in December nominations shall be made of Candidates to fill the offices of President, Treasurer, Secretary, and Librarian, and vacancies on the Council. Such nominations as regards Members of the Council other than the President, Treasurer, Secretary, and Librarian shall be made by Resolutions, duly moved and seconded, no Member being entitled to propose more than one Candidate. The President, Treasurer, Secretary, and Librarian shall be nominated by the Council. A list of all nominations made as above shall be printed in alphabetical order upon the ballot-paper. At the Annual General Meeting in January all the above Officers and Members of Council shall be elected by ballot from the Candidates; but any Member shall be at liberty to substitute on his or her ballot-paper any other name or names in lieu of those nominated for the offices of President, Treasurer, Secretary and Librarian.

Election of Officers.

Chairman.

V.—In the absence of the President and Vice-Presidents the Members present at any Meeting of the Club shall elect a Chairman for that Meeting.

Election of Members.

VI.—Every Candidate for Membership, other than Original Members of the Club, shall be proposed by two or more Members, who shall sign a Certificate *(see Appendix)* in recommendation of him or her, one at least of the proposers so certifying from personal knowledge. The Certificate shall be read from the Chair at the Ordinary Meeting following its receipt by the Secretary, and the Candidate balloted for at the next following Meeting (not being a Field Meeting), one black ball in six to exclude. [Persons joining the Club upon or within two Calendar months from its establishment shall thereupon be considered Original Members.]

Subscription.

VII.—The Annual Subscription for Ordinary Members shall be ten shillings and sixpence, payable immediately after their election, and afterwards becoming due in advance on the first day of January in each year; but Members elected within two months before the thirty-first day of December shall be exempt from the payment of subscription for the year in which they are elected. (Members residing beyond a radius of fifteen miles from the Head-quarters of the Club shall not be called upon to pay more than an Annual Subscription of seven shillings and sixpence.) No Member shall be entitled to any of the privileges of the Club whose subscription is twelve months in arrear; and any Member whose subscription is two years in arrear may be excluded from the Club by the Council.

Honorary Members.

VIII.—The Honorary Members shall be ladies or gentlemen of eminence in Natural Science or Archæology, or who shall have done special service to the Club, and whose usual place of residence is not in the County of Essex; and they shall be elected only at a General Meeting by the Members upon the recommendation of the Council, not more than five to be elected in any one year. No subscription or other payment shall be required from the Honorary Members.

Compounding for Subscription.

IX.—Any Ordinary Member may compound for his or her Annual Subscripton by a single payment of £5 5s.: all

such sums to be dealt with in such manner as the Council shall think fit.

Privileges of Members.

X.—Every Member, whether Ordinary or Honorary, shall have the privilege of attending all the Annual, Ordinary and Field Meetings of the Club, and of introducing one visitor at any such meeting (who shall enter his or her name, with that of the Member by whom he or she is introduced, in a book kept for that purpose) and shall be entitled to receive a copy of all publications of the Club during his or her membership, and to the use of the Library and Museum in accordance with the regulations.

Resignation of Members.

XI.—Members wishing to resign at the termination of any year are required to inform the Secretary, in writing, of their intention to do so, on or before the first day of November in that year.

Meetings.

XII.—No fewer than eight Ordinary Meetings of the Club shall be held in each year, at such places and at such times as the Council may appoint; the Council shall also have power to appoint Bye-meetings for study or other purposes. Field Meetings shall also be held at such places and times as the Council may direct.

Field Meetings.

Business at Ordinary Meetings.

XIII.—At the Ordinary Meetings the following business shall be transacted:—The Minutes of the last Meeting shall be read and, if approved, confirmed; contributions to the Club since the last Meeting announced, and, if consisting of anything but money, exhibited; Certificates for new Members read; Ballots for new Members taken; specimens exhibited and remarks made on the same; communications and papers read and discussed, and any other business which the Chairman or Secretary may think it desirable to bring before the Meeting, transacted. After which the Meeting shall resolve itself into a Conversazione.

Field Meetings.

XIV.—The Field Meetings shall be under the entire control of the Council, who may appoint Lecturers, and make

such other arrangements as they may deem best for the comfort of the Members and their friends.

Annual General Meeting.

XV.—The Annual General Meeting shall be held on the second Saturday in January, at which the Report of the Council on the affairs of the Club, and the Balance-sheet duly signed by the Auditors (to be appointed as provided by *Rule* XVII.) shall be read. Printed lists of Members nominated for election as President, Treasurer, Secretary, Librarian, and members of the Council having been distributed, and the Chairman having appointed two or more Members to act as Scrutineers, the Meeting shall then proceed to ballot for such elections. If from any cause these elections, or any of them, do not take place at this Meeting, they shall be made at the next Ordinary Meeting of the Club.

Minutes.

XVI.—Minutes shall be kept of the proceedings at all Meetings of the Club, and of those at all Meetings of the Council, and the Minutes of each Meeting of the Club (except Field Meetings) shall be read as the first business at the next Meeting (other than a Field Meeting), whether Annual or Ordinary, of the Club. And in like manner the Minutes of each Meeting of the Council shall be read at the next Meeting of the Council.

Accounts.

XVII.—The accounts of the Club shall be audited by two Members, one to be appointed by the Council and one by the Members at the Ordinary Meeting in November.

Investigations, and Publication of results of same.

XVIII.—The Club, on the recommendation of the Council, shall undertake the investigation of any subject of a scientific nature, relating to Epping Forest or the County of Essex, which the Council shall think it desirable to investigate, and shall, if the Council shall so recommend, publish the results of such investigations.

Publications.

XIX.—The publications of the Club shall be printed at such times and in such manner as the Council shall direct.

Preservation of Natural Objects and Antiquities.

XX.—The Club shall strongly discourage the practice of removing rare plants from the localities where they are to be found or of which they are characteristic, and of risking the extermination of birds and other animals by wanton persecution; and shall use its influence with landowners and others for the protection of the same, and to dispel the prejudices which are leading to their destruction. The rarer botanical specimens collected at the Field Meetings shall be such as can be gathered without disturbing the roots of the plants, and notes of the habits of birds shall be recorded instead of collecting specimens either of the birds or of their eggs. In like manner the Club shall endeavour to cultivate a fuller knowledge of local antiquities, historical, popular, and idiomatic, and to promote a taste for carefully preserving the monuments of the past from wanton injury. [This rule is not intended to restrict the judicious collecting of specimens by individual members *necessary* for their studies.]

Judicious collecting.

Copyright of Papers.

XXI.—The copyright in, and the original copy of every paper, after having been read before the Club, shall be considered as the property of the Club, if there shall be no engagement with its author to the contrary. But if the Club shall decline or omit to publish any paper for six Calendar months after it shall have been read before the Club, such paper and the copyright therein shall remain and be the property of the author, the Club, however, having the right to take and retain for its own use one or more copy or copies of such paper. And the non-publication by the Club of any such paper for the period above mentioned shall constitute or be sufficient evidence of an engagement to the effect above mentioned with the author of the paper.

MS. of Papers.

[It is *recommended* that every paper which is to be read before the Club should be written on foolscap paper, on one side only, with a margin of one inch on each side of the MS.]

Repeal or Alteration of Rules.

XXII.—No rule shall be repealed or altered, nor shall any addition be made to these rules, except by a majority of votes of the Members present at an Ordinary or Special Meeting

held at the head-quarters of the Club. Notice of the intention to move such repeal, alteration or addition having been given at the Ordinary Meeting immediately preceding the meeting at which such repeal, alteration or addition shall be moved, if such Meeting be an Ordinary Meeting, or by printed notice sent by post in manner hereinafter mentioned, when such Meeting shall be a Special Meeting. The Council may at any time, and shall, upon a requisition signed by not less than twelve members, convene a Special Meeting; and a printed notice stating the purpose for which the Meeting is convened shall be sent by post to each Member not less than ten days before the date fixed for such Meeting.

Special Meeting.

XXIII.—A copy of these Rules shall be sent by the Secretary to each Member upon election to membership of the Club, but no Member shall be excused from their operation on the plea of not having received or read the said Rules.

Copy of Rules to Members.

APPENDIX.

—o—

FORM OF PROPOSAL FOR MEMBERSHIP.

_____

_____

of _____

_____

being desirous of becoming a Member of "The Epping Forest and County of Essex Naturalists' Field Club," we, the undersigned Members of the Club, certify that we consider h to be a desirable Member of the Club, and beg to recommend h for election.

Dated this _____ day of _____, 188__

_____ *(from personal knowledge).*

_____

Certificate read, _____ 188__

Candidate balloted for, _____ 188__

First Year's Subscription or Life Composition paid _____

_____ 188__

_____

Secretary.

_____

J. JONES, PRINTER, WOODFORD.

AN

INAUGURAL ADDRESS

DELIVERED TO

THE EPPING FOREST

AND

COUNTY OF ESSEX NATURALISTS' FIELD CLUB,

FEBRUARY 28th, 1880.

BY

RAPHAEL MELDOLA, F.R.A.S., F.C.S.,

Sec. Ent. Soc., &c., President.

"Tongues in trees, books in the running brooks,
Sermons in stones, and good in everything."

PUBLISHED BY THE CLUB, BUCKHURST HILL.
1880.

THE

PRESIDENT'S INAUGURAL ADDRESS.

Delivered February 28th, 1880.

LADIES AND GENTLEMEN,

Before proceeding to consider the objects and functions of the "Epping Forest and County of Essex Naturalist's Field Club," it is my pleasing duty to return thanks for the honour which you have conferred upon me in electing me as your first President. In taking upon myself the honourable duties of this position, which I shall endeavour to discharge to the best of my ability, I cannot but regret that this chair is not occupied by some gentleman having more claim than myself to be considered as a naturalist. Although long devoted to this study, the pressure of work of more immediate necessity has left me without the time necessary to follow up the subject with that persistency so necessary for the achievement of useful results in any branch of science. I accept the position with the more pleasure, however, as having been a former inhabitant of the Forest District, and a constant frequenter of the Forest itself, in whose glades my own early tastes for field natural history first found full scope for gratification.

As already stated in our preliminary circulars, considering the proximity of Epping Forest to London, and the fine field which it offers to the naturalist, it is a matter of surprise that no such Society as that which we may now congratulate ourselves upon having called into existence has hitherto been formed. The idea of establishing such a Club has long been present, although but vaguely, in the minds of many *habitués* of the Forest and surrounding country, but no defined scheme was broached till our energetic Honorary Secretary, Mr.

William Cole, took the subject up, and by his zeal and energy gave to this

"Airy nothing
A local habitation and a name."

Our Society, in general terms, may be said to have for its scope the study of nature in the field. So many eminent writers have already treated of the advantages to be derived from the study of nature at first hand, instead of from books and museums, that any remarks which I might have to offer on this subject could not but be the echoes of opinions already expressed. In the words of Goethe we may exclaim:—"Nature! we are surrounded and embraced by her: powerless to separate ourselves from her, and powerless to penetrate beyond her. ..... She is ever shaping new forms: what is has never yet been; what has been comes not again. Everything is new, and yet nought but the old. ..... We live in her midst and know her not. She is incessantly speaking to us. ....."

That the Epping Forest and County Field Club has met a public want let the facts now speak for themselves. Although not quite two months old, we already number more than 140 original members. Our cause has been warmly taken up by the press; in its first attempts to struggle into existence the infant Society has met with kindly encouragement on all sides, and many of the foremost naturalists of this country have signified their approval of our objects. It is unnecessary for us, therefore, to plead any excuse for our *raison d'être*—it only remains for us to show those who have so readily extended the hand of encouragement, by our future work, that their sympathy has not been given in vain. We now look forward—I may add with confidence—to receiving from our members substantial support in the way of contributions to our publications, exhibitions of specimens at our meetings, and the discussion of problems in natural science in that amicable spirit which is most conducive to the real advancement of knowledge.

In forming a Society such as the present Field Club our primary object is of course the furthering of science—the annual addition of something, however humble, to the general

stock of human knowledge. In Epping Forest and the County of Essex we have a fine area to work in, and I am happy to say that we already include in our ranks many members well versed in special branches of natural history (using this term in its widest sense) to whom we shall look for assistance in their respective subjects; and I am also glad to be able to announce that many eminent specialists outside our own Society have promised their valuable aid in identifying specimens or in other ways promoting the objects of the Club. Our chief object, the advancement of natural science, will be best effected by the publication of *original papers*, notes, and discussions. But we must likewise bear in mind that science will be also indirectly promoted by mutual intercourse and instruction, and, above all, by fostering and educating the scientific faculty in our younger members. Who knows but that in the County of Essex there may be another John Ray or some future Darwin waiting only for encouragement and the spirit of emulation to develop faculties which will subsequently establish him in a high position in the world of science. The discovery of such an individual would surely be of far greater importance to science than the discovery of a species new to the British fauna or flora. It is our duty to go forth into the highways and byeways and bring such members into our fold. The sociable gatherings of a Field Club are far more calculated to inspire the young scientific aspirant with confidence in his own powers than the more formal meetings of a learned Society, where stern discussion is necessary, and where valuable metal must be separated from useless dross by a process of rigid criticism. Nor can our older members, whether naturalists or not, fail to derive benefit from association with those who have studied for themselves some page in the great book of nature. In these days when science is progressing with such gigantic strides that no one man can keep pace with its development in all branches—when specialism has become an absolute necessity for individual advancement, and when results of value can only be obtained by rigidly limiting oneself to some restricted subject, and ignoring, for the time, the rest of nature—there is much to be learnt by interchanging ideas with those who

are occupied with subjects distinct from one's own. It has often been said that to be thoroughly educated we should "know something of everything and everything of something;" the specialist, however, being obliged to ignore the existence of nature outside his own subject, is too apt to think that beyond his own province there is nothing worth investigating—he has been travelling for a great many years down a lane between dead walls in which it is sometimes necessary to make a breach in order to show him that there is open country beyond. If the friendly gatherings of our Club are in any way conducive to enlarging the ideas, on the one hand, of those who have never yet directly asked a question of nature, and, on the other, of those who have spent years in prying laboriously into some obscure corner of her domain, one of our main objects will have been accomplished.

Thus, in addition to the acquisition of new knowledge, Field Clubs are capable of doing good work in the way of education. The faculty of paramount importance to the scientist is that of *observation*, and no study is better calculated to develop this faculty than that of natural history. The power of observation comes naturally to the young, but unfortunately is too often extinguished before maturity is reached by the ignorance of those whose solemn duty it should have been to have assisted the development of this instinct. Charles Dickens says ("David Copperfield," Chap. II.):—"I believe the powers of observation in numbers of very young children to be quite wonderful for its closeness and accuracy. Indeed, I think that most grown men who are remarkable in this respect may with greater propriety be said not to have lost the faculty, than to have acquired it; the rather, as I generally observe such men to retain a certain freshness and gentleness, and capacity of being pleased, which are also an inheritance they have preserved from their childhood." Comparing our young Society with a growing child, let us foster among our members this observational faculty, and let us hope that we shall reach a vigorous intellectual manhood, and in due time become a "feeder" of the learned societies.

Our most useful work will thus be at first the observation and recording of the phenomena of that district which we

have fixed upon as the field for our studies. With this alone we have a large and pleasant task in hand. The County of Essex, and especially Epping Forest, has already been worked by many highly competent observers, but nature's stores are inexhaustible—there are no blind alleys in science, and what has been already recorded must serve as the point of departure for our future work. The observations of our predecessors, moreover, are to a great extent scattered throughout various publications, and are therefore without that *local* significance to which a true scientific meaning may one day be attached. We must make it a part of our duties to centralize these observations, and in time we may aspire to the proud position of seeing our publications regarded as the authority in all that relates to the natural history of the county.

With regard to the special nature of the observations with which we may commence our labours, no definite programme can be laid down at starting. This must be entirely left to the taste and knowledge of our members, and I can here only offer a few general suggestions. Some remarks recently made to the Dulwich College Science Society by my friend and colleague Mr. W. L. Distant are equally applicable to our own Club:—"The object of the Society is to promote and increase the knowledge of the natural history of the neighbourhood, and the first step, but the most indispensable one towards it, is to aim at having a complete catalogue of its flora and fauna. In other words, before we can study the inhabitants with any amount of completeness we must possess their names and addresses. The Society should thus be a Biological Registry Office. But this is not all. In certain communities which are still in an arrested or undeveloped condition of culture there exists a system of espionage or secret police, the aim of which is to know as much about everybody as possible, from purely unscientific motives. I would advocate in the strictest scientific sense that you establish a bureaucracy in this neighbourhood in which man only shall escape your domiciliary visits, by which a rabbit shall not leave his burrow without in some way you have an explanation of his goings out and of his comings in; that every bird shall be 'suspect' who, sojourning here for a period only of

the year, mysteriously disappears for the remainder; and that the strictest police supervision should entail on all insects whose purposes or habits are unknown."

When we look at the numerous woodland patches scattered throughout the County of Essex, we can entertain no doubt but that our district was originally covered with forest. It is recorded that in the reign of Henry III. a royal forest extended right across the county in a north-easterly direction from Stratford Bridge to Manningtree. In the reign of Charles I. the great Waltham Forest comprised Epping and the now almost extinct Hainhault Forests, thus forming a large woodland area bounded to the east by the River Roding, to the west by the River Lea, to the south by the great Chelmsford and Colchester road, and stretching northwards for sixteen miles as far as Roydon, almost on the boundary of the county. Thus, as might have been anticipated, our district is especially rich in woodland species. Epping Forest itself, so far as my own experience goes, certainly does not appear to be so productive from a collecting point of view as some of the woods of Kent and Surrey to the South of London; but our county, taken as a whole, has furnished many rarities. We shall hope in the course of time to be in a position to furnish local catalogues of animals and plants, for the preparation of which we shall look to our ornithologists, botanists, entomologists, microscopists, &c. I do not propose on the present occasion to enter into much detail respecting the natural productions of our district, as I should thus only have to tax your patience with a long list of specific names; but I will restrict myself to a few general remarks.

Mr. Edward Newman has given the names of seven species of bats* as being found in the Forest; and with regard to birds, Mr. James English, one of our members, whose name as a collector was long associated with that of the late Henry Doubleday of Epping, has recorded about 120 species,* 20 of which are occasional visitors driven into the Forest by stress of weather or other causes. The total number of birds consi-

* See Appendix.

dered by the best authorities to be truly British is about 350 species, so that in Epping Forest alone this interesting class is fairly represented; and if we included the species found in other parts of the county, and particularly on the coast, the list would doubtless be considerably increased. I may likewise state that three specimens of the Great Bustard have recently been shot in the county. The list of insects of Epping Forest and other parts of the county includes many rare species. Thus in the way of beetles, Mr. T. R. Billups, one of our members, has lately succeeded in capturing at West Ham a species which had not been met with for nearly seventy years—viz., *Spercheus emarginatus;* and in the same locality numerous other rare and local species, such as *Xantholinus fulgidus*, *Philonthus thermarum*, *Stenus fornicatus*, *Quedius puncticollis*, the new *Helophorus æqualis*, &c. At Loughton this same collector has taken the very scarce *Euplectus ambiguus*. Of the sixty-seven species of butterflies found in Britain, forty-six are mentioned by Newman as occurring in Essex, and three or four more species may possibly be added if search is made for them in those parts of the county that are on the chalk. From a list of the larger moths drawn up for me by Mr. Cole, it appears also that the collector may be rewarded by many prizes, whilst among the smaller species of *Deltoides*, *Pyralites*, *Crambites*, *Tortrices*, and *Tineina*, I am persuaded that there is yet a very rich harvest to be gathered in the Forest and elsewhere in the county. To the lepidopterist, indeed, our district has already been made famous by the capture of such species as *Erastria venustula* by the late Henry Doubleday, and *Sophronia emortualis* by Mr. Charles Healy. Epping Forest has furnished also the rare *Gluphisia crenata*, the almost unique *Eupithecia ægenaria* and *Stigmonota leguminana*, whilst Mr. Cole last autumn succeeded in adding a very pretty geometer, *Sterrha sacraria*, to the list of Essex Lepidoptera. Then again we have *Geometra smaragdaria*—the "Essex Emerald"—a rare moth well known to be a speciality of our county, found in the low marshes about Southend, St. Osyth, &c.; and also the extremely local *Aleucis pictaria* found about Loughton. With respect to Hymenoptera, I am informed by Mr. E. A. Fitch, who is an authority on the subject of galls,

that of his list of forty-one cynipideous oak-galls known as British, he has found all but six in Essex. In 1868 only fourteen species were known as British, so that twenty-seven species have been added in twelve years—a fact which surely offers encouragement to our workers to pursue further investigations in this direction. The absence of sandy banks will account for our poverty in fossorial Hymenoptera. Of other orders of insects, Mr. Doubleday has published a list of thirty species of dragon-flies (*Odonata*) as being known to occur in our Forest, this number being about two-thirds of the British species.

To the botanist our district offers a fine field—Epping Forest is indeed regarded as being among the richest localities for plants in the vicinity of London; but I should be overstepping the bounds of all reasonable time did I attempt to specify any of the rare flowering plants, ferns, fungi, mosses, and lichens that nature has so lavishly spread through the county. At present the standard work of reference for our botanist is Gibson's "Flora of Essex," published in 1862, and there is an older and now extremely rare book by Richard Warner entitled "Plantæ Woodfordiensis," published so far back as 1771.*

The outdoor study of the natural history of the county will of course be conducted as heretofore by our members independently, each according to his particular subject, but the formation of this Club will, I venture to think, add greatly to the zest of their pursuits. The pleasure of adding some new or rare species to the Essex fauna or flora, or of making some new and interesting observation, will assuredly be greatly enhanced by knowing that at the next meeting of the Club the captor or observer will have an opportunity of making known his results to those of kindred tastes, and an additional impulse will thus be given to his work. Such observations as our members may bring forward, or such specimens as may be exhibited at our meetings, will be gladly welcomed by the Council, and will be recorded in our publications.

To many, and especially to our younger members, the new Club may perhaps be a means of inducement for taking up the

* See Appendix.

study of some branch of natural history for the first time. Every one of our members who may possess any special knowledge will, I am sure, gladly lay open the stores of his information for the assistance of such beginners. Were I asked how such studies ought to be commenced, I would unhesitatingly say—begin by making a collection. Fix upon some group of animals or plants that may specially appeal to your interest, and get together as many species as you can, collecting them in all cases where possible with your own hand, and noting their habits and localities in so doing. You will thus get together a certain amount of raw materials which will require further study in order to arrange them; you are in the position of a child with a dissected puzzle, and the problem before you is to arrange your collection *naturally—i.e.*, to bring together those forms that are akin and to separate those which are not allied. In this way by referring to standard works, or still better to living authorities, the great principle of biological classification will gradually dawn upon you, the organic forms by which you are surrounded will become imbued with a new interest, you will be born again into the kingdom of nature, and the lowliest plant or the most minute insect that you had formerly passed unheeded by will no longer be in your eyes as unmeaning fragments, but will become portions of a great system—parts of that

> "Stupendous whole,
> Whose body Nature is, and God the soul."

In order to grasp this principle of classification thoroughly and scientifically, it is not sufficient to know that this or that book catalogues the species in such or such order. You must ask in every particular case *why* these species have been grouped together and those separated from them. The system of making a collection first and then arranging it from some already classified cabinet is, I am persuaded, a most pernicious one so far as the educational value of collecting natural history specimens is concerned. It is those who have accumulated row upon row of insects without any ultimate object in view beyond the mere possession of specimens who have made of "the mere collector" a "nayword and a common

recreation," and the gulf which separates such collectors from the much-despised maker of ornamental wall-cases is not a very wide one. I would emphatically urge upon those about to take up the scientific study of natural history from the very necessary beginning of making and arranging a collection—eradicate from your disposition the desire of possessing "fine series;" let the *cacoethes carpendi* once take possession of you and your career as a scientific biologist is doomed. We shall hope that the taste for collecting which may be engendered in the county by the foundation of this Field Club will, as enforced in our rules, be exercised *judiciously and moderately*. In the case of insects, excepting of course in species of great variability, some three or four, or at most half-a-dozen, specimens are amply sufficient for all purposes of study. There are many who have assisted in the wholesale extermination of some species almost extinct for the mere gratification of possessing a "finer series" than their neighbours; such collectors are guilty of nothing less than a biological crime as heinous in the eyes of the naturalist as would be the destruction of some "ancient monument" in the opinion of the archæologist.

In the course of time and as our Society continues to flourish—as it surely will if it only fulfils the promises of its early youth—we shall hope to establish permanent collections in a museum, and any specimens which our members may like to contribute for furnishing the nucleus of such a public collection will at any time be thankfully received. During the first years of our existence, when our funds will be necessarily limited, we shall of course be unable without external aid to establish anything in the way of a Natural History Museum that would be at all worthy of the County Club—the growth of such an institution will be a work of time; but in order to accelerate matters I would suggest that a "Museum Fund" be started among our members, and that our Treasurer should keep a separate account of such donations, which would be allowed to accumulate, and from time to time increased by such sums from our general income as the Council might think proper to devote to this object, until a sufficient amount is obtained to warrant our fixing upon some place for our permanent head-quarters.

Apart from the obvious advantages of having in one building our collections, library, and meeting-room, and of leading an independent instead of a parasitical existence, the formation of a permanent museum would, I am convinced, promote our objects in many other ways. Our "Biological Registry Office" would become better known throughout the county, and useful specimens which by accident might fall into the hands of the non-scientific would naturally be sent to our museum. Then the large number of species which would have at first to be collected would lead our active workers to co-operate for a common object—the formation of a *typical collection* representing the natural history of the county. In this undertaking our would-be beginners might well take a part, and in so doing would commence to derive those educational advantages arising from the study of field zoology and botany to which I have already referred.

It will be far more satisfactory to have a general collection formed in all parts of the county by our own members for the express purpose of being deposited in our cabinets than to exhibit the "tag, rag, and bobtail" of old collections, or to expose to public view the faded and dilapidated specimens to be seen in many local museums, both at home and abroad, the authorities of which should regard their tattered possessions with much the same feelings as did Sir John Falstaff his ragged regiment. In addition to collections of species illustrating the actual productions of our district, it would be most especially desirable in the case of insects to have preparations showing the life-history at every stage of transformation, and dissected specimens illustrating the structure and anatomy. In time we might thus come to possess a collection both of educational and technical value that would not be unworthy of a Field Club which already includes members of many of the most influential families in the county, and which might ultimately become of scientific use to specialists outside our own ranks—"a consummation devoutly to be wished."

The geological features of the County of Essex have been

mapped out broadly by the Geological Survey,* but there is yet much work to be done in the way of filling in details, especially with regard to the Drift and other superficial deposits. Geologically considered, our district is comparatively modern, the oldest formation being the chalk which crops out on the Essex shore of the Thames about Purfleet, and extends to just beyond Little Thurrock, a distance of some five miles in an easterly direction. Overlying this strip of chalk at its eastern extremity there is a detached patch of Thanet sand. A line drawn across from Grays Thurrock to Stifford, the northern limit of the chalk at about its widest part, would be nearly one mile and three-quarters in length. At Bishop Stortford the chalk again appears. The thickness of this formation in the London Basin is from over 600 to more than 1,000 feet; a boring carried down into the Gault at Loughton Station gave a thickness of about 690 feet, and at Harwich a boring to a depth of 1,042 feet carried down into strata below the Gault showed the chalk to be 888 feet thick. Cretaceous fossils have been obtained in some abundance from the chalk pits at Grays and Purfleet. By far the larger portion of our county stands on the tertiary formations above the chalk. Of the Lower Eocene series the Thanet Sands are present in a broken band of about one mile in width at its widest part, and of an average thickness of about thirty feet, which crops out to the north of Purfleet, and following the chalk extends eastward along the valley of the Thames. The chalk pits at Purfleet and Grays show well the junction of the two formations. Next in order above the Thanet beds we have the Woolwich and Reading beds following the former, as a narrow strip commencing about Wennington and extending eastwards to Stifford, where the strip commences to broaden out, and another patch of the same beds is found about Stratford and West Ham, to the east of the alluvium of the Lea valley. The Woolwich and Reading beds have an average thickness of about fifty feet. The uppermost member of the Lower Eocene

* In making the following rough sketch of the geology of the county I have largely availed myself of the admirable publications of Mr. W. Whitaker, of H.M. Geological Survey, as well as of the maps published by the Survey.

formation, the London Clay, although to a great extent covered by Drift deposits, forms by far the larger portion of the beds on which our district stands. The hills in many parts of Essex—such for instance as the ridge extending from Chingford to Waltham Abbey and the range about Havering-atte-Bower and Brentwood—are entirely of London Clay, in many cases capped with outliers of Bagshot sand and Drift formations. We have but to call to mind High Beech in our own neighbourhood to see that the most picturesque features of the county are due to this formation. Sections of the London Clay, which is about 420 feet thick in the neighbourhood of the metropolis, have been exposed in Essex at Buckhurst Hill, Theydon, Brentwood, Stifford, Upminster, Warley, &c., and sections of this formation showing its junction with the Woolwich and Reading beds have been exposed at Bishop Stortford and Roydon. The Middle Eocene period is represented in our county by the Bagshot Sands already alluded to, which form outliers capping many of our hills, such as at High Beech, Crabtree Hill near Lambourn, South Weald, Havering, Blackmore, and large patches stretching northwards from Warley Common to beyond Brentwood and again about Kelvedon Hatch. One other very interesting formation of Pliocene date—the Crag—just commences to appear in the north-eastern corner of the county at Manningtree, south of the Stour valley, and Walton-on-the-Naze has furnished Red Crag fossils of special geological interest.

At about that period of the earth's history when the Crag formations were deposited, our globe, owing to a certain combination of astronomical events, began to experience those great climatic changes which resulted in the Glacial Period, during which the whole of the northern portions of Europe and America were laid under an icy covering of great glaciers which flowed down from all the mountain slopes and high lands, levelling up the valleys, and becoming confluent, formed a gigantic ice-sheet, which extended southwards into regions which now enjoy a temperate climate, whilst floating icebergs and rafts drifted even into tropical seas, and there thawing, scattered their accumulated burdens of rock fragments and miscellaneous *débris* over the sea bottom. The Glacial Epoch,

which began about 240,000 years ago and lasted for some 160,000 years, does not appear to have been one uninterrupted era of intense arctic climate, but several milder periods intervened, when the great ice-sheet retreated northwards and the glaciers remained confined to the mountain-tops, till the recurrence of the glacial climate again caused them to spread to the lowlands and once more to push their way southwards. During those mild inter-glacial periods, when the arctic forms that inhabited this country had retreated with the glaciers, animals such as the mammoth, rhinoceros, hippopotamus, lion, tiger, bear, hyæna, &c., became inhabitants of Britain, which was then connected with the continent of Europe across what is now the German Ocean. The old inter-glacial mammals—and probably Palæolithic man was among them—would have told of mighty revolutions in physical geography could they have kept records, as our island, after they had taken possession of it, became submerged beneath the sea to an immense depth, till only the high lands appeared above the waters, forming an archipelago. Then followed a final return of glacial conditions, when the great ice-covering for the last time enwrapped our country, which slowly rose from the frozen ocean and once again became a portion of the continent. As the more genial climate which has lasted to our own times came on, the ice-sheet slowly disappeared; glaciers lingered for some time on our mountains, and finally vanished, to return no more till the next glacial epoch. It was during these continental states of Britain, when the Thames was a tributary of the Rhine, that the country became the home of those animals and plants the survivors of which constitute our present fauna and flora, the sea finally sweeping away the land connection and leaving our island much as we now find it.

The records of "the great ice age" are more forcibly impressed upon the mountainous districts of Wales, Scotland, and the Lake District than in the southern portions of England. The great submergence which preceded the last glacial relapse left only the south of our island above the sea, and a line drawn across the country from the mouth of the Thames to the mouth of the Severn represents the southernmost

boundary of glacial action in this country. Those superficial deposits which I have formerly alluded to as Drift are mostly of glacial origin, and sections have been exposed in the immediate neighbourhood of London, as at Muswell Hill and Finchley, and also on the hills of our county at Theydon Mount, Buckhurst Hill, Epping, Stondon Massey, Hutton, &c.

I have thought it necessary to lay before you this brief sketch of the existing knowledge respecting the Glacial Period because the latter forms an epoch in the life of the earth from which must be dated the present aspect of our country and of its living forms, and further, because a large field for labour here lies before our geological members in attempting to determine the relative ages of the various Drift deposits of our own district, and thus contributing our mite towards erecting the structure of that noble science which regards "ages as its days."

Although leading authorities are now agreed that man existed prior to the Glacial Epoch, the most convincing proofs that we have of his existence are of inter-glacial and post-glacial age. The savage predecessors of the various peoples that have been known to successively inhabit our country during the historical period—prehistoric man, who roamed through Britain and dwelt in our caves when the mammoth, the hippopotamus, the rhinoceros, the reindeer, and other animals here extinct formed a portion of our fauna, has left his traces in the rude flint implements of our ancient river gravels. Our county is situated in that portion of England which has been most prolific in yielding implements of early human workmanship belonging to the old stone or Palæolithic age, and we are fortunate in having on our southern boundary the broad alluvium of the Thames, with that of its tributary streams, such as the Lea and the Roding. The Thames alluvium stretches, according to Mr. Prestwich, from above Maidenhead to the sea, varying in width from two to nine miles, and in thickness from five to fifteen feet. Flint implements have been found at many places along the Thames Valley, and quite recently Mr. Worthington Smith has discovered such implements in the valley of the Lea. This gentleman writes to me :—" Up to the present time I have

found thirty-one Palæolithic implements in the gravels on both sides of the Lea between Clapton and Leyton or Forest Gate. These implements are mostly pointed or lanceolate, a few ovate. I have also found seven 'trimmed flakes,' as they are termed—*i.e.*, flints chipped all over one side (like an implement), the other side being plain or nearly so. Add to this several hundreds of flakes of all sorts and sizes—a few bones and fragments of mammoths' tusks, &c." Among numerous microscopic objects found in the gravel of the Lea Valley, at a depth of twelve feet, Mr. Smith has also discovered some human hair, which he believes to be of Palæolithic age. The remains of animals of post-glacial age have been discovered plentifully in the chalk quarries and brick-earth pits at Gray's Thurrock and Ilford*—these districts indeed appear to be veritable geological Tom Tiddler's grounds—and sections of Post-glacial beds have likewise been exposed at Leyton, Aveley, Plaistow, and in the Roding Valley at Theydon Bois. Among more recent deposits we have an old sunken forest in the peat opposite Walthamstow Marshes, which extends for several miles, and is exposed at low water.

Palæolithic man was followed by his Neolithic successors, who peopled this country after the last great glacial submergence; then we have evidence of those advances in civilization which resulted in the use of bronze, and finally in the iron age. The great geological record here passes into the historical period, the study of which comes into the province of archæology. On this subject I shall have very little to say. Good work has been done, and will no doubt continue to be done, by the Essex Archæological Society, and the fine collection of antiquities in the Colchester Museum is partly the result of their labours. The ancient earthworks recently discovered in Epping Forest by Mr. B. H. Cowper, and surveyed by Mr. William D'Oyley, will be of special archæological interest to us. The Loughton Camp is supposed to

* Among the mammalian remains found in these pits are the mammoth, two species of elephants, hippopotamus, rhinoceros, hyæna, bison, two species of bears, Irish elk, cave lion, wolf, &c. Sir Antonio Brady's Museum, at Stratford-le-Point, contained a collection of Post-glacial fossils of world-wide celebrity, now presented to the British Museum.

have been the work of the Ancient Britons, and the Camp at Ambresbury Banks that of their Roman enemies.*

That surviving remnant of primitive forest, of some 4,900 acres, which we claim as the chief centre of our studies, is, by Act of Parliament, to remain for ever unenclosed and unbuilt upon; and, as a Society founded for promoting a knowledge of the natural history of the neighbourhood, we cannot but rejoice that such a state of affairs has been established—chiefly by the energetic action of the Corporation of London. But while, as naturalists, we rejoice at the large area thus unreservedly thrown open for our investigations, as men we must not forget to give our sympathy to those who have indirectly suffered by the culpable actions of the depredators.

As to the future of the Forest, we cannot do more than forcibly support the views unanimously expressed wherever the subject has been discussed—that it should be left alone as much as possible. By this means alone can it be preserved as a "Natural Forest." The workings of nature are connected and bound up in such endless and unsuspected ways that any interference on the part of man may unknowingly upset the adjustments that have taken ages for their perfection; and in addition to any obvious results that may follow from some change made in primitive forest land there may ensue an endless chain of consequences to the animals and plants that were totally unlooked for. The opinions of naturalists have already been expressed on this point—foremost among whom Mr. A. R. Wallace† has pointed out the evils that would arise from indiscriminate and extensive draining. With regard to the large tract of land of nearly 1,000 acres which was formerly enclosed and in most part cultivated, but which is now thrown open and added to the Forest, we have a magnificent area for experimental natural

* See the pamphlet on this subject by Mr. B. H. Cowper, published by the Committee of the Epping Forest Fund.

† *Fortnightly Review*, Nov. 1st, 1878. See also the paper by Mr. Wm. Paul, and the discussion in the *Journal of the Society of Arts*, Jan. 30, 1880.

history, and we shall anxiously watch the proceedings of the Conservators with respect to this portion. For my own part, I cannot help expressing the opinion that Mr. Wallace's suggestion to make this tract into "several distinct portions of forest, each composed solely of trees and shrubs which are natives of one of the great forest regions of the temperate zone," appears to be most feasible and inexpensive.

The Epping Forest and County of Essex Naturalists' Field Club has been formed in a county already made famous in the annals of science by such names as those of the illustrious John Ray, son of a blacksmith, who was born in 1627 and died in 1705 at Black Notley, between Witham and Braintree; of Dr. Derham (1657—1735), rector of Upminster, whose "Physico-Theology" went through at least thirteen editions. Samuel Dale (1659—1739), an Essex Naturalist, wrote the "History of Harwich" (1730), and Richard Warner (1711—1775) was the author of the "Plantæ Woodfordiensis" to which I have already referred. In more recent times our county produced the celebrated Edward Doubleday, and *the* Epping Naturalist, his brother, Henry Doubleday, who was born in 1809 and died in 1875. Francis Walker, the entomologist, born also in 1809, died at his residence, Elm Hall, Wanstead, in 1874. Let us hope that to this list the future historian of science may have to add the names of some whose natural history studies were first instigated by the foundation of this Field Club.

When our Society shall have arrived at that happy mechanical condition known as a "moving equilibrium," I would suggest that those of our members who have kindred tastes should co-operate for the purpose of assisting natural history in fields where "many hands can make light work." Thus our entomologists might work together for two or three seasons and devote their entire attention to collecting some neglected order, such as the *Diptera*, *Hemiptera*, &c., and thus hasten the accumulation of materials necessary for the production of local catalogues, and the same might be done for other groups of animals or plants.

Our field meetings will, I trust, lead to many a social ramble, the pleasures of which will be greatly enhanced by

having some definite object in view. We must strive to get beyond that often-quoted Peter Bell to whom

> "A primrose by the river's brim,
> A yellow primrose was to him,
> And it was nothing more"

—an unfortunate individual whom we as naturalists must regard as a type of the blissfully ignorant. In science ignorance is not bliss, and no advance will be made if we rest contented with "it was nothing more." Nature is one—her votaries are many—but how few are her prophets! There is no natural phenomenon, however apparently insignificant, which does not appeal to us—there is not a pebble on our hill tops that does not incessantly cry out to us with a hundred tongues to read and learn. Surely to the naturalist of all others is it given to find—

> "Tongues in trees, books in the running brooks,
> Sermons in stones, and good in everything."

APPENDIX.

THE BATS OF EPPING FOREST.

(From Mr. Edward Newman's List.)

Plecotus auritus. The Long-eared Bat.
Synotus barbastellus. The Barbastelle.
Vesperugo pipistrellus. The Pipistrelle.
Vesperugo noctula. The Noctule.
Vespertilio Nattereri. Natterer's Bat.
Vespertilio Daubentonii. Daubenton's Bat.
Vespertilio mystacinus. The Whiskered Bat.

THE BIRDS OF EPPING FOREST.

(From Mr. James English's List.)

Daulias luscinia. Nightingale.
Ruticilla phœnicurus. Redstart.
Erithacus rubecula. Redbreast.
Pratincola rubicola. Stonechat.
Pratincola rubetra. Whinchat.
Saxicola œnanthe. Wheatear.
Turdus viscivorus. Missel Thrush.
Turdus musicus. Song Thrush.
Turdus iliacus. Redwing.
Turdus pilaris. Fieldfare.
Turdus merula. Blackbird.
**Turdus torquatus.* Ring Ouzel.
Troglodytes parvulus. Wren.
Regulus cristatus. Gold-crest.
Phylloscopus collybita. Chiffchaff.
Phylloscopus trochilus. Willow Wren.
Phylloscopus sibilatrix. Wood Wren.
Sylvia rufa. Whitethroat.
Sylvia curruca. Lesser Whitethroat.
Sylvia salicaria. Garden Warbler.
Sylvia atricapilla. Blackcap.
Calamodus schœnobœnus. Sedge Warbler.
Locustella nævia. Grasshopper Warbler.
Parus major. Great Titmouse.
Parus cæruleus. Blue Titmouse.
Parus ater. Cole Titmouse.
Parus palustris. Marsh Titmouse.
Acredula caudata. Long-tailed Titmouse.
**Lanius excubitor.* Great Grey Shrike.
Lanius collurio. Red-backed Shrike.
**Ampelis garrulus.* Waxwing.
**Muscicapa atricapilla.* Pied Flycatcher.
Muscicapa grisola. Spotted Flycatcher.
Motacilla lugubris. Pied Wagtail.
Motacilla sulphurea. Grey Wagtail.
Motacilla Rayi. Yellow Wagtail.
Anthus trivialis. Tree Pipit.
Anthus pratensis. Meadow Pipit.
Accentor modularis. Hedge Sparrow.
Pyrrhula Europæa. Bullfinch.
Ligurinus chloris. Greenfinch.
Carduelis elegans. Goldfinch.
**Carduelis spinus.* Siskin.
**Linota linaria.* Mealy Redpoll

The Birds of Epping Forest (continued).

Linota rufescens. Lesser Redpoll.
Linota cannabina. Linnet.
**Linota flavirostris.* Twite.
Coccothraustes vulgaris. Hawfinch.
Fringilla cœlebs. Chaffinch.
Fringilla montifringilla. Brambling.
Passer montanus. Tree Sparrow.
Passer domesticus. House Sparrow.
**Loxia curvirostra.* Crossbill.
Emberiza miliaria. Bunting.
Emberiza citrinella. Yellowhammer.
Emberiza melanocephala. Black-headed Bunting.
Plectrophanes nivalis. Snow Bunting.
Sturnus vulgaris. Starling.
Pica rustica. Magpie.
Garrulus glandarius. Jay.
Corvus monedula. Jackdaw.
Corvus frugilegus. Rook.
Corvus corax. Raven.
Corvus corone. Carrion Crow.
**Corvus cornix.* Hooded Crow.
Certhia familiaris. Tree-Creeper.
Sitta cæsia. Nuthatch.
Hirundo rustica. Swallow.
Chelidon urbica. Martin.
**Cotyle riparia.* Sand Martin.
Alauda arvensis. Skylark.
Alauda arborea. Woodlark.
**Upupa epops.* Hoopoe.
Picus major. Spotted Woodpecker.
Picus minor. Lesser Spotted Woodpecker.
Gecinus viridis. Green Woodpecker.
Jynx torquilla. Wryneck.
Cuculus canorus. Cuckoo.
Caprimulgus Europæus. Nightjar.
Cypselus apus. Swift.
Alcedo hispida. Kingfisher.
Columba palumbus. Ring Dove.
Columba œnas. Stock Dove.
Turtur auritus. Turtle Dove.
Aluco flammeus. Barn Owl.
Asio otus. Long-eared Owl.
Asio accipitrinus. Short-eared Owl.
Strix stridula. Tawny Owl.
Accipiter nisus. Sparrow Hawk.
**Buteo vulgaris.* Buzzard.
**Falco peregrinus.* Peregrine Falcon.
**Falco subbuteo.* Hobby.
Falco tinnunculus. Kestrel.
Phasianus colchicus. Pheasant.
Caccabis rufa. Red-legged Partridge.
Perdix cinerea. Partridge.
Ardea cinerea. Heron.
**Ardetta minuta.* Little Bittern.
Scolopax rusticola. Woodcock.
Gallinago gallinaria. Common Snipe.
Limnocryptes gallinula. Jack Snipe.
**Phalaropus fulicarius.* Grey Phalarope.
Vanellus cristatus. Lapwing.
Charadrius pluvialis. Golden Plover.
**Œdicnemus scolopax.* Stone Curlew.
Rallus aquaticus. Water Rail.
Crex pratensis. Corn Crake.
**Porzana maruetta.* Spotted Crake.
Gallinula chloropus. Moor-hen.
**Rissa tridactyla.* Kittiwake.
**Mergulus alle.* Little Auk.
Podiceps minor. Little Grebe.
**Procellaria leucorrhoa.* Fork-tailed Petrel.
**Procellaria pelagica.* Storm Petrel.
**Puffinus anglorum.* Manx Shearwater
Mareca Penelope. Widgeon.
Nettium crecca. Teal.
Anas boschas. Wild Duck.

* Occasional visitors driven into the Forest by stress of weather or other circumstances.

SOME OF THE RARER PLANTS OF EPPING FOREST.

Flowering Plants.

(From the Lists of Mr. Walter Reeves and others.)

Myosurus minimus. Mouse-tail.
Ranunculus auricomus. Goldielocks.
Ranunculus sceleratus. Celery-leaved Ranunculus.
Arabis perfoliata. Glabrous Rock-cress.
Senebiera didyma. Lesser Swine's-cress.
Teesdalia nudicaulis. Common Teesdalia.
Dianthus Armeria. Deptford Pink.
Cerastium quaternellum. Erect Mouse-ear Chickweed.
Hypericum humifusum. Trailing St. John's Wort.
Hypericum pulchrum. Slender St. John's Wort.
Hypericum elodes. Marsh St. John's Wort.
Oxalis acetosella. Wood Sorrel.
Potentilla argentea. Hoary Cinquefoil.
**Chrysosplenium alternifolium.* Alternate-leaved Golden Saxifrage.
**Chrysosplenium oppositifolium.* Opposite-leaved Golden Saxifrage.
**Parnassia palustris.* Grass of Parnassus.
**Drosera rotundifolia.* Round-leaved Sundew.
Dipsacus pilosus. Small Teasel.
**Oxycoccos palustre.* Red Cranberry.
**Menyanthes trifoliata.* Buck-bean.
**Utricularia vulgaris.* Bladderwort.
**Anagallis tenella.* Bog Pimpernel.
**Hottonia palustris.* Water Violet.
Viscum album. Mistletoe.

* Bog or marsh plants.

CRYPTOGAMIC PLANTS—The Ferns of Epping Forest.

(From Mr. James English's List.)

Pteris aquilina. Brake Fern.
Lomaria spicant. Hard Fern.
Athyrium Filix-fœmina. Lady Fern.
Scolopendrium vulgare. Hart's-tongue.
**Polystichum aculeatum.* Prickly-shield Fern.
**Polystichum angulare.* Soft Prickly-shield Fern.
Lastrea Filix-mas. Male Fern.
Lastrea spinulosa. Crested-buckler Fern.
Lastrea spinulosa, var. dilitata. Broad-buckler Fern.
**Lastrea Thelypteris.* Marsh-buckler Fern.
**Lastrea Oreopteris.* Mountain-buckler Fern.
Polypodium vulgare. Polypody.

* Species thus marked are supposed to be extinct in the Forest, but are likely to occur again. In addition to those above named, the following species are mentioned in Gibson's "Flora of Essex:"—*Asplenum ruta-muraria* (Wall Rue Spleenwort), *Osmunda regalis* (Osmund Royal), *Ophioglossum vulgatum* (Common Adder's Tongue), &c., &c.

SOME OF THE RARER AND MORE REMARKABLE FUNGI OF EPPING FOREST.

(From Mr. James English's List.)

Agaricus muscarius.
,, *mucidus.*
,, *splendens.*
,, *clavipes.*
,, *dryinus.*
,, *salignus.*
,, *petaloides.*
,, *rodicosus.*
,, *adiposus.*
,, *conissus.*
,, *alnicolor.*
Cortinarius caerulescens.
,, *violaceus.*
,, *decoloratus.*
Hygrophorus chrysodon.
,, *cossus.*
,, *Colemannianus.*
,, *miniatus.*
Lactarius glyciosmus.
,, *volemum.*
Russula virescens.
,, *emetica.*
Cantharellus cibarius.
Marasmius urens.
Lentinus cochleatus.
Panus torulosus.
Boletus piperatus.
Boletus edulis.
,, *satanas.*
,, *luridus.*
Polyporus perennis.
,, *picipes.*
,, *intybaceus.*
,, *giganteus.*
,, *imbricatus.*
Trametes gibbosa.
Hydnum zonatum.
,, *erinaceus.*
,, *cirrhatum.**
Radulum fagineum.
Thelephora multizonata.
,, *clavularis.*
Clavaria fastigiata.
,, *aurea.*
,, *fusiformis.*
,, *pistillaris.*
Gyromitra esculenta.
Helvella crispa.
Leotia lubrica.
Peziza macropus.
,, *onotica.*
,, *aurantia.*
,, *sepulta.*
,, *hemispherica.*

* Believed to be the only British example of this species.

Among the Mosses, &c., found in Epping Forest are *Polytrichum commune, P. juniperum, P. formosum*, and *P. ferum: Mnium hornum: Dicranum scoparium* and *D. heteromallum; Lepidozia reptum: Pottia truncata: Hypnum Schreberi* and *H. cupressiforme*, &c.

J. Jones, Printer, "Woodford Times Office," Woodford.

ESSEX

GEOLOGICAL SECTIONS

ILLUSTRATING THE DEPOSIT OF THE THAMES VALLEY AND ITS AFFLUENTS THE LEA AND THE RODING IN RELATION TO THE GLACIAL DRIFT OF THE ESSEX HEIGHTS

SECTION 1

SECTION 2

SECTION 3

SECTION 4

SECTION 5

A DAY'S ELEPHANT HUNTING IN ESSEX.

BY HENRY WALKER, F.G.S.

(A Lecture delivered May 29th, 1880.)

I.

SOME OLD GAME PRESERVES.

Each old elephant grins with vast amaze,
While rousing him from his marble hearse,
As a world so new and so strange he surveys ;
And doubtless he thinks that since his younger days
Things are strikingly changed for the worse.

WILLIAM CONYBEARE.

IN the rural sports and recreations to which so many happy Londoners now devote their Saturday afternoons, what outcroppings of the lurking instincts and pursuits of savage man might not the eyes of anthropologists detect! Below the sober-looking, scientific guise of the modern London naturalist, who starts at two o'clock on Saturdays from "the smoke and stir of this dim spot," for shining river, lake, or glooming woodland (armed with divers wondrous implements and bags of artful make), how much might, perhaps, be traced of innate and ancestral love of hunting—of reversion to the untamed instincts and delights of savage life! As lambs and kids (so Mr. Darwin tells us) betray their Alpine origin by their fondness for the smallest hillock on which to leap and frisk, so it seems do City denizens, released on Saturdays from artificial life, betray the birthplace of their race by their forms of

recreation. The hunting fields around us in Essex, Middlesex, and Surrey are changed indeed since elephants and aurochs roamed wild along the valley of the Thames; but the hunting impulse still remains. Huge bisons and huger mammoths are now no longer slain between the eyes with the well-aimed flint-stone, as once they were in more arboreal times; but we, the hunters of to-day, still track the giant pachyderms and oxen to their home. In old and well-stocked zoological preserves we well know where to find them, and spoil them, like our ancestors, of horns, and tusks, and teeth, as perchance we shall to-day.

Our trysting place, this Saturday of June, has a name that sounds anachronistic in narratives of mammoth hunting in the valley of the Thames. We meet in Bishopsgate. The railway of these late Post-Pliocene times will take us to these well-stocked zoological preserves of which we speak. Ilford, in Essex (only seven miles from the Royal Exchange), is the spot at which we know our game is likely to be found. But who are we, the hunters, who assemble in such force at this rendezvous in Bishopsgate to day?

A goodly fellowship of London naturalists crowds the railway platform. We meet with veteran geologists as well as amateurs—the fellow-workers once with Buckland, and De la Beche, and Sedgwick—with men

> Who know the birth-rock of each pebble so round,
> And how far its tour has extended,

—men who willingly lend themselves to teach and popularise their fascinating science. How many Londoners are really addicted to exploring the ancient geography of their favourite City and its environs only appears on a great occasion. The discovery of an old deserted bed of the Thames, with elephant and rhinoceros remains; the finding of a chipped flint hatchet, used by our rude Palæolithic forefathers; a new revelation of the Glacial Drift at Finchley; a fresh "section" in the submerged forest-bed of Plumstead or Walthamstow—such incidents bring out the eager host, the old and young alike, in all their glory. Here

they are, at the railway station, at two o'clock on the Saturday next following the discovery. They have sniffed the quarry from afar, and have come in multitudinous array, and with something of the hunter's zest, to stalk the country. Perchance some lingering game may yet be found, now that the ancient lurking-place has been revealed.

The scene on which we are entering this Saturday afternoon is full of forest history and tradition. What more excites the memory of the history-loving Londoner than the mention of the old Essex forests, whose fragments of their former self still linger near our City? Time was when all the Essex county lay within the bounds of a Royal forest—when the "dim and watery woodland" stretched across from Waltham to Colchester and the sea. What giant specimens of the once abundant forest fauna may not still be found in Essex to tell us of the former grandeur of these wild arboreal tracts! These may be the speculations passing in our minds as our train moves out of the station, and carries us into the heart of Bethnal-green, where, from the viaduct, we look down upon the vast acreage of red-tiled housetops that spread before us. But other topics intervene, and we will not lose the talk of our fellow naturalists, each of whom has some discovery or incident of recent rambles to relate. The microscopical brethren of "The Quekett" tell of researches made on Saturday last in Hackney Marshes—of curious polyzoans found in the Canal, of strange-looking "glochidiæ" and other creatures with fearsome names, and of Anacharis (*Babingtonia damnosa!*) choking the brooks. The geologists, too, are full of narrative and anecdote. You hear what places around London are good for field geology—what new gravel pits, railway cuttings, and other excavations have recently been visited, and what fossils from the clay, or sand, or chalk have thus been found. So we soon pass Mile-end Station and find ourselves at Ilford.

Here at Ilford we leave the train, which runs on to Chelmsford and Colchester some sixty passengers the lighter. Ilford itself has something to reward the traveller, who will not look in vain for ancient monuments of man's

device. Here, upon the south side of High-street, is St. Mary's Hospital, an institution of venerable antiquity. We can only stay to hear that the hospital was founded by an Abbess of Barking (*temp.* Stephen) for a prior, a warden, two priests, and thirteen lepers. More, we might learn, but the geologic mind seeks a greater antiquity than this. We leave St. Mary's Hospital to Lord Salisbury, its present warden, and haste to join our fellow-naturalists, who are far in advance on the Barking Road.

The plan of our expedition is now unfolded, and we learn the designs of our leaders. In this Barking Road, we meet Sir Antonio Brady, in whose preserves our game is supposed to lie, and who has hunted the country for years. Sir Antonio kindly brings his carriage for the benefit of the fair huntresses who accompany our party. Perchance a tame elephant or two, with houdahs, and gorgeous caparisons, and swarthy turban-clad riders, are not far off, and will take us to the jungle, or wherever our destination may be. We are well furnished with guides. Besides Sir Antonio, who has tracked a good hundred or more of elephants to their home about Ilford in his time, we have a skilled zoologist from the British Museum, one who well knows the old-world fauna of the Thames Valley and their hiding places.

The word is given by our leaders "To the Uphall Pits on the Barking Road!" To the Uphall Pits on the Barking Road we go. We have time to note the geography of the district. The Barking Road, which runs due north and south, goes down from Ilford towards the Thames, which is about four miles away. The tributary River Roding, at a little distance to our right, runs parallel with the Barking Road. We are on the eastern slope of the Roding Valley.

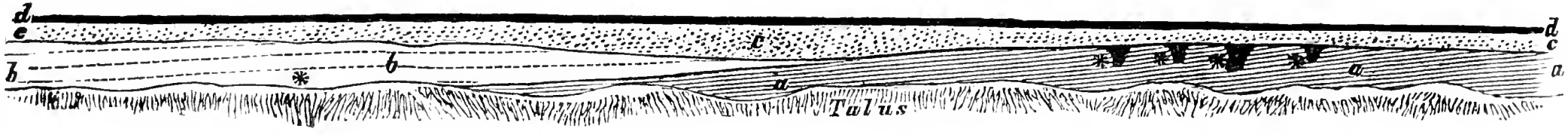
Suddenly, through a narrow hedgerow gap, our leaders disappear. The game must now be close at hand. Following our leaders, we find ourselves all unprepared among the celebrated Uphall elephant-pits. The flats along which we have walked have reminded us of the rice and paddy fields of Ceylon, but another vegetation here confronts us. In Indian file we thread our way through ranks of well-

hoed potatoes. Thus we reach the brink of one of the pits. Here, still accompanied by the ladies of our party, we begin to descend to the realms below. We reach the lower *terra firma* by a course of wheelbarrow planks. At length we are all assembled, first to receive instructions from our guides, and then to unearth what game we can for ourselves. It now begins to dawn on the minds of the uninitiated of our party that elephant hunting in Essex, in these modern days, is an underground sport—a recreation restricted to the subterranean world and no longer carried on in the open.

We have now descended from the upper air into the excavated bed of some ancient river or lake. It might be misleading, as will hereafter appear, if we said we were standing in the bed of the ancient Thames. And yet these alluvial precincts of the Roding certainly lie within the great shallow trough of what we now call the Thames Valley—that old, incalculably old, line of drainage which has seen so many and eventful changes in the physical geography of south-eastern England. Enough for the present that this excavation is the inlet to the zoological world beneath. But let us be sceptical and take nothing for granted. We are determined to sift to the bottom the strange stories told of these Ilford pits. If we are really standing in an old river-bed, we may demand to see some trace of the various organic remains which a river is always depositing with its sediment. We know that the Thames of to-day is always embedding in its mud some specimens of the aquatic or terrestrial life of the period—the shell-fish that live and die in its waters, and the land animals that are constantly, by accident or design, borne down in the stream. As in some future deserted bed of the Thames, milleniums hence, the fauna of to-day may be disembedded by the Saturday afternoon naturalists of the period, so we, in this Ilford excursion, should expect to discover in the earth around us some relics of the ancient Thames Valley, deposited milleniums ago.

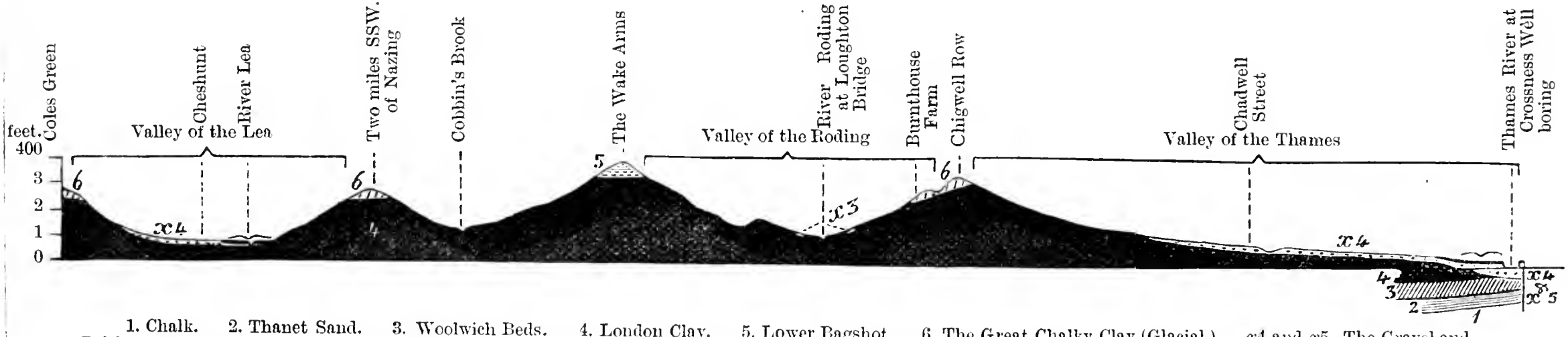
This then is what we see as we stand down below in the pit looking up to the daylight. A perpendicular face of the

Section 6.—SECTION EXHIBITED BY THE UPHALL ELEPHANT PIT, ILFORD, (West Side, parallel with River Roding). DRAWN BY MR. SEARLES V. WOOD, JUN., F.G.S.



a. Clayey Brick-earth, with *Cyrena fluminalis* and other freshwater mollusca, underlaid by sandy gravel ("hoggin" of the workmen.)
b. Bright yellow sand, with *Cyrena fluminalis*, and in which, at the point marked by the asterisk on the left hand, occurred the elephant remains found in 1863. (GEOL. MAG., Vol. I., p. 242). The black pot holes, marked by asterisks on the right of the section, are due to the denudation of *a*. and *b*. prior to their unconformable overspread by *c*.
c. Newer gravel.
d. Humus, etc.

Section 7.—GENERAL SECTION TO SHOW THE POSITION OF THE THAMES VALLEY BEDS RELATIVELY TO THE GLACIAL BEDS OF THE MIDDLESEX AND ESSEX HEIGHTS. DRAWN BY MR. SEARLES V. WOOD, JUN., F.G.S.



1. Chalk. 2. Thanet Sand. 3. Woolwich Beds. 4. London Clay. 5. Lower Bagshot. 6. The Great Chalky Clay (Glacial.) *x*4 and *x*5. The Gravel and Brick-earth of the Thames and Lea Valleys, with which are associated the beds *a*, *b*, and *c*, of Section 2. *x*3. Gravels of the Roding Valley. — Alluvium

river-bed rises before us some seventeen feet in height. Running from right to left until they disappear in the unexcavated ground, and pass away beneath modern Ilford, are horizontal bands of different coloured earths. These successive layers of loam and sand and gravel (says our guide) represent successive changes in the sediments brought down by the old and now vanished river which once flowed over the spot. In fact, we here have a lesson as to *how land is made*. Beginning at the base, there is a clayey earth, containing freshwater shells. Then comes a bright yellow sand: this too contains river shells. Above this comes gravel.

The spot is romantic with the dust of ancient zoological races. It is classic in the records of geological research. It was in this very layer of bright yellow sand that the first perfect skull of the British mammoth (*Elephas primigenius*) was found in the year 1863, to the intense interest of the geologic public. It was discovered by the workmen about fifteen feet below the surface. The cranium was nearly entire, the upper portion of the left side alone being slightly injured from the blow of a pick or a spade when the workmen unconsciously came near it. Associated with it were remains of the fleece-clad rhinoceros, great fossil ox, and numerous freshwater shells. Luckily, Sir Antonio Brady was then, as now, close at hand to assist in the difficult and hazardous process of extricating the remains in good condition. The tusk of the mammoth measured eight feet eight inches, from the point to the insertion into the socket. From that time to this remains have been unearthed year by year, and this Uphall Brickfield has thus become celebrated for its fossil relics of wild and wondrous denizens of the early Thames Valley. Not only were fleece-clad elephants and rhinoceroses found here, telling, perhaps, of an Arctic climate in these latitudes; side by side with them, strange to say, have been found the African hippopotamus and elephant—animals of a southern and subtropical clime. What could this mean? Why this astonishing assemblage of animals from diverse climates mingled in one common grave? We shall shortly see.

But all this time the amateurs of our party are getting eager for the sport. Enough of geology. What came they out for to see, but an elephant or rhinoceros dug up entire! They have read the wondrous story of the Tungoosian fisherman and the mammoth on the shores of the icy Lena; they have come prepared to assist at a similar scene. They are on tiptoe to carry home some tusk or gigantic tooth as a trophy of the eventful day. But our cool and wary leaders are choosing their time. Before we begin to make search for ourselves, it is well we should understand the conditions of fossil-finding at Ilford, at least as regards the larger *feræ naturæ* of the district.

There is a "close time" for the game at Ilford as elsewhere. In other words, the work of excavation in these pits only goes on at a certain period of the year. In the spring the ground is opened for the purpose of removing the earth, which in the autumn is to be made into bricks. It is then that important zoological discoveries are generally made. In digging out the clay, the workmen come across the fossil remains of elephants, rhinoceros, deer, and other animals mostly of extinct species. These remains are found in nearly every instance scattered over one particular floor on which the great mass of tenacious brick-earth is deposited. The perpendicular section made by the workmen presents the appearance of a wall some twenty feet high, often composed of layers of flat earth, deposited in horizontal lines. Immediately above and about the spot where these animal remains are found, the earth is denser and richer in colour, and is generally arranged in a kind of mound of some feet in thickness. The men are so well acquainted with the indications which tell of the proximity of bones that there is little danger of their destroying the fossils in digging. The principal indication is a kind of fine silver-sand, which is found powdered over the spot, and which crumbles down more readily than the soil above it. The last excavation took place some six weeks ago, and then Sir Antonio was fortunate enough to secure five perfect skulls of the great fossil ox, *Bos primigenius* (the contemporary of the British mammoth), with horn-cores complete.

As no excavations are proceeding to-day (for the workmen are enjoying their Saturday half-holiday), any fossils that we may obtain must be got from the walls of the pit, or the floor beneath us. These relics will not perhaps be of a rare and startling character; but they will, nevertheless, be genuine. Here are some to begin with. Projecting from the wall of ferruginous, finely-laminated, bright-coloured sand is a layer of shells. We all swarm to the spot, ladies included. Hammers, chisels, and "jemmies" are suddenly produced from even the most harmless-looking members of our party, and we are speedily at work as if prising open one of Nature's strong boxes to the tune of—

Hail to the hammer of science profound!
Flint-stone and rock
Quail at its shock,
And their fragments fly as the sparks around.

The fossil dead that so long have slept,
And seen world after world into ruin swept,*
Start at the sound
Of its fearful rebound.

The fossils before us need but little force to compel them to quit their sandy matrix. They prove to be the shells of the little bivalve *Cyrena fluminalis*. They are very brittle, and perhaps to some eyes they may appear somewhat insignificant as trophies of the celebrated elephant bed at Ilford. But they are genuine relics of the ancient zoology of the old Thames Valley—as genuine as the British pachy-

* Alas! for the good old cataclysmic geology, so regnant once in the spectral kingdom of Diluvia and Nightmare, and even in the verses of the period. (See Dr. Daubeny's excellent collection of "Fugitive Poems," Parker & Co., 1869.) It is curious in these more degenerate and pitiful days to see how complacently the catastrophists looked upon the pre-Adamite earth as a periodic slaughter-house on a grand scale. How ruthlessly were successive creations put an end to under that malefic theodicy! Direness was once as familiar to the slaughterous thoughts of the British geologist as it still seems to be to our Continental brethren. And yet every virtuous catastrophist would see in a familiar quotation from Horace at once a prophecy and a rule of conduct in case such a crash should come in his own time:

"Si fractus illabatur orbis
Impavidum ferient ruinæ."

derms and deer that have been excavated from the same spot. These identical mollusks, remember, were the contemporaries of the mammoth in Britain! They lived in the waters which the mammoth frequented, as they have since shared his grave for thousands of years. We will consign these precious little relics to the small chip boxes we carry with us for the purpose, and will label them at home with name and place of discovery.

This fresh-water mollusk, *Cyrena fluminalis*, has never been known in British rivers within the historical period. It is now to be found in the more tepid waters of the Nile, whither it must have retreated ages ago, when physical changes of great importance to the biological world began to take place in Britain. It is also to be found in certain streams of central Asia. The visitor to the Uphall pits at Ilford will have no difficulty in securing specimens of *Cyrena fluminalis* for his cabinet. The layer which crops out from the wall on all sides as we stand in the pit is suggestive of a large colony of happy mollusks who found here a good feeding-ground in olden time. A further examination shows that some of them were drifted here in the *post-mortem* stage of their history. The geologist will find shells of *Unio* and *Anodon* as well as of *Cyrena* at Ilford. And he may find land shells (also of the mammoth period), as well as the fresh-water shells we have mentioned. The pretty helix of the woods (*Helix nemoralis*), known to Saturday afternoon ramblers in Epping Forest, is sometimes found in these elephant beds at Ilford with colour-bands looking almost as fresh as we may see them in their living descendants in the hedgerows of to-day.

But suddenly an alarm is given. We are not to invade these sacred haunts of ancient life with impunity. The aborigines of the country have been gradually closing in upon us unseen. They now appear, some of gigantic form, looking down upon us exultingly from the brink of the pit. We are fairly caught—outflanked and surrounded by a wily foe. Not an instant is to be lost. With great presence of mind Sir Antonio, our leader, advances with dignified mien to parley with the chief. It is an anxious moment.

Happily, he speedily returns with good news. The natives are not hostile, but amicable. They are inclined to trade and barter. Better than all, their wares consist of the very spoils we are in search of. They carry with them, wrapped in textures of evidently European fabric, some of the enormous stone-like teeth of fossil elephants, and various gigantic bones. A brisk exchange is soon set up. The specie of the Victorian era, strange to say, is current in the land. One of the best of the purchases is the complete lower jaw of a young mammoth, with the tooth in place. (The junior geologists of our party are much impressed when Sir Antonio pronounces upon it in the vernacular of science:—"Left lower ramus of calf mammoth, with third milk molar *in situ*." Indeed, some of the party were seen surreptitiously writing down the mystic words.) The lucky purchaser of this relic of the juvenile Ilford elephants will be fortunate if he get his prize safely home.

Meantime not a few of our party have resumed hunting for themselves. Some of them have unearthed a few trophies—fragments of tusk (genuine ivory) flaked off a fine specimen too deeply imbedded for present extraction; several molar plates of elephants' teeth, horncores of fossil oxen, and teeth of fossil horse. Soon our palæontologist from the British Museum is as busy as our forefather in Eden giving names to the various animals, as each member, joint, or limb is brought before him by the delighted discoverers. In short, it is soon felt even by the most sceptical of the company that Ilford is indeed a great zoological preserve, and must have a wonderful story.

What this story is, and how it involves the story of Essex, and of a still wider region in times long since gone by, we are now to learn.

II.

THE MAMMOTH AND HIS COMPANIONS AT HOME.

"Stay, you imperfect speakers, tell me more."
Macbeth, Act I., Scene iii.

The curious and heterogeneous assemblage of fossil animals found lying together in one common grave in the Valley of the Roding at Ilford might well perplex and bewilder the beholder. Here on the slope of a little tributary to the Thames, within sight of tall chimney-stacks and railways, and within sound of the roar of the million-peopled city, lie side by side the strangely-mingled remains of wild, uncouth creatures of other climates and unknown times. Some of them evidently belong to an obsolete world. Year by year the number has been enriched by fresh discoveries, and even now the mysterious collection may be incomplete.

But it is time we turned our attention to the problems these remains suggest. How shall we begin the enquiries they force upon us? We shall do well in the first place to look a little more closely at the list of the animals themselves, and see into what groups they may possibly be resolved. The following are the species which have so far been identified and named by our palæontologists:—

Mammoth, or Great Hairy Elephant ..	*Elephas primigenius.*
Southern Elephant (straight-tusked) ..	*Elephas antiquus.*
Rhinoceros (fleece-clad, two-horned, stout-limbed)	*Rhinoceros tichorhinus.*
Rhinoceros (small-nosed, one-horned, slender-limbed)	*Rhinoceros leptorhinus.*
Rhinoceros (big-nosed, two-horned, slender-limbed)	*Rhinoceros megarhinus.*
Great Hippopotamus	*Hippopotamus major.*
Wild Horse	*Equus caballus.*
Irish Elk	*Megaceros Hibernicus.*
Stag	*Cervus elaphus.*
Roe	*Cervus capreolus.*

Bison, or Auroch	*Bison priscus.*
Urus	*Bos primigenius.*
Brown Bear	*Ursus arctos.*
Grisly Bear	*Ursus ferox.*
Wolf	*Canis lupus.*
Fox	*Canis vulpes.*
Lion	*Felis leo.*
Beaver	*Castor fiber.*
Water-rat	*Arvicola amphibia.*

Such is the catalogue of animals which have been disinterred during a series of years from these ancient graves at Ilford. What startling questions they raise! What was the climate and what were the surroundings of this their native land—of these now strangely altered landscapes of Essex and South Eastern England, where the hills and vales are now vocal with domestic sheep and oxen, and where only the badger, the beaver, and the otter are left as the largest of the *ferœ naturœ* of these bygone times?

Some of the species found fossil at Ilford still inhabit these islands; others, like the brown bear and the wolf, have lived here in historic times; the fossil bison or auroch of the Essex and Middlesex prairie is hardly distinguishable from the American buffalo of to-day. But what of the stranger forms which figure on the list? What of the northern fleece-clad elephant, the woolly rhinoceros, now vanished from the earth; what of the hippopotamus, the southern elephant, and the lion, which are shown to us to-day only as the captive exotics of the menagerie? How shall we assign to animals of such opposite regions and climes a common area of habitation? Did these creatures really roam wild in natal landscapes in this valley of the Thames? Did they live, move, and have their being amid scenes as orderly as the cosmos of to-day, or shall we assign them, as was done by their earlier discoverers, to a world of confusion and chaos, to the shadowy and horrific Kingdom of Diluvia and Catastrophe?

Our first task, then, is this: *To find in the Essex of to-day some traces of former climatal and geographical conditions under which these animals could have lived.*

THE NORTHERN GROUP OF THE ILFORD ANIMALS.—GLACIAL ESSEX.

Some of the Ilford animals evidently form a Northern and Arctic group. The warmly-clad mammoth, or woolly elephant, the fleecy rhinoceros, and the brown bear may be taken as examples.* If their presence as the native inhabitants of the land denotes, as it undoubtedly does, the reign of a semi-Arctic climate in Essex, where shall we find in the landscapes around us the traces and memorials of an age of snow and ice—of a long-enduring age of glaciers and an all-enveloping ice-sheet, of icebergs and icefloes! The answer, as we shall see, is not far to seek.

The Essex hills and plateaux have lately yielded some strange secrets to the explorer. Time was, and not long ago, when the well-known steep of Muswell Hill in Middlesex, one of the leafy "northern heights of London," stood in solitary and mysterious glamour, the only known monument of the great Glacial Period near our metropolis. But to-day the records of the rocks around us are more plainly read. We need not now leave these homely Essex landscapes to find memorials of the Age of Ice in Britain. They are so near to us as to have been long overlooked for those remoter spots of Glacial Britain where "distance lends enchantment to the view." Let us ascend any of the hills north and south of Epping which reach a height of three hundred feet. We lift a patch of the green turf, and what do we see beneath? The sight is no longer incredible. We look upon the *moraine* of a long-vanished British glacier, lying where it was left ages ago—a *moraine* as real as any that underlie the glaciers of Switzerland and Norway to-day, or the wider-spreading ice-sheet of Greenland. The glacier itself has gone, but here lie its remains, too solid and substantial to disappear with the climate which gave the glacier birth. The strangely commingled wreck and *débris* of rocks, and fossils, and masses of earth brought here from distant areas, are all before us; they stretch for many a mile beneath the grass.

* The musk-ox and the reindeer should also be taken into account, inasmuch as they are found in the Thames Valley, though not at Ilford.

In the pits of the tile-kilns at Epping, in excavations near Woodford, at Theydon Mount, and at many a spot "familiar long but never truly known," the daylight has now been let in upon the long-buried scene. The dried glacial mud, the transported rocks and fossils and masses of earth, may be seen and handled for ourselves. At Epping we find, almost as abundantly as at Finchley, the transported spoils of the Oolitic and Liassic districts of England. We may identify almost to a certainty the morainic accumulations of the land ice which once, stretching from the chalk wolds on the east to the flank of Charnwood Forest on the west, came down the eastern side of England from the mountain districts of the north. We pick up at Epping and Finchley alike, the well-known incurved shells of the *Gryphea*, the curious belemnites, and the hard pebbles and pellets of chalk from the Lincolnshire rocks which were abraded by this ice to furnish materials for our Essex and Middlesex boulder clay.

These solid memorials of a former climate, and of terraqueous arrangements strangely different from those of to-day, are yet only remnants of the once far-spreading phenomena. Nature, as we shall see, has perpetuated on a larger scale her achievements in the Glacial landscapes around us.

RANGE OF THE ESSEX GLACIAL BEDS.

The extent and range of the Great Chalky Boulder Clay, which is to explain for us some of the mysteries of the Ilford elephant pits, has at length been fairly determined both in Essex and elsewhere north of the Thames. North of Epping it extends for many miles in an almost unbroken sheet. From the eastern brow of the Valley of the Lea in this northern area to the mouth of the Chelmer we may travel on foot without once leaving Glacial ground. Beyond the northern borders of Essex we should trace it stretching through the Midland Counties to the chalk wolds of Lincolnshire. As we come southward to the Valley of the Thames, we are introduced to a later chapter in its history. Broken and discontinuous, it becomes still more

patchy; and at length it disappears *where the slope of the valley begins*, and here we meet the records of a later period —records which did not begin until after this great sheet of ice had disappeared in our south-eastern area of Britain.

The memorials of glacial Essex of which we thus get a glimpse on the hill-tops and plateaux take us back to the climate and time of the northern group of the Ilford fossil mammalia. We have got back to the age of the mammoth and woolly rhinoceros. It was a long enduring age in Britain, and marked by many eventful and complex phenomena. But we need only look at the later stage of this incalculably long period, and witness, as it were, the incoming of the more varied fauna with which we find these northern animals associated in the fluviatile graves of the Roding Valley.

BEGINNINGS OF PLEISTOCENE ESSEX.

At the time when the ice thus prevailed, the land—except the summits of the most elevated districts, as the Knockholt Downs, which as we look south from the Essex heights appear projected on the sky-line—was for an untold period of time lost to view beneath the sea. It suffered the slow but sure spoliation and destruction of all vegetable and animal life by that wonderful vicissitude the Great Marine Submergence. Gradually sinking beneath the waters, this part of the land-surface of Pliocene Britain, with its forests and pastures, and all the varied animal life of the period, its river courses and all terrestrial features, became a sea-floor. Here in this submarine condition it was overlaid as the slow years went on with the sediment and drifting waste of the sea, with the dropping *débris* transported from land still above the waters, and with its own looser rocks drifted to lower levels.

As the land sank, and again as it emerged, pebble-beds and gravels we see around us to-day were disturbed and spread over wider areas, gathered in the submarine valleys, and mingled with the mud and sand. The former hills and plains of heath-clad Essex were wasted and

lowered in height, and the contours of the old land-surface defaced and wrecked. Though hidden from sight, submarine England had a history of no little import for the soils of the future land-surface. At length, on rising slowly from the sea, as islands and future continents are rising above the waves to-day, the emerging land appeared with many of its old valleys and river courses choked up with sand and gravel and overspread with the *moraine* of the ice, its bolder mountain ranges and hills worn or effaced, its minor contours obliterated. But the greater watersheds survived the long-protracted waste: they began to resume their functions in the slowly enlarging area of the landscape.

Thus the larger of the ancient river valleys began to be excavated afresh, and so the post-glacial Thames may be an old river valley in part re-excavated, increasing in width and depth as time went on.

The Lea, the Roding, the Thames, belong then to the period which succeeded this great marine submergence. They were the gradual effect of the atmospheric forces which are always at work on a terrestrial surface, sculpturing it with hydrographical contours, and so forming the hills and valleys of the landscape.

But the land rose from an icy sea. The ice, which had covered so large a part of the eastern and north midland counties, retreated to the valleys of the mountain district of the north of our island. East Anglia and Essex emerged first from the waters, for here the submergence was only a few hundred feet. How long the ice of the Chalky Clay had held possession, excluding the return of vegetable and animal life, we know not. Nor do we know how long the land continued to be an island, or a group of islands. It gradually became poorly stocked with the beginnings of vegetable life, with a meagre herbaceous vegetation of mosses and lichens. It was visited sometimes by sea-birds, and in the severer winters by a few Arctic land animals—by lemmings, hares, voles, and foxes, crossing the frozen straits of Dover. It was only by so continuous and persistent a rise of the land as would unite it with the continent

of Europe that a more varied flora and fauna could advance. But that time had not yet arrived. The humbler but not insignificant herbaceous plants were the prevailing vegetation, and then began to flourish the reindeer moss, the branching "cladonia" which has ever since lived on our heaths and commons, reminding us to-day of the British reindeer that in time found its way to the glacial Essex hills.

THE GREAT EUROPASIAN INVASION.

And the time of more habitable conditions did arrive. Gradually the rising land was more and more uncovered by the retreating sea and the northward-shrinking glaciers. Reversions to the old Arctic weather still came on in the winters, but in the summers a giant herbaceous vegetation like that of Siberia established itself. Tall umbellifers, almost rivalling trees in stature during their short life, and coarse but vigorous grasses made an herbaceous forest and feeding ground for the future incoming herds. The land continued to rise: the German Ocean, from which the waters had now retreated northwards to the outlying depths, became a land-valley, and the westward and northward-travelling herbs and shrubs and forest trees gradually took possession. Southward, the valley of the English Channel had been similarly transformed, clothed with forests and open pastures, varied with mountain and ravine, and perhaps chains of lakes. Far on to the coast of Africa, where no Straits of Gibraltar then intervened, the land was continuous from Britain. Favouring climatal conditions were all that was wanted for the animals of the north and south alternately to visit and occupy each other's land. The rivers of the now united countries watered a common land, those of the British area becoming confluent with those of the continent; the fresh-water denizens of the one were no longer shut off by the sea from inhabiting each other's waters.

By this union of England with the Continent, the great physical barrier to the rehabilitation of the long-lost and long-barren land was now removed. Alternations of climate,

from milder temperature back to Lapland rigours, might occur. The higher vegetable forms might be arrested, checked, and in places destroyed, and the adventurous vanguard of the incoming animals starved or driven back, but the land was now open to the great Europasian invasion. The pine, the fir, and the birch, and turf-forming grasses, self-sown and self-advancing, could now invade the land, ousting the weaker herbaceous forms and preparing the country for the "age of elephants" which was soon to set in. In the rigours of winter the musk-ox foraged the land, and the Arctic rodents—the lemmings, the voles, and the hares —were preyed upon by the fox and the glutton, and when berries and roots had failed by the brown bear. The summers began to lengthen, and the spreading pines and firs were at length discovered by the first company of migrant mammoths. The hardy but less gregarious woolly rhinoceros, with its curious nasal horns, was seen in the land. The wide-spreading *moraine* of south-eastern and central England still stretched to the glacier foot on the mountain districts of the Pennine, but in Essex and Middlesex it was now overgrown with forest and prairie, and watered in summer with streams. Across the marshes and through the forests of the former German Ocean, and southward from the future Gaul, the invasion of the great herbivores began. The animals of a more temperate zone succeeded in south-eastern England as the musk sheep retreated northwards. Herds of gigantic bison, uri, and deer, and hosts of rodents came to the newly found feeding-ground. Yet in spite of wolves and lions, the great vegetable feeding mammalia lived and multiplied in the new and congenial home. The mammoth became one of the commonest animals of the Thames Valley; the shed milk teeth of the calf, and the last overworn molar of the patriarch of the herd, are amongst the most abundant fossil remains at Ilford, Grays, Erith, and Crayford. It was the age of the great herbivores, for it was also the age of the yet unrestrained carnivores.* At least two species of wild

* See an interesting lecture by Professor Rolleston on "The Changes roduced by Man in the Indigenous Flora and Fauna of Great

oxen of colossal size were selected and established; the enormous "Irish elk" was supreme among the cervidae of the period, and other giant animals were on their way to these western feeding grounds and fastnesses. The land had recovered from the depopulation, extinction, and wreck of the great submergence, and the glaciation which succeeded. The great Europasian invasion had begun.

THE SOUTHERN AND SUB-TROPICAL ANIMALS.

We have thus far accounted for the presence of the northern and Arctic group of animals found fossil at Ilford. We have seen the remarkable geographical surroundings amid which they lived, and we may see all around us in Essex the surviving memorials of the climate of the mammoth, and the woolly rhinoceros. The problem presented by the southern and sub-tropical fauna still remains to be considered.

This group of the Ilford fauna consists of the lion, two rhinoceroses (the "leptorhine," or small-nosed, and the "megarhine," or big-nosed), the straight-tusked elephant, the hippopotamus, and the little river mollusk, *Cyrena fluminalis*.

Of this strange collection of British Pleistocene mammalia, the *Elephas antiquus* and the two rhinoceroses are now extinct. The hippopotamus, which in Pleistocene times ranged as far as Yorkshire and has been found in valleys near Leeds, is not now found north of the Nile;

Britain" (Glasgow Science Series, 1878-9). At page 15, the lecturer remarks:—"Modern civilisation, by extirpating beasts of prey, has rendered it possible for us to leave herds and flocks of small oxen and sheep out in the open. In times of ancient savagery, in which packs of wolves held their own, none but big animals would be so left. In those times also, the country was not mapped out by 'formal props of restless ownership,' and these wild animals had a much wider range, and having better pasturage grew larger accordingly. It is clear that both causes—the presence of wild carnivora, and the absence of enclosures—must have co-operated in increasing the size of the graminivorous beasts. *Those cattle were large because, if a small bull encountered a pack, however small, of wolves, it was pulled down, and there was an end of its existence, and of the chance which it had of propagating small animals like itself.*"

and *Cyrena fluminalis* seems to-day to be cut off from Europe and Northern Asia by nearly the same barriers as those which confine the great pachydermata. It ranges, at the present day, from the Nile through Syria to the Himalayas and China.

Let us first clearly state what it is we have to explain. The problem is not, How could the musk-ox, mammoth, and reindeer, and the hippopotamus and southern elephant live together in one and the same area during the same year? It is this, How could these animals frequent one and the same area within such a period of time as would account for their being found in a common grave?

Our investigation into the history of the Ilford northern fauna has revealed to us a geographical condition of our country in the Pleistocene period which more than half explains the presence of the sub-tropical species. First, as we have seen, there was in Pleistocene Europe no great physical barrier, such as the modern German Ocean and the English Channel, shutting off England from the Continent. Our land was joined to the Europasian Continent, and even to Africa. Secondly, MAN, although, perhaps, returning to the re-born land, had not yet multiplied into the communities which have since gradually restricted the range of the *feræ naturæ*, reducing their numbers and extirpating whole species.

The migrant tendencies of animals were doubly favoured in this Continental Period of our land's history. The geographical arrangements were, perhaps, the most favourable that can be conceived for enabling animals to visit the extreme limit of their climatal range, and no great human populations yet disputed their possession.

There were doubtless times when, for years in succession, the glaciers had disappeared, the climate was equable, and summer and winter were no longer marked by wide differences of temperature. That these episodes were not of long duration is shown by the mingling together of the bones of hippopotamus and mammoth in the same level of the old river-beds in which they are found fossil to-day. A

very few years of continuously equable climate would have sufficed for the change of *habitat*. How near Essex and Middlesex were to the southern migrants is shown by the presence of the fluviatile Cyrena in the tepid waters of the Thames.*

Such, then, were the geographical conditions and climatal fluctuations in Pleistocene Britain. Familiar as we are with the far different conditions of our country to-day—with the isolation of Britain from the Continent, and the ascendancy of man over the animal world—it is difficult to realise the Britain of this earlier period. Yet this union of England with the Continent, this overlapping in Essex and Middlesex of the range of the Arctic and sub-tropical fauna, exceptional and abnormal as it at first sight appears, may have lasted for a very considerable length of time. It will hardly be doubted by geologists that this continental stage of our country's history far exceeded in

* "When the temperature of the river water was congenial to the Cyrena above mentioned it was also suited to the hippopotamus."—Sir Charles Lyell: "Principles of Geology," 10th edit., vol. 1, page 192. In the year 1863 the author of the "Principles" propounded that interpretation of the zoological phenomena in question which is now generally accepted. It is summed up in the last edition of the "Elements of Geology," for 1871, p. 138: ". . . The apparently conflicting nature of the evidence may be due to the place of our observations being near the boundary line of a northern and southern fauna, either of which may have advanced or receded during comparatively slight or temporary fluctuations of climate." A valuable collection of zoological data in support of this view has been collected by Mr. Boyd Dawkins, and is now published in his "Early Man in Britain," 1880. The stratigraphical evidence is a far different matter, involving more difficult and onerous labours, and when this shall have been completed, and the exact succession of geographical events and climatal phases of the period in question be detailed to us, some very important *lacunæ* in the history of the northern and southern fauna of the old Thames Valley will have been filled up.—[In order to show in a general way the relation of the various beds forming the country around Epping, I have given (see frontispiece) five lines of sections which I have taken from a series kindly lent to me by Mr. Searles V. Wood, Jun. The beds numbered 6 and 8 differ somewhat, *inter se*, (in a way which is beyond the scope of this lecture to describe), but they bear that relation to 7 which their numbers import.]

duration the few thousands of years which make up the poor sum of the so-called historical period.

THE SITE OF THE ILFORD GRAVES.

The kind of hiding-place in which these old British quadrupeds are found deserves to be carefully noted. The site of the Ilford graves will help to tell us in what particular physical areas of our landscapes we may expect to find similar memorials of Pleistocene Britain; they may put us on the track of fresh discoveries.

Let it be noted, then, that these strange relics—these remains of British bison and gigantic deer, of hippopotami, rhinoceroses, and elephants—are found not on the site of the old pastures and forests of Essex, but in the *old watercourses*. How has this happened?

These animals died the death of all wild creatures in a state of nature. Some were slain by the carnivores, and some, in sickness and old age, retired to the silence of the thicket to die. Some died by the watercourses, and some were swept into the river by floods, and were soon entombed in a natural grave. The greater number would die on the land and leave their remains unburied and exposed to natural dissolution and decay. The bones which the hyænas spared would lie bleaching for a few years, and soon perish and disappear from natural decay. Of the skeletons thus exposed, nothing would be left to tell us that these animals ever existed.

How has it happened, then, that this interesting group of Pleistocene mammalia has been so wondrously preserved? The answer is readily given, if we but look at the function of a river valley in the economy of the land surface.

A RIVER VALLEY AS THE HISTORIAN OF THE LANDSCAPE.

Our old river valleys cannot fail to be rich in relics of the physical and zoological history of the countries which they drain. The Thames and its tributaries may well be rich in memorials of the physical and zoological history of south-eastern England. From the time when the present

land-surface arose above the icy waters, and began to be sculptured into water-sheds and river-basins, down to these latest days, such valleys have served as great hiding-places and storehouses for the varied drift of the landscapes which drain into them.

From the deposits of our old rivers we learn the kind of denizens which dwelt on the adjacent snow-clad hills and plains, or among the forests, jungles, swamps, and prairies of mammoth-haunted England. During long and eventful ages, marked by great changes in the climate, zoology, and physical geography of our land, the rivers have entombed and treasured up the drift of the wide terrestrial area around them. They have thus preserved, until future ages, many a relic which would have been left to decay or sudden destruction on the land, had it not been swept by floods to the care and custody of the valley.

In this way the rivers were acting as the chroniclers of physical England long ere human historians appeared. In ages long antecedent to the annals of man, the Thames was storing its valley with that wondrous archæology of Nature which we to-day in weekly rambles are privileged to explore. Through an incalculable long period, marked by changes in the climate and the separation of Britain from the Continent and by the dying out or dispersal of old-world forms of life, the Thames and its tributaries, from the Cotswolds downwards, have been pouring their waters down to the great receiving-drain of the lower Thames Valley. And so to-day we learn from these involuntary chroniclers what strange inhabitants dwelt in this Essex country of ours, fellow-denizens with man, and yet of whom man himself has left no record.

These river graves at Ilford and Grays Thurrock are to the Londoner what the limestone caves of Victoria, Kirkdale, and Torquay are to the inhabitants of Yorkshire and Devonshire. They are a natural museum of the mammoth and rhinoceros period in England. In the valley of the lower Thames, the rocks are not of the limestone texture which elsewhere has been gradually hollowed out into caverns and fissures to serve as sepulchres for our old

British mammalia. In our region of softer rocks, the river valleys perform the preservative and historic functions of the hyæna-dens and bone-caverns of northern and western Britain.

III.

THE CAPTURES.

> Yours, yours are the culpable shoulders
> That bore off our bones from the quarries, to raise
> Amazement and fear when exposed to the gaze
> Of featherless biped beholders.
> —Horatio Smith (Daubeny's *Fugitive Poems*).

Our pursuit of the feral denizens of the Thames Valley this summer Saturday afternoon has been so exciting, that we now find we have unwittingly been led on from familiar tracts of Essex scenery into a new and mysterious geographical region. In vain we seek to recognise the scene before us as belonging to modern or historical England. A new and hitherto unmapped arrangement of land and water stretches far away, and the animal world that dwells around is wonderfully diverse from that we have hitherto seen. We are still, it would seem, in the country of the Thames Valley; but the tame and placid stream which a moment since was winding unseen in the valley below us, full four miles away, suddenly arises before us as a wide and impetuous river, that comes swelling up the shore till its waters lap our feet. With torrential volume it brings down from its inland course the terrestrial spoils of the country it has devastated—the carcasses of mammoths, gigantic deer, and British rhinoceroses, whose fellows are tramping and browsing in these aboriginal woodlands around us. Huge shaggy aurochs and great-horned uri, far-off ancestors of the gigantic oxen that the Romans saw when they first invaded the wooded wilds of uncivilized Europe, are

> Crushing the forest in their race,

and sharing again with the woolly-clad elephant and rhinoceros these gloaming Essex wilds.

Such is the vision we get of the country of the ancient Thames Valley in this our Saturday afternoon ramble at Ilford by descending some twenty feet down into the old and deserted bed of the river on the Essex shore.

But to our story. The great annual elephant-hunt in the Ilford district of the Thames Valley came off about six weeks before our arrival. On that occasion, although no elephants were taken, no less than five head of bison rewarded the prowess of Sir Antonio Brady and his party. These creatures were of a celebrated and historical species. It was the huge shaggy bison, and the great horned urus, we remember, that startled the Roman soldiers when first they penetrated the forests of Germany and Britain. These wild and primitive European cattle were occasionally captured and exhibited alive in the shows of the Roman amphitheatre. They are described by a modern poet, in the well-known lines,—

> Mightiest of all the beasts of chase
> That roam in woody Caledon,
> Crushing the forest in his race,
> The mountain bull comes thundering on.

Sir Antonio may well feel proud to have bagged such rare and notable creatures as these. We who have come down from London to-day can hardly expect to enjoy such sport as this. The gigantic game of the Essex wilds has been thinned by so recent an invasion of these famous geological preserves, and we find ourselves left to unearth the smaller prey that may still be lurking around. But the game which we have so far bagged, humble as it is in its powers of resistance, will at least serve to commemorate an afternoon spent in this wonderful country for the sportsman and naturalist, the old Thames Valley.

So far, then, our afternoon's sport in these old Essex hunting-grounds has not been marked by moving accidents or hair-breadth 'scapes. As yet, no tusky thick-skinned monarch of the herd has charged us through the hedgerows, trumpeting furiously with proboscis aloft, to avenge our intrusion; nor as yet have any of our *cortége* drawn their tulwars ready if needs be to ham-string the monster on his

way. But it is too soon yet to sum up the events of the day. We are still in the region where scores of elephants have been traced by our leader, Sir Antonio, during his residence in Essex, and some wonderful sights and sensations may yet await us.

The signal is given to withdraw from the Uphall field, and to hark back towards Ilford. On the London road, just beyond Ilford, are some game preserves which have been explored with great success in previous years. Towards Ilford, then, we go along the Barking road. The landscape scenery, might we linger to enjoy it, would doubtless charm us with something of idyllic beauty. All around us the peaceful aborigines of Ilford pursue their wonted toil. Their life's employ would seem to be the cartage of manure. This staple industry of modern Ilford engrosses all the rural population. They stack the precious tilth in massive banks along the road, and seem to grudge the narrow embrasure in the long unlovely parapet that leads to many a cottage. Such are the charms of the Ilford country in the month of June. But even here the ancient ivory trade would seem to have survived. Some of the natives, suspending for the moment their virtuous husbandry, make advances to us, and seem inclined for exchange and barter. They show us various articles of the elephant traffic, which seems to form the native wealth of the country. In a few minutes the lower molar tooth of a young elephant has changed hands. The purchaser knows it to be the *lower* molar because the grinding surface is slightly concave, whereas the upper molar is always in the same degree convex. Other ivory ware might perhaps have been offered to us, but the pace of our leaders began rapidly to increase, and we were speedily re-entering Ilford. Here, at Ilford, we find the aborgines assembled at a goat-fair. Goats, it would seem, are the favourite milch-fauna of the district. We push on further, and are able to descry just ahead of us the huntresses of our party. Sir Antonio's carriage is again conveying them to the scene of expected sport. We, the hardier sex, are footing it as we go. The way is longer than we expected, but it is enlivened (as is

usual, we find, in these Saturday afternoon outings) by funny stories—by such stories as hunting naturalists, above all people, seem to love to tell of each other.

Here, on the London Road, just beyond Ilford, is our destination. The game seems to have been driven in at this spot, and surrounded by the hunters, like the shaggy victims of a Norwegian bear-skall, or an Indian elephant-corral. Let us hasten to the spot.

The area to which we are now converging appears to be partly surrounded by a batten fence. The scouts of our party are peering over the pointed staves, and trying to look down into some deep excavation below, as if into a den of wild beasts. Sir Antonio, our leader, with reassuring look, bids us come down without fear into the pit. At length it would seem we are now to be initiated in the mysteries of elephant-hunting in Essex. True, no tame elephants trained for the chase are yet to be seen, or swarthy Eastern riders imported for the day. But let us be patient. A more wonderful venerie than that which is learnt in the jungles of India is now to be taught us. We will let Sir Antonio speak for himself.

This London-road pit, like the Uphall brick-field on the Barking-road, yields to the labourers who work in the ground the bones and teeth of elephant, rhinoceros, and deer. The veritable gates of Hades, leading to a realm of huge old-world forms that once stalked abroad in the upper air in these forests of Essex around us, are these pits in the beds of the ancient Thames Valley. The marvellous story of the finding of these fossil animals, ages after they ceased to exist, and the almost equally marvellous story of the manner in which their almost perished remains are restored, as we see them in public museums to-day, is now related to us in a round unvarnished tale.

As soon as the labourer in the Ilford pits, with pick and shovel and well-trained eye, discovers the signs of organic remains, a messenger is sent to Sir Antonio Brady. Sir Antonio arrives with a skilful assistant, and the work of uncovering the embedded prize is commenced. But the treasure, be it cranium, thigh-bone, or tusk, threatens

rapidly to vanish as soon as exposed to the light. The bones, which have laid here for untold years, have lost their osseous character; they are full of water, and ready to run into a shapeless mass so soon as their matrix is disturbed. How shall they be saved? was a question asked years ago, when the first of these elephant tusks was discovered. It is written in the archives of the time that—

> Doctor Falconer to his aid then called Professor Busk in,
> And, lo! a mass amorphous they found this precious tusk in!

Another Professor (Mr. W. Davies, of the British Museum) soon solved the difficulty; and now, as soon as the skeleton is exposed, a skilful practitioner is ready with a bucket of liquid size. With this preparation the uncovered bones are speedily coated. Evaporation is arrested, and the fossil is temporarily hardened in view of a more permanent dressing. But the more hazardous work sometimes comes after this investment with size (or, perhaps, plaster of Paris). Suppose the fossil in question to be the weighty collar-bone or cranium of the mammoth—the British hairy elephant! The mass to be removed, including a quantity of the surrounding earth, will amount to half-a-ton, or perhaps 12 cwt. How shall it be raised from its bed, full twenty feet down in the earth, and conveyed entire two miles to the museum which Sir Antonio Brady has provided? Here is the solution. A lofty pair of ship's shears is rigged over the spot, ropes and pulleys are soon forthcoming, and a gang of labourers are speedily working with a will to lift some member, joint, or limb of the embedded elephant out of his grave.

We may form some idea from these few facts of the expense so voluntarily assumed by Sir Antonio, as public and honorary trustee of treasures which, without his efforts, would but too likely be lost to the nation for ever. The wages of a gang of labourers who have been "knocked off" the job of digging brick-earth on the spot where the bones have been found, and who are kept waiting for perhaps three days until the prize is ready for removal, are in

themselves no inconsiderable item. Sir Antonio may well assure us that elephant-hunting in Essex is really an expensive hobby.

And now the grander trophies of elephant-hunting in Essex are to reward our eyes, the spectacle of the various skeletons of elephant, rhinoceros, and deer that have thus been excavated from these fields in the Barking and London-road. We take train at Ilford for Stratford. We soon arrive at Sir Antonio Brady's private museum at Stratford-le-Point, which we are kindly invited to inspect. Here is a brief account of some of the sights we were privileged to witness in this wonderful collection of the old-world zoology of the Thames Valley.

The five bisons' crania which were discovered in the Uphill pits are lying upon a table, and are still enclosed in plaster. They have now to be boiled or soaked in a fluid which shall restore to them the gelatine they have lost during the millenniums they have been buried in the bosom of the earth. This is the process which all the bones and tusks undergo to ensure their permanent hardening.

On the shelves around is a startling display of gigantic skulls and monstrous bones—bones such as Samson might have coveted when an ass's jawbone was his only weapon. Here is a mammoth's tusk ten feet in length. The teeth and jaws represent elephants of every age and size, from the sucking calf with his milk molars, to the patriarch of the herd, whose ultimate molars are so worn down as to be almost useless for grinding his food. Professor Owen has seen a mammoth's tooth that measured *one foot seven inches* in length, following the curve from end to end on the convex side!

The characteristic of the Ilford elephants is the number of the plates in the last molars, which has not been found to exceed 19 or 20, as against the 24, and sometimes 28, found in other species. The largest tooth is 10 inches in length. The spectator cannot fail to be struck with the long spiral curves of the tusks of the adult mammoths, as compared with the almost straight tusks of the more familiar species of modern days. Yet in spite of the enormous size

of some of the tusks, the general evidence shows that the Ilford elephants were rather a small race.

The British rhinoceroses of the Thames Valley are represented by eighty-six remains, belonging to three species, each of which is distinguished by the character or absence of the bony nasal septum—viz., *Rhinoceros megarhinus*, *Rhinoceros leptorhinus*, and *Rhinoceros tichorhinus*. The last-named is characterised by a woolly fleece, like its companion the mammoth. The British lion, which recent geology shows to have been no myth, is represented by the lower jaw and a phalanx of the left forefoot. On the Kent side of the river, at Erith and Crayford, some fine canine teeth of the lion have been found; but these are at present in a private collection at Belvedere. In addition, the Brady collection also includes the hippopotamus, which is found at Grays Thurrock, as well as at Ilford. The ruminants, such as the stag, bison, and ox, constitute fully one-half of the collection, numbering more than 500 specimens. There are 7 specimens of the great Irish deer (*Megaceros hibernicus*) and 50 of the red deer. The task of excavating and preserving the Ilford specimens forms a history of itself, and is honourably associated with the name of Mr. William Davies, of the British Museum. The majority of the bones, on being uncovered, were in a most perishable condition, having had all the gelatine dissolved or washed out, which left them in the state of minutely honeycombed mineral skeletons. Hundreds of fragments of a single bone have been restored to their original position by Mr. Davies, and gelatine infused afresh, so that the Brady collection is a marvel of art as well as of nature.

These are some of the conspicuous trophies of elephant-hunting in the Valley of the Thames that Sir Antonio Brady possesses. They have all been obtained from the pits at Ilford. It is fortunate for those who have but little opportunity of hunting elephants for themselves that these astonishing specimens have fallen into skilful, wise, and generous keeping. Their custodian is one who has made them the means of spreading more widely a knowledge of the extinct zoology of the old Thames Valley. The museum

at Stratford has now ceased to be a private collection, and the collection may now be seen in the British Museum. The visitor may there see for himself that "Elephant Hunting in Essex" is something more than a phrase, and is really a pursuit that has made substantial additions to our knowledge of the prehistoric inhabitants of the Thames country.

On the Occurrence of the Great Bustard (*Otis tarda, L.*) and of the Rough-legged Buzzard (*Buteo lagopus, Gm.*), near Chelmsford, during the Winter of 1879.

By R. M. CHRISTY.

(Read February 28th, 1880.)

As Dr. Bree observed in the *Field* a few weeks ago, one hears strange things this winter, and stranger, perhaps, than all else have been the variations of the weather. A year of almost unprecedented meteorological phenomena closed with a month of still greater weather disturbances, not the least remarkable being the excessive frost on the night of December 6th. An account of the meteorology of the year 1879, and its consequences, includes an account of many of the catastrophes and events of that year. It is probably to the vagaries of the weather we must look for an explanation of the unusual fact that during the month of December last a *Great Bustard* was actually shot in our county.

The occurrence of so interesting a bird, and the fact that no minute account of its appearance has hitherto been made public, prompt me to present this note to the members of our County Club, as it seems to me they are the persons who should take most interest in the case. Our rare and distinguished visitor was (of course) *shot*, so that we cannot boast of having received it in a very hospitable manner; and the only reparation we can make is to record the visit, and thus perpetuate its memory.

The facts of the case are as follows:—On the morning of Friday, the 5th of December last, soon after daybreak, Mr. Albert Pertwee (of Woodham Ferrers) was laid up close to Hull Bridge in that parish on the north side, and

under the wall of the River Crouch, for the purpose of shooting wild-fowl. While thus stationed he was surprised to observe a very large bird fly leisurely over the river and then over his head at but a very little height. His gun being loaded with No. 2 shot, he fired and brought it down, although but slightly wounded. At first he had no idea of the name of the bird, but it turned out to be a *Great Bustard*.

For the benefit of those who are not ornithologists I will here make a few remarks on this interesting species. So far as our own country is concerned, the Great Bustard is now almost extinct, the dawn of the present century having seen very nearly the last of it as a resident in these Islands. Indeed, one might say that it was even then quite extinct. Those stray specimens that have been met with during the last eighty years or so have been birds driven by accident or stress of weather from the Continent, where, under more favourable conditions of existence, it is still no very great rarity. During the last and the preceding centuries it might even have been called a common bird, especially on the wide open downs in Wiltshire and Sussex, and various places in Norfolk. In Gilbert White's time it was probably not a bird of every-day occurrence, for he says under date 1770: "There be bustards on the wide Downs near Brighthelmstone." A quaint and primitive natural history work which I possess* speaks of it occurring in the places mentioned, and also on Royston and Newmarket Heaths in Cambridgeshire, but admits that it was once far more common in England. The book contains a fairly good figure of the bird. I will quote a few lines describing the mode of taking them then employed:—

"Where there are neither woods nor hedges to screen the sportsman, they enjoy a kind of indolent security. . . . But though they cannot be reached by a fowling-piece, they are sometimes run down by greyhounds. Being voracious and greedy, they often sacrifice their safety to

* "The Naturalist's Pocket Magazine, or Compleat Cabinet of Nature." London, 1799 and 1800.

their appetites; and as they are generally very fat, they are unable to fly without much preparation: when, therefore, the greyhounds come within a certain distance, the bustards run off, clap their wings, and endeavour to gather under them air enough to rise; in the meantime the dogs are continually gaining ground, till at last it is too late for flight. However, notwithstanding the sluggishness of their usual pace, they can, when in danger, run very fast, and once fairly on the wing are able to fly several miles without resting." There is a gentleman here at Chelmsford whose grandfather, then resident in Norfolk, used to keep greyhounds for the purpose of coursing bustards.

The pages of the *Zoologist* have recorded a few specimens from time to time, but in rapidly decreasing numbers, and, if I remember rightly, there have been no records for several years. This will show the interest attaching in a visit once more from the Great Bustard, and perhaps justify a rather lengthy notice of it.

The Essex specimen was brought by its owner, on the day of its death, to Chelmsford Market, and deposited for a time with our local bird-stuffer. Here it was fortunately not destined long to remain. Mr. Pertwee, who valued it but slightly, not being a naturalist, after some hesitation parted with it to my friend Mr. C. Smoothy, of Bexfields, Galleywood, near Chelmsford—a very good ornithologist and an amateur taxidermist of more than average pretensions—to whose already extensive collection of rare birds, all preserved by his own hands, it forms a grand addition. It is a matter for congratulation that instead of being roasted like a turkey by some ignorant nineteenth-century heathen, it has passed into the hands of a person knowing so well how to appreciate it as Mr. Smoothy, who would, I know, be very pleased to show it to any member feeling interested enough to call upon him. There seems to be some doubt as to whether it is a young male or a female bird, but probably it is the latter. Whether this is the case or no, it has not the imposing size and conspicuous beard of the adult male, and only weighed about ten pounds; the average weight of the male being twenty-five

pounds. Its total length was about 3 feet 9 inches, and the utmost expanse of its wings exceeded seven feet.

So far as I am aware, there is no distinct and authentic record of the occurrence of the Great Bustard in Essex; but Mr. Smoothy recollects being told, many years ago, by a very aged farm-labourer, that he had once known of a nest here; and there is a hamlet called *Bustard Green* not far from Dunmow. Yarrell, too, mentions an advertisement in the *Spectator* for 1712, where an estate is to be let at Heydon, near Saffron Walden, with "woods of large timber where there is all game, even to the pheasant and bustard." The probability is that in its time the bustard was not a very rare bird here; but I should not imagine that it was ever abundant. Our county has not now, nor has it had for a very long time past, those large open and uncultivated tracts of land which form the strongholds of this species.

A report reached Mr. Smoothy that Mr. Wiseman, of Paglesham, had a bustard lately killed there, but on investigation it turned out to be a continental specimen.

The interest, however, does not cease with our specimen, for it appears that, early this winter, several were seen in the Channel Islands; and, I believe, on the very same day the Woodham specimen was killed one was observed in Cornwall, and some days later was caught by a dog, but it turned out to be a very weak bird, bearing old wounds.

I do not pretend to have wisdom sufficient to explain the fact of the occurrence of the Great Bustard once more in this country; but if my opinion were asked, I should say the only reasonable supposition is that the weather in France, which was sharper even than with us in this country, disturbed and drove them to seek refuge elsewhere, and that a few wandered to our shores.*

* I have heard of the occurrence of another bustard, not actually in Essex, but just over the county border, at West Wickham, in Cambridgeshire. This bird, during the first days of last February, frequented a large turnip-field on the farm of Mr. William Jonas, who made several ineffectual attempts to shoot it. It was, however

There is yet another rare bird of which I may give a notice, but only a brief one at this time: it is the Rough-legged Buzzard, which was shot by Mr. David Christy, of Patching Hall, near Chelmsford, on December 19th, 1879.

The bird first appeared about the beginning of the month, and from that time forward was constantly seen frequenting the meadows and fields by the side of the river belonging to the Patching Hall and Gutter's Farms, Broomfield, but I was not successful in getting a sight of it. Considering that a bird equalling it in size is but seldom seen here, I do not think it was very frequently noticed, although it seemed to keep to this one spot, and I did not hear of its being seen elsewhere. On one occasion it was fired at, but not hurt, by a relative of mine, as it was hunting a wild duck he had wounded.

During the severe frost about the above date, the ring-doves, being pressed for food, were doing great damage to the cabbages and *rabi*, and more than once the buzzard was observed perched on the same tree with a number of these birds—indeed, it was its acquaintance with them that brought about its death, for on the morning it was killed my uncle had gone out early to shoot ringdoves, and had scarcely put down a couple of decoy birds and secreted himself in his hut before the Buzzard came and perched over his head.

On dissection, I found it to be a female bird, with nothing in its stomach, probably accounted for by the early hour of the day at which it was shot. That it had, in some way or other, contrived to live uncommonly well was beyond all doubt, for I do not ever remember opening any bird having about it such a quantity of fat.

at last shot, on the 6th of February, 1880, by his foreman. I have had the pleasure of examining this specimen also, and find that both in size and colouring it almost precisely resembles Mr. Smoothy's bird, but is not quite so brightly marked. The flesh of this one was found to be very palatable by our worthy member Mr. Travis, but that of the Woodham bird was thought but lightly of. I may add that Mr. Travis says that he still knows a very aged man at Saffron Walden who can remember seeing bustards sitting on their nests on Newmarket Heath.

Its bill was of a dark brown colour, cere, legs and toes bright yellow, irides yellowish brown. The head, neck, back, and breast were of a very light colour, indeed almost white, with the exception of a streak of brown down the centre of each feather, and that part of the breast about and between the legs, which was of a very dark brown. The outer primaries were also of this latter colour, but the rest lighter in hue.

All of us will doubtless feel some regret that rare and interesting birds should be shot down almost as soon as seen; but it would be hard to dispute the statement that England is not now in a condition long to support such large birds as the Bustard in a wild state, and we must confess that the ornithologist, with gun in hand, would be sorely tempted to secure such a prize when within reach.

R. M. C.

Chelmsford, February 14*th*, 1880.

Note on an Abnormal Form of *Cardamine pratensis*, L., observed near Chelmsford.

By JOHN GIBBS.

(*Read March* 20*th*, 1880.)

It was in 1859, twenty-one years ago, that I found in a field in the parish of Widford, within two miles of Chelmsford, some plants of *Cardamine pratensis*, of which the flowers were peculiar, inasmuch as the pistil protruded above the stamens, and, after the other parts of the flower were fallen, was raised upon a lengthening stalk and swelled into the bud of a second flower, instead of becoming a pod containing seed. A specimen of this curious variety of a well-known plant I gave to my friend Mr.

D. Wheeler, to whose kind assistance about that time I am much indebted for the knowledge I possess of plants indigenous to this neighbourhood. That gentleman forwarded a specimen to Professor Lindley, who expressed much interest in it, and wrote a paragraph on the subject in the *Gardener's Chronicle*. Plants of the same abnormal character appeared more abundantly in the same place in 1860; and every year afterwards some might be found. In 1863 Mr. A. Irvine noticed it in the *Phytologist*, having received a specimen from me. In 1870 I sent a specimen to Dr. Hooker, who, in acknowledging its receipt, said that he had seen the same variety both in England and Scotland, and that it was described in Dr. Masters' "Vegetable Teratology." There is, however, some difference between the plant described therein and the form I now notice, in that my plant has a perfectly double flower contained within the valves of the ovary as a calyx, showing a multiplication of petals, as in a double stock or wallflower, but no stamens. The stamens of the original flower, out of which the second one proceeds, commonly appear in due order, but sometimes they are rather petaloid. Thus for more than twenty years, and possibly much longer, has this variety retained its abnormal character as faithfully as if it were that of a species. The year before last I transferred a plant of it to my garden, where it became quite at home and flowered well last spring. In vegetative growth it also showed that reproductive energy which is often found in plants with double flowers incapable of yielding seed. Not only did the flowering stem give origin to branches which, being laid down on the ground, became separate young plants, flowering last spring; but in the autumn the larger leaves which lay upon the ground sent out roots at the bases of their leaflets, while tiny leaves arose above, so as to form young plants capable of independent growth before the leaflets upon which they grew had lost their living green colour. A plant which in such a winter as we have just passed through could live and increase thus may be regarded as very susceptible of cultivation, for which its native beauty and the scientific

interest attaching to its abnormal form would recommend it. The common English name of the species given in the Floras is "*Lady's Smock*;" but the country people of this neighbourhood, especially the children, call it "*Milkmaid*." This abnormal form, growing as it does by nature in the parish of Widford, may therefore well be introduced to cultivation as the "*Widford Milkmaid*."

J. G.

Feb. 19*th*, 1880.

[In a letter Mr. Gibbs adds—"I have confined myself in the paper to a bare statement of facts, without indulging in the many reflections suggested by them, as to the origin of the form, its analogy with other abnormal flowers of the same natural order, &c. The fact of its growing in the neighbourhood of Chelmsford, within a short distance of the London road, without being noticed by anyone but myself, may encourage us to expect large results from an organized exploration of the several parishes of Essex in search of natural wonders." On the 15th of May last we, in company with our President, had, under the guidance of Mr. Gibbs, the pleasure of seeing the plant growing in its native habitat. It was still flourishing somewhat luxuriantly, and the case appears to be well worthy of careful consideration.—Ed.]

Natural History Notes.

By R. M. CHRISTY.

I.

(*Read March* 20*th*, 1880.)

On the morning of the 17th ultimo a rather curious occurrence took place here, Chignall near Chelmsford. A rat and a weasel (*Mustela vulgaris*, L.) were caught *together* in the *same trap*, which was set under a barley-stack. On the trap being taken up, the weasel quickly struggled itself free, but the rat was securely held and killed. The trap was set again at the same place, and later in the day the weasel had the boldness to cross it again, but was imme-

diately killed by the springing of the trap. I never remember having heard before of a similar incident, but in all probability the weasel was hunting the rat at the time they were both caught. Although ignorant keepers ruthlessly slaughter these animals, there can be no doubt, from the frequency with which they, as well as stoats, are found when corn stacks are thrashed out, that they do considerable service in destroying rats.

This unusually cold winter has caused not a few of our stoats (*Mustela erminea*, L.) to turn *white*, which is, I believe, not a common phenomenon so far south as Essex. Mr. Smoothy, of Galleywood, saw a pure white one on his farm about a month ago; and the local bird-stuffer has one in his shop very nearly so. On the 4th instant a stoat, mainly white, was put out of a barley stack that was being thrashed at Chignell Hall; and a man told me that he saw this particular animal catch and kill a rat there only a day or two before. Three days later another of our men saw one in a field near our house; he described it as being pure white without a spot. He is a somewhat aged man, and appeared to be very pleased at his observation, saying that, although he had seen such a case before, it was a long time ago.

R. M. C.

Feb. 14*th*, 1880.

II.

(*Read June* 26*th*, 1880.)

The question, How do wild ducks, moorhens and other such birds introduce their young to the water, when their nests are placed on a tree? is one that has been often discussed, but, I think, never satisfactorily settled.

I have lately been fortunate enough to discover in this neighbourhood two nests, one a wild duck's and the other a moorhen's nest, both placed on trees at a considerable height from the ground. The latter of these contained, when I first found it, nine eggs very hard sat upon, and

was placed at the height of eleven feet above the ground in a hollow formed by the branching out of the bough of a large elm-tree, standing beside a muddy stream in Lord Braybrooke's Park at Audley End. Thinking this a favourable opportunity to observe the manner in which the young would come down, I made many visits to the nest, keeping a sharp look-out for the hatching of the eggs, and frequently saw the old bird leave the nest, although on the first occasion she sat very close, and only left when I accidentally struck the tree with my stick, after having been some minutes below it. The nest was not over the water by five or six feet, and was just visible from the ground. I first discovered it on the 12th instant, and visiting it about seven o'clock on the evening of the 18th, I found that there were five young hatched in the nest and two rotten eggs. I had no sooner got up than one young one, apparently in a fright, rushed to the edge of the nest, took a header, and perished at the bottom of the tree. I directly went home and, returning with a pair of field-glasses, I secreted myself as near to the nest as possible, and watched. One old bird very soon appeared and swam about just below the tree, making a chuckling noise, seemingly as a signal, for the other bird was then seen. Both continued for some time alternately to swim in the stream and walk about at the foot of the tree as though they had nothing particular to do. During all this while the four young left had been keeping up an incessant chirping, and presently I saw something fall, which I had no doubt was one of them. At first the old birds did not appear to notice this; but soon one went to the place, and I could just see the white of its tail above the edge of a hollow in the ground, in which it seemed to be doing something. Having thus watched until it began to get dark, I went up to the tree, and at the bottom found the young one I had seen fall, lying nearly dead; those left in the nest had stopped squealing and appeared to be so weak that they were unable to hold up their heads. I therefore brought one down carefully as an experiment, and set it beside the water, the old birds clucking loudly at

some distance away. Next morning I again visited the nest before six o'clock, and found all the young ones quite dead. The result surprised me considerably; it seemed to be a failure altogether of the bird's sense—a case of complete mistake. The bird built her nest in a place from which she had no power, or at least made no attempt, to remove her young to the water, and all died in consequence.

R. M. C.

Saffron Walden, May 24th, 1880.

III.

(*Read June 26th,* 1880.)

I SEND herewith, for exhibition at the next meeting, a curious object, which Mr. Travis gave me a week or more ago. A lump of mud, such as it is, does not in a usual way carry much interest along with it; but I venture to think that this case will prove an exception. This strange lump of mud is the work of a Nuthatch (*Sitta cæsia*), and had it been used to partly close the mouth of the bird's nesting-hole, there would have been nothing unusual about it; but its history is different. It was found a year or two ago in Audley End Park, close to a place where I now know of a nuthatch's nest in which young are being reared. When found it occupied the centre of an old thrush's nest placed out on one of the branches of a large yew tree. The thrush's nest has been now removed, but its lining of rotten wood, &c., still remains adhering to the mud, which, it will be seen, is harder than many a brick, and I notice a specimen of *Clausilia rugosa* sticking in it.

The question arises, What could have induced the birds to fill the old thrush's nest with this earthy structure? It could not have been for nesting purposes; for although the hole in the centre is quite as large as that left by nuthatches in any nest I have seen, yet in the position it was

placed in the thrush's nest, the bottom of the latter would have rendered it impossible for the nuthatch to get inside, much less to set on eggs there.

I shall be glad to hear any explanation of the circumstance, as I confess myself much puzzled with it.

R. M. C.

Saffron Walden, May 24th, 1880.

IV.

(*Read June 26th*, 1880.)

Notes as to the health and condition of the various creatures which in a way are under our charge as members of the County Club should at all times be welcome at our meetings. I am sorry to report that I lately procured a fine trout thickly covered with the disease which, when occurring on salmon, is called "*fungus*," and which has lately been working great havoc with that fish in some of the rivers in the north of England. This specimen I first noticed on the 23rd of March last, and resolved, after seeing its state, to remove it. This was in the brook Cann, which runs past our house at Chignal St. James, where there are a few nice fish, but they do not seem to increase much in numbers. It was very sluggish, and would only move a short distance on being frightened. After several ineffectual attempts to obtain it, I at last fired at the fish in a shallow place and killed it stone dead. It must have been by the concussion, however, as not a shot actually touched the fish. It was a very fine specimen, 19½ inches long and weighing 2lbs. 10oz., and very much covered with fungus, of a dirty white colour; at least the half of its entire surface being affected. It was on the back principally, and the dorsal fin in particular. Not being a great angler, I do not possess much knowledge of the salmon disease, but thinking it at any rate to be something new for the disease to attack trout, and that in a little country brook, unpolluted by manufactories and

stopped by no mills, I forwarded my fish to Mr. Buckland for examination. He replied that it was a very handsome trout, evidently recovering from spawning, and covered with a fungoid growth which in external appearance at any rate resembled the salmon disease. He said that the case would be of importance when considering the whole subject of the disease.

It is, of course, possible the plague may disappear, and it is to be hoped at least that it will not spread in the county; but I think it well to send this note to inform members that the disease has been noticed in Essex.

R. M. C.

May 24th, 1880.

Two Notes on the Preservation of Plants with their Natural Colours and Forms.

By JAMES ENGLISH.

I.

(*Read April 24th*, 1880.)

I have been seeking for some simple method for preserving specimens of our wild flowers, with their natural colours better shown than in ordinary herbarium examples. The idea is by no means new. I have seen specimens for ornamental purposes with the colours beautifully retained, but the plants very much reduced in size. The process I suggest is still very imperfect, but I bring it before the Society in the hope that those interested in the subject may aid to develop and improve it, thereby helping, perhaps, to establish a permanent and useful method. At present my plan is as follows:—

1st.—For entire plants, or separate leaves with only green colouration, immerse in a bath of *petroleum*, from *one* to *four* hours, the best time varying according to the delicacy and texture of the plant; drain on absorbent

paper; press in the usual way, shifting if necessary until dry. Before mounting, place the specimens between papers on a board, and "iron" with a moderately warm laundry iron to drive off the superfluous petroleum. Keep under pressure until cool, and then mount for the herbarium in the usual way.

2nd.—In endeavouring to preserve colours, some strange anomalies are observed. Two flowers from different species, but apparently identical in colour, do not show the same result. This is a point most deserving of attention. The yellow and purple Pansies I exhibit were dried in the press, "ironed" with a warm iron, immersed in petroleum, pressed and "ironed" again. On the other hand, the specimens of *Crocus* were immersed at once in the petroleum. The difference in the results is very noticeable.

Of course time alone can test the permanency of the colours; but should any of our members think the process worth a trial, I shall be very pleased to hear from them, and exchange ideas on the subject.

J. E.

April 24th, 1880.

II.

(*Read September 25th*, 1880.)

At the April meeting I introduced the subject of preserving plants with their natural colours by using petroleum. I soon found it to be a question whether petroleum alone gave sufficient residue on evaporation to effect the purpose in view. I tried various methods to remedy this defect, by adding gum resins, solid paraffin, and other substances, but with no good result. It would be useless to enumerate the failures I have experienced since I took the subject in hand. I worked on smoothly for some time, until new flowers came into blossom, such as *Galium*, *Melampyrum*. These plants, in drying, became quite black, and I was obliged to make further trials.

I then tried petroleum last (*i.e.*, after pressing) instead of first. I found that some kinds of foliage did best in the latter way, but flowers were most successfully dried first, the petroleum being afterwards applied. This I found to be the case almost by accident. I had laid some flowers in the sun; of course they soon shrivelled and dried up, but I was surprised with the brilliant colours they retained. It occurred to me that heat and a powerful absorbent of moisture might be successfully tried. I took ordinary plaster-of-Paris, warmed to about 90 or 100 degrees (F.), and embedded the fresh flowers in it, shaking the plaster carefully down on the plants. This plan answered admirably. Small plants were preserved in less than twelve hours; larger species took longer in proportion to the amount of moisture in their tissues. When taken out of the plaster the plants presented a very dusty appearance, and if left in it too long they became somewhat brittle, but on being laid aside in the air for a time they soon relaxed. They were then brushed with a camel's-hair pencil, and petroleum carefully applied with a brush. Such is the history of the specimens now exhibited, showing well the natural form and colour. Reds and purplish-reds, however, came out too purple. I overcame this difficulty at last by immersing the dried plants in the vapour of hydrochloric acid. About a teaspoonful of acid is put into a wide-mouthed bottle or glass cylinder, and the plants suspended by the stalks, so as not actually to touch the liquid acid; when the proper shade of colour appears they must be quickly removed.

Plants thus dried can be pressed as usual for the herbarium sheets, or exhibited in cabinets, like collections of insects, and would probably be found extremely useful for educational purposes. Some of the more rigid plants can be mounted under glass shades, and they then have a very pleasing appearance, but exposure to the light is very likely to fade them.

It may be well to add that, about three weeks since, a gentleman (an artist) called upon me. He had been travelling in North America, and when in New York he was

shown some flowers preserved by a new process. The method was very similar to mine, but in place of plaster sifted lime was employed, and petroleum was not used. I have tried lime, but I think it will prove to be too caustic, and it is difficult to rid the plant of the dust. However, I think it would be well to give it another trial, and perhaps it may be worth while experimenting with mixtures of lime and plaster.

Mr. Saward has been following me in the same direction, and has helped me in working out the process with equally good results, as his specimens will prove.

J. E.

September 25*th*, 1880.

Forest Animals.

By J. E. HARTING, F.L.S., F.Z.S., &c.

(*A Lecture delivered to the Club November* 10*th*, 1880.)

A modern writer, whose felicitous descriptions of rural life have latterly become familiar to us—I refer to the author of "Wild Life in a Southern County"—has remarked that "one might begin to write a book about a hedgerow when a boy, and find it incomplete in old age." What would he say of a forest? Whatever his reply might be, it is obvious that, in the limited time at my disposal this evening, it would be impossible for me to furnish anything like a complete account of all that may be seen in a forest by those who know how to observe. Were time of no importance, I might give you some description of the former situation and extent of the vast forests which at one time clothed this island, and of the various wild animals which once inhabited them, but which are now extinct. I might discourse to you of localities where forests of pine have been replaced by trees of a different growth, thus inducing the

succession of a different fauna; or I might tell you something of those submerged forests the remains of which, upon some parts of our coast, are from time to time disclosed as the tide recedes, bringing to light the horns and skulls of animals—as the red-deer and roe-deer—which, though formerly overrunning a great part of our island, have (except in one or two localities) long been banished from the southern and midland portions of it.

But my object on this occasion is to deal not with the past, but with the present; to bring to your notice some of the characteristic creatures which may be seen in an English forest, not all in one day perhaps, but from time to time in the course of one's excursions. I propose to tell you something of their appearance and habits, and to answer, if I may, some of the various questions which I am accustomed to hear asked concerning some of the less common or little-observed animals.

On proceeding to take a survey of the denizens of a forest, the larger animals, from their size, naturally attract our attention, and we may therefore deal with them first. As it will be necessary, for the sake of clearness, to take them in some kind of order, let me pause for a moment to explain the meaning of the names which have been bestowed on the various groups into which it is convenient to divide them.

We have first the *Ruminants*—animals which ruminate, or chew the cud. They are mostly horned, although there are a few, in other countries, which are not. They are characterized by the absence of incisors, or cutting teeth, in the upper jaw. Instead of these, they have merely a callous pad, against which the cutting teeth in the lower jaw press, and so cut up the food in the same way as meat is cut up by means of a chopper and block.

In order to go through the process of ruminating, they possess a specially formed stomach, or rather a series of stomachs, through which the food passes in turn before it becomes finally digested. It would be easy to explain to you by means of a diagram the exact process which is gone through by a ruminating animal every time it chews the

cud, but it will perhaps suffice if I state only what anyone may observe who narrowly watches the actions of a cow or a deer. The animal first grazes, by nipping off the grass between the cutting teeth in the front of the lower jaw and the hard pad in front of the upper jaw. Each mouthful, instead of being masticated or chewed up, is swallowed at once, and it continues to graze until its hunger is appeased. It then lies down, and the process of ruminating commences. A contraction of the flanks, a spasmodic action in the throat, and the mouth (previously empty) is observed to be filled with the lately swallowed grass which has been forced up into it. The animal then proceeds to chew this between the back teeth, or grinders, with a slow and continuous motion of the lower jaw until the mouthful has become reduced to pulp, when it is again swallowed, and another mouthful is brought up to undergo the same process; and this goes on at intervals until most of the food swallowed has been masticated.

The canine teeth, or what in carnivorous animals would be called tusks, are noteworthy. In the lower jaw they are always present, though modified so as to resemble lateral incisors; in the upper jaw they are generally wanting, although in certain exotic species (as the musk-deer, for example) they are enormously developed, and project outwards and downwards to a considerable length.

The grinders are six on each side of each jaw, and so formed that their surfaces wear down unevenly by the lateral movement to which they are subject during the process of chewing; each tooth (as in the elephant) being composed of alternate layers of enamel—dentine and cementum—which, being of different degrees of hardness, are differently affected by the grinding action.

Another characteristic feature in ruminating animals is, that they are four-toed; they have neither thumbs nor great toes; and the feet are so proportioned that the axis of the limb falls between the two middle toes, while the inside and outside toes are much reduced in size, and in some animals (as the camel and giraffe) are lost entirely.

The only Ruminants still to be found wild in our forests are *Deer*, of which we have three species.

There was a time when we had also wild cattle in the forest, but those days have long gone by, and we can now only judge of their appearance from the few scattered herds which are carefully preserved in certain parks.

To turn, then, to the Deer: the noblest of them all is the Red-deer, now almost entirely confined to the Highlands, and a few wild districts in Ireland; for, with the exception of Martindale Fells, in Westmoreland, and a certain portion of Somersetshire and North Devon, where it still roams in a wild state, it is not to be met with in England except in a few enclosed parks. And on Martindale Fells, I am informed, the few remaining deer are in a state of semi-domestication. Still they are the original descendants of our wild red-deer, and form a pleasing link of association with the past.

Only a hundred years ago there were red-deer in Cornwall. When Borlase published his Natural History of that county, he wrote: "Red-deer are seldom seen in this county; some, however, make their appearance for a time on the hilly downs about Bodmin, whence they haunt the woods upon the moors. They are found in greater plenty in the north, betwixt Launceston and Stratton, as if they were apprehensive of wanting room to range if they advanced into the narrow western parts." *

Carew, who published his "Survey of Cornwall" in 1602, regarded the red-deer then in Cornwall as stragglers from the adjoining county of Devon,† and no doubt many of them were stragglers; but Tonkin, in his edition of this Survey published in 1811, observes: "We have some red-deer that breed in the inland and eastern parts of the

* Borlase, Nat. Hist. Cornwall, p. 288.

† "Red deere this shire breedeth none, but onely receiveth such as in the summer season range thither out of Devon: to whom the gentlemen bordering on their haunt afford so coarse entertainment, that without better pleading their heeles, they are faine to deliver up their carcases for a pledge to answere their trespasses."—"Survey of Cornwall," p. 23.

county, though not very many." * The fact of their breeding, however, in Cornwall at that date is significant, showing that there must have been a good deal of wild ground well suited to their habits.

Years after Carew's "Survey" had appeared there were still plenty of wild red-deer in Hatfield Chace, and Prynne has left a graphic account of the mode in which they were hunted there in the time of James I. He describes how, for the amusement of Prince Henry, a large herd was surrounded and driven down to the Trent, where they were forced to take the water, their antlers resembling, when close together, a moving forest; how they were pursued in boats by the Prince and his companions, and how the fattest were then selected and killed, and drawn on shore with ropes.

The precise date at which the red-deer became extinct in that wild Chace could only be approximately surmised, for the nature of the country was such as to favour their existing there for a period long subsequent to the event described by Prynne.†

In Lancashire, in the great forests of Bowland and Blackburnshire, there were red-deer until the commencement of the present century. The last herd was destroyed there in 1805.‡

In Gloucestershire, red-deer were introduced into the Forest of Dean in 1842, when two stags and four hinds from Woburn were enlarged. They increased slowly until 1849, when in consequence of the frequent and serious poaching affrays which took place, and the great difficulty in preserving them, all the deer in this forest were ordered to be killed.

Gilbert White's description of the red-deer in Wolmer Forest, Hampshire, must be familiar to everyone. In Queen Anne's time, he says, they numbered about five hundred head; but some years before he commenced his

* Op. cit. ed. Tonkin, 4to., 1811, p. 77.

† See Devon, Issues of the Exchequer (Pell Records), p. 293.

‡ Whitaker, History of Whalley, vol. i., p. 205.

delightful series of letters to Pennant they had dwindled down to about fifty, and he himself saw one of the last that was taken, the survivors of the herd being captured alive by Royal command and removed to Windsor.*

A few red-deer lingered down to the present century (1827) in Epping Forest; and Bell, in his "History of British Quadrupeds," speaks of having seen some, many years ago, in the New Forest. They were doomed in 1851.

It would be interesting to trace out the last haunts of red-deer in the various counties of England, and I do not doubt that the inquiry would result in the acquisition of some curious information; but to attempt it here would cause too great a digression.

Those who have not the leisure or opportunity of following the red-deer in the Highlands of Scotland, the wilds of Kerry, or the moorlands of Devonshire, must be content to study them in the few parks where they are still preserved in a semi-domesticated state. It was formerly the practice to keep the red-deer and fallow-deer apart in parks where both species were maintained, owing to an impression that the stags of the former species would kill the latter. Gervase Markham, in his edition of the "Maison Rustique, or the Countrey Farme," printed in 1616, says (Chap. xix.):—"You shall not by any meanes in one parke mixe the Red-deere and the Fallow-deere together, for the Red-deere is a masterfull beast, and when the time of bellowing cometh, he grows fierce and outragious, so that hee will be entire lord of the field, and will kill the Fallow-deere if they but crosse him in his walke; and therefore each must be kept severally in severall parkes."

That such was the practice in the sixteenth and seventeenth centuries is proved by the "Red-deer Parks," distinct from parks for fallow-deer, which are found in many of the great places of England, such as Badminton in Gloucestershire, and Grimsthorpe in Lincolnshire, where separate parks for the different kinds of deer were formerly kept up. The present practice appears to be generally to allow both red and fallow deer to be

* Gilbert White, Letter VI. to Pennant.

together, the danger alluded to by Markham having been proved to be exaggerated, if not without foundation.*

The different appearance presented by the stags of the two species is very marked, owing to the entirely different character of their antlers. Those of the red-deer are round, rough and tapering, with three tines directed forward (the *brow*, *bez* and *royal* antlers), and the *cup* or *crown* of three or more points at the end; those of the fallow-deer are smooth and palmated with only two anterior tines (a third being of rare occurrence), and with the hinder margin of the flattened portion of the beam notched so as to form an indefinite number of points. The horns begin to appear at the age of about seven months, when two small protuberances are perceptible; and gradually in the second year straight pointed horns shoot forth. About the beginning of April, before the animal is quite two years old, these fall off at the very root. In the course of the summer another horn grows up, and a broad antler issues from it in a downward curve towards the eyes. At this stage the deer is termed a *brocket*. A year later an additional point is seen on each horn, and the animal is then known as a *staggard*. When another year has passed each main stem is termed the beam, and the whole together is worthy the name of "antler." The animal is now a *stag*. From year to year, should no accident occur, the antlers, which in summer time shoot up anew to replace the old ones, increase in regular gradation and size and branching magnificence, and when each beam bears three anterior tines the animal is called a *hart royal*.†

This casting and reproduction of the horn, growing plant-like on the living animal, is one of the most wonderful phenomena in natural history. It is so curious and wonderful that it would be regarded as a fable were it related of a creature in a distant land which none of us had ever seen. And though the stag is a native of this country, there are probably thousands at the present day who have no correct knowledge of the process. They have

* Shirley, "English Deer Parks," p. 236.

† Boner, "Forest Creatures," pp. 58, 59.

heard that stags "shed their horns," but of the meaning of the words they have no clear idea. Least of all do they imagine that the whole of the strong, thick, solid growth parts at the base from the spot where it grows, and drops to the ground like a dead leaf in autumn. Nor do they know that out of the hard bone there sprouts forth a soft, sap-filled shoot, which grows up like a tree with branches.

The exact time of shedding the horns depends in some measure upon the age of the animal and the temperature of the winter and early spring. They are sometimes shed towards the end of February or beginning of March; but should the winter be cold and spring protracted, the stags shed their horns as late as May—the old ones at the beginning, the young ones at the end of that month. It is very rarely, however, that an old stag is seen with his old horns on after the beginning of May; but a two-year-old deer will carry them for a month or two later.*

In a few days after the old horns have dropped the new growth shows itself, and gradually the new antlers are developed. They are then covered with a thick velvet which preserves the point, as yet soft and tender, from injury. While in this soft condition they are very sensitive, and to avoid injury by striking them against trees the deer leads a life of retirement. In about twelve weeks they are full grown, and as they gradually harden the animal rubs them against a tree to get rid of the velvet. This can only be done gradually, and a stag may often be seen at this time of year with the velvet hanging in strips, being only partially detached from the horns. The weight of the antlers in a full-grown stag varies, according to their size and massiveness, from ten, twelve, to fifteen pounds. This is nothing compared to what antlers used to weigh in former days, a circumstance which must have attracted the notice of all who have examined old collections of deer's heads, such, for instance, as may be seen in some of the royal palaces and ancient halls in Germany. This is to be accounted for by the fact that the deer formerly attained a much greater age than they are now allowed

* Collyns, "Chase of the Wild Red Deer," pp. 32, 33.

to do, and they had better and more abundant pasturage than now, when the woods are cut down and the land is highly cultivated. Abundance of nutritious food usually produces antlers of large growth.

I have referred briefly to the character of the teeth in Ruminants. Red deer, both male and female, at one year old have two cutting teeth in the lower jaw; at two years old they have four; at three, six; and at four, eight cutting teeth in the lower jaw. Stags when five years old have two canines, or tusks, in the upper jaw; and occasionally, but rarely, very old hinds have these tusks also, but less fully developed than in the stags.

Deer pair in the autumn, a fact which the stags do not fail to announce by their loud "belling," and by the battles which they fight, when the crashing of their antlers may be heard at a considerable distance. The young are brought forth in the summer-time, when a high growth of fern favours their concealment.

The red-deer very rarely produces more than one young one at a birth.* This is born in June, and, up to the age of three or four months, is spotted with white like a fallow-deer. Gradually it assumes a uniform colour.

With regard to food, deer subsist chiefly on grass, leaves, and tender shoots of trees, beech-mast, acorns, and even fungus. Fallow-deer are very partial to horse-chestnuts; and both species are particularly fond of salt, which they will come a long way to lick when they have once discovered that it has been laid down for them. It is doubtless the saline flavour which attracts them to gnaw antlers which have been shed; and this in some measure accounts for the infrequency with which such antlers are found. Collyns was assured by keepers and hillmen of great experience and undoubted veracity in Scotland that it is a common occurrence for the hinds to eat the cast horns, but he was never able to confirm it from his own experience in Devonshire and Somersetshire. During the past

* So says Scrope, in his "Days of Deer Stalking;" but Collyns mentions three instances in which red-deer hinds produced twins—pp. 48, 50.

summer, however, there appeared in *Nature** a letter on the subject from the head keeper at Bradgate Park, near Leicester, which is very explicit. He says: "There is not the slightest doubt of their eating each other's horns. I have myself seen several cases where both brow antlers and the top points have been gnawed off. I have also seen Scotch heads that have been quite spoiled by the tines having been gnawed, which must have been done after the horn had become hard, and whilst the animal was living."

Before concluding my notice of the red-deer, I may mention a curious circumstance in connection with it. Lyme Park, Cheshire, was celebrated for its fine venison, and formerly the custom prevailed there of collecting the red-deer once a-year—about midsummer or rather earlier—in a herd before the house, and then swimming them through a pool of water, with which the spectacle terminated. This custom of driving deer like ordinary cattle is said to have been perfected by an old park-keeper, Joseph Watson, who died in 1753, aged 104, after having filled that office for sixty-four years. He was believed to have been in his 102nd year when he hunted a buck in a chase of six hours' duration, and is said to have successfully driven twelve brace of stags from Lyme to Windsor Forest.

This reminds me of an anecdote told by Playford in his "Introduction to Music," to the effect that he once met, on the road near Royston, a herd of about twenty deer following a bagpipe and violin; that while the music played they went forward, and when it ceased they stood still; and that in this manner they were brought out of Yorkshire to Hampton Court.

The fallow-deer is so commonly kept in English parks and forests, that its appearance must be familiar to all; and as I have already pointed out the character of its horns as compared with those of the red-deer, I need not pause here to give any further description of it.

It is believed to be not indigenous to this country, and the general opinion is that it was introduced by the Romans. The statement in Bell's "British Quadrupeds,"

* *Nature*, 8th July, 1880.

to the effect that the dark-coloured variety is said to have been introduced from Norway by James I., can hardly be deemed correct. He imported some, no doubt; in 1612* they were landed in Scotland, and were afterwards transferred to Epping Forest and Enfield Chase. But we learn from Leland that there were dark-coloured deer in England long before that date.† Indeed, on this point I have lately come across a much older authority than Leland, who commenced his "Itinerary" in 1533.

Sixty-eight years before that date—namely, in 1465—the Baron Leo von Rozmital, brother to the Queen of Bohemia, visited England, and a most interesting record of his visit, in the shape of an Itinerary written by one of his suite, has fortunately been preserved to us, although, as may be supposed, copies are extremely rare. In this journal, which is in Latin, it is stated that, amongst other places named, he visited Windsor Park, where he was particularly struck with the great number of fallow-deer, which are described as being black, white, and spotted. Thus we have evidence of the existence of this dark variety of fallow-deer in England long before the time of James I.

Another statement, which has more than once found its way into print,‡ to the effect that the spotted variety of this deer was produced by crossing with the axis-deer brought from Bengal by Capt. Gough in 1742, is incredible; the two animals belonging to such widely-different genera, it is not likely that they would interbreed. Moreover, we know, from the Itinerary above quoted, that the spotted variety existed in England in 1465. James I., too, sent some as a present to the King of France in 1608, more than a century before the introduction of Capt. Gough's axis-deer.§

With regard to the reproduction of the fallow-deer, the growth and shedding of its horns, and its food, the

* See Devon's Issues of the Exchequer (Pell Records), p. 150.

† Leland's "Itinerary," vol. vii., page 40, folio 50.

‡ Daniel, "Rural Sports," Supplement, p. 693. Scott, "British Field Sports," p. 380.

§ Shirley, "English Deer Parks," p. 9.

remarks made under the head of the red-deer will, in a great measure, apply; and I need not dwell upon the particular respects in which a difference has been observed further than to note that the fallow-deer not unfrequently has two fawns, and occasionally three, while the red-deer, as already stated, has very rarely more than one.

Modern instances, in which Fallow-deer have been allowed to range freely over unenclosed ground in England, are probably rare. They are seldom seen beyond the limits of a park paling. I may therefore mention one such instance. Longcroft, in his "Topographical Account of the Hundred of Bosmere in the Co. Southampton" (1857), tells us (p. 27) that "the Thicket, Stock-heath, and Leigh Green are the common wastes of the Manor of Havant. The former is a large tract of land containing about 800 statute acres, was formerly a chase or privileged place for deer and beasts of the forest, and till within the last thirty years (*i.e.*, till 1827) a herd of Fallow-deer ranged freely over its uncultivated space. These were preserved by the Bishops of Winchester, who appointed keepers and took every care to keep up the stock. There being, however, *no park or enclosure*, the deer strayed away into the neighbouring lands, and were gradually killed down."

The Roe-deer, one of the most graceful and attractive of forest animals, is in this country almost entirely confined to Scotland. I say *almost*, for in a certain part of Dorsetshire, where this species has been re-introduced, it not only exists, but has increased and multiplied. That it was at one time plentiful in many other parts of England there is abundant evidence to show. I have notes of its former existence in the counties of Northumberland, Durham, Cumberland, Lancashire, Norfolk, Suffolk, Cambridge, Hants, and Devon, as also in Wales, where it is said to have existed until the time of Elizabeth. In Cumberland it certainly survived until 1633, if no later; and in Northumberland the last roe-deer is reported to have been killed near Hexham, in the reign of George I. (1714—1727).

In Dorsetshire it was re-introduced in 1800 by the late Lord Dorchester, who turned out a few pairs in his woods

at Milton, from whence their descendants dispersed in a very short space of time, especially in a south-westerly direction.

A resident in that neighbourhood, Mr. J. C. Mansell Pleydell, estimated last year (1879),* that there were no less than 120 head in the Milton, Whatcombe, and Houghton Woods, which fringe the southern side of the Vale of Blackmore, from Stoke Wake to Melcombe Park and the Grange Wood westward, the number being merely a question of preservation or non-preservation.

The roe-deer was once much more common in Scotland than it is at present, but it is still very plentiful, and has much increased of late years. It is believed that the increase of plantations in the south of Scotland has been the means of spreading it much farther in that direction than it used formerly to be found.

In Ireland the roe-deer is unknown, notwithstanding the statement of Bede, so quaintly contradicted by John of Trevisa; nor have remains of this animal been discovered in the sister isle.

Those who would learn something of the habits of the roe-deer, from one who has had frequent opportunities of observing it, should read the excellent account given in the second volume of Stuart's "Lays of the Deer Forest;" nor should they omit to peruse the equally trustworthy account furnished by the author of "The Moor and the Loch."

One of the most curious points in the history of the roe-deer, but one on which I need not now enter in detail, is the phenomenon now known as "suspended gestation," and which long puzzled sportsmen and naturalists, until the scientific researches of Professor Bischoff, of Giessen, the well-known embryologist, placed the matter in a clear light. The result of his investigations will be found in the second edition of Bell's "British Quadrupeds." Unlike the red-deer, the roe generally has two fawns, and very rarely three have been observed with a doe.† These, like

* See *The Zoologist*, 1879, pp. 120, 170, 209, 262, 301.

† *The Field*, Sept. 2nd, 1871.

the young of the other species, are at first spotted with white.

A pure white roe-deer is a rarity, but is not altogether unknown. One, in the collection of Sir James Colquhoun, was obtained near Luss, on Loch Lomond; and I have heard of others in Germany. Occasionally one may see a female roe-deer bearing horns; but such instances are, of course, not common.* Mr. Duncan Davidson, of Inchmarlo, Banchory, Aberdeenshire, shot a female roe-deer, with budding horns, on the 26th October, 1875; and two other such instances are mentioned in the *Zoologist* for 1866 (p. 435).

The roe is singularly liable to malformation of the horns, and some curious collections have been made of these misshapen antlers.

Before dismissing the subject of Deer, I should like to say something of the various modes of hunting them, past and present, and refer to some of the quaint old treatises which have been written on hunting. But time will not permit, and I must pass on to another, and a very different, group of animals—the *Rodents*, or gnawing mammals; so called from their mode of life, to which the form of their teeth is admirably suited.

So peculiar is the dentition of the Rodents that it is not to be mistaken for that of any other group. They have only incisors and grinders, no canines, and never more than two efficient incisors in each jaw. I say *efficient* because, in the hare and rabbit, and some allied forms, there is in the upper jaw a second pair of *rudimentary* incisors placed immediately behind the front or cutting pair, which never become developed or used.

The position and shape of the incisors proper are remarkable; they have no roots or fangs, but grow from a permanent pulp, and so continue growing through life. Their form is that of a segment of a circle, hence they always protrude from the front of the jaws in the same direction, and meet at the same angle. By this means, as the teeth

* *The Field*, Nov. 8th, 1873.

become worn by gnawing, they continue to grow forward, and so a fresh supply of tooth, so to say, is always maintained. If by any accident (as by a shot or otherwise) one of the incisors should get broken or misplaced, the tooth with which it should come into contact, not meeting with any resistance, continues to grow downwards or upwards, as the case may be, and gradually assumes the appearance of a bony circle outside the mouth, to the great inconvenience of the poor animal, sometimes, indeed, causing death by starvation.

In the case of the rabbit, as many of you have doubtless observed, such malformations are not uncommon. The canine teeth being, as I have said, absent, there is quite a gap between the incisors and the grinders, the latter being so regular and similar in appearance that it is difficult to recognize any distinction of molars and premolars.

The articulation of the lower jaw with the skull is peculiar, for while it results in increasing the power of the incisors or cutting teeth, it prevents much lateral movement of the jaw, and ensures, as much as possible, the meeting of the incisors in both jaws.

I might proceed to point out other peculiarities of structure which distinguish the Rodents from other animals; but I fear to weary you with dry details, and will therefore merely call your attention to the strong and muscular hind limbs which they possess, enabling them to leap and run with great facility and swiftness. They may be said to be all vegetable eaters, although some of the species, like the common rat and house-mouse, are omnivorous.

In the case of such common animals as the Hare and Rabbit, it is not to be supposed that I can say anything very new; but I may assume on the present occasion that there are some who, though perfectly familiar with the outward appearance of these animals, may not have paid much attention to their natural history.

In many respects hares and rabbits, though externally somewhat similar in shape and colour (I once shot a wild rabbit of the exact colour of a hare), are very dissimilar.

Rabbits are born blind, and nearly naked; while young

hares at birth are clothed with fur and have their eyes open. Rabbits produce their young underground; hares construct "a form" above ground. To this general rule, however, exceptions have been noted. Rabbits have been known to breed above ground,* and hares have been observed to burrow.† You may generally tell whether turnips have been nibbled by hares or rabbits by the difference in their mode of attacking the root. A hare will bite off the peel and leave it on the ground; a rabbit will eat peel and all.‡

Hares vary much in weight, and occasionally in colour. The average weight may be between 7lbs. and 8lbs., but I have notes of three, shot in Lincolnshire, in the autumn of 1877, which weighed respectively 11lbs. 3oz., 11lbs. 12oz., and 11lbs. 3oz.§ With regard to variation in colour, I have notes of the capture of three black hares, several albinos, and one parti-coloured one, in different parts of the country.

Black and sandy-coloured rabbits are not very uncommon, but an albino rabbit, truly wild, is, I think, not often met with.

Both hares and rabbits can swim well, but it generally requires the persuasion of the sportsman or his dog to make them take the water. I have only once seen a hare swim voluntarily, and then the stream crossed was not a wide one.

The appearance of the Squirrel must be so familiar to everyone that I need not offer any description, but will confine myself to a few remarks on its habits.

We have seen how one Rodent lives underground, and another makes its "form" upon the surface. We have here a case of one which constructs its nest in a tree, sometimes in a hole, sometimes in a fork between two branches. This nest is made of moss, leaves, and long dry grass, and makes a soft cradle for the young ones, which are born

* See *The Field*, December 2nd and 16th, 1876.

† Annals and Mag. Nat. Hist., vol. v., p. 262.

‡ *The Zoologist*, 1878, p. 100.

§ *The Field*, November 10th, 1877.

naked and blind, towards the end of May or beginning of June, when there is a good screen of leaves, be it observed, to conceal the nest and its owners.

The bill of fare of the squirrel is a very varied one: beech-mast, acorns, nuts, young bark (especially of the birch), the cones of larch and other pines, leaf-buds and tender shoots, mushrooms, fungus, and even truffles are all eaten in turn. In search of many of these it often descends to the ground, and hunts for and digs up the truffle by scent. It lays up a winter store of provisions in some hole of a tree, not relying upon one such hole, however, but filling several in case of accident. Occasionally at least, if not habitually, squirrels will take birds' eggs; and I have noted the testimony of an eye-witness to the fact that they will sometimes also carry off, kill and eat young birds.

In May, 1879, Mr. Thomas Bagnall, of Milton Ernest Hall, Bedford, saw a squirrel in his avenue carry off, kill, and partially devour a full-fledged young Starling, the remains of which he succeeded in recovering.

During a great part of the winter, when the red fur perceptibly changes to grey, the squirrel lies up in a semi-torpid state, coming out on a fine day to feed on some of its stores, and then retiring again.

In answer to the question whether squirrels are injurious to trees, I must reply, "Yes; to some trees; chiefly in plantations of Scotch fir, larch, and occasionally spruce." They attack trees in the spring, between April and June, when the sap is in full flow, biting off the outer bark, and consuming the inner. This stops the flow of sap, which there becomes dry and resinous, and the first high wind blows the top off.

In the same haunts as the squirrel we may find that beautiful little animal, the Dormouse. It is shy and retired in its habits, and must be noiselessly approached if one would observe its movements. It is partial to woods where there is a thick undergrowth to conceal it, and amongst which it makes its nest; but this is sometimes placed on the ground.*

* *The Zoologist*, 1872, p. 2,908.

I once discovered a dormouse ensconced in an old nest of a blackbird, where it had made itself very comfortable in a bed of dead leaves. Although, like other Rodents, it is, strictly speaking, a vegetarian—feeding on beech-mast, acorns, young hazel-nuts, corn, and so forth, during the autumn, and laying up stores for the winter—yet, during the summer, when such food is not to be obtained, it is insectivorous. A tame dormouse, when allowed a run in the garden, would eat the *Aphis lanigera*, and the caterpillars of *Sphinx ocellata*. It was very fond also of the grubs of *Balanus nucum*, the nut weevil, preferring maggotty nuts to sound ones on that account; it would also eat the small caterpillars found in apples and pears.

As its name implies, the dormouse is a great sleeper, and remains dormant during the greater part of the winter. I once saw a pure white dormouse which had been captured at Cowfold, near Horsham, where it is now preserved in the collection of my friend Mr. Borrer.

Two other little animals sometimes cross our path as we take our rambles through the forest—the Long-tailed and Short-tailed Fieldmice. Strictly speaking, the latter is not a true mouse, but a vole (belonging, like the so-called water rat, to the genus *Arvicola*, the members of which are distinguished from those of the genus *Mus* by several well-marked characters).

You may know the long-tailed fieldmouse by his sharp snout, long ears, and long rat-like tail. The short-tailed vole, on the contrary, has a blunt rounded muzzle, short ears almost hidden in the fur of the head, and a short hairy tail. Though very attractive in appearance, and easily tamed, they are, unfortunately, rather mischievous in their habits, and sometimes do a great deal of damage in young plantations by barking the trees.* Fortunately, they are kept in check to a considerable extent by owls, both white and brown, who capture and devour great numbers of them, as I have often ascertained by an examination of their rejected pellets.

* See Jesse's "Gleanings," 1st series, p. 175, and St. John's "Wild Sports and Natural History of the Highlands," p. 67.

Childrey in his *Britannia Baconica*, 1660, relates (p. 14) that in 1580 an extraordinary swarm of Field-mice appeared in Denge Hundred, Essex, and eat up all the roots of the grass. "A great number of Owles," he says, "of strange and various colours [doubtless the Short-eared Owl] assembled, and devoured them all; and after they had made an end of their prey, they took flight back again from whence they came."

We come now to the order *Insectivora*, or insect-eating mammals, of which I have two to bring to your notice as dwellers in the forest, namely, the Common Shrew and the Hedgehog. The animals belonging to this order are at once distinguishable from the Rodents by their dentition. The latter, as I have pointed out, have no canine teeth; Insectivora have, and their dentition generally resembles that of the strictly insectivorous bats, the molars, or grinding teeth, being similarly furnished with several sharp cusps or points which are characteristic of insect-eating mammals, and all the teeth have roots or fangs. There are other peculiarities of structure, with which, however, at present I need not trouble you.

From its shy and retired habits, the Common Shrew is not often to be observed in a living state, but may frequently be seen lying dead on the pathway. The cause of the mortality amongst these little animals, though frequently noticed, has never been satisfactorily accounted for; and Bell, in his "British Quadrupeds," has not attempted any explanation. It has been said that their odour is repulsive to their enemies, who will kill but will not eat them; but this is not invariably the case, for I have found numerous skulls of shrews in "pellets" of the barn owl, and once took two of these little creatures from the stomach of a stone curlew.

Of the Hedgehog I might say a good deal, but having so many other "Forest Animals" on my list I must be brief.

Although from its structure and mode of life the hedgehog is properly classed with the Insectivora, it is really omnivorous. Nothing seems to come amiss to it. Beetles, worms, slugs, snails, frogs, mice, eggs, young chickens, and

even young rabbits, are eaten by turn as opportunity serves; and on one occasion a hedgehog was surprised with a young leveret struggling in its jaws.* Two that I kept in confinement for some time were particularly fond of frogs.

In this propensity for flesh, the hedgehog resembles the animals which I have next to notice—viz., the *Carnivora*—distinguishable by their immensely powerful teeth (the canines, or tusks, being largely developed), a loose skin, and strong legs and feet, armed with hard sharp claws.

Of this order we once had notable representatives in our forests in the shape of the bear and the wolf, but these, alas! are no longer to be found here; and the most powerful survivors of this group of animals are the badger, the wild cat, and the fox.

The first-named is of special interest as being the sole surviving representative of the bear-family in this country. It is a plantigrade animal, walking upon the entire sole of the foot, like a bear, instead of on the toes only, like a cat. In its habits also and food it resembles the bear, living in holes, laying up by day, and coming forth at night; and feeding on various roots, fungus, earth nuts, beech mast, blackberries, dung-beetles and grasshoppers, snails and worms, frogs and mice. Strange to say, the hedgehog is a favourite morsel, and is easily killed by a badger, notwithstanding its armour. In confinement the badger has been known to devour rabbits greedily; and a partially devoured mole has been found in a nest of young badgers.† I have never heard any accusation against the badger for damaging young trees, nor do I believe that he would do so, his diet being what I have stated. Nor do I believe that there is any truth in the allegation that if badgers are suffered to remain in a fox-covert they will drive the foxes away. Wild animals, as a rule, live in harmony, especially where (as in the case of fox and badger) neither preys on the other.

* *Gardener's Chronicle*, 1846, p. 480.

† *The Field*, March 23rd, 1872.

No apprehension need be felt about the proximity of a badger to a farmstead. He is of a retiring disposition, and will keep out of man's way as much as possible.

Badgers sleep away much of their time in winter, and can go a long time without food. Their footprints are seldom seen in the snow.

Amongst the carnivorous animals which may often be seen hanging up in "the keeper's museum" at the corner of a wood, are the Weasel and Stoat, the latter distinguished by his larger size, and longer tail with a black tuft at the end of it.

Weasels I regard as particularly useful animals, for they destroy a vast number of mice and voles. They should always be encouraged in the stackyard, instead of being caught and nailed up against the barn. Stoats I am not so sure about. They kill rabbits, leverets, and young game birds. Doubtless they kill field-mice too. I have twice seen a stoat carrying a short-tailed vole as a retriever would a rabbit; and I once witnessed a fight between a stoat and a rat, in which the stoat, after a tremendous struggle, came off victorious.

Both stoats and weasels hunt by scent, as I have several times proved by personal observation, and I could relate many curious anecdotes of what I have witnessed. Both these animals swim well, and do so voluntarily. I once had the pleasure of watching an old stoat giving her young one a swimming lesson, and a very entertaining sight it was. They carry their young in their mouths, as cats do their kittens.

The stoat becomes white, or nearly so, in winter; but there is usually a patch of brown on the face, and the tip of the tail is always black both summer and winter.

The weasel very rarely becomes white. I have only seen two that were so: one killed at Willoughby, in Leicestershire, in the winter of 1867; the other in Soham Fen, Cambridgeshire, in September, 1879.

The Polecat (from which the ferret is descended) is now becoming a rare animal in England, and is not often to be seen, so extensively has it been trapped by game preservers

and their keepers. That it is a very destructive animal there can be no doubt, not only to game, but also to poultry, for it will visit the farmyard and henroost, and in one night kill many more fowls than it can eat or carry away.

I once discovered a whole family of polecats (two old ones and four young ones) in a flint cairn not more than fifty yards from a poultry-yard. They were tracked after rain, and the stones being removed one by one, we suddenly came upon a hollow in which the whole family were snugly curled up. One of the old ones escaped; of the rest, four were killed and one was taken alive.

That beautiful animal the Marten, once so common in English forests, is still to be met with in certain parts of the country which are favourable for its protection, but it must be regarded, at least in the south, as one of the rarest of "forest animals." The last killed in Essex, so far as can be ascertained, was trapped by the present head keeper of Epping Forest in April, 1853, in one of Mr. Maitland's covers at Loughton.

Did time permit, I could say a good deal about its distribution and habits, and the former mode of hunting it.

The Wild Cat, which was also a beast of chase in former days, is now believed to be extinct in England, as well as in the southern counties of Scotland.

Mr. Alston believes that none now exist south of the northern districts of Argyll and Perthshire. Mr. Harvie Brown, who has been at considerable pains to obtain information on the point, has come to the conclusion, from statistics which he has collected, that "the wild cat is now extinct throughout a large portion of Scotland, namely, all south and east of a line commencing—roughly speaking—at Oban, in Argyllshire, passing up the Brander Pass to Dalmally; following the boundary of Perthshire, and including Rannoch Moor; continued north-westwards to the junction of the three counties of Perth, Forfar, and Aberdeen; thence across the source of the Dee northward to Tomintoul, in Banffshire; and, lastly, from Tomintoul to the city of Inverness. Northward and westward of this

line the animal still keeps a footing in suitable localities, finding its principal shelter in the great deer forests."

The Fox, with which species my list of "Forest Animals" closes, is so well known in appearance and habits that I need not trespass further on your patience by describing an animal so familiar to you.

In conclusion, I would express the hope that the remarks which I have made this evening may be the means of inducing many of my listeners to visit the forest and observe for themselves, not only to test the accuracy of what they have just heard, but to discover fresh points in the natural history of our forest animals upon which I have not had time to enter.

JOURNAL OF PROCEEDINGS

AT

ORDINARY, FIELD, AND OTHER MEETINGS.

[In commencing our Journal of Proceedings it may be well to give a brief statement of the origin of the Club. The first public proposal in connection with the subject was made in a letter addressed to the Editor of the *Woodford Times* by Mr. William Cole, which appeared in the issue for Saturday, October 25th, 1879. This letter was followed by others from Messrs. Harcourt, Lockyer, Argent and Cole addressed to various local newspapers, all strongly urging the establishment of a Naturalists' Club in Essex. A circular was issued by Mr. Cole, headed "*Epping Forest and South Essex Naturalists' Field Club*," and freely distributed, asking for the support of all South Essex naturalists and archæologists. Sufficient names having been received to warrant the step, a private meeting was held at Buckhurst Hill on Saturday, November 15th, 1879, to settle preliminaries. Mr. Cole was nominated as Hon. Secretary *pro tem.*, and was authorised to call a public meeting for the establishment of the Society, and to make all necessary arrangements. It was felt that it would be better to have a more comprehensive title than that above quoted, and the one now held by the Club was chosen. Mr. R. Meldola consented to become the first President, and ultimately the inaugural meeting was called by advertisements in the newspapers and the issue of a very large number of circulars, which were sent to the leading inhabitants in all parts of the county. The Editor places the circular letter on record here; it may be interesting in the future as expressing the views of the founders of the Club:—

Epping Forest and County of Essex Naturalists' Field Club.

Laurel Cottage, Buckhurst Hill, Essex.

Dear Sir,—I am requested to state that the inaugural meeting of this Club will be held on Saturday evening, January 10th, 1880, at the rooms of the Buckhurst Hill Art Classes, 3, St. John's Terrace (opposite the church). The chair will be taken at seven o'clock by R. Meldola, Esq., F.C.S., &c., Secretary to the Entomological Society of London.

The objects of the Club, as set forth in the proposed Rules, are as follows:—"The investigation of the natural history, geology, and archæology of the County of Essex (special attention being given to the fauna, flora, geology, and antiquities of Epping Forest); the publication of the results of such investigations; the formation of a library of works of local interest and other publications, and the

dissemination amongst its members of information on natural science and antiquities." Excursions, under skilful direction, to various localities of interest to the naturalist and antiquary, will also be a main object of the Club.

The Club will strongly discourage the practice of removing rare plants from the localities where they are to be found or of which they are characteristic, and of risking the extermination of rare birds and other animals by wanton persecution; it will also endeavour to use its influence with landowners and others for the protection of the same, and to dispel the prejudices which are leading to their destruction. In like manner the Club will endeavour to cultivate a fuller knowledge of local antiquities, historical, popular, and idiomatic, and to promote a taste for carefully preserving the monuments of the past from wanton injury.

Considering the fine field offered to the biologist in Epping Forest and the surrounding country, it is certainly a matter of surprise that a Society similar to that now in process of formation was not long since founded. At any rate the promoters of the Club venture to claim for it the cordial support of all students of the subjects comprised in the scheme, as well as the approval of those willing to encourage the pleasant, instructive, and healthful recreations of the amateur field naturalist and antiquary.

The proposed subscription will be fifteen shillings per annum for gentlemen and ten shillings for ladies. Persons residing beyond a certain radius (say fifteen miles) from the head-quarters of the Club will only be required to pay subscription of ten shillings and seven shillings respectively. Persons joining the Club upon or within two calendar months from its establishment will thereupon be considered original members.

Should you approve of the objects of the Club, but be unable to attend the meeting, I should be much obliged by your signing the accompanying letter and returning it to me at your earliest convenience. I shall then have much pleasure in adding your name to the list of original members.—I am, yours faithfully,

WM. COLE (*Hon. Sec. pro tem.*)

Several kindly and appreciative notices of the proposed Society appeared in London and provincial journals, and upwards of a hundred ladies and gentlemen enrolled their names as original members before the day fixed for the formation of the Club.]

SATURDAY, JANUARY 10TH, 1880.

A public meeting for the foundation of the Club was held at seven o'clock in the evening in the rooms of the Art Classes, Buckhurst Hill

(kindly placed at the disposal of the Society by the conductors). A large number of people were present, the chair being taken by Mr. R. Meldola, F.R.A.S., F.C.S. (Secretary to the Entomological Society of London). Mr. Meldola said it was unnecessary to make any remarks by way of apology for calling the Club into existence. The proposal had been warmly taken up in many quarters, and the number of ladies and gentlemen present that evening was an evidence that such a Society would be heartily welcomed in the county. Mr. N. F. Robarts, F.G.S., proposed the foundation of the Club, the resolution being seconded by Mr. W. C. Barnes, and carried unanimously. Mr. W. Cole (acting as Secretary *pro tem.*) then read the rules he had drawn up for the approval of the meeting, stating that the same had been carefully settled by Mr. Charles Browne, M.A., Barrister-at-law, who had consented to act as Hon. Counsel to the Club. Each rule was discussed separately, a few alterations being made, the principal one being the reduction of the subscription to half-a-guinea per annum.* Ultimately the rules were passed and ordered to be printed, on the motion of Mr. J. P. Hore seconded by Mr. W. C. Barnes. The meeting then proceeded to elect the Officers of the Club for the year 1880, and the following were chosen:—*President*: Raphael Meldola, F.R.A.S., F.C.S., &c. (Secretary to Entomological Society of London). *Treasurer*; H. J. Barnes, F.C.S. (Berlin). *Secretary*: William Cole, M.E.S. *Librarian*: W. J. Argent. The following gentlemen were selected to form the first Council of twenty-five members:—Dr. E. B. Aveling, F.L.S.; R. L. Barnes, F.C.S.; W. C. Barnes; E. N. Buxton, J.P., &c., Verderer of Epping Forest; J. T. Carrington, F.L.S. (Naturalist to Royal Aquarium, Westminster, and Editor of "Entomologist"); R. M. Christy; P. Copland; E. A. Fitch, F.L.S., M.E.S.; Rev. James Francis, M.A.; G. J. Godwin; Herbert Goss, F.L.S., F.G.S., &c.; J. C. Harcourt; Francis George Heath (Author of "Our Woodland Trees," "The Fern World," &c.); H. B. Hooper; J. P. Hore (Author of "The History of Epping Forest"); Andrew Johnston, J.P. (High Sheriff of Essex, and Verderer of Epping Forest); Alfred Lockyer; Nathl. Powell, J.P., &c.; Hildebrand Ramsden, M.A., F.L.S., F.R.M.S., &c.; Rev. C. J. Ridgeway; N. F. Robarts, F.G.S., &c.; W. G. S. Smith (Hon. Sec. "Epping Forest Fund"); C. E. Taylor; Rev. W. Linton Wilson, M.A.; T. J. Woodrow, F.S.S.

It was proposed by the Rev. C. J. Ridgeway and seconded by the Rev. W. Linton Wilson, that Charles Browne, Esq., M.A.; Charles Darwin, Esq., M.A., LL.D., F.R.S., F.L.S., F.G.S., &c.; Alfred Russel Wallace, Esq., F.L.S., F.Z.S., &c.; and William Whitaker, Esq., B.A., F.G.S., &c. (of Her Majesty's Geological Survey), be elected Honorary

* This alteration was strongly protested against by the founder of the Club, as being adverse to the conclusion he had arrived at after careful consideration of the merits and probabilities of the case, but on being put to the vote the smaller subscription was adopted by the meeting.—Ed.

Members of the Club. This proposal was carried unanimously. The first ordinary meeting of the Club was fixed for the 28th February, and the meeting then broke up, tea and coffee being served in one of the rooms.

SATURDAY, FEBRUARY 28TH, 1880.—ORDINARY MEETING.

The first Ordinary Meeting of the Club was held at the Head-quarters, at seven o'clock, the President, Mr. Meldola, in the chair. Nearly seventy members were present. The minutes of the Foundation Meeting were confirmed.

Letters were read from the gentlemen proposed at the last meeting, returning thanks for their election as Honorary Members of the Society.

In accordance with the power given to him under Rule III., the President nominated Mr. John T. Carrington, F.L.S., M.E.S. (Naturalist, Royal Aquarium), Mr. E. A. Fitch, F.L.S., M.E.S., Mr. N. F. Robarts, F.G.S., and the Rev. W. Linton Wilson, M.A., as Vice-Presidents during his year of office.

The President then delivered an Inaugural Address on the objects and work of the Club. (Transactions, Vol. I., pp. 1–26.)

Mr. John Spiller, F.C.S., said that he was sure all present must appreciate the very admirable address with which they had been favoured by their President. Its preparation must necessarily have taken long study and thought, and he begged to congratulate the members of the Society on having such a masterly plan of operations so eloquently sketched out for their future guidance and encouragement. He hoped that they might look forward not only to a careful record and revision of the facts relating to the natural history of the county, but also to making many substantial additions to the facts themselves. They had certainly enjoyed a great treat that evening in listening to Mr. Meldola's address, but they must not forget that many members of the Club were less happily situated, and had not been able to attend the meeting, and, therefore, in their interests, and in the interests of the Society itself, he begged to propose that the address should be printed and circulated amongst the members. The motion was seconded by Mr. H. J. Barnes, and was carried unanimously.

The Librarian announced that Mr. Whitaker had presented a set of pamphlets, relating to the geology of Essex, to the library, and that Sir Antonio Brady, F.G.S., had sent a copy of a privately printed catalogue of his magnificent collection of the Pleistocene Vertebrata, from the neighbourhood of Ilford, in Essex. Thanks were given to the donors.

The Secretary read a paper communicated to the Club by Mr. R. M. Christy, of Chignal, near Chelmsford, on "The Occurrence of the Great Bustard (*Otis tarda, L.*), and the Rough-legged Buzzard (*Buteo lagopus*),

near Chelmsford, during the winter of 1879." (Transactions, Vol. I., p. 59.)

The specimen of the great bustard was exhibited at the meeting, and Mr. W. Cole stated that the Club was very much indebted to Mr. P. Smoothy's kindness in allowing his valuable bird to be sent from Chelmsford for the information of the members.

Mr. E. A. Fitch, F.L.S., said that he had heard of the two other specimens of the bustard in Essex, this winter; one at Manningtree and one at Maldon. He also observed that the local papers had reported the specimen described by Mr. Christy as occurring at Chelmsford. This was incorrect, as Hull Bridge was ten or twelve miles away from that town.

The thanks of the meeting were given to Mr. Christy for his paper.

It was announced that a "Tea Fund" had been started, to be supported by the voluntary contributions of the members, and in accordance therewith tea and coffee, &c., would in future be served at the ordinary meetings of the Club.

The Secretary stated that the last day for receiving the names of original members was March 10th, after which date members could only be elected by ballot, as provided by Rule VI.

The meeting then resolved itself into a Conversazione. Among the specimens exhibited were the following:—Molar tooth of *Elephas primigenius* from brick-earth, Lea Valley, Upper Clapton, and specimens of Granites and Lavas used for road mending by the Woodford Local Board—Mr. N. F. Robarts, F.G.S.; various species of *Fungi* and *Lichens* from Epping Forest, the natural forms and colours being well preserved, and many rare species of *Lepidoptera* taken in the forest during the last thirty or forty years—Mr. James English; drawings showing differences between the Viper and the common Ringed Snake—Mr. Gould; and various living organisms were exhibited under microscopes by Messrs. F. Oxley, F.R.M.S., W. Forster, R. Letchford, F.R.M.S., and Hy. Crouch, F.R.M.S.

SATURDAY, MARCH 20th, 1880.—ORDINARY MEETING.

The Ordinary Monthly Meeting was held at the Head-quarters at seven o'clock, the President in the chair.

Presents of books and pamphlets for the library were announced from the Rev. W. Linton Wilson, Mr. W. Whitaker, and Mr. B. G. Cole, and thanks returned for the same.

Mr, W. Cole exhibited a specimen of *Daphne laureola* (the "Spurge Laurel") recently found in the forest. He had not himself seen the species there before. Mr. English observed that the plant had formerly been quite common in an enclosure near Woodredon Hill, but had been

exterminated by a man who collected it to supply nurserymen for grafting purposes; since that time he had seen specimens in Monk's Wood on two occasions.

The President said that Mr. Woodrow had just placed in his hands a flint implement, the history of which was not known. It appeared to be a very fine specimen of a flint arrow-head.

Mr. T. R. Billups exhibited several rare and interesting species of *Coleoptera* taken in Essex, and referred to in the President's Inaugural Address. Amongst them was *Spercheus emarginatus*, which had become so rare as to be considered extinct. Mr. Billups took many specimens at West Ham during the years 1878-9. The female beetle carries the egg-sac or pouch about until the young larvæ are hatched. Also the very minute but excessively rare *Trichopteryx ambigua* (*Matthews*). Of this only two specimens were known from Belgium until Mr. Billups discovered it in rotten Hornbeams at Loughton.

Mr. B. G. Cole exhibited a specimen of *Sterrha sacraria*, taken in the meadows lying in the valley between Buckhurst Hill and Chigwell, on the afternoon of August 17th, 1879; being the first recorded appearance of the moth in Essex. He also exhibited a very beautiful aberration of *Cynthia cardui* (the "Painted-lady" butterfly) caught in his garden at Buckhurst Hill last summer.

A paper by Mr. John Gibbs, on "An Abnormal Form of *Cardamine pratensis*," was read by the Secretary. (Transactions, Vol. I., p. 64).

Mr. R. M. Christy communicated a note on the habits of the Common Weasel and Stoat. (See Transactions, Vol. I., p. 66).

The President pointed out that the most important point in Mr. Christy's communication appeared to be the statement that an unusually large number of *white* stoats had been seen during the past winter, an observation which, if confirmed by naturalists in other parts of the country, might be found to bear some relationship to the extreme cold which had prevailed at that season.

Mr. Letchford asked whether the severe winter temperature might not have caused the animals to become white by acting directly on the circulatory system in such a manner as to influence the colouring matter of the fur; and he called upon the President to supply more details with reference to his statement that the white colouration might be in some way connected with the Arctic character of the winter of 1879-80.

Mr. W. Cole pointed out that no circulation of fluid could take place in hair or fur, inasmuch as hair was not tubular, but was simply composed of modified and elongated epidermal cells, with pigment diffused throughout.

The President was disposed to believe that the occurrence of an unusually large number of white stoats after a particularly severe winter might be due to reversion. It was well known that all animals and birds inhabiting the Arctic regions had a tendency to be of a white

colour, which was necessary not only for protection of the animals from foes, by causing them to assimilate in colour to the snow which constantly covered their habitats, but also because this colour was best adapted to withstand the severity of an Arctic climate. Mr. Meldola was of opinion that this last cause was of greater influence in giving white coverings to Arctic animals than had hitherto been supposed. It was well known to physicists that white was an extremely bad radiator of heat, so that an animal clad in this colour would lose less heat than if the hair were of any other colour; and by a true process of natural selection white fur, &c., would in this manner become established in the animals of the Arctic regions. It is thus probable that the ancestors of many species now inhabiting temperate regions were white during the Glacial period, a form of colouration which has been retained by Arctic species up to the present time, and which appears by reversion occasionally in species having coloured hair when they are exposed to the same conditions as those which originally gave rise to the white covering. The President stated in conclusion that he brought forward these views as they appeared to him to furnish an explanation of the fact recorded by the author of the paper.

Mr. English said he had received three white specimens of the stoat this winter from High Beach; last year he had four; previously he had not seen one for twenty years. Whether these white specimens were due to severe winters or otherwise he could not say.

Mr. Lockyer asked whether it was possible that the specimens seen were ordinary Albinos?* In the latter case, of course, the eyes would be pink.

Mr. English said that in his specimens, as far as he could recollect, the eyes were of the normal colour.

Some observations were made by Mr. Linton Wilson and others on the folly of gamekeepers destroying animals and birds in ignorance of their habits, and the necessity for controlling such destruction in the Forest districts.

Thanks were voted to the authors of the papers.

The Rev. W. Linton Wilson explained the method to be pursued in entering notes in the MS. book he had presented to the Club, and stated that he should always be happy to assist in arranging the materials thus collected.

The President remarked that a mistake appeared to prevail in the minds of many at the last meeting as to the purpose of the "Tea Fund" then started. He explained that to provide tea and light refreshment

* Mr. Christy remarks, under date March 25th, that he has no reason to suppose the specimens mentioned by him were Albinos, and that he never heard of an Albino stoat or weasel. He adds:—"Compared with the North of England, it is quite a rare thing here for the stoat to turn white, but I have just received one from as far south as Sussex that is all white except the top of the head and, of course, the tip of the tail."

for members and friends at the ordinary meetings of the Club, from £7 to £10 would be required per annum. This could not be charged to the working expenses of the Club, and the object of the fund was to provide money for what was deemed a very useful and sociable purpose, by means of voluntary contributions of members and friends.

At the Conversazione, Mr. P. F. Copland exhibited a specimen of the Green Woodpecker (*Picus viridis*) from Theydon Mount; Mr. English a specimen of *Conglomerate* found in the woods at Goynes Park, Theydon Garnon; and Mr. Cole a slide showing a portion of the *Trachea* of a larva of *Tipula oleracea*, with a parasitic larva attached thereto; Mr. Cole also exhibited his collection of European butterflies.

Monday, March 29th, 1880.—Field Meeting.*

The first Field Meeting of the Club took place on this day. The main body of the members and friends assembled at the Loughton Station in time for the 11 o'clock train from that place to Ongar, and were received by the Secretary. On arrival at Ongar the party at once proceeded to the "King's Head," where luncheon awaited them. Fifty-three members and friends sat down, the chair being occupied by Mr. Meldola. A pleasant walk across the fields then soon brought the party to Greensted, where it was met by Capt. Budworth, of Greensted Hall, and the Rev. R. M. Rodwell. The curious old church of St. Andrew's was inspected, and Capt. Budworth gave a highly interesting address on its history and construction. The body or nave of the church was entirely built of the trunks of trees (probably oaks), split or sawn asunder. The church has undergone a good deal of restoration, and on two separate occasions, the ends of the trunks of the trees composing its fabric becoming decayed, have been sawn off and underpinned with oak. This rude and unpolished building is supposed to have been first erected as a sort of shrine for the reception of the corpse of Edmund, King of the East Angles, on its return to Bury (in Suffolk) from London, whither it had been conveyed to avoid the sacrilege of the Danes, A.D. 1010. A passage in a Latin MS., cited in the Monasticon, runs thus: "This body was likewise entertained at Augre, where a wooden chapel erected to his memory remains to this day." The ancient road from London to Bury lay through Oldford, Abridge, Stapleford, Greensted, Dunmow, and Clare. There can be little doubt that the ancient part of Greensted Church was first a temporary shrine or resting place of St. Edmund,

* In these reports of our field meetings the Editor has endeavoured to present chatty and gossiping summaries of the proceedings and adventures at these pleasant *réunions*, but it must be remembered that the accounts are for friendly and kindly perusal by the members, and are not intended to be rigorously criticised.

and in process of time rendered useful as a a parochial church, many additions being made to the fabric. In his lecture Captain Budworth alluded to a curious custom as to the appointment of the rector. The Bishop of London holds the living in trust to present to it the senior curate of St. Botolph, Aldgate, for the time being, provided he is a *single man*, although of course he may marry after the presentation. The Rev. F. Rose, late curate of St. Botolph, had just been appointed, but had not then taken up his residence. In illustration of Captain Budworth's remarks, Mr. Unwin exhibited several views and sections, showing the condition of the church at various periods of its history. A cordial vote of thanks was given to Captain Budworth for his interesting address, and the party pressed forward over the fields, which were fortunately very dry, towards High Laver, Mr. Rodwell kindly placing his carriage at the disposal of some of the ladies.

The somewhat backward season precluded much work in the botanical way; the hedgerows were very bare of herbage, but in places the fragrant Ground-ivy (*Nepeta glechoma*), the "rathe Primrose," and the sweet and modest Violets (*V. oderata et canina*) were commonly seen and gladly welcomed as a sign that the merry days of spring were indeed come. Many specimens of a *white* "variety" of *Viola oderata* were noticed. The pretty and local Moschatel (*Adoxa moschatellina*) was common on many damp hedgerows and under the shade of trees; fine specimens of the Spurge Laurel (*Daphne*) were seen in a small wood near Moretown; young plants of *Hottonia palustris* ("Water-violet") occurred in a pond near Greensted, and *Potentilla fragariastrum* and *Mercurialis perennis* were everywhere in bloom. Mr. E. A. Fitch, F.L.S., pointed out the somewhat uncommon galls of the little Gall-gnat (*Cecidomyia Taxi*) on the yew-trees in Greensted Churchyard.

The only *Lepidopteron* observed was the little "March-dagger Moth" *(Diurnea fagella)*, which occurred on trunks of trees in Captain Budworth's park.

Mr. Saward noticed a curious case of almost complete etiolation in the leaves of a rose bush *(Rosa sp. ?)*.

At High Laver the Club was warmly welcomed by the Rector, the Rev. M. Rodwell, M.A., who explained the various features of interest connected with the church of All Saints, and pointed out some fragments of very old stained glass which had been recovered. The churchyard is celebrated as containing the tomb of John Locke, who died at the seat of Otes in 1704, the quaint Latin epitaph having been written by the philosopher himself. Mr. Rodwell gave some very interesting anecdotes of Locke, and recited two renderings of the epitaph—one, a metrical paraphrase by a friend, and the following prose version from his own pen:—"Stay, passer-by,—Near this place lies John Locke. To your question,—What sort of man was he?—He answers that he was of middle rank and fortune, and was contented therewith: of learned

tastes and habits: he only reached the point of consecrating his learning to the cause of truth above all things. You will discover this from his writings; and these will more faithfully exhibit to you the rest of his character than the suspected testimonials of an epitaph. Whatever virtues he had, they were not enough to put forward as a matter of glory to him, nor as an example to thee. Let his faults be buried with him. If you seek an example of good life, you have one in the Gospel; would that there were nowhere any of bad life; of the shortness of life, you have an example (may it profit thee) both here and everywhere.

"His birth, on August 29th, A.D. 1632; his death, October 28th, 1704, is recorded by this tablet, which itself must perish ere long."

The church was thoroughly examined, and afterwards the whole party was most hospitably entertained at tea at the rectory by Mrs. and Mr. Rodwell and spent some time in their pleasant garden. The Club intended visiting Magdalen Laver Church, when the Rev. Mr. Jones, rector, would have explained its points of interest, but time was wanting. In the cool of the evening the members strolled back to Ongar, and sat down to a capital supper tea at the "King's Head." The President made some congratulatory remarks on the success of the first field meeting, and announced that classes for instructing members in the use of the microscope and the study of plants and animals were in contemplation. The Club left Ongar by the 8.15 train, everything having passed off in an extremely satisfactory manner.

Saturday, April 24th, 1880.—Ordinary Meeting.

The Ordinary Monthly Meeting was held at the Head-quarters at seven o'clock, the President in the chair. Nearly fifty members and friends were present. Donations of books and pamphlets were announced from Messrs. Hy. Walker, F.G.S., A. and G. H. Lockyer, H. Goss, F.L.S., and the President. Certificates in favour of eight candidates for election at the next meeting were read.

Mr. W. Cole exhibited a series of specimens of *Ephyra punctaria* for the purpose of showing that the species exhibits in a marked degree the phenomenon of "Seasonal-Dimorphism." There are two broods of the moth in the year, one appearing in May from *pupæ* which have passed the winter in that stage. Eggs laid by the May moths produce another set of individuals in July, which are very different in appearance; but some of the *pupæ* frequently remain undeveloped, and wintering over, appear in the May following as the ordinary form of the species. Mr. Cole pointed out that this curious fact could be explained on the principle of "reversion," in accordance with Dr. Weismann's theory. The May or "Winter" generation may be viewed as the primitive form which existed in the Glacial epoch: as the summers gained in warmth

another generation became possible in the season, but certain individuals in a brood always exhibit a tendency to revert to the normal habits and form of the species. Mr. Cole also adverted to the fact that the occasional occurrence of such specimens would be of advantage to the species in affording a *cross* between individuals which had developed under very different conditions.

Mr. Robarts and the President made some remarks, the latter pointing out that Mr. Edwards's experiments with *Papilio Ajax* had afforded very similar results.

Mr. Cole also exhibited a series of specimens of *Ennomos angularia*, being the result of an experiment designed to test the influence of *food* on the colour and markings of insects. No definite influence could be traced to the kind of food on which the caterpillars had fed, although as naturally might be expected, different plants possessed very different nourishing properties. Also a very curious (*Gynandromorphous*) specimen of the pretty silver-studded Blue Butterfly (*Lvcæna ægon*), the wings on the right side being similar to those of the male insect, whilst those of the left side were of the female type. This specimen was captured at Loughton, in June, 1868.

Mr. English read a note on a new method of preserving plants for the Herbarium, so as to retain much of their natural colours and form. (Trans. Vol. I., p. 71.) The author exhibited specimens in illustration of his remarks, and asked for the assistance and co-operation of members in his endeavours to bring the process to perfection.

Mr. English also exhibited the White Weasels referred to at the last meeting, and a fine specimen of the Long-eared Owl (*Otis vulgaris*) from Magdalen Laver, in the stomach of which he had found the remains of a Song Thrush.

At the Conversazione, Mr. C. Oldham showed some fine "cut" specimens of fossil Madrapores, collected by himself on the South Devon coast; Mr. Lindsay, specimens of the minute Primrose (*Primula minutissima*), and *P. rosea* from N. India; and Mr. English specimens of the Wood Anemone (*Anemone nemorosa*) with "double" flowers, and an Albino variety of the Dog-violet (*V. canina*) from Epping; *Chrysosplenium oppositifolium* (Golden Saxifrage) from Ongar Park, and a white variety of the Common Primrose (*P. vulgaris*) from the Forest.

It was announced that at the meeting on May 29th, Mr. Henry Walker, F.G.S., would give a lecture entitled "A Day's Elephant Hunting in Essex," and that a class for the study of practical botany, open to members of the Club, would be commenced, provided the names of a sufficient number of students were received.* Also that a Field Meeting would be held on May 8th or 15th, for the purpose of visiting the ancient earthworks in the Forest.

* Sufficient interest not being shown by the local members in the project, it was subsequently decided not to hold the classes, at any rate just then.—Ed.

SATURDAY, MAY 29th, 1880.—ORDINARY MEETING.

The Ordinary Monthly Meeting was held in the St. John's Church Schoolrooms, kindly placed at the disposal of the Council by the Rector, the Rev. C. J. Ridgeway. The President occupied the chair. Upwards of eighty members and friends were present.

The following were balloted for, and elected members of the Club:—Miss Alcock, Mrs. M. Smith, Messrs. John Finzi, J. M. Gawler, Charles J. Glass, Frank Jesse, Charles Thomas, F.G.S., Charles Welsh. The names of seven new candidates were read.

Mr. Worthington Smith, F.L.S., exhibited six large and heavy Palæolithic implements, found by himself in the Valley of the Lea, near London, and of the same age as the elephants and other animals subsequently mentioned by Mr. Walker in his lecture. These implements are found on both sides of the Lea Valley, generally in sand and gravel, and not unfrequently with bones of *Elephas primigenius*.

Mr. Saward exhibited a remarkably pale form of *Argynnis Euphrosyne* (the "Pearl-bordered Fritillary Butterfly") from Ongar Park Woods.

Mr. E. A. Fitch, F.L.S., brought up for exhibition and distribution amongst the members a large number of specimens of the usually rare Cress, *Lepidium draba*. This plant is a native of the middle and south of Europe, but is not admitted into the British list, being considered by Mr. Watson as an alien; it has occurred in fields and on hedge-banks, at Swansea, St. Peter's, Ramsgate, and in Essex, but always rare, and appearing to be introduced. Mr. Fitch's specimens were from his fields at Maldon. The plant was first noticed twenty or twenty-five years ago, and is now very common. The roots penetrate to a great depth in the soil. Mr. Fitch was of opinion that the seeds of the plant had been introduced with foreign clover seed.

Mr. Henry Walker, F.G.S. (author of "The Glacial Drifts of Muswell Hill and Finchley," "Saturday Afternoon Rambles, Rural and Geological," &c.), then delivered a lecture entitled "A Day's Elephant Hunting in Essex." (Transactions, Vol. I., pp. 27–58.) Mr. Walker illustrated his lecture by reference to numerous maps, plans, and geological sections, some of which were new, and specially prepared for the occasion. He also showed some fine specimen fossils from his own collection. The lecture was listened to with deep attention by the audience, and Mr. Walker was much applauded at its close.

The President said it was almost unnecessary for him to speak of thanks to the lecturer, they had already given their verdict in that hearty burst of applause. The lecture was well worthy of the attention it had received, and he had great pleasure in announcing that the Council had resolved to print Mr. Walker's essay, so that the members

and general public might have an opportunity of studying it at their leisure. Before putting any formal vote to the meeting, he would like to listen to any remarks from members, and he was glad to say that they had amongst them that evening the very Nimrod of Essex Elephant hunters, Sir Antonio Brady himself, to whose noble and persevering exertions science and the nation were indebted for that unique and magnificent collection of *Pleistocene Vertebrata* from the ancient Thames Valley which now rested in the British Museum.

Sir Antonio Brady, F.G.S. (Verderer of Epping Forest), who was warmly greeted, referred, in a long and interesting speech, to the astronomical causes which may be held to account for the various Glacial Epochs, and mentioned in that connection two books which he deemed worthy of special study—Mr. Croll's "Climate and Time," and Colonel Drayson's "Glacial Epochs." To explain the various phenomena observed, we must have recourse to astronomical causes. It appears that the pole of the earth points to the polar star, but that the pole of the plane of the ecliptic is not quite coincident with it, being about 46 seconds from it. It is suggested that the poles do not revolve in space in a circle, but in a slightly eccentric curve. The effect is scarcely noticeable in historical time, but in the course of about 17,000 years such a declension would be caused in the earth's axis with regard to the sun as would in that time bring the arctic circle down to about the latitude of London. This would cause such a change of climate as would account for the Glacial Period, which we know once, if not oftener, obtained in this island, and is especially apparent in the northern part of it, notably in Scotland. In this condition, the sun in our latitude would not rise above the horizon for months together, and the result would be an arctic winter such as now exists in the higher regions of our globe. On the other hand, the sun would be above the horizon for many months together, giving a tropical climate, such as recent discoveries of coal measures and tropical vegetation prove to have existed near the pole in ancient geological times. The effect of the rapid melting of the accumulated winter ice and snow would cause such floods as we have now no experience of, but which would fully account for most of the phenomena of Glacial Drift, and the transport of enormous boulders, presumably ice-borne on the floating icebergs, as we see in a lesser degree at the present time. It is moreover suggested that the animals existing at that time migrated with the changing seasons, some being overwhelmed by the way. The subject was too vast for him to do more in the few remarks permitted him than just to glance at the theories promulgated to account for known phenomena; but anyone wishing for more detailed information on this most intensly interesting subject would be amply repaid by the perusal of the many works which treat on the questions raised, especially those he had already referred to.

One difficulty which always strikes the observer is to account for the number and variety of animals, the bones of which are found in the Uphall Brickfields. The spot appears to have been a perfect grave-yard for large animals, both tropical and boreal. Ilford was a cemetery for mammoths, rhinoceroses, *hippopotami*, bisons, *et hoc genus omnes*, in the old ice-age, thousands—nay, tens of thousands—of years ago; and a cemetery for Londoners it was at the present day. Sir Antonio believed that the facts could be explained somewhat as follows:—England in the Pleistocene age was not an island, but formed part of the continent of Europe. The Thames was certainly there, and although only a tributary of the great river which drained the vast valley now the North Sea or German Ocean, was a very large and broad stream. The herds of animals whose remains are found buried at Ilford occupied the whole territory so drained. There is reason to believe that the spot where Ilford now is was at that period the centre of a lake-like expansion of the river, bounded on the one side by the Kentish, and on the other by the Hertfordshire, hills. The river was, of course, not then confined, as now, by artificially constructed banks. Bones were often found deposited before the cartilaginous connections had been dissolved, but it was impossible to believe that all those large animals had lived and died in so small a space. Although the remains were not water-worn, they must have been carried to the Ilford brickfield by the same agency that deposited the sand, gravel, and silt around them—namely, *water*. The main stream probably entered the lake-like expansion of the river at or near one corner, and left at another, imparting to the current a somewhat rotary motion, which motion would tend to drift floating bodies towards the centre. The heavier parts of drowned animals, carried along with the stream, would be deposited near to the middle of the lake; and when decomposition set in, the heaviest bones would first become detached from the carcases, fall off, and sink, whilst the lighter ones would be carried further, and some perhaps become ultimately disintegrated and lost. This would explain why so many heavy bones, tusks, teeth, and skulls were seen together. The bones were mostly found in the sands under the brick-earth, soddened with percolating water, by which agency all the animal matter had been washed out, leaving the form of the bone and "skin" (*sic*) perfect, but consisting only of the mineral skeleton, and that in a very soft and pappy state. Their exhumation is therefore a matter of great difficulty, requiring the exercise of much skill. Sir Antonio gave a minute explanation of the ingenious though tedious process employed in exhuming the large and extremely fragile bones from the earthy matrix in which they are found—a process rendered more difficult in the case of large tusks by the *double curve* of those of the mammoth. The last tusk he dug up was over ten feet long. We owed the method employed to the genius and skill of

Mr. Henry Woodward, of the British Museum. The tusk, being saturated with moisture, had first to be underdrained to partially dry it, and to give it a little consistence, or it would not take any of the size or glue which must be employed to replace the cohesive animal matter which in process of time it had lost. The surface having been cleaned from sand and gravel, damp paper was then carefully laid over it, and over this liquid plaster of Paris was poured. This soon hardened, the paper preventing its adhesion to the bone. In the case of a large tusk with a double curve, rods of iron, bent to the shape of the tusk, had to be used, and solidly embedded in the plaster. So far, the upper surface only had been dealt with, and the more difficult or under part had then to be treated. This was done by undermining a few inches at a time alternately, and tying up the underlying matrix (often loose sand) with list or haybands until the entire length had been secured and fixed with plaster. The whole had then to be very carefully turned over on to a platform made to receive it, when more plaster was added, and the bone encased in a perfect splint or case, in which state it might be removed. A large tusk would require from two to three hundredweight of plaster. It was then left to dry, and when ready, the coats of earth, bands, and plaster were carefully removed with saw and chisel; the paper first laid on preventing the adhesion of the plaster to the bone, and preserving the "skin" intact. In drying, the bone cracks all over, and often separates into many hundred pieces. In this case the pieces were numbered whilst still in the plaster matrix, and then boiled in a solution of glue to give them consistency: they were then fitted together again with cement. If these operations were carefully performed, the pieces fitted so accurately that the joints were scarcely discernible.

Sir Antonio referred to his Catalogue of Pleistocene Mammalia from Ilford as being the most complete record ever made of one locality. It was always his desire that his fossils should be preserved in some local museum, so as to be available for study near the scene of their discovery. He had offered them to the East London Museum, but the Government of that day would not accept the trust, and so the collection went to the British Museum, the authorities there having expressed a great desire to have it. There was no Epping Forest Club then in existence, or its resting-place might have been different.

In conclusion, Sir Antonio expressed his pleasure at being present as a member of a society which promised so well, and which had so wide a field of work before it. He moved a cordial vote of thanks to Mr. Walker for his pleasant and instructive lecture.

The President said, before putting the vote, he had a few announcements to make. The projected Field Meeting to the Forest earthworks they were obliged to postpone, owing to the difficulty of securing the services of a skilled archæologist to conduct the same. As soon as

arrangements could be made, the meeting would take place. A Field Meeting would be held on June 5th, in Monk's Wood, with Dr. M. C. Cooke, M.A., &c., as conductor; also one on 19th June in conjunction with the New Cross Microscopical Society. In July Mr. Walker would accompany a Field Meeting to some spot of geological interest; and Professor Boulger, F.L.S., F.G.S.; &c., had also offered his valuable services as a botanist. Particulars of these meetings would be announced in the usual way.

The vote of thanks having been carried by acclamation, Mr. Walker said that his best reward was the knowledge that so strong and prosperous a Field Club had been established in Essex. He had had much experience in connection with Field Clubs and Natural History Societies, and therefore spoke with authority in expressing the pleasure he had derived at finding a club so vigorous and determined to succeed, starting on its course of pleasant usefulness.

The usual Conversazione took place at the Head-quarters of the Club, 3, St. John's Terracce, where tea and coffee were served. Mr. Wakefield exhibited some beautiful specimens of Agates, Fossil Sponges, Corals, &c., cut and polished; also a fine stone Celt, dredged up from the River Lea, near Waltham Abbey. Mr. W. White, two species of *Stigmaria* from the Coal Measures. Rev. W. Linton Wilson, various specimens of animal and vegetable "Pond Life," including *Lissotriton punctatus* and *Triton cristatus* (Newts), three species of *Lemna* from Chigwell, and many Water-beetles, &c. Messrs. W. and B. G. Cole, a box of insects from Monk's Wood, taken and bred in April and May, 1880. Mr. J. Gibbs, specimens of the abnormal *Cardamine pratensis* described in a paper recently communicated to the Club (Trans. Vol. I., p. 64). Mr. English, fine specimens of *Polyporus squamosus*; a hen Blackbird with plumage resembling a Thrush, and other specimens.

Saturday, June 5th, 1880.—Field Meeting.

The announcement of a Field Meeting in Monk's Woods, with Dr. M. C. Cooke, M.A., A.L.S., &c., as botanical conductor, attracted a large number of members and friends, nearly eighty ladies and gentlemen assembling at Loughton Station on arrival of the 2.13 p.m. train from Fenchurch Street. The weather, changeable during the morning, had then become more settled, and gave some promise of a fine afternoon. The party was soon in motion, the route chosen being over Staple's Hill, and so at once into the greenwood. There were present Mr. B. H. Cowper, the discoverer, and Mr W. D'Oyley, the surveyor, of the Loughton "Camp"—a spot which may have been associated with Queen Boadicea, and the final struggle of the

Britons against the Romans. The party was soon encamped within the ramparts of their sylvan fortress, and Mr. Cowper briefly pointed out and explained the leading features and probable intention of this interesting monument of an ancient race. But no lingering could be allowed at the spot, interesting as it is to the lover of history and legend, and the members left it with less regret, inasmuch as they were promised a Field Meeting for the special purpose of examining the Forest earthworks. So "Forward!" was the word of command; and Little and Great Monk's Woods were soon reached. Perhaps no more charming spots than these could be chosen by anyone desiring to see Epping Forest at its best. Monk's Woods are hidden in the midst of the Forest, silent and secluded. The ground surface possesses considerable natural advantages. It is modestly undulating, and in places much broken where some tiny rivulets traverse it, running in picturesque curves through the shady thickets. The trees, unscathed by "lopper" or "topper," at least in recent times, are very types of sylvan vigour, and spread around their graceful boughs with all the wild freedom of Nature. The stroller may here find bits of woodland beauty recalling New Forest itself—giant Beeches guarding vistas of speckled light and shade, with foregrounds of richly branched and tangled Brambles, graceful Bracken ferns, verdant mossed patches, and waving grass and rush. It is a true piece of natural woodland, teeming with objects of wonder and delight for all who have eyes to see, aye, and ears to hear, for the spot abounds in birds and curious forest animals. Many members of the party were soon busy with the flowers and insects, mosses and ferns, which inhabit this delightful spot. There was the Red Rattle (*Pedicularis sylvatica*), a white variety of which occurred not uncommonly; the pretty and changeable Milk-wort (*Polygalia*) in all shades of colour—white, blue, and pink. The Bracken ferns were just unfolding their fronds, and gave fair promise of coming luxuriance. The Needle-whin (*Genista anglica*), one of the prettiest of woodland plants, nestled amongst the Ling in the openings, where the little white flowers of the Heath Galium (*G. saxatile*) contrasted well with the bright yellow blossoms of two species of *Potentilla* (*tormentilla et reptans*); whilst in "shadiest covert hid," the plainer Cow-wheat (*Melampyrum*) bordered the woodland paths. In the streams the bright blue blossoms of the Brook-lime were to be found, and by the brook-side the delicate Yellow Pimpernell (*Lysimachia nemorum*), the variety *flexuosa* of the Hairy Bitter Cress (*Cardamine hirsuta*) and two or three species of *Viola*. The entomologists were not very fortunate; the weather was possibly not favourable for delicate moths—they had betaken themselves to the welcome shelter of the leafy boughs and sedge. However, several species were noticed—the Beech Hook-tip moth (*Drepana unguicula*), and the pretty Geometrid *Ephyra trilinearia*,

both peculiar to large Beech woods. The pond-hunters were busy with rod and bottle fishing up examples of aquatic life from pools and streams. We have no reports of the catches in some cases, but Dr. Cooke has furnished us with the following list of species he met with during the afternoon :—

ALGÆ.

Zygnema cruciatum (Ag.)
Zygnema stagnalis
Spirogyra tenuissima (not common)
Spirogyra turpis
Cladophora fracta

DIATOMS.

Cocconema lanceolatum
Epithemia turgida
Pinnularia viridis

DESMIDS.

Hyalotheca dissiliens
Closterium Dianæ
Closterium Leibleinii
Closterium rostratum
Closterium gracile (rare)
Spirotænia condensata
Cosmarium cucumis
Cosmarium botrytis
Staurastrum muricatum

He states, however, that he found very little animal life in the collection, except :—

PROTOZOA.

Amæba guttula
Actinophrys sol

ROTIFERS.

Rotifer vulgaris
Metopidia acuminata

(Dr. Cooke adds, " There may be one or two additions to this list, as there are a few specimens which I have not had time to examine sufficiently to fix the names with any certainty.")

About five o'clock the whistle was sounded, and the members found their way in groups to the Wake Arms, where a well-served and substantial tea awaited them. Then, making for the train, the forest road towards Theydon was taken, a halt being made in the woods to listen to the genial conductor, Dr. Cooke, as he discoursed on the wonders of the water, the curious Algæ, Diatoms, Desmids, Rotifers, &c., which a little searching would reveal in the ditches, pools, and swamps of Epping Forest. The rain came down during the Doctor's address, and he made some humorous allusions to the vanity of human wishes as exemplified by the afternoon's proceedings. But he said he had very great faith in Epping Forest as being perhaps the best spot for the naturalist within forty miles of London. As an instance, he mentioned that, on the previous Saturday afternoon, he had found at Snaresbrook three species of Algæ hitherto unknown in Britain—namely,

Hydrianum heteromorphum (Reinsch)
Sphærozosma secedens (De Bary)
Closterium linea (Perty).

This result showed that the persevering hunter might still find worlds to conquer in our own districts.

Dr. Cooke's remarks on the various forms of minute life were illustrated by a large series of exquisite coloured drawings made from living specimens under the microscope. But the rain became too persistent; the Doctor shut up his portfolio, and the Club fled along the Theydon Road to the railway, under the shelter of friendly umbrellas. The 8.37 train set down the members of the party at their proper stations; a "good-bye," a rapid hand-wave at the passing carriage-windows, and a pleasant day was gone.

Saturday, June 19th, 1880.—Field Meeting.

A Field Meeting of the Club was held in conjunction with the New Cross Microscopical and Natural History Society, the members of the two societies meeting at Theydon Bois on the arrival of the 2.13 train from London. The meeting was conducted by the respective Presidents and Secretaries of the Societies, Messrs. Martin Burgess, R. Meldola, Frederick Stewart, and W. Cole; Mr. Henry Walker, F.G.S., also giving his valuable aid. The weather during the week had been of a very doubtful character, and heavy rain had fallen during the morning. The muster was not so large, therefore, as had been anticipated, but sixty members and friends attended the meeting, and were rewarded with one of the finest afternoons of the season—warm, genial, and bright. The route taken was past Theydon Green and the Church, through the village, and into the woods on the right hand, some distance past Oak Hill enclosure. The forest was at its best; the rain had freshened the plants and trees, but, excepting in the low ground, it was quite dry under foot. Nets, boxes, and vasculums were soon applied to their proper uses. *Orchis maculata* was growing in profusion and perfection; and many were the demonstrations, with a grass stem thrust gently into the spurs of the newly-expanded flowers, of the mode in which insects unconsciously remove the pollen masses on their proboces, and carry the fertilising element to other plants. In a large open of moist heathy land, two species of Hair-moss (*Polytrichum commune et P. aloides*) occurred in plenty; and here the remains of poor "Reynard," with his bonnie brush intact, lay festering in the sun! In the woods near this spot, Mr. English found some young plants of the elegant little fern, *Lastrea oreopteris* (*montana*, Newm.) (See Ordinary Meeting, June 26th.) The party then proceeded to a piece of marshy ground on the Copthall Road, where the Bog-moss (*Sphagnum*) grows abundantly. Here the microscopists at once set to work, but with what result only home study could reveal. Two species of a delicate Fungus grew on the moss, and the moisture-loving Bedstraws (*Galium uliginosum et palustre*) were

common, with the untidy-looking *Lychnis flos-cuculi*, well named the "Ragged Robin" by village urchins. Then on through the forest towards Ambresbury Banks, noticing the heaps of Bagshot gravel by the roadside, which Mr. Walker explained at one time covered the whole country, and had since been denuded away, with the exception of the outlying patches on the Essex heights, &c. Some little time was spent in examining the Camp, which is supposed to have been the station of the Roman General, Suetonius, when he gained his great victory over the unfortunate Queen of the Iceni. The Britons, headed by Boadicea, perhaps assembled at the Camp at Loughton (visited by the Club on June 5th), were so confident of success that we read they brought their wives and families to view the confiict and enjoy their triumph ; and so certain were they of victory that they blocked up the rear of the army with their carriages and waggons. When defeat came these impeded their flight, and a dreadful slaughter ensued ; men and women without distinction were slain by the incensed Romans, to the number, it is said, of 80,000 in battle and pursuit. At least, so the story runs in county history and legend.

From this spot the members strolled gently on towards Epping, taking the old hunting glade through the Forest, which has been re-opened by the Corporation to form part of their "Green Ride" from Forest Gate to Thorn-wood Common. This part of the Forest is most beautiful, and the fine unlopped beeches were much admired. Many plants were noticed : The Sanicle (*Sanicula Europæa*) and the Pig-nut (*Bunium flexuosum*), the edible tubers of which were tasted with much satisfaction. The lovely *Lotus corniculatus* was in profusion in many parts, and the Honeysuckle and many species of *Rosa* were found wasting their sweetness on the desert air. The entomologists noticed, amongst the *Lepidoptera*, *Halias prasinana*, *Herminea tarsipennalis*, and *nemoralis*, and a very dark female specimen of *Eubolia palumbaria* ; many species of *Coleoptera*, *Trichoptera*, *Hymenoptera*, and *Diptera* were also obtained. Mr. W. G. Smith, the well-known Secretary of the Forest Fund, caught sight of a Deer in one of the glades near Ambresbury.

At the Cock Inn, Epping, a very excellent tea was furnished by Mr. Tweed, the comfort of the party being studied in every way. The Rev. W. Linton Wilson, M.A., took the chair, in the temporary absence of the President, and after welcoming the members of the New Cross Society, called upon—

Mr. Walker, who said he had no intention of inflicting a long speech upon them ; he always endeavoured in such cases to lean to the side of mercy ! They might congratulate themselves on having had a most delightful forest ramble, in company with their good friends from New Cross. It was also a great source of satisfaction to know that they had taken away the reproach from the county, for it was a reproach

for a county like Essex to be without its Field Club. The time had come to show that they were not all bicycle mad; that other things were worthy of attention besides boating and cricket, excellent as these were in their way; and they would offer their protest against the neglect of Nature in these days. They should not stop at that however: they should make their enthusiasm contagious, and seek always to impart the virus to their friends. For himself he could say that he always strove to prove a source of contagion to others. (Laughter.) Mr. Walker made an earnest protest against the wilful destruction of rare plants and animals. He was glad to see that the Rules of the Club emphasized that protest. They felt that the protest was necessary, but they also felt that they had sufficient moral sense to know how to deal with the subject. With respect to their field of study, they had a comparatively unworked ground in almost all branches of Natural History, and in Geology especially. He instanced the *Glacial Moraine* which had been recently discovered not far from Epping, with its shells and fossils transported from Lancashire and Yorkshire, and which was an example of the kind of work waiting to be done in the Geology of Essex. In the course of his very interesting address, Mr. Walker also pointed out the benefits to be derived from companionship with men who have made a special study of some one branch of natural science; they must remember that books were always far behind field work, and the great value of the social meetings of Clubs and Societies was that they brought the true student and the learner face to face.

Mr. Martin Burgess, President of the New Cross Society, returned thanks for the cordial welcome accorded to the members of his Society. They had that afternoon seen some of the beauties of Essex, and he hoped it would not be the last occasion on which the two Societies might be able to co-operate in so pleasant and profitable a way.

The company then rambled about Epping until the time of departure by the 8.33 train. This, the third Field Meeting of the Club, was in all respects a successful one.

Saturday, June 26th.—Ordinary Meeting.

The Monthly Meeting was held at the Head-quarters, at seven o'clock, the President in the chair. The following were elected members of the Club:—Rev. F. A. Walker, B.D., F.L.S., &c., Professor G. S. Boulger, F.L.S., F.G.S., Messrs. W. H. Wright, Ernest Thompson, John Waller, T. Travis, and Wm. Bodle. The names of eight new candidates for election at the next meeting were read.

The President announced that a Field Meeting would be held on Saturday, July 3rd, for the purpose of visiting the ancient camps in the Forest. Major-General Pitt-Rivers, F.R.S. (Vice-President of the Anthropological Institute), would act as Archæological conductor, assisted by Mr. B. H. Cowper, the discoverer, and Mr. Wm. D'Oyley, the surveyor of the Loughton Camp. Professor Boulger, F.L.S., F.G.S., &c., would superintend the botanical researches of members, and many other well-known men were expected to be present.

Mr. James English exhibited the following insects taken in Epping Forest:—*Notodonta dictæoides*, *Stauropus fagi* (the "Lobster Moth"), and curious varieties of *Eubolia palumbaria* (captured at the last Field Meeting), *Argynnis selene* ("Small Pearl-bordered Fritillary" butterfly), and *Lomaspilis marginata*. Mr. English also referred to his re-discovery of the "Mountain Buckler Fern," *Lastrea oreopteris* (*montana* of Newman's British Ferns), at the Field Meeting on the 19th of June. The plant used to occur near Fair Mead Bottom at the back of the "Royal Oak," High Beach, and one or two other localities, years ago. He had often searched of late to re-discover the species, but in vain, until the occasion referred to; he had since noticed another plant. Mr. Cole remarked on the probability of many lost species re-occurring; and instanced the Lily of the Valley, which had become very rare in the Forest. This year young plants were springing up in numbers in several spots.

Mr. Meldola exhibited *Aplecta occulta* (dark aberration), *Aplecta tincta* and *Noctua glarcosa*, all captured in the woods near Woodford some years ago. Mr. English remarked that *glareosa* occurred occasionally in some parts of the Forest, but that *A. occulta* was a great rarity. Mr. Doubleday had once bred a batch of thirty or forty specimens, but all of the grey tint common in southern specimens, whereas Mr. Meldola's example was similar to the dark northern form of the moth.

Mr. B. G. Cole exhibited the following moths:—*Cucullia chamomillæ*, taken at Buckhurst Hill in May; *Tephrosia consonaria* and *Nola cristualis*, taken in Monk's Woods in May; and a series of *Demas coryli* (the "Nut-tree Tussock" moth) bred from *larvæ* found in the same place in September and October, 1879.

The Secretary exhibited some living plants of the "Sundew" (*Drosera rotundifolia*), gathered that morning in Epping Forest. He called attention to the very restricted habitat of the species, and the certainty that any extensive drainage of the locality would inevitably exterminate this, one of the most wonderful of British plants.

The President gave some interesting details of the results of modern study of the "Sundews." He briefly described the structure of the leaves of the *Drosera*, the gland-bearing tentacles, and the viscid fluid secreted by them. Insects alight on the leaves, probably attracted by some odour exhaled by the plant. The viscid fluid covering the ten-

tacles holds the insects prisoners, and in a short time the longer marginal tentacles bend over and with merciless grasp crush the poor captives down to death. The secretion from the glands increases in quantity, and acts, as Mr. Darwin's patient experiments have shown, with a veritable digestive action on the softer tissues of the insects. The nutritive nitrogenous substances are thus dissolved and taken up by the glands, which possess the power of absorption as well as that of secretion. The leaves again unfold, the secretion dries up for a time, the indigestible hard parts of the insects are blown away by the wind, and the leaves are again in a condition to resume their predatory functions. Sometimes large insects are caught in this way, and Mr. Cole mentioned that he had on two occasions seen *Satyrus janira* (the "Meadow-brown" butterfly), an insect measuring nearly two inches across the wings, thus held fast. The vigorous growth of the plant is evidently dependent on the supply of nitrogenous substances obtained by the solution and digestion of its insect prey. Its natural habitat on the surface of a thick layer of *Sphagnum* moss can give the plant little beyond a plentiful supply of moisture, whilst the smallness of the roots, which merely serve to anchor it to its mossy bed, proves that it derives but little benefit from the soil. The predacious habits of the plant are therefore probably of great importance to its well-being. Mr. Letchford mentioned the fact that gardeners find the *Droseraceæ* very difficult to cultivate; in confinement they probably miss their weekly rations of flies and gnats.

An interesting discussion followed Mr. Meldola's observations, in which Messrs. Letchford, Robarts, Lockyer, the Secretary, and President took part. The habits of carnivorous plants, the functions of Chlorophyll (in which the *Drosera* is very deficient), and the supposed distinctions between plants and animals, were touched upon.

Communications from Mr. R. M. Christy, on "A curious mass of mud found in a thrush's nest at Audley End Park, by Mr. Travis, and supposed to be the work of a *Nuthatch;*" on the question, "How do Wild Ducks, Moorhens, and other such birds introduce their young to the water when their nests are placed on a tree?" and on "Diseased Trout in Essex," were read. (Trans., Vol. I., pp. 66-71.)

Remarks on these subjects were made by the President, Messrs. W. C. Barnes, Letchford, Robarts, English, and the Rev. C. J. Ridgeway, and thanks voted to the author.

Mr. Lockyer read the rules he had drawn up for the Exchange Scheme which had been sanctioned by the Council, and which he would superintend (particulars can be obtained by applying to Mr. Alfred Lockyer, Tavistock Road, Snaresbrook).

At the Conversazione Messrs. English and W. Cole exhibited various plants from the Forest in flower, including *Orchis maculata* (the "Spotted Orchis"), *Habenaria bifolia* ("Butterfly Orchis"), *Listera ovata* ("Tway-

blade"), *Erica tetralix* ("Bell-heath"), *Pendicularis sylvatica* ("Red-rattle"), &c., &c.; and Mr. English several species of *Fungi*, including *Polyporus sulphureus*, *Marasmius urens* (poisonous), &c.; also an example of the rare sub-genus *Eccilia* of *Argaricus* gathered at the last Field Meeting and preserved by his well known process.

SATURDAY, JULY 3RD, 1880.—FIELD MEETING.

"A Field Meeting will be held on Saturday, July 3rd, 1880, for the purpose of a thorough investigation of the Ancient Earthworks of Ambresbury Banks and at Loughton." So ran the circular, which, sent to all members of our Club, had induced nearly fifty enthusiasts to brave the perils of the storm, and take the 2.13 train from Fenchurch Street to Theydon Bois. As the train paused at the several stations to take up some courageous and resolute members, and to set down some timorous and vacillating ones, the greetings and opinions on the weather exchanged from the carriage windows were the reverse of assuring—the rain was simply pouring down, and the sky burdened with dense masses of cloud and vapour sufficient to strike terror into the heart of the most hardened forester. Sometimes, however, fortune favours the brave. At Theydon Bois the rain soon ceased, the sun shone out brightly, and some hopeful ones even predicted a fine afternoon. Alas! again had we to lament, with Dr. Cooke, the "vanity of human wishes"—but more of the weather anon.

In spite of untoward circumstances our party was a goodly one. Our learned archæological conductor, Major-General Pitt-Rivers, F.R.S., Vice-President of the Anthropological Institute (better known, to those who have examined his magnificent anthropological collections lately shown at the Bethnal Green Museum, by his former cognomen, Colonel Lane Fox), and his colleague, Mr. W. L. Distant, Director of the same Institute, were present. Also Mr. B. H. Cowper, so well-known from his discovery of the Loughton Camp and his various papers thereon. Professor Boulger, F.L.S., F.G.S., represented the claims of botanical science; and last, but not least, our good friend Mr. Walker, F.G.S., gave us the benefit of his company and kindly aid. Of course our President was at his post; and no less than eight of our lady members and friends donned "waterproofs" and umbrellas, boldly facing the fortunes of the day. Captain Alex. McKenzie (Superintendent of the Forest) courteously placed the services of the head-keeper, Mr. Luffman, at our disposal, and a start was soon made through the woods to Ambresbury Banks; Mr. W. C. Barnes and Mr. J. Eliot Howard, F.R.S., kindly giving carriage accommodation to some of the party. The Forest was in places very wet, and it required

some amount of skill and agility to safely cross the numerous quagmires which now and again sought to bar our progress; whilst every incautious tap at the trees or bushes showered down glistening rain drops upon devoted heads. At Ambresbury we were joined by Mr. D'Oyley (the Hon. Surveyor to the Club), who brought with him some beautifully drawn plans of the two Camps made from his own surveys.

The archæologists at once set to work to verify the details of the Earthworks, and Mr. B. H. Cowper gave an interesting sketch of their broad features, and the circumstances under which he first made their acquaintance, seven or eight years ago. He referred to the name Ambresbury (or "Amesbury," as it is pronounced by the country people), as being identical with that of the well-known town in Wiltshire, near Stonehenge, and the celebrated Vespasian's Camp. The word Ambresbury is thought by some to be derived from Ambrosius Aurelius, a foe of the Saxons. If this derivation is allowed to be correct, we may associate the Epping Camp with the most romantic stories of our history, and may conjure up visions of Vortigern and Merlin, and Tennysonian legends of King Arthur and the Knights of the Round Table. But descending to mere matters of fact, he said it was curious that so far as he knew no relics had been found in either the Epping or Loughton Camps; he had often examined them carefully, but could discover nothing in the way of a coin or medal, or other object that would interest the simple antiquary, and enable the true date of the Camps to be fixed. During the examination, General Pitt-Rivers remarked upon the amount of denudation which had evidently taken place from the ramparts, and the large quantity of vegetable and other soil which had accumulated on the ancient level of the Camp. In order to have even a remote chance of finding coins, pottery, or other relics of their founders, it would be necessary to get at the former base of the Earthworks by a careful excavation.

At Mr. Meldola's suggestion, all discussion as to the nature of the remains was deferred until after tea, and a move was soon made to the Loughton Camp, which was first made known by the researches of Mr. Cowper in the year 1872. Owing to the dampness of the herbage our party was obliged to keep much to the main road, and we so lost the ramble through Monk's Woods, which had been looked forward to as one of the pleasantest features in our programme. Professor Boulger's office as botanical adviser was almost a sinecure. Little opportunity was afforded to the phytological enquirer, and the plants observed hardly call for particular notice; but few could fail to be struck with the beauty and profusion of the Orchids in the forest openings. Insects of course were very scarce; with a weather wisdom superior to our own, they refused to creep out from the shelter of their leafy bowers. "Cowper's Camp" was examined by our archæologists amid the growlings of the coming storm. Viewed from where we stood on the

high ground to the South of the Camp, very grand and impressive were the atmospheric effects exhibited in the valley stretching below us to the Kentish Hills on the other side of the Thames. But even our enthusiasm was soon put to too severe a test, and as the flashes of lightning increased in number and lurid brilliancy, and the rumbling thunder of the ever approaching storm became louder and louder, a general stampede took place. In parties, some in carriages and some on foot, we made for our promised haven, the "Forest Hotel," at Chingford. Some of the number took refuge at the "Robin Hood," and secured conveyance from thence. Mr. Barnes and Mr. Distant *felt* the effects of one of the electrical discharges as their carriage ran along the Lower Road. However, all were eventually safely lodged in the Hotel, and enjoyed the excellent "high tea" provided for us by the manager, Mr. Jesse. After tea, a move was made to the fine room known as the Banquetting Hall, where the President expressed the pleasure he felt at seeing so large a meeting assembled in spite of the adverse meteorological conditions. It was a very gratifying indication of the vitality of the Club. He remarked that the early archæology of Essex came legitimately within their scope; and at a very early stage of the Club's existence he felt that it would be very desirable for it, as a scientific body, to take up this question of the Forest Earthworks, with the view of settling, or attempting to settle, their date. He congratulated the Club on its having been able to secure the co-operation of their eminent conductor, one of the highest authorities in the kingdom on subjects of that nature, upon whom he would call to favour the meeting with the benefit of his opinion.

General Pitt-Rivers said that Mr. Meldola had spoken in very flattering terms of his (the General's) qualifications for the post he had the honour to occupy that afternoon. He confessed he was somewhat taken aback at seeing himself announced as conductor of the meeting, inasmuch as although he had been engaged for many years in studying ancient camps in many parts of the kingdom, he had not before had the pleasure of viewing these remains in Epping Forest. However, they had had the benefit of the best local knowledge as represented in Mr. Cowper, and the assistance of the very excellent tracings prepared by Mr. D'Oyley; these plans formed a great step in advance toward obtaining a knowledge of the remains. In fact he felt that his office as conductor was not a case of the blind leading the blind, but rather an instance of the blind attempting to lead those who could see. He believed there could be no question that both the remains they had visited that afternoon were veritable Camps, such as were found in other parts of the country. He did not himself think there was any evidence for supposing that either of them were Roman. They might be of the Roman age, or possibly of more recent date—Saxon or Danish, or even later in time. Roman Camps are generally rec-

tangular, and at one period he thought that some *data* might be gained as to the origin of a Camp from an inspection of a tracing of its outlines. Further experience had dissipated that idea, and without actual exploration it was impossible to decide on the date of the formation of any of these remains. There are certain Camps which from their outline may be pronounced Roman, and others which may with safety be set down as Norman ; but as the general principles of defence have always been the same, it is not safe in the absence of relics to judge from the external appearance of Camps like these, which have no special peculiarities.

The result of their day's work was therefore mainly negative ; but the course to be taken in order to settle the question was very clear. They must cut sections through the Ramparts, so as to reach the original basement soil on which the Camps were raised. In his experience he had never known an instance in which this plan had been followed where something had not turned up sufficient to settle the date of the Camp. When you come to the surface line, whatever you find upon that (fragments of pottery, and such things as a knife, spear-head, or a coin) must be of the date of the Camp's erection, or earlier. He would merely make the suggestion that as the Club had been started for the purpose, amongst others, of investigating the Forest, it might be a good way of commencing their proceedings to make such an examination of the Camps. He did not think it need be a very great undertaking, and he thought they would find it satisfactory. At any rate it was the only possible way of settling the interesting problems raised by the existence of these Earthworks.

Mr. Distant considered that the interest which was attached to these Camps, though a purely archæological one, still appertained to anthropology. For if, as Professor Huxley had remarked, "Biology included man and all his works," so much the more did Anthropology. The necessity was by the scientific method of excavation to prove whether these Earthworks were Pre-Roman, Roman, or Post-Roman. This was the kind of work that could and should be done by local Societies, and if undertaken by this Club would act as an example to other provincial associations.

Mr. B. H. Cowper, in an eloquent speech, said that after mature consideration he quite agreed with the views of General Pitt-Rivers, and admitted that the subject was not so simple as he had at first imagined. On the whole, assuming a foundation for the association of Queen Boadicea's name with the locality, he inclined to the opinion that these Camps were the work of the later British, just about the date of St. Paul's preaching. He referred to the accounts of Tacitus and other ancient historians which give colour to the idea that the last struggle of the British took place in Epping Forest. He hoped the Society would take steps to make the proposed explorations of these

ancient landmarks of our forefathers at an early date. There were hardly any monuments of greater antiquity than these in England, certainly not in the neighbourhood of London, and the results of the enquiry would be viewed with interest by all thoughtful students of science and of man.

Mr. D'Oyley made some reference to the first discovery of the Loughton Camp, and Mr. Frederick Young (President of the "Forest Fund") said that it was clear they had only touched the margin of a most interesting subject, and urged upon the Society the necessity of investigating in a thoroughly scientific spirit these curious records of a nation long passed away.

Mr. Fisher Unwin pointed out that these forest Camps were probably not the only remains of the kind in their district, and he thought that the subject of these Camps should be considered as a whole. He mentioned the large Camp or earthwork near the High road between Ilford and Barking. He also referred to the Camp-like appearance of a field on the High road between Chigwell and Abridge, a little beyond Woolston Hall, which had also been pointed out to him by Mr. Cole. He understood that Roman pottery had been found there some years since. The various earthworks in the district were probably related the one to the other.

The President said that the results of their afternoon's work appeared to him to be the following:—There were two Camps in the Forest of ancient date—both undoubtedly the work of man—but their precise period could only be determined by an excavation such as that suggested by General Pitt-Rivers. He hoped that the Club, with the permission of the Forest Conservators, might be enabled to settle this highly interesting local archæological question.* He then called upon the meeting to pass a cordial vote of thanks to their eminent conductor, and to those gentlemen who had so kindly given their services to the Society. This was passed by acclamation, and the company soon afterwards separated.

Saturday, July 24th, 1880.—Field Meeting.

A Visit to Ilford.

Ilford is by no means wanting in interest to the intelligent visitor; it has a history of which some records happily still persist, in defiance of modern "improvements." A short distance out of the village (or town) may be seen the remains of a Camp which is generally held to be of Roman origin; and it is certain that the Roman road to Colchester

*See Ordinary Meeting, October 30th, 1880.

ran through Ilford about 200 yards south of the present High Road. In the village are eight houses and a chapel, formerly part of a Hospital dedicated to St. Mary and St. Thomas of Canterbury, now used as Almshouses for poor persons, and supposed to have been founded by Adeliza, Abbess of Barking, in the reign of King Stephen, as a retreat for lepers. Of course there is a trace of one of Queen Elizabeth's hunting lodges; ignoble, indeed, must be the locality in the Forest district which does not claim some remembrance of the Imperial (and imperious) Diana. From the Naturalist's point of view the lanes, ditches, and marshes about Ilford are not without attractions, although the impious and devastating hands of the speculative builder are active at their evil work: "destroying beauties that took centuries to make and not a month to mar." But on this charming Saturday afternoon, we (that is some fifty or sixty members and friends of "Our Club") have not met to lament the blows dealt by a money-loving and land-jobbing generation at the fair face of Nature, nor to talk scandal about Queen Elizabeth—we seek records of a past compared with which human histories and legends are but tales of yesterday, and look for antiquities treasured up in the womb of earth, æons before Auctioneers were dreamt of as the coming Iconoclasts! And long will Ilford claim a place in the remembrance of those true antiquaries, the Geologist and Palæontologist; not from its perishing tokens of Roman Legions, fair Queens, fat Abbots, or prim Nuns, but from its rich store of fossil bones: relics of the gigantic animals which lived and died in Britain during the ages limiting that wonderful phase in its life-history, called Pleistocene in modern Earth-lore. The story of the discovery of these records of old-world life at Ilford dates back for nearly seventy years. In 1812, about 300 yards from the River Roding, in a field forming part of an estate called "Clements," some bones of Oxen, horns of Stags, and head bones and teeth of Elephants were disinterred; and in or about 1824, Mr. Gibson, of Stratford, obtained a collection from near the same spot, portions of which are now supposed to be in the Museum of the College of Surgeons. One of our party, Mr. J. Eliot Howard, F.R.S., informed the Editor that he well remembered, when a boy, some of Mr. Gibson's specimens being brought into his father's office at Stratford, and seeing them undergo the process of anointing with a solution of glue to prevent them crumbling into pieces. Then, years afterwards, Sir Antonio Brady took up the quest; with what success let his magnificent collection of Pleistocene Mammalia serve as an imperishable memorial. We have the honour and great advantage of his company this afternoon as one of our conductors, his coadjutor being Mr. Henry Walker, F.G.S., so well known to members of the Club. Our party also includes Mr. A. R. Wallace, F.L.S., the celebrated traveller, philosophical naturalist, and geologist; Mr. Worthington Smith, F.L.S., of

fungological and palæolithic fame; the Rev. Nicholas Brady, M.A., and many distinguished members of the Society, lay and clerical, including our indefatigable President.

We start in good order from the court-yard of the station, and taking the lane on the right leading to Barking, we soon reach the Uphall Brickfield on the banks of the Roding. By the kind orders of Mr. Rawkins, the proprietor of the field, some workmen have been engaged all the morning in clearing one of the pits, and making fresh excavations. We stand with them in the old river bed, watching the turning up of myriads of minute river shells which testify to the fluviatile character of the sand and gravel in which they are embedded. Soon the announcement of a "find" increases the interest; a row of very large and bright molar teeth are first seen, and gradually the lower jaw of the great fossil Ox (*Bos primigenius*) is unearthed in almost perfect condition. It lay embedded in the soil some ten feet from the surface. Some smaller bones are also obtained, and plenty of the shells of *Cyrena fluminalis* which are so characteristic of these deposits. With his accustomed kindness Sir Antonio obtains from the workmen some bones of Mammoth and presents them to the ladies of our party as a memento of their visit to his hunting fields—now, alas! quickly vanishing away and doomed soon to be flooded over with the surging tide of Ilford building operations. Sir Antonio tells us that it was from this, and the adjoining pits a few furlongs south, that he obtained, during thirty-five years' careful research, most of the specimens in his collection; viz., remains of at least 100 British Elephants, as well as bones and teeth of Hippopotamus, Rhinoceros, Bison, and many other animals. A list of some of the species found in the pits at Ilford had been printed on the circular of the meeting, together with two sections showing the geology of the district, kindly lent for the occasion by Mr. Searles V. Wood, F.G.S., and the Editor of the "Geological Magazine."* In response to the President's request Mr. Walker then gives us an account of the former physical geography of this interesting spot, as throwing light on the presence and former existence, in a wild state, of such strange animals in this country. Mr. Walker illustrates his remarks with a series of most instructive maps, showing the different geographical phases which Britain has presented in pre-historic times, when these animals lived. The first map gives a view of Britain rising from the waters of the Glacial Sea, presenting the appearance of an icy archipelago, the higher hills and mountains only being above the waters. The second map exhibits our island not only completely emerged from the sea, but the German Ocean and English Channel laid dry, so that the animals of the Europasian Continent could travel over from the east and the south, even from

* See Mr. Walker's Lecture; Trans., Vol I., pp. 32 and 38.

Africa, into the rich valleys of the Thames country. And this they actually did, the Mammoth and Rhinoceros coming from the east, and the Hippopotamus and Southern Elephant from the south, there being then no Straits of Gibraltar to bar their migration. Whole herds of the great Pachyderms and Deer, which once lived in the wooded wilds of Essex, had died and left no trace of their existence, their bones being devoured by the Hyænas, or gradually dissolved by exposure and decay; but the carcases of others had been swept into the rivers, where—entombed in the sand and mud—they were safely preserved for thousands of years; and now to-day, when these ancient rivers have disappeared, and we dig down into their sandy beds as we do this afternoon at Ilford, we find these wonderful remains commemorating a vanished past. Another map shows where may be found the physical memorials of the Mammoth period in Essex—the Moraines of the Essex glaciers, as they may be seen to-day up the hills at Epping, Theydon Bois, Havering, &c. Referring to the Great Glacial Submergence and its traces in Essex, the speaker quotes the important investigations of Mr. Searles Wood, who, he assures us, has found on the Essex hills the old beach line of the Glacial Sea at the time the chalky fossiliferous Boulder Clay at Epping, and elsewhere, was deposited. At that time the sea occupied the Thames Valley up to about the level of 150 feet at the part opposite the Roding Valley, and about 180 feet at Cheshunt. To the east of this the level falls, but to the west it rises, so that at Stewkley, in Oxfordshire, it is nearly 400 feet, at Birmingham 500 feet, and so on further west until in Wales a submergence of more than 1,600 feet is reached.

Mr. Walker's remarks are listened to with great interest by us all, standing around him in the pit, not to speak of the crowd of village urchins, and the groups of more attentive navvies, who (neglectful of their Saturday half-holiday) lean on shovel and pick, with their wives and daughters from neighbouring cottages, to "hear tell" of the fashion of the earth they delve in, and how

> "Britain *last*, at Heaven's command,
> Arose from out the azure main."

He concludes by a kind of apology to those who may hail from more romantic scenery in England—from Derbyshire and Devonshire—for the very unpicturesque country about Ilford, but humorously vindicates the equality of the flat river gravel district of the Thames, in point of palæontological value and interest and geological romance, with the country of Hyæna dens and limestone caves.

We then break out into the London Road to visit the pits in the field formerly known as Curtis's, but now owned by a Mr. Judson. As we stand on the precipice of untouched earth, and look down into the

excavated valleys below, Sir Antonio points out the spots where were found the Lion, the Elephants' tusks *eleven feet in length*, and other prizes of his collection. We ask whether he thinks there is any game left for future hunters; he points to our feet, and hints that there may be as good bones in the bank as ever came out of it. Meanwhile some of our number endeavour to enjoy the pleasures of the chase; not, however, with the flint implements of their palæolithic progenitors, or even the shovels and picks of our friends the navvies, but with a far more potent weapon in these degenerate days—the almighty dollar. With such arms, Mr. Walker secured an excellent molar tooth of a Mammoth with twenty-two dental plates, as well as a tooth of a Calf Mammoth. One workman had a large collection of bones, including a magnificent pair of horns of *Bos primigenius*, but the price—£2 10s.—rather scared even the boldest of our huntsmen.

A move was soon made to the Angel Inn, an afternoon's Elephant hunting by no means lessening our appreciation of the good and substantial meal provided for us by Mr. Ashmole.

After tea the Ordinary Meeting of the Club was held. The minutes of the last meeting were read and confirmed, and the following persons balloted for and elected members:—Messrs. R. J. Friswell, F.C.S., F.I.C., Ernest Heathfield, C. E. Prince, W. Mackonochie, W. E. Martin, Luther Reeves, R. M. Bird Thompson, and G. J. Thompson. The names of fifteen new candidates for membership were read.

The Secretary exhibited, on behalf of Mr. R. M. Christy, some plants of *Galium aparine* sub-species *Vaillantii*, gathered in fields near Saffron Walden, where it was discovered by Mr. Gibson many years ago. This form of a very common plant is especially interesting from the fact that it does not occur elsewhere in England.

Mr. F. Parker exhibited a number of bones obtained at various times at Ilford, including a large hip-bone of Mammoth, a vertebra of Irish Elk, and many bones of *Bos*.

The President said that he wished to make a proposal in connection with their last Field Meeting. It would be in the recollection of those who were present on that occasion that General Pitt-Rivers, and the other archæologists who had examined the ancient Camps in Epping Forest, had come to the conclusion that these were not Roman, but that it would be impossible to fix their period without carrying on excavations. The President stated that he had now much pleasure in informing the Club that since that meeting referred to, General Pitt-Rivers had suggested that an excavation fund should be started for this purpose; that the General had offered to head the list with £5, and he was of opinion that the necessary operations could be completed for about £30 for each Camp. Mr. Meldola said that in his opinion this archæological problem was one which the Club ought to take up,

but it would be of course necessary in the first place to obtain permission from the Forest Conservators. He would therefore propose that the matter should be put in hand at once, and that an official letter on the part of the Club should be addressed to the Epping Forest Committee, after which—supposing, as he was led to anticipate, that the required permission should be granted—circulars should be sent round to all the members in order to raise the requisite funds.

This proposal was received with acclamation.

The President then entered upon the results of the afternoon's excursion. He stated that the Ilford Pits which they had visited were of world-wide celebrity in the annals of Post-Glacial Geology. The brick-earth, gravel, &c., of which sections were there exposed, were deposited at a time when the old Thames was a gigantic stream, and when the Mammoth and other great mammals were denizens of this country. It added greatly to the interest of the remains from these pits to know that the animals of that period were contemporaneous with Palæolithic man. The past had there "buried its dead," but the past was not a "dead past." Their worthy and esteemed member, Sir Antonio Brady, had acted the part of resurrectionist, and by a skilful process of "body-snatching," described in full at one of their previous meetings, had succeeded in exhuming and preserving these great mammals for the instruction of modern and future geologists. In addition to their conductors, Sir Antonio Brady and Mr. Henry Walker, the President said that they were honoured that afternoon by the presence of a Naturalist of European reputation, his friend Mr. Alfred R. Wallace; and they also had amongst them Mr. Worthington Smith, who had recently acquired celebrity as a discoverer of Palæolithic implements. He had much pleasure in calling upon their esteemed conductors and the eminent naturalists he had named to favour the meeting with their remarks.

Sir Antonio Brady, whose name was received with much enthusiasm, said that, although suffering from a severe cold which had prevented him from making any extended remarks at the pit, it gave him much pleasure to be present, and have an opportunity of listening to the observations of some of the gentlemen he saw around him. Sir Antonio brought up with him specimens of stone implements and carved bones from his extensive collection, which he considered to be of special value and interest in reference to the question of the antiquity of man. These included a portion of a horn of Reindeer, with a carved profile of a man's face, found in a Glacial Drift. He considered it to be the oldest work of art known, and to his mind it was an evidence of the existence of Palæolithic man in the Glacial age. Also a carved figure presenting a human face when examined in front, and the representation of a bird or beast when viewed sideways; this he took to be one of the *Penates* of these ancient men. He also exhibited a Flint Spear-

head from a deep cutting on the west bank of the Mississippi, dug up in his presence from an excavation for the foundation of an iron furnace. This weapon was "rifled," so to speak; that is, its outline formed part of a screw, and the spear or arrow to which it was attached would in its flight produce a rotary motion, and so tend to keep in a straight line when thrown through the air. Another very remarkable specimen was a polished Flint Celt, found at Barking Side, Essex, in 1868, in five feet of gravel; this was the only Essex specimen Sir Antonio possessed. Some of the flint hand daggers exhibited, from the Peat of Denmark, were highly wrought, and the handles were ornamented to give a more perfect grip. In the collection shown us were also other curious and highly-finished flint tools—saws, chisels, &c., and one implement of very remarkable construction, highly polished, and so formed as to constitute a very perfect Gouge, with an edge wrought to form an "ogee" curve, best adapted for cutting into wood. This specimen was from America.

Sir Antonio entered into detailed particulars as to the nature and teachings of the specimens exhibited, and recapitulated the results of Mr. Croll's and Col. Drayson's observations on the causes of the glacial epochs, which had been so fully stated by him at the meeting of the Club on May 29th. He was very glad to see his friend Mr. Wallace present, and hoped that veteran naturalist would give them the benefit of his opinion, although Sir Antonio feared that Mr. Wallace differed from him, *toto cœlo*, with regard to this difficult problem.

Mr. Walker congratulated the Club on the success of the meeting, and said that in his opinion it would be an honour to any society to enlist the aid and co-operation of the gentlemen whose names had been announced by the Secretary and of those eminent men of science he saw around him in that room. They had had so much from him that he would only make a few remarks on the stratigraphical conditions of the district they had visited that afternoon. Mr. Walker then briefly discussed the nature and history of the gravel deposits in the London district, and referred to the possibly marine origin of the older Thames Valley gravels. In reply to Mr. Wallace, who inquired on what grounds Mr. Walker founded his conclusion that these deposits were marine, Mr. Walker stated that no remains of land animals had been found in them. The speaker made some humorous remarks with respect to his fondness for the study of the gravels, which were to him a great institution, and he could lie down any day beside a barrow of flints and enjoy himself very much. (Laughter.)

Mr. A. R. Wallace, after some prefatory remarks, said that there were one or two points in the discussion that afternoon about which he should like to say a few words. First of all he must refer to the interesting and most remarkable specimens of ancient implements and art which Sir Antonio Brady had been good enough to show them. He

was particularly struck with the stone spear-head so fashioned as to give the weapon a rotatory motion in the air, and thus increase the accuracy of flight. This specimen was especially interesting to him because it came from America. When he was travelling there he noticed that the arrows of the aborigines of the Amazon valley were fringed with feathers arranged spirally round the shafts so as to keep the weapon in a straight path when projected. In many other parts, as for instance in New Guinea, weapons are not so "rifled," and it was, therefore, a very noteworthy fact that the custom of rifling spears and arrows had persisted in America from the earliest stone ages until now.

In Mr. Wallace's opinion the carved figures of men and animals which Sir Antonio Brady had exhibited were also of the very greatest interest; they were of such intense interest that it was difficult to believe they were genuine. If he remembered rightly, the animal carvings of Reindeer, Mammoth, &c., which had hitherto been discovered were all of a period supposed to be intermediate between the Palæolithic and Neolithic ages—the "Reindeer Period" of M. Lartet; but it was evident, Sir Antonio's carvings being accepted as genuine, that such were not by any means the oldest. They had represented by them not only the animals then existing, but also the men who fed upon them; of the hunter as well as the hunted. It must be remembered that savages always depicted in their carvings and drawings their own type, and therefore we may take the figures carved upon the bones to represent the type of face which prevailed among the hunters of the Mammoth. One of the carvings presented a curious resemblance to the profile of the Duke of Wellington, and accepting that as a contemporaneous carving, they might draw therefrom the conclusion that the early hunters of the Mammoth were by no means a low and degraded race. This was an exceedingly interesting point in connection with the question of the antiquity of man. We have not made the slightest approach towards the discovery of a lower type. Although we have been enabled to trace the Old World hunter back to the Pleistocene age, he remains as much man as the most intelligent races of the present day. Of course he did not mean therefore to infer that men of a lower type had not existed, but he believed that they must go immensely further back to discover the first traces of primeval man. He did not agree with Professor Boyd Dawkins in the inference that man did not exist in the Miocene age because the animals which must have surrounded him, being of forms which had developed into other species, man would have therefore been influenced by the law of development, and in the succeeding ages would have presented characters very different from the genus *Homo* as at present existing. Mr. Wallace was disposed to think that, man having reached a certain stage of development, his physical and mental qualities would enable him rather to control than be controlled by the changing character of his environment; and there-

fore, although he might advance in his mind, his bodily structure would remain very constant. The fact that the earliest races of men yet traced out present a type similar to man now existing is rather a proof that the human species is immensely more ancient than we hitherto have had any conception.

With reference to the Glacial Epoch in Geology, Mr. Wallace said it was a subject which for upwards of fifteen years he had thought and written upon. He was glad to say that he did not differ from their good friend Sir Antonio Brady to the extent he believed. He quite agreed that the period of the Mammoth and the earlier *Mammalia* was a period close upon or within the Glacial Epoch. In point of fact he considered that the time would come when they would find that changes in climatal conditions have been the principal causes in producing the changes of plants and animals on the earth. He believed that the chief agent in inducing these changes of climate was the geographical alterations in the contours of continents by submergence and upheaval in different stages of the earth's history. He had lately been attempting to show in some detail how it was that these changes in Geography did afford us the means of explaining that hitherto insolvable problem —the mild and luxurious vegetation of the Arctic regions during the Miocene and many earlier Geological epochs. It was quite impossible to accept in its entirety Mr. Croll's explanation; but Mr. Wallace believed he had found the solution in Mr. Croll's own theory of Ocean Currents. Mr. Croll maintained that there had been alternate mild and glacial conditions in the northern hemisphere throughout the Tertiary period; but the objection to this was that all the Geological evidence showed that before the last Glacial Epoch mild climates alone prevailed in the Arctic regions, whether in the Upper or Lower Miocene, the Cretaceous, the Jurassic or the Carboniferous period;—in fact, every Geological Formation in the Arctic Regions, anterior to the Pliocene, furnished evidence of mild, and in no single instance of cold climates. Now Mr. Croll had himself demonstrated the wonderful power of the Gulf Stream in carrying the warmth of the Tropics into North Temperate and Polar Regions. At present this was the only important body of warm water that reached the Arctic Seas, but there was good geological evidence that in earlier ages the great Northern Continents —Europe, Asia, and North America—were not as now solid masses of land, but were broken up and penetrated by arms of the sea which carried other bodies of warm water northward. When this was the case, the formation of ice in the polar seas would be entirely prevented; and when there was no ice the power of the sun during the long day of the polar summer was amply sufficient to support the vegetation, the remains of which so astonish us in the Arctic Regions. The last Glacial Epoch was undoubtedly produced by the astronomical conditions which have been so well set forth and illustrated by Mr.

Croll, but it was only rendered possible by the concurrence of geographical conditions, then recently brought about, by which the greater part of the warm water of the Tropics which had before entered the Polar seas was shut out from them by the elevation and solidification of the great Northern Continents. This continued growth and extension of the land in the Northern Continent during the Tertiary period has been long known to geologists, but its importance as affecting the most powerful of all climatal agencies—northward flowing and heat-bearing ocean currents—appears to have been hitherto overlooked.

By thus modifying Mr. Croll's theory, giving greater importance to ocean currents and comparatively less to astronomical causes, Mr. Wallace believed that the difficulties that had hitherto beset all attempts to explain the mild climates of the Arctic Regions, so as to satisfy both geologists and physicists, might be overcome; and in his forthcoming work, "Island Life," he had endeavoured to demonstrate the correctness of these views. (Loud applause.)

Mr. Worthington Smith, F.L.S., in thanking Sir Antonio Brady and Mr. Henry Walker for their great and valuable assistance during the afternoon, suggested that caution should be exercised before concluding that the "ogee" curves on the edges of the American instrument had been actually designed; similar curves being frequent on Flint Implements of all ages and from diverse places, the curves commonly arising from the natural conchoidal fracture of the flint. In reference to the sculptured subjects said to have been derived from a deposit of Glacial age, Mr. Smith said that from the brief examination he had been able to make of them, he looked upon the carvings as undoubted modern fabrications; though found by Sir Antonio himself, yet it must be remembered objects are sometimes so placed by designing workmen that they may be apparently found by an unwary visitor. The carvings referred to by Mr. Wallace as Neolithic works from Caves were really Palæolithic, and of an immensely greater antiquity than Neolithic work. As to the polished Celt said to have been found in five feet of gravel at Barking Side, Mr. Smith said he had no doubt that this was an error of observation, and that the Celt did not point to the comparative modern epoch of the Mammoth, or the great antiquity of the men who polished their stone weapons. He thought there could be no doubt that this Celt was British or Neolithic, and was originally embedded in the surface soil. Gravel diggers, in making a "fall" with their crowbars, throw surface-soil, loam, sand, and gravel all down to the bottom of the pit together; and although this Celt was no doubt found at the bottom of the pit, yet it undoubtedly belonged to the modern soil at the top. Such instances were common; Neolithic implements and flakes being profusely spread over Essex, nothing was more frequent than the finding of some comparatively modern object at the bottom of a gravel pit. The colour as

well as the nature of the Barking Celt showed that it had not come out of undisturbed gravel. The speaker then said that he, like Mr. Wallace, often felt considerably puzzled with some of the gravels of Essex, Middlesex, and Kent; and if the Dartford gravels were really marine, as stated by Mr. Walker, it must still be remembered that implements made by primæval man, and of the same immense age as the Dartford marine gravel itself, were found deeply embedded in that matrix. Mr. Smith said that while Antonio Brady had been chasing the Mammoths with such admirable success, he (the speaker) had been hunting for the works of those remote primæval men who long ages ago lived in Essex as companions and hunters of these huge beasts. He gave a list of objects he had lately secured from a small piece of sewer excavation through gravel on the west side of the Lea, Lower Clapton. This list included among many other bones, the greater part of one bone of a Mammoth's leg, four fine Palæolithic implements of flint, many "flakes," a large number of shells of land and fresh water *Mollusca*, carbonised leaves, and small branches of trees and pieces of drift-wood. He had also found a very large pebble of Grey Granite in the Lea sands at Shacklewell; and he had seen disinterred from the bottom of the gravel at Hackney a boulder of trap rock weighing 1½ cwt. An immense block of sandstone was found at the same place weighing between 4 and 5 cwt. Mr. Smith gave it as his opinion that these great stones were probably brought down in very remote times from the North on Icebergs, and were dropped by the melting ice in the positions where now found.

Some little time was spent in examining the various objects, and commenting thereon, and about nine o'clock the members separated, well pleased with their first visit to the Mammoth's grave in the ancient clays and sands of Primæval Ilford.

The Editor has endeavoured to give as clear an idea as possible, in a condensed account, of the statements of the various speakers respecting the many difficult questions raised during the afternoon's discussion. He thinks it, however, right to add that Sir Antonio Brady has since expressed his firm belief in the genuineness of the works of Palæolithic humanity exhibited at the meeting; and Sir Antonio further remarks (referring to Mr. Worthington Smith's criticisms), "if manufactured by designing workmen more would probably have been made, whilst mine are the only specimens known to exist."]

SATURDAY, AUGUST 28TH, 1880.—ORDINARY MEETING.

The Ordinary Monthly Meeting was held at the Head-quarters, Buckhurst-Hill, at 7 o'clock, the President in the chair. The minutes of the meeting at Ilford were read and confirmed, and the following

persons were elected members of the Club:—Walter Crouch; the Right Hon. Lord Carlingford; the Right. Hon. the Earl of Essex; William Fawcett; W. R. Fisher, M.A., Barrister-at-Law; William George; David B. Jones; Rev. Alfred Leeman, M.A.; Edward Martin, B.A., F.Z.S., Barrister-at-Law; Miss Eleanor A. Ormerod, F.M.S., M.E.S., &c.; Arthur Priest, M.D., &c.; the Right Hon. Lord Reay, D.C.L., F.R.G.S., &c.; the Right Hon. the Earl of Rosslyn, M.A., F.Z.S., &c.; W. Pickett Turner, M.R.C.S., &c.; Lord Walsingham, M.A., F.Z.S., M.E.S., &c. The names of three candidates for election at the next meeting were read.

The President, alluding to the lamented death of Mr. George J. Thompson, a member of the Club, who was drowned whilst bathing at Budleigh, Salterton, on July 28th, said the unfortunate fate of Mr. Thompson was probably known to all present, and he thought it their duty to pay that slight tribute to his memory.

Mr. James English exhibited some leaves of the common Cottage-garden shrub, *Lycium barbarum* (the "Tea-tree"), to which were attached specimens of a small moth (*Camptogramma bilineata*). The moths had evidently died in the position in which they were found, and Mr. English asked whether a like mortality had been noticed in other species of *Lepidoptera* in the perfect state. The bodies of the moths were apparently fastened to the leaves of the plant by some exudation or growth from the insect, and he suggested that the insects had been killed by a *fungoid* disease similar to that which so commonly attacks caterpillars of *Lepidoptera*.

The President thought it would not be right to infer a similarity between the two phenomena, without further investigation.

Mr. W. Cole referred to an analogous exhibition by Mr. Boyd at the Entomological Society some years ago. The insects were Trichopterous (*Brachycentrus subnubulus*); and they were congregated in hundreds on the underside of a leaf of the Comfrey (*Symphytum officinale*), and all in a dead or dying state. No explanation had hitherto been made of this curious occurrence.

Mr. Robarts suggested further careful observation and experiment with various plants and insects, as likely to afford interesting results.

The President said that being engaged on a translation of Dr. Weismann's "Studies in the Theory of Descent," he was desirous of obtaining some practical information with respect to the biological history of certain caterpillars. He wished particularly to be furnished with instances, drawn from personal observation, of caterpillars which, feeding on trees in the autumn, and hibernating, were compelled in the spring to betake themselves to low growing herbs for subsistence, the buds of the trees not opening until later in the season.

In the course of conversation, called forth by the President's request, Mr. Argent stated that he had some *larvæ* of *Sphinx ligustri*

found feeding on Laurustinus and some found on Lilac. The caterpillars on the Laurustinus were of a much darker green colour than the Lilac feeders, which latter were of a pale bluish-green, although the leaves of the two plants on which they fed did not much differ in depth of tint.

Mr. N. F. Robarts, F.G.S., exhibited some fossil corals and shells which he had lately obtained from the Carboniferous or Mountain Limestone at Llangollen, North Wales. He gave a brief exposition of the fossils and the characteristics of the formation in which they occur.

The President announced that two Forest Field Meetings were in course of arrangement: one in September, under the direction of Professor Boulger, F.L.S., for the observation, more particularly, of the autumnal flowering plants of the Forest, when the Professor would deliver an address on "Botanical work to be done;" and the other on October 2nd, when two celebrated Fungologists, Dr. M. C. Cooke and Mr. Worthington Smith, F.L.S., would expound the rich cryptogamic flora of the Epping woods.

At the Conversazione, Mr. English exhibited an extensive and beautiful series of the larger *Fungi*, gathered the previous afternoon in the woods above Epping. The collection included many rare species, as *Boletus setanus*, *Thelephora clavicularis* (a new species within the last four or five years), and *Gyromitra esculenta*, the plant exhibited being only the *second* Epping Forest specimen known, &c., &c. He also brought up a specimen of the pretty and rare Snapdragon (*Linaria spuria*) from Epping. Mr. H. J. Barnes exhibited a fine fossil *Echinus* in flint, from the "Cuckoo Oak" Gravel Pits, Fairmead Bottom. Messrs. W. and B. G. Cole showed a number of living specimens of characteristic littoral plants, gathered the previous day on the "Saltings" at Brightlingsea, St. Osyth, &c., Essex, and also a long series of the British *Geometræ*, from their cabinet.

SATURDAY, SEPTEMBER 11TH, 1880.—FIELD MEETING.

Our trysting place this afternoon is at Theydon Bois, and our purpose is to note and examine the floral riches which early Autumn scatters with lavish hand in hedgerow, field, lane, and coppice. During the month of August no meeting had been held; so many members, it was thought, would be gratifying that yearly longing for sand and shingle, and a gulp of the fresh breezes vexing old Neptune's restless domain, which has struck so deeply into our modern insular life. So this is our first *réunion* since we met at the Mammoth's grave at Ilford. Our organizers had looked forward to a large and pleasant meeting, and had secured the kind aid of our colleague, Professor Boulger, F.L.S.,

F.G.S., as the botanical "Guide, philosopher, and friend" of the expedition. In vain, almost, their care:—

"The best laid schemes of mice and men,
Gang aft a-gley."

The day's meteorological horoscope, since the earliest hours, had been crossed with malign influences. Some of our members, watching for the dawn and the Deer near Monk's Woods, had seen the sun rise with auroral splendours—the ominous "red sky in the morning" of the shepherd's rhyming adage—and gloomy forebodings of the predicted sea-borne storm filled our minds. However, as we cross the railway at Theydon Gate, the afternoon, at worst, is but dull and sullen; we strike up the lane towards Theydon Garnon Church, some thirty of us, hopefully but doubtingly. Here is plenty of work for our botanists, particularly in a piece of broken ground to the right of the lane; the spot is quite choked up with many kinds of weeds, common but welcome to the sight. Several species of *Veronica* and *Epilobium* (Willow-herbs) in profusion; the charming little Enchanter's-Nightshade (*Circæa*), *Ranunculus sceleratus*, Teasels, Spurges, and fifty other plants can be gathered in blossom or in fruit. Even the lane itself is gay with Willow-herbs, Fleabane (*Inula*), Wound-worts, St. John's-worts, Cranesbills, and Ragworts; whilst the amateur botanist's *crux*, the order *Compositæ*, is in great force. Our geologists stop to examine a section of the chalky boulder-clay exposed on one side of the lane, albeit a hidden fear of local boards and road-surveyors checks the free use of the pick and hammer. The route chosen for our ramble is truly a pretty one: pleasant flower-decked lanes, shut in by hedges of Black-thorn, Dog-wood, Spindle, Maple, Hazel, Honeysuckle, and Briars; with long aisles of Nature's own Gothic architecture: tall Elms and Lindens meeting over-head, and blotting out now and again broad views of fertile valley and swelling upland, where quiet Essex hamlets and homesteads, red-tiled and gabled, nestle warmly amid the deep green trees in the distance; fair meadows and stubble-fields in which child-gleaners still linger and claim "largesse" from the wayfarer; deep shady woodlands, and an antique church, rich in memorials of forgotten grandeur and past renown. The programme is surely tempting, and with only a fair share of old Sol's ever welcome beams, the enjoyment of the "meet" would have been ensured. But no! At an early period of our ramble dense masses of vapour form and re-form under a leaden sky with vicious and presaging aspect. In vain we encourage ourselves with rash prophecies; we feel that our doom is written on the contracted and lowering horizon in unmistakable characters.

At the church we are welcomed by the Rector, Sir Cavendish Foster, Bart., who kindly takes upon himself the office of cicerone. The Rectory garden is of good old-fashioned type, designed ere carpet

bedding had spoilt our taste; it recalls Lady Corisande's garden described in "Lothair;" full of sweet-scented honest flowers, unmarred by the often perverted skill of the florist, and with many a tall tree and cool leafy nook. The garden gate opens into a fine avenue of Limes and Chestnuts, and so into the Churchyard. You cannot but note and admire the lofty red-brick tower of the Church, weather-beaten and ivy-clad; the ancient and well-kept cottage of the sextoness, with latticed windows and clean white-washed walls, serving to "set off" the red tower hard by; the Yews and Shrubs bordering the trim walks, or shielding many a stately tomb and daisy-studded grave; tall Elms, untrammelled and luxuriant, surrounding and framing in the whole. It is a charming spot on a sunny summer morning, fresh and secluded—the prettiest of God's-acres!

The Church, dedicated to All Saints, is of great interest to the Antiquary and Genealogist. The date of its erection is probably not known, but on the south side of the tower is a stone recording the contribution of Sir John Crosbie and Dames Anne and Agnes "his wyfs" towards the making of "thys stepyll." This worthy merchant lived in the reigns of Henry VI. and Edward IV., and died in 1475, so that the church can claim a very considerable antiquity. In the nave is a brass plate to the memory of the Rev. William Kyrkaby, who was rector of Theydon Garnon, and died in 1458. The church was restored, chiefly by the present Rector, between the years 1863 and 1873. All visitors must be struck by the unusual number and interest of the monumental tablets, many of them relating to personages figuring in our English annals. Sir Cavendish Foster conducts us over the church, and carefully points out the special objects worthy of attention. He had himself prepared copies of many of the more notable inscriptions for our information. It is curious, but exasperating, to note how studiously the Puritans have chipped out or otherwise erased all phrases savouring of the "Scarlet Lady"; not a single "Pray for the soul" escaped their zeal, and all the older monuments are thus disfigured. We examined the register, which commences in the year 1558, and contains many curious records of social manners. There is a large muniment chest full of documents, which would no doubt repay a careful investigation. Altogether a most interesting building; and on the motion of our President we cordially thank Sir Cavendish for his kindness and courtesy.

And now what is to be said as to the rest of our walk? The rain begins in good earnest soon after leaving Theydon Garnon, and our subsequent adventures are to be wept over rather than recorded. Botany, of course, is at a discount; practical meteorology absorbs our whole faculties, and "Forward as quickly as possible" is the word of command. Two or three of the more enthusiastic do indeed stop to note the extreme abundance of the curious plant *Bartsia* (*Euphrasia*) *odontites* in one meadow, along with the charming little *Lotus corniculatus*:

and in another field, near the hamlet called "Ivy Chimneys," the equal luxuriance and plenty of the purple flower heads of *Scobiosa succisa*, anent which Old Parkinson sayeth as follows:—"Fabulous antiquity (the Monkes and Fryers, as I suppose, being inventors of the fable) said, that the Devill envying the good that this tribe might do to mankinde, bit away part of the roote, and thereof came the name *succisa*, Devill's-bit." We recall this fragment of mediæval phytology as we surmount the last of a long series of tall and difficult Essex stiles, find a piece of decent road ahead, and follow our leaders with all speed to the "Wake Arms." A little damp we may be, spite of waterproofs and umbrellas, but all disposed to conquer circumstances and be as jolly in face of discomfort as a field club of Mark Tapleys; even the ladies "smile a kind of sickly smile," pardoning Jupiter Pluvius; and Mrs. Gearing's warm tea and excellent providings give us courage soon to laugh at our misadventures.

Anon comes Professor Boulger's impromptu lecture, "Botanical work to be done"—problems that is in plant life awaiting solution, and solvable by amateur botanists when they shall tire of mere collections of dried leaves, and begin to look upon plants as living forms, of the nature and structure of which we are, to a great extent, profoundly ignorant. In his opening remarks, the Professor takes exception to the word "primæval" as applied to Epping Forest; in his opinion, the Forest is, both geologically and botanically, remarkably modern. When we hear the Essex Forest spoken of as "the forest primæval," we ask in what sense the words are to be taken. Are we to go back to remote geological times—the true primæval forests of the period of the London clay? In the Isle of Sheppy abundant evidence may be found of the existence of a tropical forest at the time the London clay was deposited. The land was then clothed with a luxuriant *flora*, probably resembling that now found on the banks of the Ganges; since the fruits of the Screw-pines (*Nipadites*), for example—amongst the commonest fossils at Sheppy—are there represented by the living genus *Nipa*. Then come the forests of the late Eocene, or Miocene, age; with Tulip-trees, Magnolias, Banksias, Vines, and the *Sequoias* of Bovey Tracey—a flora reminding us of California. A colder period succeeds—the period just before the Glacial epoch; and at Cromer, in Norfolk, we have the old forest beds, consisting mainly of *Pinus sylvestris* and *P. excelsa*, representing a climate perhaps very similar to the northern parts of Scotland. In yet more modern (Post-glacial) times we have the submerged forests of Oaks and Hazels at the mouth of the Thames, marking the incoming of a flora contemporary in Denmark with Neolithic man, and recorded in such names as *Thurrock* (Thor's Oak) and *Acton* (Oak-township). High "Beech" and our finest Elms probably are post-Roman in date; whilst the Hornbeams, which "lopping" has rendered so prematurely antique in appearance, are

perhaps never two centuries in age, and may only have "come in with the Conqueror." Though valued only as covert for game, our English forests probably owed some little planting, besides protection, to the Norman. Gurth, and his acorn-eating swine, was ousted by the foresters of Malvoisin.

So also the rest of our flora should be studied. Following up the fine "Flora of Essex," by Gibson (unfortunately a scarce work), we should endeavour to trace the history of the introductions of Nature and of human agency, and by careful study of so-called "critical" species, or "splits," we may be able, even in the tributaries of the Thames, or at least in the main watersheds of England, to illustrate those laws of geographical distribution which have been shown in the case of the Amazons.

At the same time, we should learn the lesson of Continental botanists; trace every stage of development in any plant we can; study every phase of physiological life by field observation, as well as by laboratory experiment: not omitting the minute discrimination of the much maligned "species-monger." In fact, the Darwinian must note details even more than the mere species-discriminator, since he looks for the intermediate variations that the latter would rather discard.

A recognition of the necessity for thoroughness in the many new fields of work suggested by the Theory of Evolution must necessarily lead to an increase of specialism; but the lecturer thinks that the local Field Clubs have an important function to perform, to some extent counteracting this tendency, in keeping alive that fine old type, now in danger of sharing the fate of our Ilford Mammoths, the "good all-round" naturalists. This is a type represented by such men as John Ray—name dear to Essex—and Gilbert White, naturalist and poet. Such Clubs also bring together students of various branches of science, and so teach us to appreciate work in directions untrod by our own footsteps, and to learn the true proportions of our work to the general scheme of Nature.

An eminent geologist once said to the lecturer, "Botany! what's to be done in botany? Our plants are all known as well as the butterflies." It may be enough to reply that one or two plants "new to Britain" are discovered nearly every year, even among Phanerogamia. This is not, however, the sole aim of the botanist. If we turn to the base of the scale of vegetable life, we find the but newly-discovered *Myxomycetes* (perhaps plants, perhaps animals), the virtually unknown *Schizomycetes*, and the constantly increasing list of the higher *Fungi*, among which even the mushroom has not been traced with certainty through its whole life-history. The fresh-water *Algæ* have not been recently monographed; the *Characeæ* are unplaced, and we are much in want of a satisfactory classification of *Thallophytes* as a whole. Higher up we have the apparently causeless variation in the Ferns,

and an infinity of work in the unravelling of the web of Nature's mind, by fixing the position of numerous natural orders. We want to learn the function of the various elements of plant-food; we want *Parnassia Helleborus*, and other "carnivors" studied as *Drosera* has been studied. We have, undoubtedly, much to learn as to the modes of branching, the inflorescence, fertilization, hybridization, flowers that never open, leaves that "sleep," the means of dispersal in fruits and seeds, plant-crystals and secretions, and many another wide-reaching topic. We cannot say that many of our "critical" groups are yet satisfactorily arranged. The aquatic *Ranunculi*, the genus *Cochlearia*, the altitude variations of Violets, the hybrid *Epilobiums*, *Cardui*, and *Verbascums*, *Arctium*, *Erythræa*, *Euphrasia*, *Atriplex*, *Potamogeton*, and others, stand in need of careful study, not to mention such well-known puzzles as Roses, Brambles, Hawkweeds, and Willows. In these cases, field-work—the examination of whole, growing plants, and their surroundings—is the chief thing of which we have as yet had too little.

The lecturer concludes by expressing a hope that his suggestions may lead members of the Club to endeavour to fill up some of these *lacunæ* in our knowledge of the plant-world.

A cordial vote of thanks is given to our conductor for his deeply-interesting and suggestive remarks; Mr. Gearing's interesting collection of coins, and other relics found on the Forest, is examined, Theydon Bois Station gained in good time, and so end our "Chronicles of a Wet Day."

SATURDAY, SEPTEMBER 25TH, 1880.—ORDINARY MEETING.

The Monthly Meeting was held at the Head-quarters, 3, St. John's Terrace, Buckhurst Hill, at 7 o'clock, Mr. R. Meldola, President, in the chair.

The minutes of the previous meeting were read and confirmed. The following were elected members of the Society:—Messrs. William Cutting, W. Elliott Hutchinson, and E. Delacourt Kell.

Mr. F. G. Hart exhibited a fossil *Ammonite* from the glacial clay at North Weald.

Mr. James English brought up a *Quail* (*Coturnix communis*) shot by Mr. Symonds at North Weald. Mr. English stated that this was the first Essex specimen that had come under his observation. [The following remarks, extracted from the 4th edition of Pennant's British Zoology, 1776, may be given here:—"A gentleman, to whom this work lies under great obligations for his frequent assistance, has assured us, that these birds (quails) migrate out of the neighbouring inland counties into the hundreds of Essex, in October, and continue there all the winter; if frost or snow drive them out of the stubble

fields and marshes, they retreat to the seaside, shelter themselves among the weeds, and live upon what they can pick up from the *Algæ*, &c., between high and low water mark. Our friend remarks, that the time of their appearance in Essex coincides with that of their leaving the inland counties; the same observation has been made in Hampshire."—Ed.]

Mr. English also exhibited a fine specimen of the rare Fungus *Thelephora multizonata* from Epping Forest. Since he had discovered the species in the Forest he had found seventeen specimens in about nine years. He believed that two examples had been gathered in Hereford, but as far as he knew, these were the only specimens recorded.

Mr. W. Cole exhibited some remarkably dwarf specimens of *Lepidoptera* all taken at large in the Forest district, Chingford and Buckhurst Hill. The species were *A. cardamines*, *Crocallis elinguaria*, *Ennomos angularia*, and *Abraxas grossulariata*. Some of these diminutive insects were less than half the normal size of the species.

The President showed some specimens of Exotic butterflies for the purpose of illustrating some interesting remarks made by him on the phenomena of *Protective resemblance* amongst insects. The specimens well demonstrated the existence of two classes of cases—one in which the insects derived protection from their enemies by reason of their resemblance to living or dead leaves, twigs or flowers. This case is well illustrated by the Indian Leaf Butterfly *Kallima Inachis*, and by many moths and caterpillars in England. The other class of cases, including those rarer species which find protection by "mimicing" some commoner species, which may itself be protected by some special quality, such as nauseous taste or odour, from the attacks of birds or other enemies. This class Mr. Meldola illustrated by *Diadema misippus*, the female of which very closely resembles the common *Danais chrysippus*. Among English species it may be noted that the comparatively scarce little Geometrideous moth *Acidalia subsericeata*, closely mimics the common *Asthena candidata;* and many examples of these phenomena could probably be found in British insects.

Mr. Cole mentioned that his brother had seen a specimen of *Cynthia Cardui* at Ramsgate, hovering over and settling upon some artificial flowers in a lady's hat. The observation was worth recording, as it tended to show that the colour and form of flowers were the chief attraction to insects.

Mr. N. F. Robarts, F.G.S., wished to call attention to the Deer in Epping Forest, in the hope of eliciting some information with respect to their peculiarities. When compared with the ordinary Fallow-deer of our parks, he thought they presented noticeable differences, and they appeared to be a separate race. He also wished to know whether the cause of the mortality of the Shrew-mouse (*Sorex araneus*) was

known. He had often seen them lying dead on paths with no signs of injury.

The Secretary said he had also frequently noticed dead Shrews, generally, he believed, in the autumn. He suggested that sharp night frosts may be answerable for the death of these much maligned little creatures. He could confirm Mr. Robarts' remarks with respect to the Epping Forest Deer; they presented race characters in colour as well as in the absence of decided palmation of the antlers, thus being curiously without one mark of the species; they were probably much more ancient than our semi-domestic Fallow-deer. It was not generally known that Red-deer existed in a wild state in Hainault and Epping Forests until a comparatively late period. He had a map in his possession with manuscript notes by Mr. John Cary, the celebrated map engraver. In one note Mr. Cary stated that on October 20th, 1827, he had assisted at the hunt of a Red Stag, which was finally taken at Plaistow, adding, "Red Deer to be so near the Metropolis in their wild state I consider as a singular circumstance." This event took place, of course, long before the disgraceful and lamentable destruction of Hainault Forest.

Mr. English read a paper on the preservation of flowering plants so as to retain much of their form and colour. This process is an improvement on that proposed by the author in a communication to the Club on April 24th last. (See Transactions, Vol. I., p. 71.) Mr. English exhibited a large box filled with beautifully preserved specimens, comprising more than fifty species. Some of the plants presented a most life-like appearance; and as the forms and scientific characters are often well retained, the process bids fair to be of very considerable value, especially for the production of museum specimens and for educational purposes. Mr. Saward also exhibited specimens of the same nature. Thanks were returned to Mr. English for his communication.

The President called attention to the Field Meeting to take place on October 2nd, for the study of the *Cryptogams* of the Forest, under the leadership of Dr. Cooke, Mr. Worthington Smith, and Mr. English, and mentioned that it would probably be the last field meeting of the season.

At the Conversazione, Mr. C. Thomas, F.G.S., exhibited under the microscope the following living objects:—*Chara translucens*, for the purpose of showing that beautiful and wonderful phenomenon the circulatory movements of fluid protoplasm within the cells of the plant commonly called *Cyclosis*. Also amongst the *Rotatoria*, the charming *Floscularia ornata*, *Æcistes crystallinus*, and *Limnias ceratophylli*, all from the neighbourhood of Epping Forest.

SATURDAY, OCTOBER 2ND, 1880.—FIELD MEETING.

How frequently we have the enquiry from incipient naturalists, "What shall I study—how shall I begin?" Those who attended this meeting had both precept and example to direct their choice, and to point the way, into one at least of the byepaths of Nature which it is the duty and pleasure of the naturalist to tread. The byepath is one which needs careful journeying, for it is strange and difficult, and often but dimly defined, although full of interest, and beauty, and wonder, to the enthusiastic wayfarer. It traverses the province *Cryptogamia*, once of great empire and dignity in the kingdom of Nature, but now seen of humbler guise; our horsetails, ferns, and mosses are but dwarf and degenerate descendants of the gigantic *Lepidodendra*, Tree-ferns, and *Calamites* of the Devonian and Carboniferous ages of the earth's history. But fortunately for us, size is no measure of merit; the great *Sigillariæ* could we have seen them growing, wildly luxuriant, in the reeking forests of the coal-period, would perchance have taught no higher biological lessons than can be gathered from the study of the humble club-mosses of our native woods and heaths. And how much there is of interest in the history, but very partially known, of that mysterious tribe called *Fungi* by the learned, and Toadstools, Mushrooms, and Moulds by the general. Flowerless they are by name and nature, but often of striking beauty. A search in Epping Forest any fine morning in this present month of October will reveal many a cryptogamic gem; the brilliant Fly-Agaric, with its scarlet crown; the coral-like *Peziza aurantia*, or the golden yellow *Clavaria*, found springing up in luxuriant clusters by woodland paths and hedge-rows. Here then is a "hobby," attractive and comparatively unridden; and our Forest is the very place in which to exercise it; Epping being perhaps one of the best localities for the larger *Fungi* in England. And at the meeting we chronicle what better teachers could the developing mycologist desire? Dr. Cooke, the hero of a hundred fungus forays and author of many a recondite treatise and popular history anent his favourites, was on the Forest betimes, in company with a portmanteau of wondrous capabilities, destined ere the day was over to be the resting-place of many a rare *Agaric*. With him was Dr. Wharton, M.A., F.L.S., himself an accomplished mycologist and ornithologist. Later trains brought to Loughton Professor Maxime Cornu, of Paris, of European reputation as a fungologist; our kind friend Mr. Worthington Smith, F.L.S., to whom our members were indebted for the jocular woodcut which proved so attractive on the programme of the day's proceedings; Mr. James English, than whom no one is better acquainted with the secret homes and haunts of many a rare Epping fungus; Mr. E. M. Holmes, F.L.S., an authority on mosses, lichens, and sea-weeds; Mr. Howse, the Woolhopean; the High Sheriff and Verderer, Mr. Andrew Johnston, and upwards of fifty members and friends, including several ladies. Never was a Naturalists'

excursion better officered, and the President and Secretary were full of congratulations as they conducted their batch of visitors towards Monk's Woods, the appointed afternoon rendezvous. Alas! just as we entered the broad shadow of the trees, down came the rain, sullenly and remorselessly. In vain did we shelter ourselves, "*sub tegmine fagi*," making occasional sallies into the open to secure some particularly large or fascinating Fungus. We soon became uncomfortably moist, and when Mr. Smith's and Mr. English's parties appeared, crossing a sedgy wood opening, and looking if possible even wetter than ourselves, we, after a brief consultation, adopted the advice of the "*veterans*," and struck the woodland path across the valley to the "Forester's Arms." Just outside the woods we met the last arrivals from the station, and the united parties fled before the pitiless tempest. A short lull in the storm tempted us to make another incursion to the woods, but we could not get far. However, we found Dr. Cooke's party loaded with spoils. The genial Doctor's wonderful bag was stocked with type specimens for his Lecture, and one enthusiastic member had converted his umbrella into a temporary vasculum, preferring to bear the rain rather than run the risk of spoiling his pretty *Agaricini* and *Bolcti;* whilst Mr. Grut (the well-known Librarian to the Entomological Society) carried in triumph an immense *Boletus edulis*, 2 feet 4¼ inches in circumference, which he had gathered at High Beach. But the downpour soon forced the botanists back. Just outside the Forest a large specimen of the "Parasol Mushroom" (*Agaricus procerus*) was noticed, a species of very fine edible qualities. Listening to the chatty reports of the skilled botanists, it was soon evident that in spite of bad weather the afternoon's hunt had proved very successful. Doctors Cooke and Wharton had gathered nearly sixty species, including many rare and remarkable forms, particularly the generally scarce *Agaricus ericæus*, which they found commonly. But their greatest prize was *Agaricus udus*, a species new to Britain; this interesting species was found in great plenty. Mr. Worthington Smith also found on dung numerous specimens of *Agaricus sphinctrinus*, which he took to be new to our flora; but on this point Doctors differ, and Dr. Cooke informs the writer that the species has been already recorded. Mr. Smith had been busy determining and registering the species met with, and his list extended to more than forty species. Amongst the notable forms recorded by him may be mentioned *Agaricus radicosus*, growing from the ground on hidden stumps. It has pink gills and mimics the common mushroom, for which it could be easily mistaken, but it is very poisonous and dangerous. *Ag. sublateriteus*, a new form of this species with deeply decurrent gills. The orange Chantarelle (*Cantharellus cibarius*), a pretty species with an odour like apricots, and which is so good when cooked that a botanist once said that a well-prepared dish of it would arrest the pangs of death, was very common in Monk's Woods, and at High Beach.

A. mucidus was very handsome, with its beautifully white gelatinous pileus, growing in overlapping clusters on the beeches; and here the edible *Hydnum repandum* was springing from the ground in abundance, Professor Cornu stating that it was sold in French vegetable markets at 3d. per pound. *Agaricus mappa* was frequent with the poisonous *A. semilanceatus, cervinus, spectabilis,* the edible *campestris* (Mushroom), and the somewhat uncommon *Ag. sericellus.* Further on were *Ag. lacrymabundus, pyxidatus, rhodopolius, pascuus, fastibilis, Saponaceus* (smelling of soap), *amethystinus, mollis, squamosus;* the edible species *rubescens* and *excoriatus,* and many common forms too numerous to mention. Mr. English met with many interesting *fungi.* Near High Beach was a beautiful group of *Agaricus radicatus,* with its gelatinous cap, pure white gills, and elongated stem rooting deeply by the side of an old stump, the other side of which was clothed with *Polyporus adiposus* nestling amongst the moss, accompanied by *Stereum purpureum,* one of the leathery group of *fungi.* On another stump was *Bulgaria sarcoides* and a pretty yellow *Peziza.* These old beech stumps seem very prolific in *fungi* and will often repay a search. Near the "King's Oak" the edible *Boletus* (*B. edulis*) was in plenty, some young plants of which Mr. Fitch carried home, had cooked for breakfast, and reported well of the dish. Several species of the genus *Russula* occurred, and with them the brilliant scarlet *R. emetica,* very showy but very poisonous. Also the rarer *Russula cyanoxantha,* an edible species, as well as the hurtful *R. furcata* with *R. fœtans* (stinking and poisonous) and *lutea.* Young specimens were seen of the Fly-agaric (*Amanita muscarius*), groups of the large *Lactarius vellereus,* a poisonous species, and *Ag. phalloides,* with the hateful smell. Also *Lactarius insulsus, quietus, piperatus, serifluus,* and *subdulcis.* On the trees *Polyporus cuticularis, Dædalea quercina, Trametes gibbosa,* and *Tremella albida.* A few Puff-balls were common, as well as *Paxillus involutus* and *Clavaria pistillaris* and *cristata.* But to mention by name all the Nature's rarities found would only weary the reader by reproducing on a small scale a "check-list" of our British *fungi.*

Discussing thus the spoils of the day we wandered back to our Inn, and we were soon enjoying one of those sociable "teas" which are so familiar to the members of "Our Club," and which proved very acceptable to many after a long and fatiguing Forest ramble.

After tea the President had much pleasure in stating that the Epping Forest Committee of the Corporation of London had agreed, in accordance with a motion made by their distinguished colleague, Mr. Andrew Johnston, to sanction the thorough examination by the Club of the ancient earthworks in Epping Forest. The work would be commenced as soon as possible, but as large funds would be required, the Council asked for liberal contributions from members and others interested in archæological discovery. With respect to the afternoon's results, he thought they had great reason for congratulation, notwithstanding the weather,

which had proved so inclement on that and several other former Field Meetings. On looking along the tables, the officers of the Club could not but feel proud to note the large and eminent cryptogamic forces they had succeeded in bringing together. He was sure all were deeply indebted to their conductors, Dr. M. C. Cooke, Mr. Worthington Smith, and Mr. James English, for their valuable assistance, and as some members might be obliged to leave before the termination of the discussion, he proposed to reverse the usual order of things, and at once call upon the meeting to pass a cordial vote of thanks to the botanists named. In doing so he could not but refer to the many well-known naturalists who attended the meeting as visitors, and he was sure all were proud and pleased to welcome their illustrious *confrère*, Professor Maxime Cornu, of Paris, among them that afternoon. The vote of thanks was given with much cordiality and enthusiasm.

Dr. Cooke then delivered one of his characteristically humorous and learned extemporaneous lectures, taking as his subject the discrimination of *Fungi* generally, and edible and poisonous species in particular. He alluded to the extreme richness of the Epping Woods in this class of plants, and congratulated the Society on having inaugurated so successfully a much-wanted mycological meeting. Since the collapse of the Fungus Meetings of the Royal Horticultural Society, lovers of these lowly plants had had no opportunity of meeting together for pleasant conversation and comparison of notes, and he was sure, should the meetings become an annual institution, they would be much appreciated by metropolitan botanists.

The Doctor gave an admirable *résumé* of the characteristics of the principal families of the larger or pileate *Fungi*, illustrating the points insisted on by means of fresh specimens extracted from the hidden recesses of his wonderful portmanteau. He described the mode of examining specimens with a view to classifying and naming them—whether with gills, pores, or teeth, on the underside of the pileus; the colour and nature of the spores, the structure of the stem, whether solid, hollow, or fibrous, the attachment of the gills to the stem, &c., &c.; all these points were touched upon, and demonstrated practically with the aid of a table knife, and the inexhaustible bag. He also pointed out what species to select, and what to avoid from a gastronomic point of view, particularly praising the "Orange Chantarelle," alluded to above; and one species *deliciosus* of the genus *Lactarius*, known by exuding a milky fluid when broken. Our giant friend *Boletus edulis* came in for a large share of commendation, and the visitors were told to study its characters well so as to know it again, particularly remarking the delicate pinkish reticulation of the stem which serves to distinguish the right species from its congeners, many of which are the reverse of wholesome. One of these *Boletus luridus* had been found plentifully during the afternoon's hunt. It is poison-

ous and turns to an azure colour when cut or broken, and Dr. Cooke thought the plant was designed by Providence to indicate "blue ruin" to the unwary fungus-eater!

Mr. Worthington Smith thought the Doctor had made a slight slip in stating that *Lactarius deliciosus* was the only edible member of the genus, as the allied *L. volemum* grew in Epping Forest, and was universally allowed to be one of the greatest gastronomic delicacies in the family of mushrooms. He had been several times asked during the afternoon whether there was any general rule for distinguishing an edible from a poisonous species; no such general rule existed. *Fungi* like other natural objects required to be studied to be well known. In addition to the anatomical details mentioned by Dr. Cooke, Mr. Smith stated that there were many empirical characters of great importance in the discrimination of *fungi*. For instance, the habitat is always of great value, and notice should be taken whether the fungus to be determined grew in a wood, a hedgeside, or meadow. If in a wood the character of the trees should be noted; some *fungi* are peculiar to Fir woods, others to plantations of Beeches, Larches, and other trees. If the *fungi* grow on trunks or stumps, especial attention must be paid to the nature of the trunks, whether of Oak, Elm, Beech, Fir, or any other tree or bush. The same rule applied to fallen twigs and dead leaves. The habit also was of great value, whether growing in a solitary manner, in groups, in "fairy-rings," one or two together, or in great companies. Coming to the plant itself, Mr. Smith said that as there were about 1,000 species of mushroom-like *fungi* in this country, it was evident that only the most careful examination of all parts of the structure, stem, pileus, gills, and spores would enable the botanist to discriminate many critical species. Especial attention should be paid to the top, whether it is fleshy or thin; its "flesh" dry, watery or milky; its upper portion smooth, rough, warted, or gelatinous; the *stem* may be rough or smooth, with or without a ring, springing from a bulb or from an attenuated root-like growth, hollow or solid, with or without bark, have pith or be pithless. The gills or plates under the top must be noted, whether these structures are thick or thin, crowded together or distant from each other, whether running down the stem or free from it, and whether the colour is black, white, pink or brown. The spores are equally important; their colour, form and size must be observed with care in the discrimination of critical species. Some spores are very large, as in *Agaricus mucidus* (found that afternoon); whilst others, as in *Polyporus cæsius*, are excessively small; some are round, others oval, some pip-shaped, some nodulose, others furnished with spines like a hedgehog. Odour, too, is of great importance as an empirical character, said Mr. Smith; different *fungi* are furnished with the most diverse smells, and many can be named at once by the fragrant or fœtid scent alone. Taste was of equal importance, some

fungi being sweet and nutty to the taste, others bitter and highly pungent.

Professor Maxime Cornu, who was very cordially received, and who spoke in French, said he felt much flattered by the honour they had done him. He was very charmed to be able to be present at such a pleasant *réunion* of London botanists. In his opinion, meetings of the kind had the greatest scientific interest independently of their social and friendly character. He hoped, on his return, to initiate similar meetings in Paris, and he need not say that any he saw around him would find a hearty welcome there.

A few practical observations on fungus hunting were made by Mr. Howse and Mr. Holmes, time forbidding any further extended remarks, and then the party sallied forth to catch the train at the Loughton Station. Shining like "a good deed in a naughty world," our leader's entomological lanthorn signalled the way through the almost impenetrable darkness, and enabled us to steer our course without much discomfort. Mr. Smith records some of the conversation of the experts as they trudged through the Essex lanes. In reference to the darkness, M. Cornu said that Dr. Quelet could recognize several species of *Hydnum* in the dark by merely squeezing the hymenial surface between his fingers and noting the amount of moisture exuded. Someone else said he could always make out *Phallus impudicus* in the dark, even *without* touching it, and Mr. English said he always knew the poisonous *Russula emetica* from any other species because the red colour of the pileus invariably got washed out and dissolved over the gills by his hot wax process—a character, so far as he knew, peculiar to this species. He also said *R. emetica* turns brownish-black in drying. These characters (if they are to be relied upon) are very valuable, as no species is more difficult to make out with certainty than *R. emetica*, its characters being closely "mimiced" by several other red *Russulas*, said Mr. Smith. The rain holding off for a brief space, and friendly converse so beguiling the time, all ended happily, and the LAST Field Meeting of the season is, in everything but the weather, a pleasant memory.

[In penning the last gossiping report, the Hon. Secretary cannot refrain from taking the opportunity of publicly thanking all friends, scientific and others, to whose kind aid and encouragement the success of the first series of these pleasant gatherings has been mainly due. In spite of bad weather, the interest taken in them by the members has never waned, and we may hope that the next season's meetings will profit from the legacy of pleasant recollections bequeathed by those of 1880.]

SATURDAY, OCTOBER 30TH, 1880.—ORDINARY MEETING.

The Monthly Meeting was held at the Headquarters, at seven o'clock, the President in the chair.

The minutes of the previous meeting were read and confirmed. The names of twelve candidates for election into the Society were read.

The Secretary read the following letter :—

Aldershot, 24th October, 1880.

Dear Sir,—In reply to your letter, I am directed to state that H.R.H. the Duke of Connaught will have great pleasure in becoming a Patron of the Epping Forest and County of Essex Naturalists' Field Club.—Yours truly, H. ELPHINSTONE.

The President said that he knew the members of the Club would hear with great pleasure of the honour conferred upon the Society by His Royal Highness, and he was sure they would gladly pass a cordial vote of thanks in acknowledgment of the favour so freely and kindly rendered.

The vote was passed by acclamation amid loud cheers.

The following letter was also read :—

Guildhall, E.C., 4th October, 1880.

Gentlemen,—The Epping Forest Committee have considered the memorial addressed by you to them on behalf of the Epping Forest and County of Essex Naturalists' Field Club, for permission to make a scientific examination of the Camps or Earthworks at Loughton, and of the Camp called Ambresbury, in Epping Forest, under the personal superintendence of Major-General Pitt-Rivers, and the following is a copy of the resolution passed by them on the subject :—

"Resolved : That the application be granted subject to the works being carried out under the superintendence of Mr. McKenzie, the Superintendent of the Forest, and to the ground being subsequently restored by the Club to its present condition and to his satisfaction ; and also that all relics and other objects of interest which may be found in either of the Camps or Earthworks shall be handed over to, and become the property of, the Conservators."—I am, &c., JOHN B. MONCKTON.

To the Council.

Mr. Meldola said that, in accordance with the above, the Secretary had issued a circular to the members, asking for subscriptions to found a fund to be called "The Forest Camps Exploration Fund," to enable the Society to carry out the work. He was glad to say that £40 had already been subscribed, sufficient to explore one Camp; and the Council confidently hoped that further sums would be sent in as the desirable object of the fund became more generally known. Acting

under the advice of their Hon. Surveyor, Mr. D'Oyley, the Council had resolved to defer the exploration until the spring, when the earth would probably be in a condition to allow of sifting, so that coins or other small objects might be readily detected. By that time also the Council hoped that a sufficient sum would be received to enable the Club to thoroughly explore *both* Camps, and to publish in a suitable manner a full account of the investigation, with maps, plans, &c., constituting a complete history of these interesting relics. In moving that a vote of thanks be passed to the Epping Forest Committee, the President wished to bear testimony to the services rendered to the Club by their colleague Mr. Andrew Johnston, High Sheriff of the County, in proposing, in his capacity of Verderer and member of the Committee, "that the Club's application be granted," and also for his kind efforts in connection with the application to H.R.H. the Ranger. The votes of thanks were passed with much cordiality by the meeting.

The President also said, that acting upon the excellent suggestion of their Secretary, the Council had resolved to establish a series of Winter Science Lectures for the instruction and amusement of the members and the public generally. The first lecture would be given by Mr. J. E. Harting, F.L.S., F.Z.S. (Editor of "Zoologist"), on Wednesday, November 10th, subject, "Forest Animals." He was glad to be able to announce that his friend, Mr. A. R. Wallace, had consented to deliver a lecture during the course. They also hoped to secure the kind aid of Dr. Cooke, Mr. Whitaker, and other distinguished scientific men.

The following books were presented to the Society: Warner's "*Plantæ Woodfordienses*," a rare book of great interest to the Essex botanist, presented by Mr. Fisher Unwin, and "The Transaction of the Essex Archæological Society," Vol. II., Part I., by the Society.

Mr. English exhibited several rare and interesting species of *Fungi*, from Epping Forest, and made some remarks upon their peculiarities. *Polyporus intybaceus*, rare; he had only found this on few occasions on one particular stump in the Forest. It was a remarkable fact that the plant did not occur annually; it slipped some years, and then reappeared in the same locality. This year he had found a fine specimen; it was very beautiful, with its white pileus, studded with pores, and looking like some varieties of coral. *Agaricus storea*; that morning he had been out with Dr. Plowright, who had journeyed all the way from King's Lynn in order to see some of the Epping Forest *Fungi*. They succeeded in discovering some very beautiful things, especially this species. It only occurs on the site of a fire where there is a layer of charcoal; and it is worthy of note that many curious species are only found on these charcoal heaps. *Stereum hirsutum*, very common in the High Beach woods. *Trichia chrysospermum*, a species very interesting

to the microscopist. *Cortinarius rigens*, a very rare species and recently new; Mr. English had found it in Monk's Wood; the form very much resembles *C. ochroleuca*, although in his opinion perfectly distinct. *Agaricus ericæus*, a common species in the Epping Woods, but one which appears to be a great puzzle to mycologists; it had been returned to him under three names, *velutinus*, *stercoraria* and *squamosus*.

The Secretary exhibited some insects from his own collection for the purpose of illustrating Mr. Meldola's remarks at the last meeting on mimicry and protective resemblance in these animals. The case of mimicry was that of the little moths *Acidalia subsericeata* and *Asthena candidata* before explained, and "protective resemblance" was exemplified by many specimens of caterpillars which possess various modes of concealment.

Taking these specimens as his text, Mr. Meldola engaged the attention of his audience by a short dissertation on caterpillars, their habits and appearances, considered as means of protection from their enemies. He pointed out that many caterpillars resemble twigs, dead leaves, flowers, leaves, etc., and so escape detection. Such cases are easily recognised. On the other hand many caterpillars are hairy or brightly coloured and appear to court observation rather than concealment. Many experiments made by Mr. Jenner Weir, Mr. Butler, and Dr. Weismann, went to show, however, that insectivorous birds rejected such larvæ, probably on account of some unpleasant taste or odour. Of course it would benefit the insect but little to be bitten in two and then rejected, and Mr. Wallace had suggested that bright colours and hairs served the purpose of *danger-signals*, warning the birds of the nauseousness of the morsel. Some caterpillars have fringes of hairs just above the legs, and Mr. Meldola suggested that such hairs might be of advantage by softening the shadow thrown by the insect when stretched along a bough, and so rendering it less distinctly seen. This was the case with the larva of the "Lappet-moth," *Lasiocampa quercifolia* shown by Mr. Cole. Other caterpillars possess *eye-like* spots, and Dr. Weismann found by direct experiments that these frightened birds off the insects; his results being confirmed by the experiments of Lady Verney. In short, there was not a hair, spot or marking on a caterpillar but possessed some meaning, and indicated some trait in the economy of the species.

The Secretary read a letter from Mr. Andrew Johnston asking for information as to the correct orthography of the words "High Beach." The general opinion of the meeting was that the word should be so spelled, and not "Beech;" the words probably indicating high ground, in which pebbly gravels cropped out, so forming a "beach."*

* We have adopted the form "Beach" in the reports, but must confess to feeling considerable doubt as to its correctness; it must be noted that the word is spelled "Beech" in the Ordnance Maps, in Warner's "*Plantæ Woodfordienses*," and also is so written in some MS. notes in Mr. Unwin's copy of the same work. We shall be glad of information on the point.—Ed.

Also, extract from a letter from Mr. Christy, taking exception to the explanation proposed by Mr. Cole at the last meeting to account for the death of Shrews, viz., that they were killed by exposure to sharp autumnal frosts. Mr. Christy stated that he had as often found dead Shrews in the spring and summer as in the autumn. He suggested that many of them die through fighting, as they often bear old and new wounds. Some die from other causes, however, as they often present a compound dislocation of the backbone. Mr. Christy suggested that the members should make a careful examination and record of all Shrews found dead, so that some data might be accumulated to aid in solving the question; a desirable result were it only to disprove the belief (common in Essex) that they die from inability to cross a path!

Mrs. Yeates exhibited a sample of some masses of a curious stony substance found in quantities in digging the foundations for Mr. Barnes's house, Oak Hall. They seemed very like the well-known *septaria* from the London clay.

WEDNESDAY, NOV. 10TH, 1880.

Science Lecture.

The first of the projected series of Winter Science Lectures, in connection with the Club, was given by J. E. Harting, Esq., F.L.S., F.Z.S. (Editor of *Zoologist*). The President occupied the chair, and in introducing the lecturer said:—There is an oft-quoted proverb, which tells us that "Wisdom cried aloud in the streets, and no man regarded her." In opening the present session of lectures in connection with our Club, I can only express a hope that the streets of Buckhurst Hill will not be the scene of this intellectual degeneration. The work which can be done by a Field Club is, as I pointed out in my Inaugural Address, of two kinds: original research, and the promotion of science in our own district. We thus appeal to two widely different classes: to the special scientific worker on the one hand, and to the general public on the other. In lectures such as we commence with this evening, we have a common meeting-ground for both these classes. Being fortunately situated close to the great focus of scientific activity in this country—the metropolis—we can secure the co-operation, and, I am happy to say, have been promised the assistance, of some of the most eminent among our scientific workers. We thus commence our labours as missionaries of science under good auspices, and we appeal to the outside public to show that these labours are appreciated. The President then called upon Mr. Harting, who delivered a lecture on "Forest Animals" (Transactions, Vol. I., p. 74). At the conclusion of the lecture, Mr. Meldola suggested that Mr. Harting would be happy to answer any question on matters connected with the lecture.

Mr. Andrew Johnston, in his capacity of Verderer of the Forest, asked whether there was any likelihood of the Roe Deer, and Badger, remaining in Epping Forest if undisturbed there.

Mr. Harting replied that both these animals were of a retiring nature, and required to be kept absolutely quiet. If the public had access to all the covers in the woods it would be impossible to keep them, but if they could be kept undisturbed they might do very well. The Roe Deer was of a wandering disposition, and would require a large area of forest wherein it could roam undisturbed. Therefore he thought there would be some difficulty in inducing it to remain in Epping Forest. The Badger only required protection, quiet, and water, and he thought there would be no difficulty with that animal.

A cordial vote of thanks to Mr. Harting was carried by acclamation.

THE PRESIDENT'S ADDRESS

Delivered at the Annual Meeting, January 22, 1881.

BY RAPHAEL MELDOLA, F.R.A.S., F.C.S., ETC.

Vice-President of the Entomological Society of London.

LADIES AND GENTLEMEN,

Although our Rules do not make the delivery of an annual address a necessary part of the duties which devolve upon your President, I think that the custom of reviewing the labours of the Club annually is a healthy one, and on the occasion of this our first Anniversary it will not be amiss to express the hope that this custom will be regularly observed by our future Presidents.

In taking stock of the work done during the first year of our existence, we have every reason to congratulate ourselves upon the general success of the Club; and I do not think that I go too far when I state that it is impossible to name any other Society of a similar character which has grown so rapidly within such a small period of time. From the 140 original members entered down to February 28th of last year—the date of the delivery of my inaugural address—we have now risen to about 240 members, and candidates for admission still continue to come forward. It is often observed, however, that when an organism grows too rapidly, a constitutional weakness is the result, and I should be no true friend of the Club if I reviewed our work solely from an optimist point of view; it will be more conducive to our future welfare if I point out what appear to me to be certain weaknesses, so that some of

this growing energy may be directed into the proper channels for strengthening our constitution.

In the first place, we must never lose sight of the fact that we profess to be a local Natural History Society, and although we include the names of some few county naturalists whose scientific *status* is well established, we cannot close our eyes to the fact that we are, generally speaking, in a state of scientific poverty. I dwell upon this point because in starting this Club our first object was to promote local scientific work, and if we fail in doing this we must necessarily undergo degeneration, and our case may be in danger of becoming suggestive of the tragedy of Hamlet with the Prince of Denmark left out. It is true that our meetings have, on the whole, been well—I may say excellently—supported, but it must not be forgotten that our chief help has come from external sources. Our "Proceedings and Transactions," which are just published, will show that many of our contributions, and our most interesting discussions and exhibitions, have been left dependent on a very limited number of our own members, or have come from outsiders. We must express our thanks to those who have so kindly extended their aid to us; but we must do more if we are to maintain our high position—we must show our appreciation of their support by working ourselves. It is my sincere desire to see the Club stand as an independent edifice, based on a secure foundation, and strengthened, if necessary, by occasional external support, but not left as an altogether shaky structure entirely dependent upon such props.

Our rapid growth bears witness to the fact that our objects and pursuits are of widespread interest, and it must now be our earnest endeavour to convert this passive interest into active co-operation. I again appeal to our younger and rising members to take up the study of some branch of natural science—to make observations bearing on the natural history or geology of our district, and to communicate the results of their labours to the Club. One of the most serious obstacles in the way of natural science studies among those who have had no special training in

such subjects appears to be the belief that some special quality of mind is necessary, and many who are really interested in the pursuits of the naturalist allow their interest to remain passive for this reason. But the necessary qualities of mind really differ in no way in kind from those possessed by any person of average intelligence. Professor Huxley is never tired of insisting that science is but organized common sense :—"Anyone who looks into the matter attentively will soon perceive that there is no solid foundation for the belief that the realm of science is thus shut off from that of common sense, or that the mode of investigation which yields such wonderful results to the scientific investigator is different in kind from that which is employed for the commonest purposes of every day existence. Common sense is science exactly in so far as it fulfils the ideal of common sense—that is, sees facts as they are, or, at any rate, without the distortion of prejudice, and reasons from them in accordance with the dictates of sound judgment. And science is simply common sense at its best; that is, rigidly accurate in observation, and merciless to fallacy in logic."* These statements, coming from one of the masters of biological science, must surely hold out every encouragement to those who desire to take up the study of these subjects. There is no one amongst us but, after he has once acquired a substantial groundwork in some branch of our studies, can do real service to the Club and to science at large, and I only hope that our next volume of publications will show that these remarks have fallen upon fertile soil.

In many scientific societies it is customary for the President to occupy the attention of the members at the annual meeting with a discourse upon some special branch of science with which he is most familiar, and although this is a custom of which I greatly approve, I much regret that my numerous occupations have left me without the time necessary for collecting the materials for such an address.

* "The Crayfish: An Introduction to the Study of Zoology," 1880, pp. 1 and 2.

As this is only our first year, however, it is perhaps better that I should draw more attention to the general work of the Club, in order to show to what extent we have striven to carry out our objects, and how far we have been successful.

As already stated in the Report of the Council, we have held eleven Ordinary Meetings and seven Field Meetings during the year. Although our Ordinary Monthly Meetings have been on the whole well supported, we have thought it desirable to diminish their number this present session, in order to increase our chance of securing good attendances throughout the year, and no Ordinary Meetings will be held during the months of June, July, and August. By this means we hope to concentrate the energy of twelve meetings into nine, and in order to make further sure of keeping alive the interest of our members, the Council has decided that each meeting shall be announced by a special notice, so that members may be made acquainted beforehand with the subjects which authors or exhibitors propose bringing forward. For the carrying out of this plan we are entirely dependent upon our members, and it is earnestly requested that notice will be given to the Secretary of any paper that is to be read, or any exhibition that is to be made, at least ten days previous to the meeting.

Of the numerous subjects brought forward and discussed during the past year, it is not my intention to give a detailed account, as our "Proceedings" containing full reports of the meetings are now in your hands. For maintaining the interest of these meetings, the Club is very much indebted to our indefatigable Honorary Secretary, Mr. William Cole, and to our members Mr. R. M. Christy, Mr. James English, and others. Mr. Henry Walker's interesting lecture on "A Day's Elephant Hunting in Essex" formed the first part of our "Transactions" published in September. Among the discussions raised, one of the most suggestive appears to me to be that which followed the reading of Mr. Christy's note on the habits of the weasel and stoat, at the March meeting, on which occasion I had the pleasure of giving expression to some ideas which I have long entertained with respect to the white colours of

Arctic animals. I hope to have an opportunity of enlarging upon this subject on some future occasion.

Our Field Meetings cannot but have left pleasant memories with us all. In spite of unfavourable weather on many occasions, they have always been well attended, and their success is largely due to the efforts of the eminent gentlemen who have acted as our conductors. The best thanks of the Club are due to Sir Antonio Brady, Professor Boulger, Dr. M. C. Cooke, Major-General Pitt-Rivers, Mr. B. H. Cowper, Mr. D'Oyley, Mr. Worthington Smith, and Mr. Henry Walker; whilst upon our Honorary Secretary has not only devolved the organization of these meetings, but likewise the preparation of those excellent reports which have appeared in the *Woodford Times*, and which we shall many of us peruse with the interest of personal experience as now published in our "Proceedings." Among the most memorable of these excursions was the visit to Ilford in July, under the leadership of Sir Antonio Brady and Mr. Henry Walker, on which occasion most interesting collections of flint implements and other objects of Palæolithic and Neolithic age were exhibited by Sir Antonio Brady and Mr. Worthington Smith; and Mr. A. R. Wallace favoured us with a brief sketch of his views on the great question of geological climate which have recently appeared fully elaborated in his admirable "Island Life." It would be quite out of place to attempt here to lay before you any of the lines of argument adopted by Mr. Wallace in support of his theory, but it will be instructive, as showing the rapidity of the onward march of science, if I just mention one of his main conclusions, in so far as it bears upon a statement made in my inaugural address delivered last February. In speaking of the glacial epoch (*i.e.*, the last glacial period, with its alternations of warm periods), I stated that the causes of these wonderful conditions of climate were of an astronomical nature, thereby of course indicating the occurrence of winter in aphelion (brought about by the precession of the equinoxes) during a period of great excentricity of the earth's orbit. This theory, due to Dr. Croll, has long been held by our most eminent

geologists, but Mr. Wallace has now given weighty reasons for believing that this explanation is inadequate, and that purely astronomical causes are insufficient to account for such great climatic changes. He is of opinion that certain concomitant geographical changes are also necessary, and he thus adds to Croll's astronomical theory a modification of the purely geographical explanation of climatic change long ago advanced by Sir Charles Lyell in the "Principles of Geology." The history of science presents many such instances of the amalgamation of hypotheses. A theory may for a long time be maintained until some new and more perfect theory is offered in its place—in the heat of intellectual excitement the older theory is rejected under the belief that the newer one has rendered it unnecessary, but in the course of time it is seen that the two are not necessarily mutually exclusive, and some master worker shows that they are both requisite for an adequate explanation of the phenomena concerned.

The Field Meeting held on the 3rd of July, when Major-General Pitt-Rivers gave us the benefit of his large experience on the occasion of our visit to the ancient earthworks in the Forest, has opened up a line of work which may enable our Club to do substantial service to archæology. At this meeting, in addition to our conductor, we had with us Mr. W. L. Distant, one of the directors of the Anthropological Institute; Mr. B. H. Cowper, the discoverer of the Loughton Camp; and Mr. D'Oyley, the surveyor of the earthworks; to these gentlemen the thanks of the Club are due. The history of these camps is quite unknown, and their supposed founders come down to us only through uncertain traditions which are valueless to the scientific archæologist. At the suggestion of our conductor we therefore determined to attempt to settle the problem, by raising an "Exploration Fund" for the purpose of opening these earthworks, with a view to obtaining some relics of their constructors. I have already had the pleasure of informing you that the necessary permission has been granted by the Forest Conservators, and the thanks of the Club have been rendered to this body, and to our esteemed

member the High Sheriff, Mr. Andrew Johnston, who laid our cause before the Epping Forest Committee of the Corporation of London. The details of the proposed method of excavation have been made known to you on a former occasion, but as there still appears to be some uneasiness in the minds of many of our members as to our possibly doing a permanent injury to these picturesque remains, I will give a few words by way of further explanation. The investigation will be conducted by digging a trench about ten feet wide from inside the camp right through the inner rampart and ditch, and on through the outer rampart to the exterior boundary of the camp. This trench will be carried down to such a depth as to get below the old surface line, and a most searching examination of the soil will be made as it is removed. Any relics found on this old and buried surface will certainly have been left by the original builders of the camp, and every precaution will be taken to insure an accurate record of the exact position of any object that may be found. A plan of the proposed method of working has been kindly drawn up for our use by General Pitt-Rivers, and Mr. W. D'Oyley has offered his valuable services in assisting to carry out the practical details. In accordance with the terms of the permission granted by the Epping Forest Committee, the trench will be filled in, and the original form of the camp restored after the conclusion of our examination, so that our members may rest satisfied in the belief that no permanent disfigurement will result. It may perhaps be thought advisable to erect some mark indicating the position of our cutting, so that if at any future period other investigations of the same camps should be made, the excavators may not run the risk of going over our work again. The Exploration Fund, as you already know, now amounts to about £40, a sufficient sum to enable us to investigate one of the camps, and to publish our results; and if these are sufficiently encouraging, we shall feel justified in appealing for a further sum of £20 or £30 to enable us to open the other camp. A preliminary survey will be made, and operations will be commenced as soon as

the weather gives some prospect of our being able to find the earth dry enough for sifting.

In attempting to unravel the mystery that surrounds these venerable relics of human workmanship, and in endeavouring to discover the true origin of the camp at Ambresbury Banks, and of "Cowper's Camp," we may perhaps be accused of trenching upon the province of our old-established colleagues the Essex Archæological Society, but as this is far from our intention, it will not be here out of place if I venture to define what to me appears to be our position with respect to this Society, and to archæology in general. In point of fact the studies of the Society mentioned commence where ours leave off—it is more especially prehistoric archæology with which I think we should concern ourselves as a Natural History Club; and although we shall always welcome historic archæological contributions from our members—especially when relating to the biographies, &c., of Essex naturalists—I am of opinion that our Treasurer's purse should not be bled in order to publish such papers *in extenso*, but that such materials when communicated to us should be handed over by the Council to our brother Society to be published or dealt with as they shall think fit. Let not these remarks in any way deter our members skilled in archæology from giving us the results of their labours; their contributions will add greatly to the interest of our meetings, and their value to the science will be the rather augmented by their being ultimately referred to a Society which has made these subjects its proper study.

The only other Field Meeting upon which I feel called to make any comment was the last of the session, held on October 2nd, under the leadership of Dr. M. C. Cooke, Mr. Worthington Smith, and Mr. James English. A humourous account of this "Fungus foray" appeared in the *Gardener's Chronicle* of October 9th, from the pen of one of our conductors, and the full list of the most noteworthy species collected appears in our "Proceedings." The meteorological authorities treated us badly on that occasion; but notwithstanding their "aqueous humours" we mustered

strongly, and the Cryptogamic Botany of this country was powerfully represented in the persons of our conductors and visitors, whilst French science did us the honour of recognizing our meeting in the person of the eminent botanist Professor Maxime Cornu, of Paris. So successful was this meeting in the opinion of our leaders that we have determined to make an annual institution of it, and I only hope that for many years to come we may rally around the same able conductors.

The next point to which I propose to direct your attention is the existing state of affairs with reference to our Library and Museum. These are still in a rudimentary condition, but a fair start has been made, and many donations of books, periodicals, and specimens have been received during the year. The prospects of seeing ourselves established in a building of our own appear to be as yet remote, but a timely offer of assistance has come from the proprietors of the Art Classes, to whose kindness we are indebted for the use of the apartments where we now hold our meetings. Two rooms in this house have been allotted to the Club for the Library and Museum, and the Council has resolved that a certain portion of the funds arising from life-subscriptions shall be expended for the legitimate purpose of putting up such fittings as are considered sufficient to meet our present requirements. We are thus in a better position to make an appeal for donations, and I cannot too strongly urge upon our members the necessity for using every effort in their power to assist in the furthering of this object. If it is made generally known that we have accommodation for books and specimens, I have no doubt but that many contributions will be forthcoming; and when we are able to show that a good nucleus exists, scientific writers will be encouraged to place copies of their works on our shelves, where they know that good use will be made of them, or to present us with collections which they desire to keep local, and which they may feel assured will be well looked after.

The various books presented have been announced at our meetings, and the thanks of the Club have been

voted to the respective donors. Among the first contributions of value to the Museum is the Herbarium of mosses and lichens, formed by Richard Warner, presented by Sir J. Clarke Jervoise, Bart. I am also glad to be able to inform you that the Rev. Francis Walker, of Dry Drayton, has recently offered us his ornithological and entomological collections formed in that parish. As the specimens were all collected in the neighbouring county of Cambridgeshire, this generous offer has been accepted, and, in accordance with the wishes of the donor, the collection will be kept separate in our Museum. I trust that at no very distant period it may be the duty of your President to announce that we have outgrown our present accommodation; this will be a sure sign that we have workers in our midst, and an appeal for disestablishment from our present quarters may then be met by substantial support.

In the course of our endeavours to promote science in this neighbourhood, a series of winter lectures has been commenced, the first of which, on Forest Animals, delivered in November by our well-known colleague Mr. J. E. Harting, has been published in full in our "Transactions." The second lecture of the session, delivered at the beginning of this month by Mr. A. R. Wallace, on "The Natural History of Islands," must yet be fresh in your memories. Although this discourse was replete with facts and arguments of the highest importance, and we had the privilege of hearing directly from the mouth of the investigator a most masterly exposition of those subjects which he has made his life-study, we cannot fairly consider it within our power to print this lecture *verbatim*. The subjects treated of by Mr. Wallace will be found in one of the Manchester Science Lectures, and fully elaborated in his "Island Life," to which work I may refer any of our members who require further information; the lecturer's remarks, moreover, covered a field too wide to be considered as legitimately coming within our province as a local Club. We shall hope to continue these lectures from time to time during the present session at least, and as their object is

solely to awaken a general interest for science in our own district, it will be better not to consider our lecturers in any way bound to treat of purely local subjects. As this part of our work is in fact educational, I am of opinion that any branch of natural history (in its widest sense) may justly come within our scope; and, in order to give the greater effect to our operations as scientific missionaries, I would suggest that these lectures, if carried on next session, should take the form of a course on some particular subject.

As a Club founded for the purpose of studying the natural history, &c., of the county, and of Epping Forest in particular, we have every reason to be grateful to the Corporation of London for their successful efforts in preserving the Forest, and I hope I may add, in accordance with the words of the Epping Forest Act, in maintaining as far as possible its "natural aspect." To us, as naturalists, the Forest is only of interest so long as it remains as such. When we consider that we have within easy reach of the Metropolis a magnificent area of wild and picturesque country freely accessible to the public at large, and long the resort of that more limited class who wander through its copses or across its heathy expanses as students of nature, the majority of us must feel that it is our duty to express our disapprobation of any act that would tend to injure directly or indirectly the natural features of that Forest which both in our own interest, and in that of the numerous kindred societies in and around London, we now justly regard as the object of our watchful care. It was on these broad grounds, and quite independent of all questions of private interest, that our Council met on the 8th of this month to consider the proposed extension of the Great Eastern Railway from Chingford to High Beech. Mr. Francis George Heath, one of our members well known to the public for his zealous efforts in connection with the preservation of open spaces, brought under our notice a resolution protesting against this scheme. This resolution was carried by a large majority, and has been published in many of the papers, where

it has doubtless come under your notice. Those of our members who agree in this decision cannot but rejoice that the press generally, as well as many large and influential bodies, have also expressed their disapproval of this interference with the Forest, and for my own part I can only give utterance to the wish that the Railway Company may be led to reconsider their plan, or to alter the route of the projected extension so as to leave our Forest untouched.

The remarks made at the commencement of this address with reference to our lack of active science workers will, I trust, be taken in the spirit in which they were offered—the desire to see the Club doing good work and taking a high position among such societies. We are still in our infancy, and too much ought not to be expected from us at first starting. Still, in view of our increasing energy, it is not too soon to begin to consider some of the numerous lines of useful work which we might take up, and I will therefore in conclusion offer a few suggestions which may possibly serve to hasten the production of some of the more solid contributions to science which it should be our ambition to see emanate from this Club.

In the first place, as regards local catalogues of animals and plants—our County Directory—why should we not commence this next season upon some of the better known orders of insects, such as Lepidoptera or Coleoptera? Supposing we take the former, as having been the more extensively worked at. A large amount of material already exists scattered throughout the various British entomological publications, and we should have to commence our list by systematic compilation. That done, we can begin to collect records from our own members, many of whom have long collected in the county; and I would suggest that a circular should be sent round, not only to our members, but also to all entomologists who may have worked our district, asking for their assistance. In the case of the rarer species, the locality, date of capture, and name of captor should be given, together with references if the capture has already been published. Every care should be taken to make our first list a typical one, and workers at

other groups would thus be encouraged to follow it up by catalogues of their own special objects of study. There is yet another point to be mentioned in connection with the preparation of such lists, and that is the possible occurrence of local variation. Of course we cannot expect in such a limited area to find many or well-marked instances of this phenomenon, but it nevertheless seems to me desirable to make a most careful comparison, especially in the case of variable species, between series from the various portions of our own county and series from other parts of the country and from the Continent. This is the more especially desirable with common and variable species which extend to our marsh-fringed coast. Mr. H. W. Bates tells us that in the Amazon Valley the butterflies undergo modification to such an extent that many species appear to change into a distinct local race in every fresh district. It is obviously useless to look for such striking instances in a small island like ours, where there are but few facilities for isolation, and where local variation is consequently obliterated by free intercrossing. But there is no reason why the phenomena which occur in the tropics *en grand* should not appear in this country *en petit*, and a searching examination of long series of specimens in the manner suggested may possibly result in the discovery of some positive evidence in this direction.

The next suggestion is one that appeals to our botanists. We have had recently added to our Forest large tracts of land formerly under cultivation, but now being gradually reconverted into forest land. It appears to me that we have here a natural experiment going on of which we should take advantage: we can surely learn something of the manner in which a forest spreads by keeping a careful watch upon such tracts, noting the plants that from time to time make their appearance, and by this means recording the encroachment of species, and observing the effects of that struggle for life which is one of the prime factors in the evolution of living forms.

One other suggestion, and I have finished. Now that our sylvan head-quarters have so much increased in extent

and are preserved, I hope, from rough usage, why should we not make an attempt to restore some of the beautiful insects that formerly inhabited our Forest, but which have been collected off the face of the district? Why should not our glades be once more enlivened by the graceful flight of *Limenitis Sybilla*? Why should we not see *Argynnis Paphia* a common frequenter of our bramble-blossoms? Such species abound in New Forest, Hampshire, and the conditions of our own Forest seem favourable for them; they formerly inhabited this district, and there is no reason, as far as we can see, why they should not do so again. Some of our members will, perhaps, bear this suggestion in mind during the approaching summer, and, instead of filling rows in their cabinet drawers, will forward living specimens to enable us to attempt this restoration.

The brief *résumé* of our work which I have now laid before you cannot but impress those who are interested in our progress with the idea that we have entered upon our career with an activity that promises well for our future prosperity. The objects of the Club, as laid down in our Rules, have thus far been carried out with success, and our position as a scientific body is now well established. We are about to enter upon another year of our labours: it is for you to carry on the good work.

SATURDAY, NOVEMBER 27TH, 1880.—ORDINARY MEETING.

The Monthly Meeting was held at seven o'clock, the President in the chair. The following persons were ballotted for and elected members of the Club:—Messrs. George Brooke, F. T. Lockyer, Thos. S. Morten, C. J. S. Parker, Rev. T. W. Peile, Edwin Richardson, G. T. Saul, F.Z.S., Miss Spicer, Messrs. W. Thorp, B.Sc., F.C.S., &c., T. H. Varley, F.R.A.S., &c., F. B. Wells, E. Wheeler.

Mr. P. Copland was chosen Auditor on behalf of the Council, and Mr. Saul on behalf of the members.

The following works were presented to the Club: Warner's "Plantæ Woodfordienses," by Sir J. Clarke Jervoise; Relham's "Flora Cantabrigiensis," Ray's "Wisdom of God in Creation," and Ray's "Travels," by Messrs. W. and B. G. Cole.

The following letter from Lieut.-Col. Russell, J.P., D.L., North Ockenden, Essex, addressed to the Secretary, was read:—

"November 10th, 1880.

"Dear Sir,—The enclosed notices of motion have been given at the last Essex Quarter Sessions, and the one of them which there seems to be best supported will be made January 4th. Motion No. 2 would meet with overwhelming support as against March 1st for beginning of close time for *all* birds, but No. 1 is, I think, better in itself, and is preferred by the men near the coast on whose land large numbers of Ducks breed, by Decoyholders, and by shooters of all sorts. I shall be glad to know the opinions and wishes of the members of the Epping Forest Naturalists' Club on the subject, with a view to try and get done what will be most generally suitable. With the exception of the few migrants mentioned in (1), which do not breed in this county, and whose numbers experience shows not to be affected by close time in this county, everybody seems willing to let the birds have close time from the 1st of March.—Yours faithfully,

"C. RUSSELL."

The resolutions referred to above:—

"(I.)—That this Court do apply to the Secretary of State for the Home Department to vary the close time under the Wild Birds Protection Act 1880, for this county in manner following, that is to say: That the close time as regards the Curlew, Dunbird (including Scaup Duck), Gedwit, Knot, Oxbird, Plover (not including Lapwing), Snipe, Widgeon, Wild Goose, and Woodcock, extend annually between the 1st day of April and the 1st day of August." *

* At the meeting of the Essex Quarter Sessions held on January 4th, 1881, the above (first) resolution was carried, on the motion of Lieut.-Col. Russell, seconded by Mr. J. Round, M.P.; and upon the proposition of Mr. Round, seconded by Mr. E. N. Buxton, it was agreed that the following gentlemen be appointed a Committee to

"(II.)—That this Court do apply to the Secretary of State for the Home Department to vary the close time under the Wild Birds Protection Act, 1880, for this county in manner following, that is to say: That the close time as regards all Wild Birds extend annually between the 15th day of March and the 1st day of August."

In the discussion which followed, Mr. J. E. Harting, F.L.S., remarked that although in the recently passed "Wild Birds Protection Act, 1880," which repealed the three Acts of 1869, 1872, and 1876 an endeavour had been made to fix such a close time as would be most generally acceptable throughout the United Kingdom, it was quite possible that in some parts of the country a different close time would be more suitable. It was well known to naturalists that some species of birds begin to nest earlier in some counties than they do in others; and it was also well ascertained that certain species, like the Woodcock, whose protection during the breeding season was very desirable, were very early breeders. He had observed in certain districts that where owners of game preserves had given orders not to have the coverts disturbed after the 1st of February, Woodcocks had remained to breed. It was to meet cases of this kind that the close time fixed by the Act now in force had been made to commence early, usually from the 1st March to the 1st August. But he was quite prepared to hear that this was too early a commencement for some counties, and they had just learnt from Lieut.-Col. Russell's letter that in his opinion this was the case in the county of Essex. If so, the Act provided a remedy by enabling the Home Secretary, upon application of the Justices at

communicate with the Home Secretary in regard to the close time for wildfowl, with power to make any slight changes necessary to meet the views of the Home Secretary:—Messrs. C. P. Wood, E. N. Buxton, J. O. Parker, R. Woodhouse, T. C. Baring, M.P., J. Round, M.P., and Lieut.-Col. Russell; and it was further agreed, on the motion of Lieut.-Col. Russell, seconded by Major Tufnell-Tyrell, that, if thought advisable, the Committee be empowered to ask for a close time for all wild birds in the county from the 15th March to the 1st August. In a further letter, dated December 10th, Col. Russell remarks:—"I do not know whether I made it clear that we could probably get a change for *all birds* to 15th March and 1st August, and this would suit fairly well both birds and shooters; but it seems to me better to let all the birds have protection from 1st of March, except the few which perhaps once in several years give a chance in passing in March, such birds being worth shooting, and, as I am satisfied, will not have their numbers sensibly diminished by what are killed here, vastly greater numbers passing than can find accommodation or inducement to remain." Referring to the Wild Birds Act he adds: "I should have been glad to see *eggs* protected, but there are several objections, some of which were several years back well pointed out by Professor Newton—so I did not see my way to advise this. I suggested some limit of time being put to the sale of foreign fowl. This was not done, and if the killing or taking of migrants, as Widgeons, is stopped many weeks earlier than in Holland (1st April in one part, 15th April in another) so that our shops are full of Dutch birds, there will be great dissatisfaction and temptation to break the law, and many opportunities of doing so profitably, by passing off our few birds as Dutch. This is one great reason for extending the time of killing such birds."—Ed.

Quarter Sessions, to make an order extending or varying the close time. No doubt those sportsmen and naturalists who resided in Essex would be the best judges of the period which would be most suitable in their own county; and from what he knew of Col. Russell's capabilities and long experience in matters relating to wild-fowl, he felt sure that his proposed application to vary the close time would not be made without good reason.

The President was sure the Club was much obliged to Mr. Harting for his remarks; few naturalists had a better right to speak with authority on the subject, and he proposed that the Secretary be requested to write to Col. Russell with reference to this matter.

The Secretary thought that the great thing to be agitated for was a close time for ALL birds without exception. At present the Act was almost nugatory; it was simply impossible in most cases to prove legally that a Hedge-popper or Bird-catcher was trapping or murdering any particular species, and so a beneficent Act had become almost a dead-letter in the law.

Mr. English exhibited a large number of species of *Fungi*, both in a fresh and preserved state, belonging to the *Agaricini* and *Polyporei* for the purpose of illustrating some remarks he had drawn up on the connecting links which united these two orders of the family *Hymenomycetes*. Among the species exhibited were *Polyporus fomentarius*, from which *Amadou* or German tinder is made, the fungus being cut into slices, dried and beaten until soft; *Polyporus lucidus* from Hornbeam, interesting as being a cosmopolitan species, and *Lenzites betulina* from Birch stumps. Mr. English exhibited also a specimen of *Osmylus chrysops. L.*, a pretty insect belonging to the *Hemerobidæ*, which had flown into his shop in August last. It is generally found amongst hedges, seeming to prefer stony rapid streams fringed with alders. Mr. Cole had taken it in New Forest, but had not observed it at Epping.

Mr. Argent exhibited, on behalf of Master G. Watkins, a specimen of *Vanessa antiopa* (the "Camberwell-beauty" butterfly), taken near Ilford during the last week in August.

Mr. W. C. Barnes exhibited some pieces of a felt-like substance which had been found closely covering some hot-water pipes in his house. It had every appearance of being the work of spiders.

The Secretary presented, on behalf of Sir J. Clarke Jervoise, Bart., a collection of *Mosses* and *Lichens* made by Richard Warner (1711-1775), author of "Plantæ Woodfordienses." He thought that the Club was much indebted to Sir J. C. Jervoise for another copy of the above-named work, and also for his kind present of the Herbarium. Although the latter was perhaps of no great scientific value, it was extremely interesting as a memento of an Essex worthy—a quiet "ingenious" country gentleman, who, at a time when botanical studies

were held in much less esteem than at present, did his best to aid forward the science which had afforded him such true and life-long delight. Mr. Cole read a paper he had drawn up giving as complete an account as the scanty materials would allow of Warner's life and "botanical amusements," and of the origin of the book by which he is best known.* Sir J. C. Jervoise had also sent up for the inspection of the members a quaint and valuable parchment Pedigree of the Warner Family.

Mr. Fisher Unwin exhibited a large number of views and drawings in illustration of persons and places mentioned by Warner. He thought as naturalists they might learn especially one thing from the interesting sketch of our author given by Mr. Cole, and that was to do the thing which came nearest to hand; study first the productions of their own neighbourhood, and let wider fields of work come as they may. He had been searching for the "Plantæ" for years, but had lately come upon quite a preserve of copies of the book, and had secured two or three enriched with curious notes. These he exhibited. One had belonged to the Rev. J. Shepard, Rector of Woodford, and a friend of Warner's. In it was a note of the dimensions in 1774 of the Yew-tree in Woodford Churchyard, and Mr. Unwin thought it would be well for the Club at one of its Field Meetings to visit the tree and take the dimensions now for the purpose of comparison. Another copy of the book contained a MS. list of plants growing in the neighbourhood of Chigwell, drawn up by the Rev. S. Palmer, of that place, as well as many other interesting notes of the plants of the Forest. Mr. Unwin's exhibits were a source of much pleasure to the meeting, interspersed as they were with short remarks upon the persons and places referred to.

Mr. George Spicer exhibited a view of the Old House in which Richard Warner lived, and copies of the same print were presented to the Club by Sir Clarke Jervoise.

The President thought it would be a good work for some of their botanical members to make a comparison of the list of plants now known to occur around Woodford, and those recorded by Warner. The question of the extinction of species is always one of great interest.

Cordial votes of thanks were accorded to Mr. English, Sir J. C. Jervoise, Mr. Cole, Mr. Unwin, and Mr. Harting, for their various communications.

Mr. J. Travis, of Saffron Walden, communicated the following list of rare birds taken in Essex, recently received by him for preservation:—

(1.) September 6th, 1878 (?). Dusky Petrel (*Puffinus obscurus*) found in the early morning after a very rough night, by the roadside

* The Editor reserves this paper for the present, at least, in the hope of obtaining further information of Warner and his scientific friends. Any particulars of this nature will be welcomed gladly.

at Sampford, by Barker, the Postman. It was apparently in a fatigued state, but lived two days in my (Mr. Travis's) possession, during which time it ate a few slugs, and sometimes used its hooked bill to assist it in climbing about the cage. The specimen was sold to Mr. Burrell, of Littlebury.

(2.) November 9th, 1879. Fulmar Petrel (*Procellaria glacialis*), taken by G. Pavitt, Esq., Battle's Bridge, near Chelmsford, and now in his possession.

(3.) December 5th, 1879. Great Bustard (*Otis tarda*), shot by Mr. Pertwee on what is called the "Main" near Chelmsford, and

(4.) February 6th, 1880. Another Bustard shot by the foreman to Mr. Jonas, Manor Farm, West Wickham, Cambridgeshire, and now in the latter's possession. Has any other naturalist within the last fifty years been so fortunate as to receive two English specimens of the Great Bustard within so short a period?

[These specimens are, of course, the birds referred to in Mr. Christy's paper, "Transactions," pp. 59 and 62.—Ed.]

(5.) August 27th, 1880. A pair of Woodchat Shrikes (*Lanius auriculatus*), shot by a man named Jeffrey, between Elmdon and Arksden. A boy driving sheep into Walden was accosted by Jeffrey, who had a gun. He gave the birds to the boy, remarking that they were "a pretty pair, and perhaps the bird-stuffer might give something for them." I received them within two hours of their death, quite fresh and hardly stiff. These are the first specimens of this very rare bird I have heard of as occurring in Essex.

(6.) , 1880. Peregrine Falcon (*Falco peregrinus*), taken by the gamekeeper to Squire Wilkes, of Lofts Hall, in whose possession it now is.

(7.) November, 1880. Peregrine Falcon, a young bird trapped by one of Lord Braybrooke's keepers at a moorhen, on which it had been feeding, near the Debden Road, Saffron Walden. Two other Peregrines killed in the neighbourhood are now in my hands.

(8.) 1880. Two Merlins (*Falco Æsalon*), killed by Mr. Chipperfield, of Newport, near Saffron Walden.

(9.) November 1st, 1880. Two Black-throated Divers (*Colymbus arcticus*), taken at Southend, and now in the possession of Mrs. Ackland, of Saffron Walden.

(10.) November, 1880. Sclavonian Grebe (*Podiceps auritus*), taken at Southend, and now in possession of Mrs. Ackland, Saffron Walden.

(11.) November 12th, 1880. Great Grey Shrike (*Lanius excubitor*), a good female specimen, shot by Mr. H. Rolfe, of Clavering, and now in his possession.

(12.) June 27th, 1879. A Lesser Redpole's nest (*Linota linaria*), taken by a boy named Rushforth out of some fir trees by the roadside close to Shortgrove Park. It contained young, which were brought to me,

and I have one of them yet—a very healthy bird, thanks to the care of Mrs. Travis. The boy had thrown away the nest, but described it as very much like a linnet's, but smaller.

Mr. Harting said he should like to make a few remarks on the above list. Many of the birds mentioned were of extreme rarity, and he thought it would be wise to ask for further particulars before giving the list a permanent place in the records of the Club. From experience he could say that in many cases it would be found on examining the evidences on which such lists were based that the writers have been too hasty in identifying their specimens with rare species. The very first bird on the list, to his mind, was very doubtful; the Dusky Petrel was of extreme rarity in Britain, and has only been obtained on one or two occasions; he could not help thinking that the bird referred to would prove to be a specimen of the *Manx Shearwater;* that bird breeds here, and it is often called a Petrel, although it differs from that genus in some respects. Of course it was quite possible that all the birds mentioned were correctly named, but he would strongly urge the necessity of caution and enquiry before accepting as absolute facts the statements made in such lists as the above.

The President thought all would agree with Mr. Harting in the necessity for caution: errors were easily committed and then became difficult to eradicate. He would suggest that the Secretary should communicate with Mr. Travis, with the view of settling the questions raised.

[The list was returned to Mr. Travis, who, we understand, is a good ornithologist, and it is now printed as revised by him.—Ed.]

Mr. P. Copland exhibited some specimens of fossil wood from the London clay at Walton-on-the-Naze, and Mrs. Yeates some glacial drift fossils picked up in the neighbourhood of High Beech.

The meeting then resolved itself into a conversazione.

Saturday, December 18th, 1880.—Ordinary Meeting.

The Monthly Meeting was held at the Head Quarters, at seven o'clock, the President in the chair. The following works were presented to the library: "Journal of Royal Microscopical Society," presented by W. Emmens, Esq., F.R.M.S.; "History and Description of Cassiobury Park" (folio), by John Britton, presented by Messrs. Alfred and G. H. Lockyer; "Deterioration of Oyster and Trawl Fisheries of England," by J. P. Hore and E. Jex, presented by the authors. The following persons were elected members of the Club:—Charles

Copland, C.E., H. C. Chilton, W. T. Christian, Sir J. Clarke Jervoise, Bart., and James Miller.

The Secretary gave notice, on behalf of the Council, that it was intended at the Annual General Meeting to propose some slight alterations in, and additions to, Rules III., IV., VII., and XV.

It was announced that, in accordance with Rule III., the following members would retire from the Council: H. B. Hooper, Rev. C. J. Ridgeway, C. E. Taylor, and T. J. Woodrow. The following members were recommended for election into the Council: B. G. Cole, Rev. T. W. Peile, Charles Thomas, F.G.S., and T. Fisher Unwin. No other candidates were proposed. As officers for 1881 the following members were recommended by the Council: *President*—Raphael Meldola, F.R.A.S., F.C.S., &c.; *Treasurer*—Henry J. Barnes; *Secretary*—William Cole; *Librarian*—Alfred Lockyer.

The President said that, by Rule XV., the Annual General Meeting should be held on the second Saturday in January, which would fall on January 8th. The Council was of opinion, however, that this would hardly allow time for the officers to prepare their statements, and therefore, with permission of the members, it was proposed to alter the date to January 22nd, and to confirm such alteration at the Annual Meeting. This was agreed to.

The Secretary exhibited, on behalf of Mr. John Waller, some sections of the common crab-apple (*Pyrus Malus*) with *Mistletoe* attached, showing the mode of growth of the parasite in the wood of the tree. These specimens were obtained at High Beech, Epping Forest, in 1876, by Mr. Waller, and were beautifully cut and polished. The specimens showed the root of the parasite forcing its way into the very heart of the wood, the pressure distorting the concentric rings and medullary rays of the apple tree in a very curious manner.

Mr. Meldola observed that there was a point in the life-history of the Mistletoe well worthy of consideration. It was well known that the glutinous seeds were deposited on the bark of the trees by birds, and it was stated on very good authority that in whatever position the seed might be placed with respect to the branch, the *radicle* (or embryo root) always turned towards the bark of the tree as development took place. He was disposed to think that the cause of this phenomenon lay in the avoidance of light; the *radicle* required shade for vigorous growth, and therefore it turned towards the bough of the tree to which the seed was attached. He would recommend it as a matter for experiment to their botanical members; it would lend a new and scientific interest to a plant which possessed, he understood, a peculiar charm at this season of the year.

Mr. H. J. Barnes exhibited, on behalf of his brother, some fossils found at Shanklin, Isle of Wight. They appeared to belong to the Lower Bagshot formation.

The Secretary called attention to the Second Science Lecture, which would be delivered in the Woodford Lecture Hall, on January 4th, by Mr. A. R. Wallace. He trusted that a large number of members would attend, and show their appreciation of a lecturer of Mr. Wallace's high scientific and literary reputation.

The usual conversazione closed the meeting.

TUESDAY, JANUARY 4TH, 1881.—SCIENCE LECTURE.

The second winter Science Lecture was delivered this evening by Alfred Russel Wallace, Esq., F.L.S., F.Z.S., &c.—subject, "The Natural History of Islands." The lecture took place in the Woodford Hall, Mr. Meldola occupying the chair and, in a few appropriate words, introduced Mr. Wallace. It is unnecessary to give any abstract of Mr. Wallace's very interesting and instructive remarks, as the subjects touched upon will be found fully elaborated in his "Island Life; or, The Phenomena and Causes of Insular Faunas and Floras, including a Revision and attempted Solution of the Problem of Geological Climates," London, 1881.

Before asking the audience to pass a vote of thanks to Mr. Wallace, the President invited questions on the subjects brought forward.

Mr. Harting, referring to the lecturer's remarks on the probable mode of the introduction of fresh-water fish into remote islands, suggested the following as worthy of consideration: That the heron, being a fish-eater and of rapid flight, might, after having seized its prey, travel a long distance and disgorge the fish in a living state in some island lake. It was a well-known fact that when disturbed these birds had the habit of freeing themselves of food; and he thought it was not unlikely that to such a cause may be owing some of the puzzling facts respecting the distribution of fishes mentioned by the lecturer.

Mr. Wallace said that the essential point to be decided was whether a fish, after being carried any considerable distance in such a way, could be disgorged alive, and asked Mr. Harting whether he knew of such an occurrence.

Mr. Harting gave one instance related to him by the falconer to the King of Holland; and he thought it not at all improbable that a fish could exist for some time in the gullet of the bird.

Andrew Johnston, Esq. (High Sheriff), proposed a hearty vote of thanks to the lecturer, which was passed by acclamation.

SATURDAY, JANUARY 22ND, 1881.—ORDINARY AND ANNUAL MEETINGS

In accordance with notice sent to all members, the Annual General Meeting was held at the Head Quarters, the President in the chair.

Previous to the Annual Meeting an Ordinary Meeting took place, when the following were elected members of the Club:—Mrs. Barnes, Rev. W. J. Bolton, M.A., Edward Brooke, J.P., D.L., &c., Lieut.-Col. Russell, J.P., D.L., &c., Samuel Smith, Frederick Stewart, J. G. Thomasin, Mrs. Thomasin, Rev. W. J. Wright, B.A.

The following books and magazines were presented to the library:—Gerarde's "Herball, or General Historie of Plantes," presented by Mr. J. Hutchison; "Midland Naturalist" (monthly), by Mr. A. Lockyer; "Naturalist" (monthly), by Mr. G. H. Lockyer; "American Entomologist" (monthly), by Mr. F. T. Lockyer; "Flora of Essex County Mass." and "Notes on Woody Plants of Essex County Mass.," by the author, Mr. J. Robinson; Moffat's "Insectorum sive Minimorum Animalium Theatrum," &c., 1634, by Mr. B. G. Cole; "Nature" (weekly); "The Cobham Journals," and "Synopsis Plantarum insulis Britannicis, &c.," by Mr. W. Cole. By exchange:—"The Proceedings of the Boston Society of Natural History," Vol. XX., Parts 1, 2, and 3; and "Report of South London Entomological Society for 1880."

It was also announced that the Rev. F. A. Walker, B.D., F.L.S., had presented to the Club his Collections of Birds, Birds'-eggs, and Insects, formed during the preparation of his "History of Dry Drayton, London, 1876."

The thanks of the Society were unanimously voted for the above valuable donations.

The Secretary read a letter he had received from Mr. J. Eliot Howard, F.R.S., suggesting that the needs of insectivorous birds should be provided for during the hard weather by hanging a netted bag full of scraps of meat, suet, &c., from the bough of a tree or bush in some convenient place. Mr. Robarts remarked that he had adopted Mr. Howard's suggestion; the plan answered well, and the lively habits of the hungry little visitors afforded much pleasure.

The President said the Society was probably aware that the Council had passed a resolution as follows; that it had appeared in most of the influential London and county newspapers, and that the scheme of destruction was almost unanimously denounced by those whose opinion was entitled to weight. He read the resolution passed at the Meeting of the Council on January 8th:—

"That the Council of this Society, on behalf of the large section of the population of London interested in the pursuit of Natural History, desires to record an emphatic protest against the proposal of the Great Eastern Railway Company to carry a line across Epping Forest

believing that it is wholly unnecessary for the railway to take the route projected, and that it would not fail to prejudicially affect the advantages secured by the Epping Forest Act, which directs that the Forest is to be preserved as far as possible in its natural aspect."

The Club than resolved itself into the

Annual General Meeting.

The Treasurer's Statement of Account (see page lxix) was read, and after some little discussion, was agreed to unanimously, on the motion of Mr. Letchford, seconded by Mr. J. Hutchison.

The Secretary read the Report of the Council for the Year 1880:—

In presenting the first Annual Report, the Council feels that it can honestly and sincerely congratulate the members on the success which has attended the foundation and first year's work of the Club. It is unnecessary to recapitulate the steps taken in the formation of the Society; a short sketch of its origin has been prefixed to the Report of the Inaugural Meeting in the "Proceedings," and its subsequent progress is fresh in the minds of members. Within two months of the establishment of the Club, when the list of original members was closed, the number was 169; since that date 58 members have been elected. The Council regrets to record the loss of one member, Mr. G. Thompson, by death, already alluded to by the Chair; two members have resigned, so that our strength on December 31st was 224. It will be admitted that this forms a very gratifying token of the position the Society has already taken in public estimation, but your Council is sanguine enough to hope that it is but the precursor of further advance. The real backbone of a Society such as yours is the possession of a large body of enthusiastic members, and it cannot be too strongly urged upon all well-wishers that it should be their duty and pleasure to obtain additional recruits, and so add to the stability of the Club, and its power of accomplishing useful and permanent work.

In reviewing the events of the session, a first place must be given to the honour conferred upon the Society by the Duke of Connaught. The fact that his Royal Highness has both an official and personal interest in the County as Ranger of Epping Forest lends a peculiar appropriateness to his kind and ready acceptance of the office of Patron of the Club.

Income and Expenditure during the Year ending 31st December, 1880.

Dr.	£	s.	d.
To Subscriptions for 1880	91	2	6
,, ,, ,, 1881	6	18	0
,, Life Compositions	36	15	0
,, Donations	3	13	0
,, Sale of Publications	3	2	3
,, Receipts at Field Meetings	39	1	6
,, ,, Mr. Harting's Lecture ..	2	0	6
	£182	12	9

Cr.	£	s.	d.
By Books and Stationery	13	13	0
,, Printing Transactions	35	18	6
,, Miscellaneous Printing	14	13	6
,, Expenses at Field Meetings	39	2	5
,, Postages	12	5	6
,, Advertisements	4	11	4
,, Sundries	2	13	4
,, Expenses of Science Lecture	4	19	0
,, Balance in hand	54	16	2
	£182	12	9

HENRY J. BARNES,
Treasurer.

Audited and found correct, *January 21st*, 1881. { DAVID H. SAUL, P. COPLAND.

The details of the establishment of the "Forest Camps Exploration Fund" will be found in the "Journal of Proceedings." The Treasurer reports that the sums given or promised up to January 1st amount to £44 3s. This sum will enable the Club to work at one Camp as soon as the weather is favourable in the spring, and in all probability the surplus will be sufficient to cover the cost of printing the results of the investigation in the "Transactions." It is very desirable that *both* Camps should be examined, and the Council solicits further subscriptions from members and others interested in the subject.

Eleven Ordinary Meetings of the Club have taken place during the year; 341 members have attended, giving an average of 31 for each meeting. Seventy-six visitors have also been present. At the seven Field Meetings held during the summer, 226 members have attended, giving an average of 32, with 106 visitors. Your Council is fully sensible of the great importance of interesting and instructive meetings; every effort will be made to maintain that character, and it is sincerely hoped and requested that members and friends will in all ways within their power aid such attempts. The Club is very much indebted to those gentlemen who so kindly acted as conductors at the Field Meetings. The Council also records with gratitude the pleasant hospitality accorded to the Club on its visit to High Laver Rectory by Mrs. and Mr. Rodwell.

Two parts of the "Transactions" have been published, in addition to the President's Inaugural Address, which comprises pp. 1-26, the whole occupying 154 pages. Part I. is occupied by Mr. Walker's lecture, a sheet of geological sections being given with it; whilst Part II. gives papers and full reports of meetings up to and including November 10th. The Council is painfully aware of the paucity of papers and communications submitted to the Club, but as this subject is dwelt upon elsewhere, it is unnecessary to do more than refer to it in this place.

A few books and publications have been presented to the Club during the year, which are duly acknowledged in the reports of the meetings, but the Library is necessarily at present in an embryonic stage. Pressure of other affairs obliged Mr. Argent to resign the office of Librarian in October, when the post was taken by Mr. Alfred Lockyer until the Annual Meeting. Mr. Lockyer offers his services as Librarian, and he has already been working energetically to establish friendly relations and exchange of publications with London and Provincial Societies. Two rooms at the Head Quarters will shortly be fitted up as a Library and Museum, and the Council earnestly begs members and others to aid with books and specimens. A special circular will be issued giving details as to the kind of specimens required, and best mode of preparing the same for our collections. Two contributions to the museum demand special notice: a small Herbarium

of *lichens* and mosses collected by Richard Warner, given to the Club by our member Sir J. Clarke Jervoise, Bart.; and the collections formed at Dry Drayton by our member Rev. F. A. Walker, B.D., F.L.S. These latter comprise small collections of birds, birds'-eggs, and insects, gathered in the preparation of the donor's "History of Dry Drayton, London, 1876."

The thanks of the Club are due to the Conductors of the Art Classes (Miss J. E. Cole and Mr. H. A. Cole) for permission to meet in the rooms at 3, St. John's Terrace, and the Council has great pleasure in accepting the offer of two rooms for the sole use of the Club's Library and Museum.

Bearing in mind the large amount of work involved in launching a Society such as ours, the members will probably consider the Treasurer's statement satisfactory. The Council records with thanks special donations towards expenses from Mr. Darwin, Mr. Walker, Mr. Letchford, and Mr. Browne.

In conclusion, your Council cannot but consider that the events of the year form an encouraging earnest of future work, and the officers confidently hope that they will not lack the energetic and enthusiastic support of members and friends during the year 1881.

The Report was carried unanimously, on the motion of Mr. B. G. Cole, seconded by Mr. Hutchison.

The Secretary proposed on behalf of the Council the following slight alterations in the Rules:—Rule III., to strike out the word "seven," and to read "*five to form a quorum.*" After Rule IV. to add "*should a vacancy occur in the Council by retirement or otherwise, the Council shall have power to nominate any member to fill the vacancy until the next General Meeting.*" In Rule VII. to add at end of first sentence, "*but shall not be entitled to receive the publications of the Club during the year without payment;*" and in Rule XV. to strike out in the first sentence the words "on the second Saturday," so as to read, "*The Annual General Meeting shall be held in January.*" These alterations were unanimously agreed to.

The members nominated at the meeting on December 18th were chosen to fill vacancies on the Council and as Officers for 1881.

On the proposal of the Council, the following gentlemen were elected HONORARY MEMBERS of the Club, in recognition of distinguished efforts for the advancement and spread of natural science, and in grateful acknowledgment of services rendered to the Club:—Dr. M. C. Cooke, M.A., A.L.S., J. E. Harting, F.L.S., F.Z.S., Worthington G. Smith, F.L.S., Major-General Pitt-Rivers, F.R.S., and Henry Walker, F.G.S.

The President then delivered his Annual Address ("Transactions," Vol. I., p. 97).

Mr. Robarts, in proposing that the address be printed and circulated in the usual way, said it was the future which should possess the most interest for them. It was very desirable that all members should strive to add their quota, however humble, to increasing the interest of the meetings, especially in objects and facts connected with the County. They ardently wished for a great increase in the number of members, not mainly to augment the funds, but that more matter in the way of original contributions might find its way into their hands. The resolution was seconded by Mr. Lockyer, and carried by acclamation.

Mr. Letchford proposed a hearty vote of thanks to the Officers of the Club in a humourous speech. Mr. Hutchison seconded, saying that few were aware of the large amount of work thrown upon officers of such Societies. The compliment was suitably acknowledged by Messrs. Meldola, Barnes, Cole, and Lockyer. Thanks were also voted to the Auditors; and on the motion of the President, seconded by the Treasurer, Miss J. E. Cole and Mr. H. A. Cole, the Conductors of the Government Art Classes, were warmly thanked for the accommodation afforded to the Club for its meetings, and the use of rooms for the Library and Museum.

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ERRATA.

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,, 20	,, 17	,,	,,	,,	,,
,, 26	,, 11	,,	*rodicosus*	,,	*radicosus.*
,, ,,	,, 14	,,	*alnicolor*	,	*alnicola*
,, ,,	,, 2 from bottom		*reptum*	,,	*reptans.*
,, ,,	,, 3 do.	,,	*ferum*	,,	*puliferum*
,, ix	,, 18 & 20	,,	*oderata*	,,	*odorata.*
,, xi	,, 25	,,	weasels	,,	stoats.
,, xiv	,, 6	,,	*omnes*	,,	*omne.*
,, xlix	,, 19	,,	*Bolcti*	,,	*Boleti*

The Epping Forest & County of Essex NATURALISTS' FIELD CLUB.

LIST OF MEMBERS.

PATRON.

H.R.H. THE DUKE OF CONNAUGHT & STRATHEARN, K.G.
(Ranger of Epping Forest).

Officers,

Elected January 22nd, 1881.

President.

RAPHAEL MELDOLA, F.R.A.S., F.C.S., &c.
Vice-President of Entomological Society.

Vice-Presidents.

J. T. CARRINGTON, F.L.S. (*Naturalist, Royal Aquarium*).
EDWARD A. FITCH, F.L.S.
N. F. ROBARTS, F.G.S. Rev. W. LINTON WILSON, M.A.

Other Members of Council.

WILLIAM J. ARGENT.
EDWARD B. AVELING, D.Sc., F.L.S., &c.
RICHARD L. BARNES, F.C.S.
W. C. BARNES.
E. N. BUXTON, J.P., &c. (*Verderer Epping Forest*).
ROBERT M. CHRISTY.
B. G. COLE.
PATRICK COPLAND.
REV. JAMES FRANCIS, M.A.
GEORGE J. GODWIN.
HERBERT GOSS, F.L.S., F.G.S., &c.
GEORGE C. HARCOURT.
FRANCIS G. HEATH.
J. P. HORE.
ANDREW JOHNSTON, *High Sheriff*, (*Verderer, Epping Forest*).
REV. T. W. PEILE.
NATHANIEL POWELL, J.P., &c.
HILDEBRAND RAMSDEN, M.A., F.L.S., F.R.M.S., &c.
W. G. S. SMITH.
CHARLES THOMAS, F.G.S.
T. FISHER UNWIN.

Treasurer.

H. J. BARNES, F.C.S., (Berlin), *Oak Hall, Buckhurst-hill Essex.*

Secretary.

WILLIAM COLE, M.E.S., *Laurel Cottage, Buckhurst-hill, Essex.*

Librarian.

ALFRED LOCKYER, *Tavistock-road, Snaresbrook, Essex.*

JANUARY, 1881.

Head Quarters of Club:
3, ST. JOHN'S TERRACE, BUCKHURST HILL.

LIST OF MEMBERS.

(Corrected to January 22, 1881.)

Patron.

H.R.H. THE DUKE OF CONNAUGHT AND STRATHEARN, K.G.,

RANGER OF EPPING FOREST.

Honorary Members.

Date of Election.	
Jan. 10, 1880.	BROWNE, CHARLES, M.A., Barrister-at-law, 2, Stone-buildings, Lincoln's-inn, W.C.
,, 22, 1881.	COOKE, M. C., M.A., LL.D., A.L.S., 146, Junction-road, N.
,, 10, 1880.	DARWIN, CHARLES, M.A., LL.D., F.R.S., L. and E. F.L.S., F.G.S., &c., Down, Beckenham, Kent.
,, 22, 1881.	HARTING, J. E., F.L.S., F.Z.S., 22, Regent's-park-road, N.W.
,, ,,	PITT-RIVERS, Major-General, F.R.S., 19, Penywern-road, South Kensington, W.
,, ,,	SMITH, WORTHINGTON G., F.L.S., 125, Grosvenor-road, Highbury, N.
,, ,,	WALKER, HENRY, F.G.S., 6, Oakington-road, St. Peter's-park, W.
,, 10, 1880.	WALLACE, ALFRED RUSSEL, F.L.S., F.Z.S., Pen-y-bryn, St. Peter's-road, Croydon.
,, ,,	WHITAKER, WILLIAM, B.A., F.G.S., &c., Her Majesty's Geological Survey, Jermyn-street, S.W.

Ordinary Members.

(*Original Members, registered under Rule VI., are denoted by an* * ; *Life Members are indicated by a* †. *Where no county or postal letter is added, Essex is understood.*)

Date of Election.

* Adams, Herbert, J., Roseneath, London-road, Enfield, N.

May 29, 1880. Alcock (Miss), The Hall, Sunnyside, Chingford.

* Alcock (Miss), Ada, The Hall, Sunnyside, Chingford.

* Allen, William, *at* 3, Liverpool-terrace, Canning Town, E.

* Argent, W. J., Nightingale-villas, Wanstead.

* Aveling, Edward B., D.Sc., F.L.S., &c., Royal Polytechnic, Regent-street, W.

* Babington, C. C., M.A., F.R.S., F.L.S., F.G.S., &c. (*Professor of Botany, University of Cambridge*), 5, Brookside, Cambridge.

* Barclay (Mrs.), H. F., Woodford.

* Barnes, Charles E., Oak Hall, Buckhurst-hill.

* Barnes (Miss), Clara, Oak Hall, Buckhurst-hill.

* Barnes, Henry J. (*Hon. Treasurer*), Oak Hall, Buckhurst-hill.

Jan. 22, 1881. Barnes (Mrs.), Oak Hall, Buckhurst-hill.

* Barnes, R. L., F.C.S., Oak Hall, Buckhurst-hill.

Date of Election.

* Barnes, W. C., Oak Hall, Buckhurst-hill.

* Barnett (Miss), Melrose Villa, Buckhurst-hill.

* Benton, George A., Yarra Villa, Princes-road, Buckhurst-hill.

* Billups, T. R., M.E.S., 4, Swiss-villas, Coplestone-road, Peckham, S.E.

June 26, 1880. Bodle, William, Palmerston-road, Buckhurst-hill.

Jan. 22, 1881. Bolton, Rev. W. J., M.A., St. John's, Stratford.

* Boscher, E., M.E.S., Bellevue House, Twickenham.

June 26, 1880. Boulger, Professor G. S., F.L.S., F.G.S., 144, Kensington-park-road, W.

* Brady, Sir Antonio, F.G.S., J.P., &c., (*Verderer of Epping Forest*), Maryland Point, Stratford.

* Brook, George (Ter.), F.L.S., Fernbrook, Huddersfield.

* Brooke, Arthur, Carisbrooke, Muswell-hill, N.

Jan. 22, 1881. Brooke, Edward, D.L., J.P., &c., Caen Wood Towers, Highgate, N.

Nov. 27, 1880. Brooke, George, Beech Hall, Hale End, Walthamstow.

* Browne, Colvill, 5, Hilldrop-road, Camden-road, N., and Scientific Club, Savill-row, W.

* Burney, George, Millwall, E.

* Burrows, John, Wanstead.

* Buxton, E. N., J.P., &c., (*Verderer of Epping Forest*), Knighton, Woodford.

* Buxton, Sir T. Fowell, Bart., J.P., &c., (*Verderer of Epping Forest*), Warlies, Waltham Abbey.

* Buxton, T. F. V., Warlies, Waltham Abbey.

Date of Election.

* Cansdale, W. D., M.E.S., Guithavon-terrace, Witham.

Aug. 28, 1880. Carlingford, The Right Hon. Lord, Dudbrook House, Navestock.

* Carrington, John T., F.L.S., M.E.S. (*Vice-President*), Royal Aquarium, Westminster S.W.

* Challis, A. F., The Chestnuts, Buckhurst-hill.

Dec. 18, 1880. Chilton, Henry C., Woodford.

,, ,, Christian, Walter T., 2, Eaton-villas, Loughton.

* Christy, Robart M., Chignal St. James, near Chelmsford.

* Clapham (Mrs.), A. H., Buckhurst-hill.

* Clarkson, James A., 4, St. John's-terrace, Buckhurst-hill.

* Clegg, Joseph, M.R.C.S., Epping.

* Cole, Benjamin G., Laurel Cottage, Buckhurst-hill.

* Cole, Henry A., Laurel Cottage, Buckhurst-hill.

* Cole (Miss), Laurel Cottage, Buckhurst-hill.

* Cole (Miss), Jane E., Laurel Cottage, Buckhurst-hill.

* Cole, Rev. John F., Roffey Vicarage, Horsham, Sussex.

(*Founder*) Cole, William, M.E.S. (*Hon. Secretary*), Laurel Cottage, Buckhurst-hill.

* Cooper, Frank W., L.R.C.S. (Edin.), Gainsborough House, Leytonstone.

* Cooper, John D., The Hollies, Woodford Green.

Dec. 18, 1880. Copland, Charles, C.E., &c., The Park, Kingston-upon-Hull.

Copland (Mrs.), Hillcote, Buckhurst-hill.

Date of Election.

* Copland, Patrick, Hillcote, Buckhurst-hill.

* Copland, P. F. (Junr.), M.E.S., Hillcote, Buckhurst-hill.

* Corder, Henry, Grove House, Great Baddow.

* Crisp, Frank, LL.B., B.A., F.L.S., *Secretary to the Royal Microscopical Society* M.E.S., &c., 5, Lansdowne-road, Notting-hill, W.

* Crouch, Henry, F.R.M.S., &c., Grove-hill, Woodford.

Aug. 28, 1880. Crouch, Walter, Grafton House, Wellesley-road, Wanstead.

Sept. 25, 1880. Cutting, William M., Elm House, Loughton.

* Deacon, Octavius, Golding's-hill, Loughton.

* Devitt, Henry, Hillside, Buckhurst-hill.

* D'Oyley, William (*Hon. Surveyor*), Loughton.

* Duffield, Frederick H., 78, Claverton-street, Pimlico, S.W.

*†Dunning, J. W., M.A., F.L.S., F.Z.S., 12, Old-square, Lincoln's-inn, W.C.

* Durrant, W. G., Whitehall-road, Woodford.

* Emery, W. Francis, 104, Liverpool-road, Islington, N.

* English, James, Epping.

Aug. 28, 1880. Essex, The Right Hon. the Earl of, Cassiobury Park, Watford, Herts.

,, ,, Fawcett, William, Fern Villa, Maybank-road, Woodford.

May 29, 1880. Finzi, John, 105, Gower-street, W.C.

* Fisher, Lionel P., South Side, Harrow, Middlesex.

Date of Election.

Aug. 28, 1880. Fisher, William R., M.A., Barrister-at-law, &c., South Side, Harrow, Middlesex.

* Fitch, Edward A., F.L.S., *Secretary to the Entomological Society*, &c. (*Vice-President*), Brick House, Maldon.

* Forbes, William P., Evergreen Lodge, Wanstead.

* Forster, William, East Lenham Lodge, Cleveland-road, Wanstead.

* Fowler, William, J.P., &c., Forest House, Leytonstone.

* Francis, Rev. James, M.A., Vicarage, Waltham Holy Cross.

* Francis, William, Ph.D., F.L.S., F.G.S., F.C.S., F.R.A.S., &c., Manor House, Richmond, Surrey.

July 24, 1880. Friswell, Richard J., F.C.S., F.I.C., &c., 10, Clapton-square, Lower Clapton, E.

* Gardner, Samuel, 5, Whitehall-lane, Buckhurst-hill.

* Gardner, Thomas, Oak Lea, Whitehall-road, Buckhurst-hill.

May 29, 1880. Gawler, John M., 2, Park-villas, Margery-park, Stratford.

Aug. 28, 1880. George, William, 19, Church-crescent, South Hackney, N.E.

* Gibbs, John, Writtle-road, Chelmsford.

May 29, 1880. Glass, Charles J., Bocking House, Walthamstow.

* Godwin, George J., 4, St. John's-villas, Buckhurst-hill.

* Godwin (Mrs.), 4, St. John's-villas, Buckhurst-hill.

* Gomm, William H., Waltham Abbey.

* Gordon, Frederick, Ellerslie, Buckhurst-hill.

* Goss, Herbert, F.L.S., F.G.S., M.E.S., &c., The Avenue, Surbiton-hill, Surrey.

Date of Election.

* Gould, F. C., 10, Knighton-villas, Buckhurst-hill.

* Gripper, Joseph E., 35, High-street, Worcester.

* Grut, Ferdinand, F.L.S., &c. (*Librarian to the Entomological Society*), 9, King-street, Southwark, S.E.

* Halsey, William, 3, Mornington-road, Woodford.

* Harcourt, George C., 34, Wellesley-road, Wanstead.

* Harper, Augustus, Lomsenheim, Cleveland-road, Wanstead.

* Hart, F. G., Canes, near Harlow.

* Heath, Francis G., Brunswick Lodge, South Hackney, N.E.

July 24, 1880. Heathfield, Ernest, Snakes-lane, Woodford.

* Henty, Robert, Nazing Park, Waltham Cross.

* Hodge (Miss), Catherine L., Magdala House, Buckhurst-hill.

* Hodge (Miss), Mary, Magdala House, Buckhurst-hill.

* Hodge, Samuel W., Magdala House, Buckhurst-hill.

* Hooper, Basil M., 2, Albert-villas, Whitehall-road, Woodford.

* Hooper, Horace B., Roden House, Abridge.

* Hore, J. P., 7, Charlotte-street, Portland-place, W.

* Howard, David, Rectory Manor, Walthamstow.

* Howard, John Elliot, F.R.S., F.L.S., &c., Lord's Meade, Tottenham, N.

* Howard, William C., North Side, Tottenham, N.

Date of Election.

* Howard, W. Dillworth, City Mills, Stratford.

* Hutchison, John, Fairlight, Palmerston-road, Buckhurst-hill.

* Hutchison, W. D., 22, Bruce-road, Bow, E.

Sept. 25, 1880. Hutchison, W. E., 9, Hill-street, Clapton, E.

Dec. 18, 1880. Jervoise, Sir J. Clarke, Bart., Idsworth Park, Horndean, Hants.

May 29, 1880. Jesse, Frank.

* Johnston, Andrew, *High Sheriff of Essex* (*Verderer of Epping Forest*), The Firs, Woodford.

Aug. 28, 1880. Jones, D. B., 13, Old Broad-street, E.C.

Sept. 25, 1880. Kell, E. Delacourt, Holland House, Spring Grove, *near* Isleworth.

* Kelly, Alexander, Sprigg's Oak, Epping.

* Kelly (Mrs.), Sprigg's Oak, Epping.

* Kelly (Miss), Catherine, Aubrey House, Woodford.

* King, David A., St. Bartholomew's Hospital, E.C.

* King, Joseph E. S., 16, North-buildings, Finsbury-circus, E.C.

* King (Mrs.), 37, Arundel-square, Barnsbury, N.

* Kingdon, Rev. H. J., M.A., Good Easter Vicarage, Chelmsford.

Aug. 28, 1880. Leeman, Rev. Alfred, M.A., &c., Starling Lodge, Buckhurst-hill.

* Letchford, R., F.R.M.S., &c., Prospect House, Woodford.

* Lindsay, R. B., 1, St. Ann's-terrace, Stamford-hill, N.

* Lister, Arthur, J.P., F.L.S., &c., Leytonstone.

Date of Election.

* Lockyer, Alfred (*Hon. Librarian*), Tavistock-road, Snaresbrook.

* Lockyer, Bernard, 33, Freegrove-road, Holloway, N.

Nov. 27, 1880. Lockyer, F. T., Raleigh, North Carolina, United States.

* Lockyer, G. H., Tavistock-road, Snaresbrook.

* Lubbock, Sir John, Bart., D.C.L., LL.D., M.P., F.R.S., F.G.S. (*President British Association*), High Elms, Farnborough, Kent.

* Mackmurdo, Walter George, Beechmont, Palmerston-road, Buckhurst-hill.

July 24, 1880. Mackonochie, William, St. Mary's Hospital, Paddington.

* Makins, Colonel, M.P., J.P., D.L., &c., Prince's-gate, S.W.

* Marriage, F. G., Barnes Farm, *near* Chelmsford.

Aug. 28, 1880. Martin, Edward, B.A., Barrister-at-law, F.Z.S., &c., 6, New-square, Lincoln's-inn, W.C.

July 24, 1880. Martin, Walter E., 1, Victoria-villas, Derby-road, Woodford.

* McKenzie, Alexander (Captain Hon. Artillery Company), *Superintendent of Epping Forest*, Ferrestone Lodge, Hornsey, N.

* McKenzie, John A., Ferrestone Lodge, Hornsey, N.

* Meldola, Raphael, F.R.A.S., F.C.S., M.P.S., F.I.C., &c., *Vice-President of the Entomological Society* (*President*), 21, John-street, Bedford-row, W.C.

*† Melles, William, F.L.S., &c., Sewardstone Lodge, Sewardstone.

Date of Election.

* Miall (Miss), Darwen House, Buckhurst, hill.

* Mildred, Mrs., Chigwell.

Dec. 18, 1880. Miller, James, Woodford Wells.

Nov. 27, 1880. Morten, Thomas S., 42, Haverstock-hill, N.W.

* Oldham, Charles, 2, Warwick-villas, Chelmsford-road, Woodford.

Aug. 28, 1880. Ormerod (Miss), Eleanor A., F.M.S., M.E.S., &c., Dunster Lodge, Spring-grove, Isleworth.

* Owen, John, 320, Old-street, E.C.

* Oxley, Frederick, F.R.M.S., &c., Woodford, and 8, Crosby-square, E.C.

Nov. 27, 1880. Parker, Charles J., Rosslyn Villa, Snaresbrook.

* Parker, James F., 6, Adelaide-terrace, Ilford.

Nov. 27, 1880. Peile, Rev. Thomas W., Rectory, Buckhurst-hill.

* Powell, Nathaniel, J.P., D.L., &c., Buckhurst-hill.

Aug. 28, 1880. Priest, Arthur, M.D., &c., Waltham Abbey.

July 24, 1880. Prince, Charles E., M.R.C.S., &c., Buckhurst-hill.

*† Ramsden, Hildebrand, M.A., F.L.S., F.R.M.S., &c. (*President of the Hackney Microscopical Society*), 26, Upper Bedford-place, Russell-square, W.C.

* Rayleigh, The Right Hon. Lord, M.A., F.R.S., &c. (*Professor of Experimental Physics, University of Cambridge*), Terling-place, Witham, *and* 5, Salisbury-villas, Cambridge.

Date of Election.

Aug. 28, 1880. † REAY, The Right Hon. Lord, D.C.L., F.R.G.S., &c. (*President Social Science Congress*), 6, Great Stanhope-street, Mayfair, W.

July 24, 1880. REEVES, LUTHER, Prospect Cottage, George-lane, Woodford.

Nov. 27, 1880. RICHARDSON, EDWIN, 289A, King's-road, Chelsea, S.W.

* RIDGEWAY, Rev. C. J., B.A., 31, Albany-street, Edinburgh.

* ROBARTS, N. F., F.G.S., &c. (*Vice-President*), Rosebrae, Glengall-road, Woodford.

* ROBARTS, SYDNEY, Stamford-hill, N.

* RODWELL, Rev. R. M., M.A., &c., Rectory, High Laver.

Aug. 28, 1880. ROSSLYN, The Right Hon. the Earl of, M.A., F.Z.S., &c., Easton Lodge, Dunmow.

* RUSSELL, Rev. A. F., M.A., Rectory, Chingford.

Jan. 22, 1881. RUSSELL, Lieut-Col., J.P., D.L., &c., Stubbers, Romford.

* SAUL, DAVID H., 1, Elm-terrace, Woodford.

Nov. 27, 1880. SAUL, GEORGE T., F.Z.S., &c., Bow Lodge, 33, Bow-road, E.

* SAWARD, WILLIAM, Epping.

* SHIPLEY, ARTHUR E., Springfield, Windsor, Berks.

May 29, 1880. SMITH (Mrs.), Mary, Woolpits, Great Saling.

Jan. 22, 1881. SMITH, SAMUEL, 331, Hackney-road, N.E.

* SMITH, SIDNEY, Tavistock Villa, Lea-bridge-road, Leyton.

* SMITH, W. G. S. (*Hon. Sec.* "*Forest Fund*"), Rose Cottage, Forest Gate.

* SMITHER, WILLIAM, Woodford Wells.

* SMOOTHY, CHARLES, Bexfields Farm, Galleywood, Chelmsford.

Date of Election.

* Snell, Edward A., M.B., &c., 70, City-road, E.C.

* Spicer, Albert, Woodford.

Nov. 27, 1880. Spicer (Miss), Ellen, "Harts," Woodford.

* Spicer, George, "Harts," Woodford.

* Spiller, John, F.C.S., &c., 2, St. Mary's-road, Canonbury, N.

* Spiller, William, F.C.S., &c., Fitzjohn's-avenue, Hampstead, N.W.

* Stable, Robert S., Cleveland-road, Wanstead.

* Stainton, H. T., F.R.S., F.L.S., F.G.S., (*President of the Entomological Society*), &c., Mountsfield, Lewisham, S.E.

* Stephens, R. Darvell S., Bradpole, Bridport, Dorset.

* Stevens, William, The Green, Woodford.

Jan. 22, 1881. Stewart, Frederick (*Hon. Sec. to the New Cross Microscopical Society*), 516, Kingsland-road, N.E.

* Swallow, Rev. R. D., M.A., &c., Grammar School, Chigwell.

* Sworder, Charles B., Woodlands, Epping.

* Sworder, Walter, 1, Blandford-villas, Queen's-road, Buckhurst-hill.

* Taylor, Thomas P., Bocking, Braintree, *and* St. Bartholomew's Hospital, E.C.

May 29, 1880. † Thomas, Charles, F.G.S., Clarendon House, Buckhurst-hill.

Jan. 22, 1881. Thomasin, James G., St. Ann's, Hendon, Middlesex.

,, ,, Thomasin (Mrs.), J. G., St. Ann's, Hendon, Middlesex.

* Thompson, A., Beech View, Buckhurst-hill.

Date of Election.

June 26, 1880. Thompson, Ernest E., 66, Albany-street, Regent's-park, W.

July 24, 1880. Thompson, Robert M. Bird, Walden Hall, Saffron Walden.

Nov. 27, 1880. Thorp, William, B.Sc., F.C.S., F.I.C., 39, Sandringham-road, Kingsland, E.

* Thorpe (Mrs.), Dowgate, Cambridge-park, Wanstead.

* Tozer, Edward, Woodford.

June 26, 1880. Travis, J., Saffron Walden.

* Trimmer, Francis, M.D., &c., Forest Gate.

Aug. 28, 1880. Turner, W. Pickett, M.R.C.S., &c., Lancaster-terrace, Leytonstone.

* Tweed, Walter, Epping.

* Unwin, T. Fisher, The Elms, Woodford Bridge, Chigwell.

Nov. 27, 1880. Varley, Frederick H., F.R.A.S., M.P.S., &c., Mildmay Park Works, Mildmay-avenue, Highbury, N.

* Vaughan, Howard, M.E.S., 11, Ospringe-road, Brecknock-road, N.W.

* Vincent, Ralph, Leytonstone.

* Wakefield, W. T., Farm-hill, Waltham Abbey.

June 26, 1880. Walker, Rev. F. A., B.D., F.L.S., &c., Bourne Villa, Bournemouth, Hants.

June 26, 1880. Waller, John, 5, Talbot-road, Tottenham, N.

Aug. 28, 1880. †Walsingham, Lord, M.A., F.Z.S., M.E.S., &c., Eaton House, Eaton-square, S.W.

May 29, 1880. Welsh, Charles, 6, Julia-terrace, Leytonstone.

Nov. 27, 1880. Wells, Frank B., 25, Lorne-road, Finsbury Park, N.

* Weston, Walter P., Auburn Villa, Disraeli-road, Putney, S.W.

Nov. 27, 1880. Wheeler, E., Whitehall-road, Woodford.

Date of Election.

* WHITBOURN (Miss), Darwen House, Buckhurst-hill.

* WHITE, WILLIAM, Morden House, 55, Highbury-hill, N.

* WILSON, Rev. W. LINTON, M.A. (*Vice-President*), Oakhurst, Chigwell.

*†WINSTONE, BENJAMIN, M.R.C.S., &c., Ockeridge, Epping; *and* 53, Russell-square, W.C.

June 26, 1880. WRIGHT, W. H., Oakburn, New-road, Buckhurst-hill.

Jan. 22, 1880. WRIGHT, Rev. W. J., B.A., St. John's, Stratford.

* YEATES (Mrs.), Erin Villa, Buckhurst-hill.

* YOUNG, FREDERICK, J.P., &c. (*President "Forest Fund"*), 5, Queensberry-place, Queen's Gate, S.W.

N.B.—Members are requested to give early notice of any Change of Address to the Hon. Secretary.