WOOLHOPE · NATURALISTS · FIELD · CLUB · 1851

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TRANSACTIONS

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NATURALISTS' FIELD CLUB

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TRANSACTIONS

OF THE

WOOLHOPE

NATURALISTS' FIELD CLUB.

(ESTABLISHED MDCCCLI.)

1869.

"Hope on—Hope ever."

HEREFORD:

PRINTED AT THE "TIMES" OFFICE, MAYLORD STREET.

MDCCCLXX.

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OFFICERS FOR THE YEAR

1869.

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The Rev. James Davies, M.A., Moor Court, Kington.
Dr. M'Cullough, Larchfield, Abergavenny.

Honorary Secretary:

The Rev. Sir Geo. H. Cornewall, Bart,, Moccas, Hereford.

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John Lloyd, Esq., Huntington Court, Hereford.

Assistant Secretary and Treasurer:

Mr. Arthur Thompson, St. Nicholas Street, Hereford.

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Professor John Phillips, F.R.S., F.G.S., Oxford.

Rev. W. H. Purchas, Falkner Street, Gloucester.

Rev. Professor A. Sedgwick, B.D., F.R.S., &c., University, Cambridge.

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W. H. Paine, Esq., Stroud, Honorary Secretary of the Cotteswold Naturalists' Field Club.

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Rev. R. P. Hill, Broomesberrow, Ledbury, Hon. Secretary.

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The President and Hon. Secretary of the Oswestry and Welshpool Naturalists' Field Club.

The President, Curator, and Hon. Secretary of the Dudley and Midland Geological and Scientific Society and Field Club.

The President and Hon. Secretary of the Severn Valley Field Club.

The President and Hon. Secretary of the Caradoc Field Club, Shropshire.

The President and Hon. Secretary of the Worcestershire Naturalist Club.

Mr. With, Hereford.

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1869.

Adams, Mr. Thomas.
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Hereford, Rev. R., M.A.
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Jones Thomas, Rev. Wm., M.A.
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Lightbody, R., Esq., F.G.S.
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Lloyd, John, Esq.
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Stanhope, Rev. William P. S., M.A.
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Turner, Thomas, Esq.
Tweed, Rev. H. W., M.A.
Vaughan, James, Esq.
Warner, W. H., Esq.
Weare, Rev. T. W., M.A.
West, Rev. Thomas, M.A.
Westropp, Rev. C. J., B.A.
Williams, Captain.
Williams, Thomas Edward, Esq.
Wood, J. H. Esq.
Woodhouse, Rev. Thomas, M.A.
Wynne, N. S., Esq.

NEW MEMBERS ELECTED DURING THE YEAR

1869.

Bodenham, Frederick, Esq.
Bulmer, John, Esq.
Carless, Joseph, Esq., jun.
Chapman, T. Algernon, Esq., M.D.
Evans, Rev. John, M.A.
Hall, Mr. H. S.
Jenkins, Rev. John Rees
Lawrence, David, Esq.
Matthews, B., Esq.
Pechell, Captain.
Phillipps, Rev. Alfred.
Price, Mr. William.
Symonds, Lieutenant-Colonel.
Taylor, William, Esq., M.D.
Truscott, Charles, Esq., jun.
West, W. H., Esq.
Williams, Rev. R. H., B.A.

RULES

OF THE

WOOLHOPE NATURALISTS' FIELD CLUB.

I.—That a Society be formed under the name of the "WOOLHOPE NATURALISTS' FIELD CLUB," for the practical study, in all its branches, of the Natural History of Herefordshire and the districts immediately adjacent.

II.—That the Club consist of Ordinary Members, with such Honorary Members as may be admitted from time to time; from whom a President, four Vice-Presidents, a Central Committee, Treasurer, and Honorary Secretary be appointed at an Autumn Meeting for the following year, though they shall not take office until after the Annual Meeting to be held at Hereford in the early part of each year. The President and Vice-Presidents to change annually.

III.—The Central Committee shall consist of three members, resident in the city or in its immediate vicinity, with the President Vice-Presidents, and Honorary Secretary *ex-officio*. It shall be empowered to appoint an Assistant Secretary; and its duties shall be to make all the necessary arrangements for the meetings of the year, and take the management of the Club during the intervals of the meetings.

IV.—That the members of the Club shall hold not less than three Field Meetings during the year, in the most interesting localities for investigating the natural history of the district. That the days and places of such regular meetings be selected at the Annual Meeting, and that ten clear days' notice of each be communicated to the Members by a circular from the Secretary; but that the Central Committee be empowered, upon urgent occasions, to alter the days of such regular Field Meetings, and also to fix special or extra Field Meetings during the year.

V.—That an Entrance Fee of Ten Shillings shall be paid by all Members on election, and that the Annual Subscription be Ten Shillings, payable on the 1st of January in each year, to the Treasurer, or Assistant Secretary. Each Member may have the privilege of introducing a friend on any of the field days of the Club.

VI.—That the Reports of the several meetings, and all the papers read to the Club during the year, be forwarded to the *Hereford Times* newspaper for publication as ordinary news, and that the type be re-set in octavo at the expense of the Club, to form (with such additions as may be deemed advisable) the Transactions of the Club.

VII.—That the cost of any lithographic or other illustrations be defrayed by the author of the paper for which they may be required, unless the subject has been taken up at the request of the Club, and in that case the cost of such illustration to be paid for from the Club funds, must be specially sanctioned at one of the general meetings.

VIII.—That the President of the year arrange for an address to be given in the field at each meeting, and for papers to be read after dinner; and that he be requested to favour the Club with an address at the Annual Meeting, on the proceedings of the year, together with such observations as he may deem conducive to the welfare of the Club and the promotion of its objects.

IX.—That all candidates for Membership shall be proposed and seconded by existing Members, either verbally or in writing, at any meeting of the Club, and shall be eligible to be ballotted for at the next meeting, provided there be Five Members present; one black ball in Three to exclude.

X.—That Members finding rare or interesting specimens, or observing any remarkable phenomenon relating to any branch of Natural History, shall immediately forward a statement thereof to the Hon. Secretary, or to any member of the Central Committee.

XI.—That the Club undertake the formation and publication of correct lists of the various natural productions of the County of Hereford, with such observations as their respective authors may deem necessary.

XII.—That Members whose subscriptions shall remain for *three* years in arrear after demand, be held to have withdrawn, and their names shall accordingly be omitted from the list of Members at the ensuing Annual Meeting.

XIII.—That the Assistant Secretary do send out circulars ten days at least before the Annual Meeting, to all Members who have not paid their subscription, and drawing the particular attention of all those that may be affected by the operation of Rule XII, to that Rule.

XIV.—That these Rules be printed annually with the Transactions, for general distribution to the Members.

ADDRESS OF THE RETIRING PRESIDENT,

(JAMES RANKIN, ESQ., M.A.)

READ AT THE ANNUAL MEETING, TUESDAY, FEBRUARY 22, 1870.

GENTLEMEN OF THE WOOLHOPE CLUB—The time has now arrived for fulfilling the last of the many pleasant duties which have devolved upon me during my year of Presidency, and I gladly embrace this opportunity to say a few words on some subjects of special interest to this Society, and also to make a few remarks on some topics which have taken up the attention of science in general during the last year.

In the first place it becomes my duty briefly to review the work done by our own Society during the season of 1869. Few, I think, will consider that the Woolhope Society has retrograded, either in prestige or in real work done during the past year; and I am certain of this, that no one who had the opportunity of joining the excursions of the Club, will look back on those days except as days of enjoyment and of profit.

The Field days of 1869, in one important element for their success, were singularly fortunate; the weather—that glorious uncertainty in our climate—was most propitious, and, with the exception of a little haze on the visit to Pontrilas, which rather interfered with the full beauty of the landscape, nothing was left to be desired.

Thanks to our talented Editor, the physical and social aspects of our field days will appear so fully, so accurately, and so interestingly reported in our forthcoming volume of Transactions, that I feel it quite unnecessary to enter on that subject, and will, therefore, pass on at once to review the varied scientific work which has come under our notice during the year 1869.

Taking the various departments of science in order, I will first notice that science which, perhaps, is of the most general interest to members of this Society, namely,

Geology.—On this subject our Society has been favoured with several important and interesting papers and field addresses. At our first meeting the Rev. Mr. Symonds, President of the Malvern Club, in his field address, ably pointed out the ancient date and conformation of the Malvern Hills, and how the rocks which form the basis of that range of hills are probably coeval with the Laurentian rocks of Canada, which may be looked upon as the lowest known sedimentary rocks. As yet, the Malvern Hill rocks have failed to afford any traces of organic remains, but investigation by the members of the Malvern Club may, perhaps, bring to light some Eozoon, something similar to what has been found in Canada.

It is also interesting to know that even at that early date the working of volcanic action must have been something like what is at the present day in some of the intermittent volcanoes.

Mr. Symonds' remarks upon the formation and subsequent denudation of the old red sandstones of Herefordshire, point to studies of the greatest interest, and I am convinced that no greater aid to the science of geology can possibly be afforded to members of this Society than by the careful investigation of the phenomena connected with the physical conditions of the formation of ancient strata; and I doubt not but that such researches will go to the further establishment of the great physical probability, that the workings of Nature in primæval days were similar to what they are at the present day.

At our second meeting at Pontrilas we were much indebted to Dr. M'Cullough for his interesting remarks on Cornstones, and I doubt not, systematic geologists will not be slow to avail themselves of his clear and well defined divisions of concretionary and conglomerate cornstones; and I am sure the Club will feel greatly obliged to Dr. M'Cullough if he will continue his investigations both on the chemical and palœontological composition of the cornstones.

The Society has also to thank the Doctor for bringing to light some new and interesting fossils.

On the Ladies' day, at Downton Castle, Mr. Lightbody gave us his excellent paper on Geological Time, and in it has given a very perfect epitome of the sequence of the earth's strata, and when we consider the time which even the most recent formations, such for instance as the delta of the Nile, have taken to become what they are now, our minds are lost in utter bewilderment at the length of time this earth must have been rolling on, unceasing changes going forward the while upon its surface. As Mr. Lightbody justly observes, geology deals with time as astronomy deals with space, and to both sciences are we greatly indebted for the ideas of grandeur and magnitude which they give us of creation, the one indicating space so immense as to require hundreds of thousands of years for even that most swift of travellers, Light, to go from one body to another, and the other telling us of the lapse of time sufficient even for such distant bodies to become visible to each other, both proving to any reasonable and reasoning mind that this earth is but a part of a magnificent design.

To Mr. Lightbody too this Society is much indebted for his papers on the Passage Beds between the Silurian and Old Red Systems, and I trust some active member will take his suggestion and carefully work the subject up.

At our Usk meeting, beyond the finding some good though somewhat mutilated specimens of the Homolanotus, the characteristic Trilobite of the Silurian Rocks at Usk, the chief geological work of the day was Mr. La Touche's able paper on Spheroidal Structure in Silurian Rocks. This structure is not, I believe, by any means confined to Silurian rocks but occurs frequently in rocks of other formations. The explanation given by Mr. La Touche of the cause of this peculiar structure seems to be of a chemical nature, namely, the centralization and concentric rearrangement of the lime particles of a rock mass, this motion being induced by some internal molecular attraction. This explanation seems probable as regards nodules or small masses of rock, but I should be inclined to refer any large spheroidal structure, especially where, as Mr. La Touche remarks, "there is no apparent difference whatever between the character of the nodule and the surrounding rock," to physical and mechanical causes, for it is well known that any rock exposed to the action either of aqueous or aërial forces becomes rounded in form, the resisting corners having been taken off. Now, if these rounded shaped rocks or stones be again brought into an area of deposition, it seems probable that on one side at least the deposit would partake of the spheroidal form of what might be called its foundation. The ripple marks of a tidal beach might possibly in some instances be the starting point.

Passing onnow to the subject of BOTANY, we find that this subject has, as usual, engaged the attention of several of our most active members, and we have had some important notices of new and rare plants.

Dr. Bull has brought to light another Mistletoe Oak, in Deerfold Forest; and there also, a plant new to Herefordshire, the *Asarum Europæum*, was found. Indeed, these discoveries have led Botanists to look forward with great eagerness to our expected excursion to that newly-discovered region.

Another new plant has been added this year by Mr. Martin to the Flora of Herefordshire, namely, the *Saponaria vaccaria* (Cow-wort). A capital illustration of this plant will be given in our volume. It has been found in England before in cultivated positions, but has not as yet been admitted into the British Flora, nor has it been figured before as a British plant.

It is with much satisfaction that I have to congratulate the Club on the prospect of the completion of the Flora of the County, by Mr. Purchas. This talented botanist has now kindly consented to prepare for the Club the second part of the Flora of Herefordshire, and the committee appointed for its publication at our last meeting have made arrangements which, I trust, will enable the Flora to appear in the volume of 1870.

With regard to Fungology we have once more to thank our indefatigable Editor for his labours in this branch. Also many other gentlemen, among the foremost of whom I would mention Edwin Lees, Esq., F.L.S., Vice-president of the Worcester and Malvern Field Clubs, and Worthington G. Smith, Esq., F.L.S., of London. Although the summer of 1869 was singularly unfavourable to the production of funguses, yet before our October foray came off plentiful showers had brought an abundant harvest of them. At our meeting all who saw it must have been gratified by the splendid exhibition of funguses which was held in this room. The remarkable species found last year are so fully named and described in our volume that it is needless for me to go over their names, especially as those names are somewhat crack-jaw.

The most important phase perhaps of these researches, at least to the mass of mankind, is their economic value. If, as I think most probable, fungus-eating becomes general, and this society leads the van in pointing out and describing accurately the many good and nutritous kinds which grow about us it will have done a great work.

Edible Funguses, by their chemical constituents, are known to be highly nutritious, and in a great degree supply the elements of animal food; but hitherto the ignorance of those forms which were wholesome has deterred most people from making any use of them beyond the common mushroom. Without this practical knowledge it is undeniable that serious mistakes may be made, and therefore the great aim for our Fungologists should be to lay down some easily comprehended rules for the diagnosis of wholesome species. No better method perhaps than carefully drawn and coloured plates, such as appear in our Transactions can be devised for giving popular instruction on the subject. Those in our present volume bear the inviting names of the Beef Steak, the Sweetbread, and the Plum Mushroom.

The most valuable addition to the resources of the student of Fungology, however, is the new Key to the large class of British Agarics, *Clavis Agaricinorum*, by Worthington Smith, Esq., F.L.S. This key divides this very numerous tribe of Funguses into different sections according to the colour of the spores, as they may be white, salmon-coloured, brown, purple, or black, and by giving an illustrative page, to each colour, upon which the leading typical form of Funguses are given, the student is guided in the most ready and satisfactory manner to the discovery of the right genus of any particular fungus he may have in hand. Mr. Smith has done the Club very great honour, in giving this valuable addition to science to the public for the first time, in the pages of our Transactions.

I am happy also to be able to state that although we have had no communication from our Tree Commissioner this year, yet our volume is to be graced by photographs of some of the noble trees of the county.

Before I leave this subject I must briefly notice the interesting discussion which took place on Mr. Edwin Lees' theory of the cause of Fairy Rings. Although the learned gentleman failed to convince his audience of the truth of his Mole theory, and if I remember aright the views of most of the other speakers were against him, yet, we must thank him for bringing forward so interesting a discussion, and I trust before another year this subject may be investigated by several of our members, and some definite conclusion arrived at on the matter.

I feel sure that you will all join with me in assuring Mr. Lees that the Woolhope Society heartily congratulates him on the well-earned honour which the Worcester and Malvern Clubs have paid him, and in the hope that he may long live to wear his laurels, to add to the stores of our knowledge in his favourite science, and to enjoy, moreover, the unselfish pleasure which it always gives him to encourage the study of Natural History in all its branches.

Passing on to ZOOLOGY, we have on this subject several good papers which have been given to the society, and being the branch of natural science in which I feel most interest, I sincerely hope that future years may see it absorb and receive that amount of attention which it deserves.

Among the Vertebrates, Mr. Armitage and Mr. Clement Ley have favoured us with an excellent and very comprehensive account of the Rare Birds of Herefordshire.

There seems to be great scope for the ornithologist in this county, and some day I hope when we have got our Museum established, we may be able to show a perfect collection of the Birds of Herefordshire. The curious instinct of the cuckoo was remarked upon in the above mentioned paper, and I think that there can be little doubt of the truth of the supposition that the cuckoo deposits her eggs in the nest by means of her mouth. This idea is confirmed by the small size of the egg in proportion to the bird's own size, and also by the fact that the cuckoo's egg is often found in a position too small to allow of the bird having introduced its whole body. In Morris's British Birds, I find the notice of a cuckoo shot, which is said to have been carrying its egg in it bill.

It has also been suggested that it may possibly insert its egg by means of its foot; the only thing, as far as I know, to uphold this latter idea is the shape of the foot, which has two toes turned forward and two backward, resembling in this particular scansorial birds; this kind of foot doubtless would be competent to carry an egg, but the principal weight of evidence, I think, inclines towards the mouth theory. It is quite within the range of instinct possibility to believe that the colour of the eggs, varying in some degree, the cuckoo selects a nest with eggs in it, of a hue somewhat resembling her own.

The interest and instructiveness of this paper were greatly enhanced by the beautiful drawings by the pencil of Mrs. Armitage, which were shown at the time of its being read.

Mr. James Lloyd, of Kington, and the Rev. Robert Blight have also given to the club very useful and complete lists of Herefordshire birds.

I believe the only other paper relative to vertebrates read before the society last year was my own on British Cheiroptera, and the only remark I shall trouble you with reference to it is (to say) that the published account is only an abstract, and therefore I hope will only be regarded as such.

The most important zoological work, however, last year was undoubtedly done by the entomological labours of Dr. Chapman and Mr. Steele. The investigations of these gentlemen upon the economy of the mason wasps and their parasitic allies, the Chrysididæ, have unquestionably added valuable knowledge to this department of zoology; and when we consider the boundless field for careful research and observation which entomology affords, I think the club must deem itself fortunate to have such workers among its members, and I, for one, live in hopes of a rich harvest of entomological lore being yet in store for us from these gentlemen. I would venture to ask them to direct especial attention to some of those insects which at present are such a scourge to the farmer, such as the turnip beetle, the wireworm, the blight, rust, and others. If they could suggest any remedy against the attack of these animals their names would be handed down to posterity as great, not only to men of science, but blessed by the whole body of agriculturists.

Meteorology, &c.—In Meteorology we have to thank Dr. Stewart for his able and interesting communication, and his suggestions might with great benefit to science be adopted by some of the members of this society. At all events let us hope that the learned doctor himself will by his efforts some day throw some light on those most interesting and most important but most obscure phenomena connected with the science of meteorology.

To medical men some of the points raised in Dr. Stewart's paper must possess the highest interest; but I fear that the problem of the "Effect of Climate upon Health," beyond the more obvious and apparent results which are now tolerably well known, is one so dependant on such a multitude, not only of climatal and meteorological influences, but also on so many physiological peculiarities, that there is little hope of its ever being completely and satisfactorily solved. However, careful and numerous observations may go a long way towards settling some of the, at present, many doubtful points.

To Mr. Isbell we are again indebted for those very careful and elaborate statements with respect to the temperature, rainfall, &c., &c., of the year 1869, which render his reports so valuable to our records, and indeed to science in general. The year 1869 is chiefly remarkable for a very dry and fine summer, and, as far as I am aware, not a single thunderstorm during the months of June, July, and August.

In connection with this subject I may notice Mr. With's able lecture and experiments upon lightning delivered at our last meeting. Not being an electrician I will not venture to make any remarks of my own upon his paper which was a very clear and lucid one, and in which all the points introduced were fully explained and shown by experiment. From his remarks and from Dr. Richardson's experiments, it seems that the electric discharges vary not only in degree of force, but also in kind, as that form of discharge called No. 1 by Dr. Richardson seems to burn but not to kill, whereas No. 4, which is always fatal, does not burn or in sny way contort the body. The thunder cloud and the lightning flash afford a very good instance of the manner in which natural laws are employed to work out the Creator's grandest and most majesic displays of power. I feel sure the Woolhope society will agree with me in congratulating itself upon Mr. With's having become an honorary member, and I hope he may on future occasions give us more information on this most interesting subject.

The subject of ARCHŒOLOGY has, I think, this year received unusual though not unmerited, attention, and with the varied and conspicuous talent of many members of this Society it is a subject well worthy of their research. Wall Hills, the first rendezvous fo the season, one of the numerous so called camps of this county, was made the subject of an interesting discussion between Mr. Lees and Mr. Edmunds, two well known antiquaries, but for myself, and perhaps there may be some other non-archœological gentlemen who sympathize with me, it would have been more satisfactory had the two learned antiquaries agreed a little more in their views, at at present those who, like msely, do not feel competent to decide the point for themselves are left in a deplorable state of doubt and uncertainly as to the real origin of the Wall Hills, and yet are not permitted to enjoy the bliss of utter ignorance. The volume which Mr. Flavell Edmunds has this year given to the public will, I feel sure, not only be a public benefit but reflect honour upon this Society. To Dr. Bull we are indebted for bringing to light some interesting historical details concerning Ewyas Harold Castle and also for introducing the various ideas as to the derivation of its name proposed by Mr. Fowle and Mr. Edmunds. This name, like so many other of ancient date, seems to be shrouded im mystery, but let us hope that Mr. Edmunds has hit upon the real derivation in connecting it with yew trees which are so plentiful in the district.

The very interesting record of the researches into the history of the Bringewood Forge and Furnace which were laid before the Society on their visit to the site of the Forge near Downton Castle demands our thanks. To this paper I would venture especially to direct attention, as on account of the length of the walk round by the Forge none of the ladies and but few of the gentlemen who were out on that day had the opportunity of hearing it read.

But the paper which shows the deepest historical research is undoubtedly that upon the history of Deerfold Forest by Dr. Bull, but as that paper is of so great an interest, and is sure to command the attention it deserves, it would be superfluous for me to do more than draw your attention to it, and leave it to speak for itself, as it does most eloquently.

I must now pass on to notice the elegant and instructive volume which has lately been produced by the pen of the Rev. C. J. Robinson, of Norton Canon. This book supplies a want which must often have been felt by those whose minds were eager for information on historical subjects, and all must be grateful for such a book as the "Castles of Herefordshire," giving as it does ample information in a concise and pleasantly written style, and saving the student in antiquity much laborious research. Let us hope that the reverend gentleman will still further extend his investigations, and that some day we may have a volume entitled perhaps the "Castles of Siluria."

Having now briefly passed in review some of the principal work done by this Society during the past year, let me, in a few words, make one or two remarks on what we should aim at for the future.

Some have expressed their fears to me that if we went on at our present pace we should soon have worked up all the available natural history material of the neighbourhood; such fears, I must say, do not appear to have any foundation in fact or in Nature, for I feel persuaded that those who have gone deepest into the secrets of Nature amongst us, will be those who perceive the clearest how much there is still left for them to learn. I would now venture to propose that some of the various subjects embraced by our Society should be dealt with in a more systematic manner than heretofore, and that certain competent naturalists among us be asked to get up certain subjects and give the Society, from time to time, papers on these subjects.

This has been already done with respect to Botany, the Trees of Herefordshire, and also with Fungology, and to some extent also with Geology.

The Fauna of the county, however, has received but little attention, and I must confess that it appears to me that a series of papers, being the result of careful research in the various branches of the animal kingdom, from the Mammal down to the Protozoon, would be a subject worthy of the attention of some of our zoological members; and as we are now able to commence the publication of our Flora, I see no reason why we should not publish our Fauna. After such papers as Dr. Chapman, Mr. Armitage, Mr. Ley, Mr. Blight, and Mr. Lloyd have given to this Society, there can be no doubt, I think, of the possibility of having the Fauna of the county worked up systematically, and there are many branches in Zoology, as, for instance, the fresh-water Crustacea, the terrestrial Mollusca, and many others which have received but little attention, to say nothing of the many others which have, no doubt, received some notice, but could very well do with a great deal more.

In Geology we have in our volume for 1867 a very complete account of the Geology of the Woolhope district by the Rev. Mr. Dixon, and in the volume for 1866 there is a brief though comprehensive summary of the Geology of the whole district by the Rev. W. Symonds. Now such a general outline as that I have referred to, which is found in our volume of 1866 is most useful and may be regarded as the framework or skeleton, and Mr. Dixon's paper is an excellent example of the filling up of that framework for a certain locality or a limited area, and what I should like to see would be the rest of the frame filled in a similar manner to that done by Mr. Dixon with the Woolhope district; especially noticing the physical conditions under which the various strata were formed. Although, no doubt, we have at various times had papers on the Geology of different districts, as for instance, Mr. Beavan's on the Pontypool district, Mr. Salter's on the Usk, and Mr. Symonds on the Malvern and other districts; yet there are still many localites which would afford interesting papers if carefully worked up.

Especially would I venture to apply my remarks on systematic work to Palœontology. Within the legitimate area of our operations there are several productive regions for fossils, and yet, as far as Iknow, we have no systematic collection whatever, and I have little doubt that, although nearly every member of this society knows very well what are the formations of the district, their proper sequence, their physical, and even their chief mineralogical characters, yet very few could tell the characteristic fossils of the different formations, and fewer still could name the fossils when they saw them. This I attribute chiefly to the want of a good collection systematically arranged; and this brings me to speak of a matter which I deem of considerable importance to this society, namely, the establishing a Museum. The Woolhope Society has now reached such a position and has amongst its members so many industrious and talented workers, that it seems to me unfair that there should be no repository for their collections of natural objects. In an address like the present it would be out of place to enter into any discussions as to theways and means of establishing or supporting such a scheme, but it seems to me not out of place to consider the scientific advantages which would accrue from it.

First then, I think, a museum is desirable as a repository for the collections of the members of the Society in order to give a zest and a zeal in collecting natural objects; now, many, I feel sure, are deterred from active search from the feeling that, when they have found anything, they don't know where to put it or what to do with it, and it will surely be allowed that were there more zealous searchers we should be more likely to bring to light more of the interesting treasures of the rocks, and perhaps even it might be permitted to some members of this Society to make discoveries of some missing links, and so throw light on the great question of the chain of Creation.

Secondly, I think a museum very desirable for the purposes of instruction; this, perhaps, would be its greatest benefit. I feel quite confident that a good collection of the natural objects of the neighbourhood, both of extant and extinct life, properly named and arranged, would be felt to be a very great boon to many members who wish to know something about such things, but have not the time or perhaps the knowledge to go into the matter by themselves.

I see no reason also why such a museum should not be open to the public inspection, and perchance such a privilege might awaken the love of the study of creation in minds before totally ignorant of it, and this would surely be a result which would be most pleasing to every member of this Society, for I consider one chief use of a society of this kind is a diffusion of the love of the study of nature, and, I think, a good museum would be a very powerful auxiliary in such a good work.

Thirdly, I would urge the establishment of a museum for the sake of having a suitable room for meetings and for our library, which, I trust some day, will be larger than it is at present.

This Society has a name, I trust, of some reputation, why should we not have a local habitation as well? And then, if in connection with this Society, we are able to introduce evening scientific soirees' and lectures, and I see no difficulty in this, what a comfort and convenience a good room would be. Therefore, for the three good, and as I think sufficient reasons: first, of imparting more zeal to those already conversant with the various departments of science; secondly, of imparting instruction to those who are not so, and, perhaps,stirring up some love for natural science, and lastly, of giving the Society a better position, and of enabling it, if so disposed, to widen its sphere of usefulness. I certainly think that we should endeavour to carry out this scheme. I have said that this is not the place to enter into any discussion respecting the ways and means for establishing such a scheme, or to combat the difficulties and objections which are sure to be raised against it, and I intend to keep my word, but I cannot refrain in concluding my notice of this subject, saying, that whatever these difficulties or objections may be, and I doubt not they will be many and will be serious, yet, if this Society is in earnest, they will findthe truth of the old proverb, that "Where there is a willthere is a way."

Mr. Curley's discoveries of *Bos longifrons* and *Cervus Elephas*, in the valley of the Lugg, point, I think, to a most interesting and important branch of geological research, which I would recommend to the notice of our geological members. As far as I know, recent and pleistocene geology has not received much attention in this county, and to my mind there is no more attractive branch of the science of geology, as it is so closely linked with Ethnology.

Passing on now from subjects of comparatively local interest, I will briefly remark on some topics of general scientific importance.

Deep Sea Dredgings.—There have been of late few more interesting and important scientific investigations than those carried on by Dr. Carpenter and his colleagues, Professor Wyville Thompson, and Mr. Gwyn Jeffreys, in

Deep Sea Dredgings, and this address would not be complete without some mention of them; but Dr. M'Cullough's paper on the subject has given the results of the enterprise so concisely and so clearly that I shall trouble you with very few remarks on the subject.

The most general and important results of the investigation seem to be—1st, the establishment of the fact that there exist under currents of water in the ocean of very various temperatures, some being as low as 32° fah., and that therefore a uniform deep water temperature of 39° fah. is not, as formerly supposed, the condition of all deep water. This consideration leads us on to suspect a corresponding modification of the fauna, and this may be called the second great result, that submarine faunas are much more widely distributed, and at the same time often very rigidly restricted to definite areas by these currents than has been hitherto supposed. As an example of what is meant we may suppose a cold Arctic submarine current to flow southwards as far as the Straits of Gibraltar—and there is considerable probability of there being such a current—this would enable the fauna living in deep water to extend through a very considerable range of latitude, and in after ages rocks might be found in sub-tropical climes having shells of an Arctic type, and this would of course suggest to geologists some great differences in the distribution of heat and cold from what obtains at present, which might be altogether erroneous, and easily comprehended by the knowledge of submarine currents.

On the other hand a warm current like the Gulf Stream might flow northwards and enable tropical and temperate forms to exist in Arctic regions. If these two currents flowed side by side, as they might easily do, and the rocks were at a future period raised above water, geologists would find in the same latitude, but in different longitudes, quite a distinct fauna. Theso considerations of the possible distribution of submarine fauna will no doubt have a very important result on geology.

Another important fact brought to light by Dr. Carpenter's dredging, is that highly organised beings are now known to live at very great depths; and, what is more, forms supposed to have been long extinct have been found still living at the bottom of the sea.

These considerations plainly show that any deductions as to the age of geological formations from their organic remains must be of a most uncertain character.

Another very interesting discovery is that the öoze or semi-animal substance found at the bottom of the sea covers immense areas, and appears to be the pabulum of the Rhizopods and Sponges which are imbedded in it.

Several eminent naturalists have pointed out the similarity of this deposit to the chalk, and it seems very probable that this lowly organised material, which Huxley has named Bathybius, has some power of deriving its nourishment from the sea water, and then forming a pabulum for higher organisms. There seems also every reason to believe that this Bathybius has beeu existing in all ages and forming chalk, so that the cretaceous is really one great continuous formation.

Another of the latest, and at the same time most interesting, scientific discoveries is that made by Professor Tyndall, of the composition of the ordinary dust floating in our atmosphere. This he conclusively shews to be in great part of organic particles, which can be burnt and so destroyed. His experimenst go to prove that we are habitually lodging this organic dust in our lungs, as the final part of our expirations are invariably free from all dust; but he also points to a remedy in the shape of a cotton wool respirator, which he finds an efficient filter for the air, and capable of stopping all dust particles from entering the mouth. This kind of respirator will doubtless come into use in hospitals and other tainted atmospheres. The Professor believes these discoveries tend to strengthen the theory of germ origin of disease.

As this society numbers amongst its members several eminent members of the medical profession, it is possible that a notice of the newly-used substance called CHLORAL may not be uninteresting. This substance is an artificial organic compound, and consists of C2 Ch3 O.H., carbon, chlorine, oxygen, and hydrogen. It was, Sir J. Simpson tells us, discovered by Baron Liebig in 1832; but has ouly recently been brought into use by Dr. Liebreich, of Berlin. Sir J. Simpson says that he uses it as a hypnotic and anodyne, and finds it a sure producer of sleep, and free, in nearly all cases, from any after ill-effects, such as opium leaves, aud he gives it as his opinion that Dr. Liebreich, in introducing chloral, has proposed a remedy which will yet prove of immense value in the practice of medicine and surgery. Herr O. Liebreich has also found that chloral can be used with good results as a counteractive to strychnine.

Another interesting chemical discovery is that by Graebe and Liebermann, in the artificial production of Alizarine, the colouring matter of Madder, from Anthracen. This discovery is especially interesting, having been led up to by purely theoretical considerations. It is thought likely, also, to be of some practical importance, as it will allow a great extent of land now employed for growing Madder to be used for grain.

ASTRONOMY.—In Astronomical Science some most interesting discoveries have been made during the last eighteen months.

The two total eclipses which have occurred during that period, the one seen in India and the other in America, have given astronomers excellent opportunities of observing the red flames which had been before noticed to exist round the sun. The spectroscope has now decided that these flames consist of hydrogen gas intensely heated.

It is also interesting to know that these hydrogen flames seem to be intimately connected with the solar spots; also the lines on their spectra are sometimes slightly displaced from their usual position in the spectrum of hydrogen.

These variations and relations are now being made the subject of careful observations, and Dr. Tait remarks that in this one direction alone a field has been opened up for inquiries which, even with our present appliances for observation, may well occupy the world for a generation to come.

Professor Tait has made also some most interesting observations upon Nebulæ and Comets ; on the former of these bodies, he says that they have now been proved to shine as glowing gas merely, and therefore in all probability they are not much more distant than some of the nearest stars, and they may be, the professor adds, "Vast systems of small cosmical masses in the act of grouping themselves by mutual gravitation, impact, and friction into a new star, the incandescent gas being due to the impact and the friction." In them we may be actually watching the formation of a Solar System. These ideas seem to lend countenance to La Placés Nebular Hypothesis.

With reference to comets, the professor says that there is good reason for thinking that they are only showers of stones ; and in proof of this theory he remarks that a shower of stones would behave very much like a comet in its revolution round the sun ; and also that the orbits of the August and November meteors have been found identical with those two well-known comets.

The heads of the comets give spectra, like those of Nebulæ, of incandescent gases, but their tails appear to shine by reflected solar light only. If these views be true the meteoric displays would receive a full explanation, as the earth would be in fact passing through the tail of a comet.

Before leaving this subject it will, I know, give this Society gratification to know that Dr. Balfour Stewart, who so kindly gave us a suggestive paper on Meteorology, last year obtained the Rumford medal, one of the highest scientific honours. It was awarded to him for the discovery of the law "that the absorption of a particle of light or heat is proportional to its radiation, which law holds for every variety of light or heat."

Dr. Stewart has also been making investigations on the solar spots of his enquiries leave no doubt that the sun is a variable star, and that the spots depend on the position of the planets.

But perhaps there are no more interesting speculations of modern science than the views of some of our first naturalists concerning the origin of life and the correlation of vital with other forces.

Mr. Darwin's theory of the origin of species by natural selection is so well known that it is quite unnecessary for me to dwell upon it, snd in his most interesting work upon Plants and Animals under Domestication he gives valuable information on many subjects, and also brings forward the interesting theory of Pangenesis. Referring physiological enquirers to the above work, I will pass on to notice the theory of the origin of species brought forward by Professor Owen in the concluding remarks of his great work on the Comparative Anatomy and Physiology of Vertebrates.

This theory he terms the "DERIVATIVE HYPOTHESIS."

The professor agrees with Mr. Darwin, Lamarck, and others, in repudiating the idea of any special creative miracle on the advent of a new species, and supposes that new species are derived from old by the ordinary process of generation, but that the new species is born, with some more or less marked distinction, from its parent, amounting in some cases to what we should term a monstrous birth.

These differentiated beings he regards as varieties which, for some good cause and to supply some necessity in the cosmical economy, are pre-ordained by the Creator, and brought forth by the working of natural laws at appointed seasons, and as a rule are produced in regular sequence, and not having an excessive amount of difference from the parent species.

As a good example of his successively derived species he gives the case of the horse, which was probably derived from the Hipparion, that again from the Paleothere, and so on.

At first sight the views of Professor Owen might be thought very similar to those of Mr. Darwin; but on carefully examining the two theories, it will be seen that although both these naturalists regard existing forms as lineal descendants of pre-existing and extinct forms, yet they regard the manner and cause of their being so in very different lights. On one point, however, they agree, that is, to do away with miraculous intervention and attribute new species to the working of natural laws.

This tendency to refer all cosmical phenomena to natural laws is certainly one of the most marked features of our time; and I would venture to remark that, although it places the Divine origin of things in one sense further away from us, yet it in no wise lessens the constant miracle of Divine superintendence, and in many ways tends to increase our admiration of creative skill by seeing what mighty results have been evolved from such small beginnings by the almost unobserved workings of natural laws, that is, laws ordained by the Creator.

But beyond the one great similarity to which I have alluded to there are many essential points of difference between Professor Owen's theory of derivation and Mr. Darwin's theory of natural selection, and perhaps one of the greatest is that derivation holds that species change in a pre-ordained manner, and by virtue of inherent tendencies thereto. Natural selection holds that altered circumstances make the new species by a long course of slight changes.

The author of the Derivation Hypothesis admits that when once the change has been made by the birth of an organism different from its parent, surrounding circumstances may affect the new species, and somewhat modify it, but that they are not the first cause of change, and he believes that the new species are brought into the world at a time when conditions of life are suitable for them. Professor Owen believes also that habits are the results of modified structure, and not like Lamarck, that structure is modified by habit.

The author of Derivation holds that the "struggle for existence" explains in a great measure the extinction of species, but does not, as Mr. Darwin, apply it also to the creation of species.

The Derivation theory does not require such a multitude of intermediate forms as the natural selection theory, and therefore, as far as geology shows at present, is more supported by facts. The Derivation theory also better explains how it is that among the lower forms of life, such as Foraminifera, and Polyps generally, such a variety of structure is found under the same circumstances, for derivation holds that mere beauty and variety are among the aims of the Creator.

Derivation and natural selection differ also in the hypothetical *origin* of organic beings; the latter holds that created organisms have descended from *a few*, or perhaps *from one* primarily created being, and since then direct creative action has been dormant. The former holds that daily and hourly the Creator is calling into life multitudes of beings by the conversion of physical and chemical into vital modes of force.

This last expression of opinion leads me to touch briefly in conclusion, on a subject of profound interest, but one shrouded in mystery, and which will never, probably, in this world, be cleared up; I mean the Origin of Life or Vital Force.

The subject of the correlation of forces has made such progress of late and has obtained such sway over men's minds, that it is not surprising to find that vital force or life is sought to be correlated to other physical and chemical forces. The physiologist argues that the vital phenomena displayed by man and those displayed by the protozoa are more different, both in kind and degree, than the differences which are observable between the protozoa and the magnetised steel; and it is argued that as we say a magnetic bar becomes unmagnetised, or in other words, loses magnetic force, and sarcode or protogenal jelly becomes unvitalised, that is, loses vital force and becomes what we term dead, so we may say magnetism is to the steel what vitality is to the sarcode, both being affections of matter, but neither of them matter itself, and it is concluded that as inorganic matter is endowed with this affection of magnetism, so organic matter is endowed with the affection of vitality, and that this vitality of life is only an analogous force, and in some manner correlated to other physical and chemical forces.

Professor Owen's belief is that daily and hourly vital or living organisms are called into being by the conversion of chemical and physical modes of force into vital modes, and that then, through pre-ordained series, these organisms are led up to the higher animals. These views of life almost necessarily lead one on, in ascending the scale of animal life, to see how far mental and spiritual attributes are regarded as affections of matter. In studying the views of certain physiologists on these subjects, it is quite evident that they regard the soul, spirit, and mind, as almost synonymous terms, and merely as affections (contractility and so forth) of the nervous matter of the brain.

This view, it will be perceived, at once does away with the idea of a spiritual part in man apart from the body, and irrevocably chains the soul to the course of human life, and that when the body ceases to exist so must also the soul. This view is most materialistic, for the soul, being only the sum of the vital phenomena of the brain, must of necessity act in a manner similar to matter, that is, be governed by physical law. How thought and the perception of thought can be originated and recognised, and how by an effort of the will past thoughts can be recalled, are phenomena which seem certainly beyond the power of protoplasmic contractions ; and surely it does not appear more wonderful that a Spiritual Creator should have thought proper to create spirits any more than bodies, for we may believe—

> " That even while the world came forth
> In all the beauty of its birth,
> In His deep thought He did behold
> Another world of nobler mould."

Natural philosophers now tell us that Cosmos does not for ever go on in cycles, but tends towards an end, however remote, and our knowledge of terrestrial organisms certainly tends by analogy to point that way ; and therefore we may confidently hope that as matter has been led from the Eozöon up to highly-organised Man—and for our argument it matters not whether we accept the natural selection, the derivative, or the miraculous theories of creation —so mind will in another state be capable of almost infinite advancement, and that though now we see things as through " a glass darkly," we shall hereafter in the reign of mind " know as we are known," and perceive that the wonders and glories of creation are unexhausted and inexhaustible.

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THE REMARKABLE TREES

OF

HEREFORDSHIRE.

THE HAYWOOD FOREST OAK.

(Quercus robur.)

MARCH, 1870.

This tree is the finest of the group of old Oaks standing by the homestead of the Haywood Farm. They are the only remaining trees of the Royal Forest of Haywood of olden times. It is now about 60 feet in height, and at 5 feet from the ground, where the card of the Club is placed (itself 1 foot by 6 inches in size), it measures 20 feet 7 inches in circumference.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

The Woolhope Naturalists' Field Club.

MEETING AT THE WALL HILLS FOR LEDBURY.

THURSDAY MAY 20TH, 1869.

"Up ! let us to the fields away,
And breathe the fresh and balmy air ;
  The bird is building in the tree,
  The flower has opened to the bee,
And health, and love, and peace are there."
Mary Howitt.

Thus thought, or certainly thus acted, the members of the Woolhope Club on Thursday last, when they held their first field meeting for the year. The season is so forward that it seemed late to begin these pleasant excursions, but though the foliage has well nigh all the fulness of Summer, it still has all the brightness, and freshness, and charm of the Spring. They met for the transaction of the office business of the Club, at the Barr's Court station, where the President for the year, James Rankin, Esq., M.A., of Bryngwyn, punctually took his seat ; and we may as well state at once that his "following" for the day was thus composed :—Arthur Armitage, Esq., one of the Vice-presidents ; Sir George H. Cornewall, Bart., the Hon. Sec. ; J. E. Lee, Esq. (Caerleon), F. J. Mitchell, Esq. (Llanfrechfa Grainge), R. Lightbody, Esq., F.G.S. (Ludlow), Elmes Y. Steele, Esq., and Dr. Chapman (Abergavenny), Dr. Bull, Evan Pateshall, Esq., Rev. H. C. Key, Rev. W. P. Stanhope (Holm Lacey), John Lloyd, Esq., Rev. Thos. Phillipps (Dewsall), T. Curley, Esq., F.G.S., D. R. Harrison, Esq., Rev. E. Du Buisson (Breinton), John Lambe, Esq., Rev. J. T. Parsons (Dewchurch), Edward Armitage, Esq., Rev. C. Smith (Tarrington), J. H. Mapleton, Esq., Rev. David Price (Little Marcle), Dr. J. H. Wood (Tarrington), Rev. J. Holloway (Clehonger), G. C. Martin, Esq., Reginald Symonds, Esq., Mr. Lloyd (Kington), Mr. Pitt (Freetown), Mr. Downing (Holm Lacey), Mr. Andrews (Bosbury), and Mr. Arthur Thompson.

The Central Committee reported that with a view of taking a more accurate account of the rainfall of the valley of the Wye two new certified rain-gauges had been ordered ; one was stationed on the Irvon valley under the care of Mr. S. B. Kelland, at the school, Llanwyrtwyd; and the other on the valley of the Ithon, with Capt. Penry Lloyd, of Hoewy Hall, Llandrindod. These gentlemen had kindly undertaken to make careful observations for the Club; and with those of Lewis Lloyd, Esq., of Rhydoldog, Rhayader, which had been also kindly promised, the reports would be much more satisfactory than has been the case hitherto from observations made only at Hereford. These proceedings were approved, eight new members were then elected to the Club, viz., Dr. Taylor, of Cardiff; the Rev. John Evans, Ailston Hill; the Rev. R. H. Williams, Byford; Dr. Chapman, Abergavenny; W. H. West, Esq., Gliffaes, Crickhowell; F. Bodenham, Esq., Joseph Carless, Esq. (Town Clerk), and Mr. John Bulmer, of Hereford; and four others were proposed for election at a future meeting.

A suggestion was made by the President for the alteration of one of the Rules, which will be brought forward on a future occasion, for by this time the minute of departure was at hand and they all soon found themselves seated in the train for the Ashperton Station. Here the work of the day was to begin, and a body of gentlemen of some thirty naturalist-power, under the guidance of Dr. J. H. Wood, of Tarrington, struck across the fields for Eastwood. A sharp-eyed lover of ferns, Mr. Lloyd, of Kington, quickly detected the little Adder's-tongue fern, *Ophioglossum vulgatum*, and it was afterwards frequently found during the day's walk. Passing through Eastwood—a wood of young oaks with profitable ash nurses in attendance—as well as its wet and dirty ground permitted, the far corner close to the high road was soon reached.

The Montrose Oak lives here. It has been named by Lady Emily Foley in honour of the Duke of Montrose, and is a young freely growing specimen of *Quercus sessiliflora*. It measures 11 ft. 7 in. in circumference at five feet from the ground, and has a diametric spread of foliage of, E. and W., 22 yards, and N. and S., 26 yards. It carries its timber well up into its head, and has a trunk of some 45 feet, which is rather more than half the height of the tree. It promises to become a fine tree, but it sadly wants just now the attention of a careful woodward. Several dead boughs should be at once taken off, for the size of them is such as may otherwise do a serious injury to the tree itself. This tree has only increased two inches in circumference during the last five years, and the question as to its age elicited various opinions. Sir George Cornewall attempted to throw light upon it shortly afterwards in the most practical way. An oak had been felled in a field near it, which showed clearly its rings of growth. It measured 7 ft. 5 in. at five feet high, and with the allowance of the timberman's measure of six inches more for the bark, 7 ft. 11 in. It was found to have exactly 81 rings of annular growth, and, judging from their relative thickness, be it added, this tree certainly bore out well the opinion of Mr. South, in his "Essay on the Age and Growth of Trees," that an oak of sixty years standing will, in twenty-four years more, double the contents of its timber. From this observation, and some other facts mentioned, it was thought that the Montrose oak could not be more than 110 or 120 years old.

The Eastwood Oak, the noted old tree which stands on the high road from Hereford to Ledbury, some 80 or 100 yards distant from the Montrose Oak, was next visited with much interest. These lines of the poet Cowper were specially applicable to the condition of this fine old tree :—

————— "The spring
Finds thee not less alive to her sweet force
Than yonder upstarts of the neighbouring wood
So much thy juniors, who their birth received
Half a millenium since the date of thine."

This tree is very picturesque in growth, and though at 5ft. from the ground it only measures 20ft. 11in. it increases in size very much before the boughs are given off, and has a very large circumference at the surface of the ground. It is a pollard tree of the intermediate variety, and long past its prime. It is hollow in trunk and in some of its branches. Some gipsy children set it on fire about 15 years ago, when the fire engines from Ledbury were fetched to put it out. Its hollow wounds have, however, been carefully boarded up, and three of its large branches are supported by iron frames and chains, placed there some years since by Lady Emily Foley. The tree, however, is still very luxuriant, and spreads its branches to a diameter N. and S. of 21½ yards and E. and W. of 18 yards, and will yet doubtless continue to be a landmark for many generations of men.

The route now lay across some pleasant meadows sprinkled copiously with many varieties of orchis, *Orchis morio* in deep purple, in pale rose, and in white,—*Orchis mascula* the meadow orchis, and *Orchis maculata* the spotted orchis. G. C. Martin got a fine specimen of the frog orchis, *Habenaria viridis* and the butterfly orchis, *H. bifolia;* and some spikes of the twayblade, *Listera ovata*, were afterwards seen shooting up for blossom.

Suddenly a cry of enthusiasm is heard, for D. R. Harrison, Esq., has come upon a fairy ring. It formed nearly the half segment of a circle 40 feet in diameter, and was abundantly supplied with the true St. George's mushroom, *Agaricus gambosus*. Most of them were getting old, but still there were plenty of young ones, which were quickly gathered for the dinner table, In the same field Elmes Y. Steele, Esq., called attention to another fairy ring of unusual size and completeness, marked out chiefly by a rank growth of grass. It had a diameter of 75 feet, and here and there in the circle a matured specimen of the Puff-ball, *Lycoperdon cœlatum*, seemed to indicate its particular fungus occupant. Whilst these were being examined a shower came on, which soon became a sharp hailstorm, that drove all the naturalists to the shelter of a splondid hawthorn hedge, almost overpoweringly beautiful from the scent of its splendid sprays of blossom. It lasted for some minutes. Let us take the pause to name the other funguses found in the day's walk. A small ring or two of the Fairy Ring fungus, *Marasmius oreades*, which were also called upon to supply their contingent to the dinner table; the edible *A. arvensis;* and the *Agaricus Dryophilus; Coprinus striatus;* and the *Agaricus fascicularis* more abundantly than any, were all that was noticed.

The storm over, the way was taken direct for Mains Wood, a very interesting and promising locality, with an abundance of whortleberry, *Vaccinium myrtilus*, *Calluna vulgaris*, and the hard fern, *Blechnum boreale*. There were many nests of the large wood ant, *Formica fusca*, observed, and owing to the philosophical observation of one gentlemen, that if you disturbed them they gave out the smell of formic acid ; they were stirred up pretty considerably, as one after another made the experiment to his satisfaction. But the underwood was wet, and the ground was wet, and so it came to pass that a rapid passage was made through it to Putley Common. Here a small party of archæologists made a detour to see Putley Church and its quaint old cross. The main body led by Dr. Wood took the prescribed route for the Putley quarry, passing close by a copse with a mistletoe-hazel—a rare occurrence and of high mystical virtue.

The quarry was of the ordinary sandstone, being quarried for the repair of Little Marcle Church, and offered nothing so much worthy of interest as the two men who were there with horses and cart to carry the stones away. Each had lost an arm, the one the right arm and the other the left. If the two arms left between them wanted somewhat in instantaneous unanimity of direction, they certainly stretched further than an ordinary pair, and acted together with a precision and effect which showed they were well accustomed to do so. Leaving the quarry of the one-armed, a direct route was taken for Pixley Church, and here the members of Malvern Club were observed coming along the lane for the same point. A hearty greeting took place, for the appointed trysting spot was a full hour distant both in time and in space.

Pixley Church with its curious roodloft, "like an inverted canoe," as one gentleman observed, was then visited, and the party soon set out for the Wall Hills. The weather had now become bright and cheerful, and as the members in pleasant converse form the straggling line to the camp, we will give the names of the gentlemen representing the Malvern Club. They were the Rev. W. S. Symonds, F.G.S., president of the club ; Edwin Lees, Esq., F.L.S., vice-president ; the Rev. A. J. Douglass, Mathon, honorary secretary ; Captain Serocold ; the Rev. J. H. Thompson ; Colonel Scott, The Eades ; E. J. Stone, Esq., Chambers-court ; Major Roberts ; E. B. Fitton, Esq., Worcester ; the Rev. W. R. Villiers, Torquay ; Dr. J. Griffith Griffiths, hon. sec. to the Worcester Field Club ; the Rev. J. T. Eld, Worcester ; the Rev. W. Calvert, Kentish Town ; J. Edgell, Esq., Tewkesbury ; the Rev. H. Steward ; the Rev. R. Robeson, Forthampton ; J. Greaves, Esq., Malvern ; G. H. Piper, Esq., Malvern ; W. H. Pritchard, Esq. ; Captain Roberts, R.A. ; Mr. Gassion, formerly a member of the Newcastle Club, Malvern ; and Mr. Morris, of Malvern.

In an orchard near Pixley the *Narcissus biflorus* was observed, and on Wall Hills the *Iris fœtidissima*, the *Rhamnus catharticus*, and some fine young specimens of *Equisetum Telmateja* were gathered. The walk from the brow of the first hill along a dingle leading to the camp was especially pleasant, and the beauty of the fresh foliage in the sunshine and shade most agreeable. The sides of the dingle itself were ornamented with some splendid specimens of oak, not of any very great size, but so finely grown as timber trees in height and straightness of stem that they attracted universal admiration. As old Chaucer has said, it was

"A plesaunt grove—
* * * * * *
In which were Okis grete, streight as a line,
Undir the which the grass so freshe of hew
Was newly sprong, ...
Every tree well fro his fellow grew
With braunches brode, ladin with levis new,
That sprongin out agen, the sonnè shene,
Some very rede, and some a glad light grene."

The Floure and the Leafe.

An active member, Dr. Chapman, who had waved his net through the day with much zeal and perseverance, has very kindly provided this report of his success.

The cold wind, with the hailstorm of the morning, were not very favourable to the appearance of much insect life. The few bees that were seen were for the most part at rest on leaves and flowers, several species of our spring *Lepidoptera* were on the wing. *Argynnis Euphrosyne* was seen sunning itself in several dingles by the way, and *Hipparchia Megæra* was also observed. The local *Leucophosia Sinapsis* (the Wood White Butterfly), one of whose head-quarters appears to be in the Ledbury district, was flying in some numbers in several coppices near the Asperton station, where *Adela viridella* and *Micropteryx calthella* basking in the flowers of Ranunculus were also noticed. A specimen of *Heliodes Arbuti*, one of the earliest of the season, was met with by the wayside, and several members were favoured by a view of *Macroglossa stellarum* (the Humming Bird Moth) on the wing. This insect has been rather scarce for several years since its plentiful appearance in 1866, there is some reason to believe that it will not be rare this season, as its larvæ were observed last autumn in several parts of the country. That a fair share of sunshine was accorded us may be gathered from the fact that the President picked up a specimen of the beautiful *Cicindela campestris* (the Green Tiger-beetle) which, however common, rarely shows itself except in the bright sunshine. *Hylesinus Fraxini* was noted, burrowing in ash logs, at many parts of the route, and *Scolytus intricatas* in several oak branches on the Wall Hill. In some branches of fruit trees, near the Wall Hill farm, *Scolytus rugulosus* was found plentifully, this species, hitherto accounted a rarity, is probably abundant wherever the apple is extensively cultivated, and notably therefore in Herefordshire.

A pleasant outwork of the camp overlooking the railway viaduct, the Ledbury Hills, with the Malvern Hills above them, was chosen as the lecture ground—and after waiting some little time for the truant archeological members the following able address without notes was given :—

THE GEOLOGY OF THE DISTRICT.

By the Rev. W. S. SYMONDS, F.G.S., President of the Malvern Club.

He need scarcely remind the geologists present that the range of the Malvern Hills before them represented the oldest rock history of the world on which we live, so far as is known. They were formerly considered to be purely volcanic, but the researches of Sir Roderick Murchison, of Mr. Strickland, and of Dr. Holl, had proved that they consisted in great part of sedimentary rocks, interspersed with very frequent trap or volcanic dykes. When the railway cutting was made through the hills there was often considerable difficulty in making out the exact character of the rocks, which were embedded lavas, and which were real sedimentary rocks. These ancient Gneiss rocks were the oldest sedimentary rocks known, more ancient than the Cambrian system of Sedgwick, and they are now fully recognised as the equivalents to the Laurentian Gneiss rocks of Amercia.

The time at which these ancient beds must have been deposited is so immensely remote as to be beyond calculation. What the distant star was to the astronomer in regard to space, such were these old rocks to the geologist with reference to time. They offered no traces of land or of life. There were no pebbles or conglomerates to tell of currents or land, nor had even a shell been found in them. In America, however, one of these deep ocean deposits had been found to contain foraminiferous shells, which are allied to some which are now found in the Pacific ocean. These are the earliest records of life to be found. These old Laurentian gneiss rocks were succeeded by the Cambrians, and here animal remains became more abundant,—zoophites and worm tubes, and an occasional trilobite. Above the Cambrian came the Lower Silurian rocks, plentiful in the records of the lower animals, which lived in those ancient seas ; many species of beautifully preserved *Trilobites*, allied to the lobsters of our own age, and still more closely to the King crab existing in the present seas.

One point of the Malvern Hills was peculiarly interesting. It was impossible for any geologist to stand in that valley just over the ridge of the hill, the Valley of the White-leaved Oak, without feeling convinced that he is standing near the site of an ancient volcano. And the more he studies the rocks around him the more sure he will become of the fact ; for he finds beds of pumice and scoriæ, interbedded with sedimentary rocks of *shale*, and recognises the proofs that it was an island volcano with a deep surrounding sea—a volcano that showed the intermittant action of the volcanos of the present day—that vomited forth its streams of lava and threw up its scoriæ at periods of time so distant from each other that sedimentary accumulations in the surrounding ocean had become deposited between them.

Then came the Upper Silurian Rocks, abounding in the remains of marine animals ; indeed, in some of their limestones it was scarcely possible to break off a portion without finding some shell or fossil denoting the existence of life. All these beds presented evidence of having been formed beneath the sea ; and if he was asked to point out the first traces of land, the first plant that bloomed upon the shore, or the first animal that lived on the land, he must admit that there was no such evidence in rocks beneath the Wenlock limestone. In the Upper Ludlow *Bonebed* some small bodies had been found, which had been carefully examined by the most celebrated botanists, and pronounced to be the humble seeds of a humble plant, the seed of a club moss, or *Lycopodium*, closely allied to the common *sphagnum*, or club moss of our hills. These seeds gave the first real proof of dry land. The first evidence of fishes appeared in the Upper Ludlow Rocks, which Mr. Lightbody, of Ludlow, had done so much to elucidate ; and the *Pteraspis* found by Mr. Lee, of Caerleon, in the Lower Ludlow rocks, presented the very first evidence of fish life as yet found. It was a great gratifica-tion to him to see both Mr. Lee and Mr. Lightbody out in the field that day (applause).

Above the Upper Silurian Rocks came the Old Red Sandstone, upon which we were now standing. The transition was gradual, and without any signs of earthquake, action, or convulsion. Here is evidence of existing fishes of a very peculiar kind, and sometimes in great abundance, not like our modern fishes, but fishes with external plates ; cartiliginous fishes, with armour, of which one representative in our day is the pike with bony scales which is found in the great lakes of NorthAmerica. All the fishes of the Old Red Sandstone had this character, and belonged to the Ganoid class. Now it was curious to observe that all the Ganoid fishes known at the present time, and there are upwards of 100 varieties, all more or less fresh water fishes, which would seem to imply that these Old Red Sandstone beds were the deposit of lakes. Marine shells mixed with the remains of fresh water fishes, as in Devonshire, might, of course, be explained by the connection of the lakes with a neighbouring sea. Hugh Miller had very graphically described the fishes of the Old Red beds in Scotland, and now it was most interesting to know that undoubted remains of a *Pteraspis* had been found in the Old Red Sandstone of Devonshire. Of the Denudation of the Old Red Sandstone in Herefordshire, much might be said if time permitted. The remains of the rocks which are the summit of the Old Red Sandstone could still be seen *in situ* on the Black Mountains—but from the surface of Herefordshire these beds had been swept off by the currents of preglacial and glacial seas. Denudation offered a wide field of study to geologists. Whilst the rocks of softer structure were swept away, the harder ones were left and gave beauty of outline to the sylvan scene. The charming undulations of Herefordshire are chiefly due to the presence of cornstone protecting the Old Red Sandstone from denudation and thus leaving our fine rounded hills. The elevation on which they now stood was due to the hard cornstone which protected it, and which is quarried at the back of the hill. The lecturer finished his very eloquent and interesting address by calling on the members of the Clubs to study well the Geological landmarks about them, and trace from them as they always might, the wonderful effects that had been produced by the action of marine currents acting upon the old sea beds as they rose to the surface, and by the various forces of subaerial agencies, rain, rivers, frost, snow, and land ice which in preglacial, glacial, and postglacial times combined to form the existing contour of the land now inhabited by beings capable of reasoning on the marvels of its structure.

The lecturer was much applauded.

EDWIN LEES, Esq., F.L.S., then gave the following—

REMARKS UPON THE ENTRENCHMENT OF THE WALL HILLS, NEAR LEDBURY.

BY EDWIN LEES, F.L.S., F.G.S., &c.

From the sublimities of geological research and the depositions of ages past, almost too remote for imagination to contemplate, it seems a revulsion from the grand to the insignificant to turn to the petty relics left by savage tribes upon the ground they once occupied. Milton has stated that any account of the turmoils and contentions of barbarous tribes in remote times was little better than would be a history of the quarrelling of kites and crows,or the snarling of the wild beasts of the forest. But if the indistinct markings left in the sand of a former seashore by marine-worms, or the ripple-marks in stony strata of tides that have ceased to flow, though once mighty in their actions, are seized upon by geologists in proof of palæozoic life, where all is now dead and petrified, so the Archæologist is entitled to look with interest on those notches in the soil which mark the treads of human feet in times when the pen of history had not commenced its chronicles. Even conjecture is almost at fault when adverting to

"Antient times so long forgot,
Of feuds whose memory is not;
To manners long since changed and gone,
And chiefs who under the grey stone
So long have slept, that fickle fame
Has blotted from her scroll their name."

The geologist looks upon the materials of the hills before they rose into their present shape, and the antiquary marks the hills with equal curiosity, as he sees there traces of the first labours of man in community, whether the trenches on the uplands were formed for protection from wild animals, who then held the supremacy ot the country, or whether tribes hostile to each other defended the ground against pillage and outrage.

In every country abandoned mounds and trenches meet the eye and awake the curiosity of the investigator. The term Camp or Castrametation, has generally been applied to the fosses and terraces marked upon hill sides, though, in all cases, these defences were not strictly formed as military positions for armed soldiery. Perhaps the majority were made for military purposes, as, in ancient times, no army felt itself secure without a defensive ditch, however short their intended occupation; while many of these systems of fosse and vallum encompassing heights were occupied as permanent fortresses. Where there are several entrenchments succeeding each other, it is clear that the defences were of the nature of a military fortress, especially where a prætorium or citadel appears, and where the inner trenches might still be maintained, if the outer ones were taken. The single fosse might imply a less permanent occupation, or it might surround the habitations of a town, which usually had a ditch and a rampart behind it.

If man commenced a savage life in isolated families, we may believe that rude stone implements for domestic purposes are of earlier date than fortifications, which indicate the existence of associated tribes. I do not, therefore, claim for these Wall Hill trenches any extraordinary remote antiquity, nor do I connect them with military tactics or strategic positions. The name Wall Hills, too, may be some guide to our deductions, as at all events bringing down the occupation of the place to Saxon times, however long the spot may have been inhabited previously.

It required a considerable time for the Saxon invaders to obtain permanent occupation of what we now call England, and the counties bordering on Wales were not easily subdued, the tide of conquest rolling on and receding from time to time. Borlase and other writers on British affairs have distinctly stated that the Welsh were not entirely driven from the country between the rivers Severn and Wye which includes a great part of Herefordshire, until the reign of King Athelstan, between the years 924 and 939. It is necessary to bear this in mind, as proving that the native population had their dwellings in the country and their particular haunts up to the tenth century. These towns and villages would be known to the Saxon invaders, and they would designate them in the same way as the residence of men inimical to them, In the absence of relics of tools, weapons, or coins, the archæologist in some instances is reduced to conjecture as to the nature of the earthworks before him, and the people who occupied them. But it is remarkable that the Roman soldiery were so well supplied with coin, that in every camp they occupied they have left money behind them as if carelessly scattered about, a fact that Mr Wright observes is difficult to explain. But this was not so in the British posts where coin was a scarce article, and even weapons, too valuable to be abandoned, unless in death.

I therefore believe this to have been a British post, and the site rather of a town than of an exact military position; for every town of permanent occupation would have a surrounding trench. Julius Cæsar tell us in his Commentaries, that "the Britons call by the name of town a place in the fastnesses of the woods surrounded by a mound and trench, and calculated to afford them a retreat and protection from hostile invasion." A place like this, rather secluded than strong, seems well enough to agree with Cæsar's statement.

But without absolutely insisting that we have here the site of British or Silurian town of ante-Roman age, I am inclined to believe that the name of Wall Hills given to it points out that it was occupied by the natives of the country up to the time of the latest Saxon invasion, and until the Saxons obtained permanent possession of Herefordshire.

Borlase, the Cornish antiquary, says that "when the Saxons had driven the Britons before them into the extremities of the country, they called one place of their retreat WEALAS or WALES, either from their being strangers to them, or from their supposed descent from and resemblance to the Gauls. The other place to which the Britons retired they called CORN-WEALAS. The origin of the name Wales is here evident, for the Saxons did not call the natives they dispossessed Britons as the Romans did, but gave them the appellation of *Waal*, which, whether a corruption of Gaul or not, meant with them *strangers.* These *Waal* or *Wall* Hills then were so called not from the walls upon them, but from the people who there had their habitations. This appears highly probable when we find these *Waal* Hills chiefly if not entirely *on the Welsh confines*, where, of course, the natives would linger longest. Besides the *Wall Hills* before us, there is a Wall Hills near Thornbury, Wall Hill near Orleton, Herefordshire, Wall Hill at Suckley, Wall Hill at Alfrick, and another at Eastham—these last in West Worcestershire—and there is also Walls-field at Cradley, Wall-batch in Grimley, and Wall-ford near Goodrich. Coxwall Knoll in Radnorshire may supply another, and more might be enumerated.

It is but candid in me to say that my friend Mr. Flavell Edmunds, a member of this Club, with whom I have often had a friendly fight, and whose researches in archæology and etymological derivations entitle his opinions to great respect, differs with me as to this particular Walls Hill entrenchment, and to my idea as to Wall Hills in general. He considers this fortification to be one that was occupied and defended in post-Roman times by the Welsh against the Saxons; while the word *wall* he thinks was used by the Britons to indicate Roman works, and was derived from the Latin *vallum.* The word *gwawl*, he says, was used by the Britons to denote Roman works, and the great wall of Severus was called by them *Gwawl Severus.* He also adduces Walls-End and other places that no doubt had reference to actual walls. The war of words need not much trouble us, and mere sounds are often very uncertain. My friend invites me to run my head against a wall *literally;* but I decline to do so, and with the utmost courtesy *give him the wall!* The enquiry is not what the Britons called the Roman works, which might be *gaul* as Camden says, or *gwaul* according to Mr. Edmunds, but what term was applied by the Saxons to the Romano-Britons, and their positions. Borlase, Wright, and all who have studied the subject, admit that the terms Welsh and Wales are derivations of a Teutonic appellation that meant foreigners—not of the Saxon race. If then the people and the country of their refuge were *Wealas*, or *Waalas* (the latter latinized, as Borlase says, into *Guallia*), surely the last refuge of the demoralized natives on their wooded hills, where perhaps by sufferance they long remained even after the fertile vallies were settled and cultivated, might very properly be referred to as the *Waal* or *Wall Hills*,—eminences surrounded by woods and thickets, where the last relics of a degraded population clung to a miserable life as long as they could pick up a subsistence, or till their stern oppressors in their greed for land finally seized upon the last unappropriated acres that remained to the disinherited sons of the soil. This no doubt is the reason that the name given by the Britons themselves to the place is lost, as the Saxons, after occupying the country, would be as indifferent to the native appellation as we should be to a spot where a camp of gipsies had taken up their abode, and would only call it *Waal*, or *Welsh hill.*

Mr. Allies, author of the "Antiquities and Folk-Lore of Worcestershire," has mentioned what he calls "the *camp* at Wall Hills, which contains an area of near thirty acres, and is supposed to have been originally British, and subsequently occupied as a Roman station." I know of no valid ground for the latter assertion, and it is opposed to the supposition of Mr. Edmunds that it was a camp of late construction, used as a defence against the Anglian invaders, perhaps as late as Athelstan's time. But I would ask, after the great fortress of the Herefordshire Beacon was taken, what defence is it likely the Wall Hills could make? It must surrender to an advancing army as a matter of course; but as a mere collection of huts, and not a military post, it may have been tolerated by the Saxons for some time after the conquest of the country.

MR. EDMUNDS'S REPLY.

Being unable to attend the society's meeting at Ledbury, and therefore prevented from answering *vivâ voce* the friendly challenge of my esteemed brother antiquary, of which he had considerately forewarned me, I am obliged to make my rejoinder with the pen.

To my friend's general remarks I have nothing to except. It is, as I think, perfectly correct to say that the phrase Wall Hills "brings down the occupation of the place to Saxon times," although it seems to me that it is possible to fix somewhat more closely the period when that occupation commenced. I think, too, that this more precise knowledge of the time is to be found by pursuing a line of investigation which my friend has treated as Juno did Samos:

Post habitâ coluisse Samo.

I would solemnly warn my friend that the *læsa majestas* in all such cases exacts its own revenge. If some doughty Romano-Briton, borne down by the hard fortune of war nine centuries ago, should rise upon my friend's slumbers angrily demanding why his toils in warfare and his more or less glorious death in defending the Wall Hills are denied even empty fame—altogether passed over by the cruel antiquary who, like the fierce Athelstan, has made a wild raid upon us men of the Marches, now as then the most peaceful people under the sun when let alone, he knows to what cause to attribute the awful vision. He knows, too, why I, as a humble champion of our beautiful Siluria, now do not scruple to run tilt at the doughty Paladin of Wigornia.

In plainer words, I suspect my friend's etymology has gone astray, and has carried off his topography on its back. My objections to his theory are manifold—negative as well as positive.

First, I think that he has quite overlooked the evidence of Roman ideas in the construction of Wall Hills camp. That castrametation, although simpler in form than Risbury and Capler, not to mention the elaborate entrenchment on the Herefordshire Beacon, is yet manifestly constructed on a Roman plan, of which the right angle is the basis, and is of definite proportions, the length being to the breadth as 3 to 1. The pool at the N.E. end for water, and the fact that the site is so chosen as to allow its defenders to communicate by signal with the Herefordshire Beacon on the one hand and with the Roman station at Circutio on the other, are also manifest indications that it belonged to a time when the Beacon heights were defended although the Roman station was still standing. That there ever was a British town here is wholly unproved. Wherever it is certain that British towns existed, we find their names still preserved more or less purely. Here there is none, and the inference is that there never was any such town, although it may nevertheless have been, as my friend thinks, "occupied" as a camp "up to the time of the latter Saxon invasion."

Secondly, if we leave topography for etymology we are led to the same result. The name, Wall Hills, is compounded of two words, only the latter of which is undoubtedly Saxon, and as that is the generic term, and one of frequent occurrence, nothing can be drawn from its use except that the Saxons became at some time possessed of the hills, upon which they found "walls." The inquiry must turn upon the specific word in the name, which is *wall.* I think it will be found that this word always points out a site on or near to a Roman work, whether a fortification or the road which that fortification is meant to command. Wall's End (Northumberland), is the end of the wall of Severus. Wal-ford (Hereford), Bower Walls (near Bristol), Wall Hills (near Thornbury), and those which my friend cites, at Suckley, Cradley, Alfrick, Eastham, Orleton, &c., are all situated near Roman camps or roads. If the word were Saxon, we ought to find it most commonly in the Saxon districts, and not, as my friend himself remarks, most frequently in the very strongly British district of Herefordshire, and the frontier Angle and Wiccii land of West Worcestershire. Yet I know of no single example in Wessex to set against the many in the marches.

3. I derive the word *wall* through the Britons from *vallum.* It should be remembered that the Romans came first in contact with the Belgæ of S.E. England, whose posterity (the cockneys) still sound the *v* as *w.* This may not have been a blunder in Roman times. I find the Romans, when adapting into their tongue British words commencing with *gw*—which according to rule in some cases drops its initial—representing the *w* by a *v.* Thus Gwrtheyrn and Gwrthefyr appear in Latin as Vortigern and Vortimer.

The proper Saxon word is *dic*, or (as now spelt) dike, which is still used in Yorkshire and in lowland Scotland to mean a stone wall.

4. My case is greatly strengthened by the fact that the Britons actually used their word *gwawl*, meaning first a trench and afterwards a wall, to designate Roman fortifications. "Gwawl Severus" was their name for the wall of Severus, the Eastern end of which is still known as Wall's-End. An ancient British poet (cited by Richards) speaks of it as

Rhag gwerin gythrawl, gwawl fain.

Conspicuous against the people (i.e. the Picts), a stone wall.

5. Cornwall is no doubt from Corn wealas, i.e., the strangers' promontory or horn-shaped land; but the Latin Gwallia is a corrupt spelling; it should be Gwalia, the middle *a* being long, with only one *l*. The word is, indeed, altogether doubtful Latin, of monkish manufacture, a mere Latinising of the Saxon word *Waela* or *Weala*, which originally meant the British inhabitants of Wessex, but was afterwards extended to the Britons of the mountains, and finally was applied to the mountain land itself.

To sum up, I look upon the Wall Hills as one of the chain of *late* British fortifications, constructed near the Roman road from Magna eastward, as a defence against the Anglian invaders, or perhaps even as late as Athelstan's time. Not only has the camp no British name, but there is not a single British-named place within some miles. Hill and dale alike all round it are thoroughly Saxon in name. All which facts are intelligible only on the theory that this was a camp of late construction, captured probably almost as soon as made, as my friend has shown to be in brief the history of the Herefordshire Beacon camp

Then followed a short paper on

THE MISTLETOE-OAK OF DEERFOLD FOREST.

Quercus Sessiliflora—Viscum album, fæm:

This very interesting tree grows in the hedgerow of a field called "The Harps," at Haven, in the ancient forest of Deerfold, on the property of the Messrs. Fortey. It was discovered about 3 months since, but the Mistletoe must have been growing upon it for some years. At five feet from the ground the girth of the Oak is 5ft. 8in. The Mistletoe grows in one large wide-spreading branch, with a diameter of 3ft. 6in., though it springs out from the Oak by only a single stem, nearly 4in. in circumference. This tree makes the eighth example of an Oak bearing Mistletoe.

(This Sketch is drawn from an excellent Photograph taken by Henry Moore, Esq., of Leominster.)

REMARKABLE PLANTS IN DEERFOLD FOREST.

By Dr. BULL.

Dr. Bull then said that he had recently had the pleasure of visiting a very out of the way part of Herefordshire, the ancient Forest of Deerfold, and he had the satisfaction to call their attention to some remarkable plants he observed there. He would first mention

THE MISTLETOE-OAK, OF DEERFOLD FOREST.

This very interesting tree grows in the hedgerow of a field called "The Harps" at Haven, Aymestry, in the ancient Forest of Deerfold, on the property of the Messrs. Fortey. It was discovered about three months since, but the mistletoe must have been growing upon the oak for some years. The oak is of the variety *sessiliflora* and may be some 50 or 60 years old. At 5 feet from the ground it measures 5 feet 8 inches in girth. The mistletoe, *viscum album, fœm,* grows high up in the oak on the main stem of the tree after it has bifurcated. It forms a large wide spreading bunch with a diameter of 3 feet 6 inches, and springs out from the oak in a single stem nearly 4 inches in circumference.

The mistletoe is also growing on a thorn in the hedge immediately below the bunch in the oak and has probably sprung from a seed dropped by the birds from above. The great rarity of the growth of mistletoe on the oak is proved by the fact that there are but eight examples, which have been well authenticated, as existing at the present time. They are as follows :—

THE LIST OF EXISTING MISTLETOE-OAKS.

Eastnor Park, Herefordshire,
Tedstone Delamere, Herefordshire,
The Forest of Deerfold, Herefordshire,
Frampton-on-Severn, Gloucestershire,
Sudbury Park, Chepstow, Monmouthshire,
Burningfold farm, Dunsfold, Surrey,
Hackwood Park, Basingstoke, Hampshire,
And on an oak near Plymouth.

Full particulars have already been given in the Transactions of the Club of all these mistletoe-oaks. He would therefore pass on at once to call their attention to another rare plant of the Forest of Deerfold, and that was

THE ASARUM EUROPŒUM.—*Linn.*

THE ASARABACCA,

One of the Natural Order *Aristolochiæ.* It was not only new to Herefordshire, but was only to be found in four other places in England and in one in Scotland. It grew upon a hedgebank, amongst the old roots of thorns and brambles, in the Forest of Deerfold and in the parish of Wigmore, for thirty or forty yards. It was in a thoroughly wild state, and far removed from any cottage or other habitation, nor, he was assured, was the plant to be found growing in any of the gardens of the neighbourhood.

The Asarabacca was a plant with considerable medical properties, and until quite recently held its place in the Pharmacopœias. It is emetic and purgative, and used as Ipecacuanha would be used. The plant had, as they might know, but a couple of leaves, somewhat resembling the human ear in shape and size. Now, in the fourteenth and fifteenth centuries, the absurd belief in the doctrine of "signatures" prevailed—that is, the belief that all natural productions indicated by some external mark the diseases in which they are efficacious; and thus the Asarabacca was used in all affections of the ear—as the scarlet poppy was for erysipelas, the yellow juiced celadine for jaundice, the mottled lungwort for diseases of the lungs, the knotted figwort for scrofulous swellings, &c., &c. Its latest medical use, however, was as a snuff with marjorum and lavender, and of which it formed an active ingredient. The great renown of this plant for its medical virtues from the earliest times has always led to the suspicion of its having been introduced into the few localities in which it is known, and from the fact of there having been a chantry in the Forest of Deerfold, in the fourteenth century, it is possible that "William the Hermit," as the recluse was called who lived here, introduced it into the Forest.

THE JUNIPERUS COMMUNIS.

Common juniper also grows very freely on the eastern side of the Forest, and this was not a common plant in Herefordshire.

Dr. Bull added that so few people knew there ever was a Forest of Deerfold in this county, that he hoped at a future meeting to be able to tell them something about it (applause).

The descent from the Camp was now made in the direction of Ledbury, through the elm-studded meadows of the Leadon to the Feathers Hotel. Dinner was made very welcome by the long walk, and it was well provided. "Were the funguses eaten" does any stranger ask. They were, every one of them. Forty-seven guests at the table out of fifty-two partook of them with much satisfaction, a per centage of honest inquiry quite cheering to observe. It shows how rapidly prejudice is giving way in the clubs at any rate. Was the St. George's mushroom, *Agaricus gambosus*, the best? or the Fairy-ring mushroom, the *Marasmius oreades?* or the *Agaricus arvensis*, the horse mushroom? Some thought one, and some the other, and so opinions will ever vary, for each has its own peculiar flavour, and different kinds of fungus will vary as much as different kinds of other vegetables or fruits.

Immediately after dinner, and the few complimentary observations deemed necessary to the occasion, an excellent paper was read by Captain Serocold, of the Malvern Club, on "THE COMPARATIVE FLORA OF NORTHERN EUROPE AND NORTHERN AMERICA INCLUDING ICELAND," which will be published at full length in the Transactions of the Malvern Club.

This was followed by one of much thought, read by Mr. Rankin, the President of the Woolhope Club.

ON THE DISTRIBUTION OF ANIMALS,

By JAMES RANKIN, Esq., M.A., President.

The subject of this paper, though one of very great and general interest, has been selected chiefly with a view to elucidate and try how that great question of the Origin of Species may be affected by the facts learnt from a study of the Distribution of the living and also of the extinct species of animals.

It will hardly be necessary to state that in a short paper like the present it will be impossible to do more than give a *resumé* of some of the leading facts in the distribution of animals, and I therefore have considered that the subject will be best treated by endeavouring to answer two or three great questions bearing, as will be perceived, on the subject of the Origin of Species.

The first question I propose to consider is, "Whether the facts of the Distribution of animals lead us to believe in the creation of species or groups of animals in centres and subsequent migration therefrom; or do they lead us to believe in sporadic creations, that is, in the same species being created in various parts of the world?"

The first thing which will strike any one studying the facts of Distribution is, I think, that the Fauna of each country is more or less peculiar; and more than this, that the more separated are the countries by natural barriers the more different are their animal productions.

We also find that wide areas if unbroken by any serious obstacle to migration have many species in common, whereas islands and isolated regions on the main land have a very limited and also usually a very peculiar fauna. To establish the above propositions I need only point to the tropical regions of South America, Africa, and Australia—countries most widely separated by the most impassable of all barriers to land animals, namely, the sea. On these three areas there is not one species of mammal in common, not one species of bird in common. Amongst reptiles also the difference is remarkable: thus the cayman is peculiar to the new world, the crocodile to Africa, and the gavial to India and Australia; the boa belongs to America and the python to India, the rattlesnake to America and the cerastis to Africa, and the cobra di capello to Asia. Amongst fishes, molluscs, and other classes, we find the same rule of limited Distribution hold good, though perhaps in a less degree. Again, looking at islands, we find several remarkable instances of peculiarity of fauna.

Thus the island of Madagascar alone presents us with the genus lemur, and has, I believe, no species of mammal but the centetes, which is not peculiar to it.

In the same way the Galapagos isles, Australia, and the islands of the Eastern Archipelago have, more or less, faunas peculiar to each. It should be noticed with reference to island faunas that the species inhabiting them are nearly always allied to those which inhabit the nearest mainland.

Glancing now at other portions of the world which are to a great extent continuous; we find no very noticeable breaks in specific forms, nor any sudden appearances of numerous new species, but that gradually one by one the species give way to other species. This is especially striking while travelling north or south, but is also observable, though in a much less degree, going east or west. This is, of course, easily comprehended, as we know that latitude has a far greater effect upon climate than longitude.

It is also remarkable that as we approach the poles, we find that the same species have frequently a very wide lateral range. This, of course, is more observable in the case of the north pole than the south pole; but aquatic animals such as seals and penguins are found to prove the rule in the south.

It should be carefully observed in studying the facts of distribution that the same conditions of life, that is the same climate, same kind of food, &c., do not at all ensure the presence of the same species of animals.

Thus the climate and conditions of life of the tropical regions of America and Africa are very similar, but the natural productions are wholly dissimilar. Also the same may be said of Africa and Madagascar; and perhaps the most striking case of all is that of the islands of the Malayan Archipelago. The researches of Mr. A. Wallace have brought to light the interesting character of the faunas of these isles, and the great peculiarity of their distribution.

He found the greatest contrast between the faunas of some of the islands though only separated by a narrow strait. Thus between the islands of Bali and Lomboc the strait is only 15 miles wide, and yet these two islands have hardly a mammal or bird in common. In Bali are found woodpeckers, fruit thrushes, and other birds belonging to Asia; in Lomboc none of these are known, but in their place cockatoos, honey-suckers, and brush turkies, which are all unknown west of Lomboc, and are characteristic features of the Australian Fauna. In the same way a striking difference is observable between the faunas of Borneo and the Celebes, which are divided by the Macassar Straits. In the former are found the large apes and monkeys of many kinds, wild cats, deer, otters, and squirrels; in the latter the cuscus, wild pigs, and deer, which latter Mr. Wallace says have been probably introduced.

These facts strike one as most incomprehensible until it is known that the seas which separate the Malayan Peninsula, Sumatra, Java, and Bali, are comparatively shallow seas, rarely exceeding 40 fathoms in depth, whereas the straits between Bali and Lomboc are very deep, as are also the Macassar Straits between Borneo and Celebes.

As all this region is highly volcanic with the exception of Borneo and New Guinea, it is highly probable that at some period or other the islands of Sumatra, Java, and Bali, were severed from the main land, bearing with them of course some of their original fauna, which would be of Asiatic character; and on the other hand the eastern islands, beginning with Lomboc and the Celebes, have probably had some connexion with New Guinea or Australia, though in all probability their relationship to each other is immensely more remote than that between the isles of Sumatra, Java, and Malay.

These facts, viz., the dissimilarity of the faunas of widely-separated countries, though perhaps of the same climate and conditions, the peculiarity of island faunas, and yet their evident relationship to the nearest mainland, or at any rate to the mainland with which they were originally connected; and the fact that those most isolated in space or time, have the most differentiated or peculiar faunas,—These facts, I say, seem to me to point clearly to centres of creation, with subsequent migration and concomitant modification.

It is, of course, impossible to say where the original centres of creation were, and how many of them there may have been. The theory of Mr. Darwin would limit the number almost to a single pair. Without going as far as that, I cannot help thinking that the number of centres was less numerous by far than the existing number of species; possibly they might bear some relation to the great families, such as the Felidæ, the Equidæ, and the Cervidæ; but this is an idea which at present I am not able to elucidate.

The great difficulties to be overcome in accepting the view of a limited number of centres of creation are the difficulty of migration, and the difficulty of modification to the extent necessary.

With regard to the latter of these difficulties, I think the example of the domestic animals, the varieties of which are almost certainly known to have proceeded from a single species is sufficient to prove that an immense amount of variation is capable of being produced in some animals, at least, by altered circumstances and careful selection, at any rate as far as regards such characters as size, colour, prolificacy, and many others more or less of a superficial nature.

Granting this, which can hardly be denied, that in most animals there is a certain amount of inherent variation which can be brought out by altered conditions of life, there is no insuperable difficulty in believing that the species of some natural family may have all proceeded from some common progenitor; further than that it is not prudent, I think, to go.

The other difficulty that of migration will be a legitimate topic to say a few words upon in this paper.

If we concede what I for one am inclined to do, that the centres of creative action were less numerous than the existing species now on the face of the earth, it will be necessary to show how migration to all the inhabited parts of the world may have been effected.

With regard to the diffusion of the lowest classes of life, namely, those sub-kingdoms Cœlenterata or Polyps, and Protozoa which contains the Sponges and Infusorial Animalcules and the Foraminifera, it easy to understand how their diffusion may have been effected.

In these low grades of animal life, the spores are nearly always at some period of their life free ciliated bodies swimming about in the water, and carried to and fro by currents. At that period of their development, when they assume a fixed habit of life—as is the case with many of the corals and Medusæ—they attach themselves to the most convenient body they may happen to come into contact with, generally speaking a rock under water, and there they flourish, and soon become a fresh colony. Of course it is necessary for the climatal conditions to be such as are favourable to the animal before it can live in its new situation.

Although the means of distribution of these lower animals are so perfect, yet, nevertheless, the same general rule of peculiarity of distribution applies to them as well as to the higher forms of life, though in a far less degree. Thus we find that a natural barrier, such as an isthmus between two seas has the same effect on the distribution of aquatic animals, as a strait has on land animals; as an example of this, none better, I believe, can be found than that of the Isthmus of Suez, separating the Mediterranean Sea from the Red Sea.

Although the conditions of life on both sides of this isthmus are much the same, yet, according to Ehrenberg, out of 120 species of Anthozoa (corals, &c.), there are only two species common to both seas.

It should be remarked also that in these low classes, as in the higher, those forms which have the greatest powers of locomotion, and also those forms which, from their inhabiting the depths of the ocean, can get a very uniform temperature everywhere, are the most widely diffused. In support of the first of these statements I may adduce the case of the Sertularidæ, and of the Hydridæ, and of the class Infusoria, all of which include animals of very perfect means of locomotion and of almost universal distribution. In support of the second statement no better example can be found than the Foraminifera. These animals, which are little else besides living jelly, inhabiting however very beautifully formed shells, live at the bottom of the sea, where the temperature is very much the same all over the world, and hence they are not much affected by the obstacle of climate, and accordingly they are found nearly everywhere; one genus especially, namely, Globigerina, being almost cosmopolitan. To the geologist they are a singularly interesting group, as their calcareous shells go to form great mountain ranges called Nummulitic Formations.

These rocks are found of many thousand feet of thickness in the Alps and the Carpathians, in Algeria and Morocco, also in Egpyt, and as far as the frontiers of China, showing that these animals had as extensive a range in geological periods as at present. These Nummulitic formations are usually referred to the Middle-Eocene.

There is good reason for thinking that a deposit of Foraminifera is going on at at present in the North Atlantic.

Passing on now to consider the means of distribution of the mollusca (*i.e.*, shellfish, &c.), we find that here also a somewhat similar device exists as among the two lower sub-kingdoms; for very frequently the young fry or larvæ are furnished with cilia with which they can row themselves about.

More commonly than not the eggs of the mollusca are laid in clusters on bits of stick, or on seaweed, and, in the case of fresh water species, on the leaves of aquatic plants. These often get carried by currents and floods to great distances, where the eggs are hatched, and thus new regions may be peopled. Many of the mollusca are free swimmers all their lives, such as the Cephalopoda and Pteropoda, and nothing but the temperature of the water exists to prevent their universal diffusion.

Another class of molluscs, many of which float about free in the sea, sometimes in colonies and sometimes as single individuals, is the Ascidiæida.

In many other ways, no doubt, can the diffusion of molluscs be accounted for ; and, in the case of fresh-water species, wading birds perform no small part. The eggs get attached to the feathers or the feet of the bird, and are carried by it often long distances. Some of the species of the helix or snail have a very wide range, and most probably were diffused by the agency of birds.

In this sub-kingdom we can observe, as before, that natural barriers separate faunas ; for instance, the molluscs on the east and west sides of the Isthmus of Panama are said to be quite distinct. Again, a different kind of sea bottom is a barrier to some species ; thus the mytilus or mussel requires rocks, the solen or razor-shell requires sand.

These few cases out of many must suffice to show that, although the means ot diffusion of molluscs are very ample, yet they also follow the general law of peculiarity of distribution, though generally speaking the species of this sub-kingdom have a wide range.

On account of these differences in distribution, zoologists have been able to define several provinces distinguished by their different molluscs.

We must now take a rapid glance at the means of the distribution of the sub-kingdom Annulosa. This sub-kingdom comprises the classes of crustaceans—spiders, insects, myriapods, worms, intestinal worms or parasites, and echinoderms or star-fish.

In this sub-kingdom we have examples of both terrestrial and aquatic animals. Amongst the former are the spiders, insects, and earth-worms ; and amongst the latter the crustaceans, most ringed worms, the star-fishes, &c.

In the aquatic classes the young larvæ are, with hardly an exception, free and able to roam about the water at pleasure, and in the vast majority of instances the adult forms have the power of locomotion.

These animals are found nearly all over the world, though many species, or perhaps varieties, are very local, and, as we saw with regard to some shell-fish, they also require peculiar conditions of life, such as depth of water, amount of salt in the water, kind of sea-bottom, and above all degree of temperature.

Amongst the terrestrial animals of this sub-kingdom are found some curious and interesting cases of distribution.

Although in the insect class the locomotive powers of the adult form are very well developed as a rule, yet these animals are not very wide rangers, and species are generally somewhat local, carrying out the rule which we have already seen to obtain in the other classes of animal life.

With regard to the diffusion of insects, no doubt migration plays a very considerable part; for although the majority of insects are not migratory, yet when their numbers increase to any great extent, from some cause or other, they are known to migrate in enormeus numbers.

This has been known to occur with some butterflies *(Vanessa Cardui)*, and with many kinds of *Orthoptera*. Involuntary migration caused by strong winds has frequently been known to occur, and insects have been met with far out at sea carried by the wind.

Floods of rivers also carrying away plants with insects on them are another means of dispersal. Few animals are so dependent on temperature as insects, and accordingly it is found that a lofty range of snow-clad mountains is a more effective barrier against diffusion than a wide expanse of water; as a proof of this, entomologists inform us that the species of insects on the West and East sides of the Andes in South America are mostly distinct. Another effective means of diffusal is by the eggs of insects being carried off in the wool, hair, or feathers of the vertebrate animals, and also in their stomachs, for they are often able to resist the digestive action of the gastric juice.

Such being the ample means of dispersal afforded to the insect class, it is only surprising that their distribution should not be more general, but these instances seem to me to strengthen the belief in centres of creation, and radiation therefrom by natural means.

A most curious instance of an insect confined to a narrow locality is the tsetse fly of South Africa.

With this brief notice of the invertebrate classes I must pass on to the vertebrate, which for our present purpose are more important because better known.

In the Vertebrate Classes, namely, the mammals, birds, reptiles, and fishes, the locomotive powers of the adult are in most cases so perfect that migration can be easily effected, so long as no insuperable barrier occurs to prevent further progress. The barriers which chiefly obstruct the paths of Terrestrial Vertebrates are the sea, rivers, high mountains, and generally differences of climate; and with the aquatic are the land and the temperature of the water.

I have already indicated that the distribution of Vertebrate Species is generally very local, and that the more remote are two countries, the more different are their respective faunas, and that although the conditions of life are often almost the same, yet the faunas of remote areas differ from one another; also that continuous or unbroken areas have a community of species. These facts seem to point to a natural dispersal or migration from a common centre or centres, and therefore it behoves those who wish to establish the above conclusions to be able to point out the means of the general and usual migration of animals, and to give some sort of explanation of the apparent exceptions to the rules before stated.

If the view that each existing species was a separate centre, be adopted the difficulties of explanation are not so great, for hardly a case occurs in the animal kingdom of the same species (so called) being common to two distant and widely separated countries, without admitting of some easy explanation; but if the view that creative centres were less numerous than the so called species, which view seems to me most probable, be taken, then the difficulties are much more formidable, for it becomes necessary to show how migration may have been effected from fewer points or centres.

Thus we see that not only species (so called), but also in those parts of the world where free communication is difficult, or next to impossible for land animals, families or genera are for the most part distinct. This fact, to my comprehension, strongly supports the theory of creative centres.

But it will be said how can the presence of animals ot the *same* family, in these distant lands, be explained on the theory of centres of creation? This, no doubt, is the greatest difficulty to the belief, and to this subject I propose to devote a few words in concluding this paper, already too long.

Now some natural families are found to be represented in nearly every quarter of the globe, although the species in different parts may be extinct; thus for example, the family, or Linnean Genus, Felis has its representatives both in South America and in South Africa, though the species are different, as also the Genus Ursus, Cervus Lutra (otter), Canis (dog), Vespertilio (bat), and some others.

In reviewing the number of natural families which are common to both hemispheres, it should be especially remarked that the Arctic circle possesses several common families in both Asia and America, and indeed many species, for Canis Lagopus, Ursus Maritimus, and Cervus Tarandus, are found throughout the Polar circle, not to mention Marine Mammalia.

Taking a survey of the temperate regions of both hemispheres, we find a few species common to both (*e. g.*, Mustela, Martes, Mustela, Erminea, Castor Tiber), and many families or genera common, as the Genus, Bos, Felis, Ursus, Canis, Cervus, Lepus, and others. Amongst these genera, however, the species seem to be all distinct in the two hemispheres. Passing on now to the Tropical regions of the New and Old Worlds, there is not found a single common species of mammal, and but few common families.

Thus the New and Old World apes are generically distinct; most of the bats are so also. The ant eaters, the sloths, and the armadillos are peculiar to South America; also the Genus Auchenia, containing the Llamas and Alpacas.

Again, looking at the Old World, we find peculiar the genera Sus, Equus, Camelus, Rhinocerus, Manis, Viverra, Erinaceus, Talpa, and the Apes, nearly all the Antilopes, and many others; and to Australia the Marsupials, with one exception.

In looking at a map of the world three is hardly anywhere in Europe, Asia, and Africa where active mammals could not penetrate, and if once at a place and the climate and conditions of life were suitable to them they might multiply and flourish; thus, were the birthplace of a species in either of these three Continents, it would not be at all surprising to find them in the others, for there is no broad ocean to stop their migration, and climate would be the chief obstacle. As a matter of fact, however, species are much more local than this. When we look at the Continent of America, however, the case is very different, for the broad Atlantic and Pacific oceans separate it on either side fron the Old World. These oceans, are, of course, quite impassable by terrestrial animals, and at first sight it would appear as if by no possibility could any interchange of species take place between the Old and New Worlds.

It is found, however, as a matter of fact, that about twelve genera of mammals have species in both hemispheres, among the chief of which are, Felis, Canis, Lutra, Mustela, Gulo, Ursus, Cervus, Lepus, Mus, Sciurus, Vespertilio, and Bos. Of this genera nearly all are found in North America, except the feline animals, and are animals such as bear, otter, elk, and dog, which can support great cold, therefore, it is not improbable that these animals, at some remote period, found their way from the Old to the New World, or *vice versa*, by the chain of the Aleutian Isles, or, perhaps, by some more northerly passage about the poles.

With regard to the tropical forms belonging to the genus felis, namely, the Jaguar, Panther, and Ocelot, the explanation given above of the means of transit from the Old to New World will be objected to, because it will be said that these animals could not support the cold of the journey round by the Aleutian isles. Without granting the truth of this objection, which can be contradicted, I think, by the fact that these animals can exist through an English winter, and also by the fact that tigers have been met with far north in Siberia, yet it must be owned that there is some weight in it, and that had this been the course taken by feline animals it would be a matter of great surprise. There is, I think, another way of accounting for their distribution, which gets rid of the difficulty of climate and calls in to its aid the facts given us by geologists.

These are, that prior to the cold or glacial period which overspread the temperate zone, there seems to be some good reason for thinking that the climate of the earth was considerably warmer than at present. This is borne out by the evidence of the remains of animals which now only inhabit tropical regions being found in the northern latitudes.

This fact, if true, would of itself account for tropical animals finding their way so far north as Kamtschatka and Behring straits ; but geologists tell us not only of changes of climate, but of changes of land and sea, and it is not at all beyond the bounds of geological possibility to believe that the Atlantic and Pacific oceans were at one time, even since the recent fauna came into existence, more thickly studded with islands so as to form a bridge between the Old and New Worlds, and to allow some of the tropical forms to pass across.

The subsequent Glacial period, of which there can be no doubt, quite explains how some of the northern and temperate forms have become common to the two hemispheres, being borne by icebergs, or the northern seas being bridged over by ice so as to form a continuous tract. These considerations of the dissimilarity of most of the animal productions of distant lands, taken together with a knowledge of the ample means provided for the dispersal of living creatures, which explains apparent exceptions to the rule, seem to me to testify to the unity of creative centres, and to the intention that created beings should be fruitful, and multiply, and replenish the earth. (Applause.)

The lecture was no sooner over than "To the train, oh Woolhopians!" was called out, and this pleasant meeting was suddenly terminated.

THE REMARKABLE TREES

OF

HEREFORDSHIRE.

THE TIBBERTON OAK.

(Quercus sessiliflora.)

APRIL, 1868.

For many a year this tree has been the envy of timber dealers, and large sums of money have been offered for it. From its great height and size it has long been considered the finest Oak in the county. It is rather over 100 feet in height, and the diametric measure of its spread of branches is 98 feet. At 5 feet from the ground, where the card of the Club is placed (1 foot by 6 inches), it measures 23 feet 9 inches in circumference. The branch forming a second stem, has spoilt this magnificent tree before its time. Water has lodged, and decay set in at the junction, reaching the heart of the tree, until in a severe storm in the spring of 1869 (since this photograph was taken), the branch gave way, and the tree was split.

(Ladmore and Son, Photographers to the Woolhope Naturalists' Field Club.)

The Woolhope Naturalists' Field Club.

MEETING AT PONTRILAS,

FRIDAY. JUNE 25TH, 1869.

The trysting spot for the second Field Meeting of the year was the Station at Pontrilas, and there, on Friday morning, a goodly company assembled for the day's investigations. The spreading Bell-flower *(Campanula patula)*, which has a *habitat* on the high road just by, was not out to welcome them. The route was taken across some pleasant meadows for the high common of Ewyas Harold. The success of the day was very quickly established on high poetical authority, for Bishop Mant has said—

> "Well boots it the thick mantled leas
> To traverse: if boon Nature grant
> To crop the insect seeming plant
> The vegetable Bee: or nigh of kin
> The long-horned Butterfly."

For on the brow of the hill the Bee orchis, *Ophrys apifera*, was found in great perfection and in great number, and throughout the day's walk an abundance of the sweet scented Butterfly orchis, in both its varieties, *Habenaria bifolia*, and *H. chlorantha*, was gathered. The Yellow-wort, *Chlora perfoliata*, and its bright sister, the pink Centaury, *Erythræa centaurium*, were also growing abundantly in the limestone gravel of the brow of the hill, and on the common itself the pretty creeping St. John's-wort, *Hypericum humifusum*, was in flower, and those who looked closely might observe plants of the autumnal Gentian, *Gentiana Amarella*, not yet in flower, and could not fail to see the common cudweed, *Filago Germanica*, shooting up everywhere.

The day, like so many we have lately had, was over-cast and hazy; and whether this may be due, as has been said, to the fact that just now the sun presents an unusual number of spots on its surface or not, it certainly was not favourable for the full enjoyment of the fine rich prospect this common affords on every side of it. It mattered not so much to-day, however, for naturalists can always find objects of interest immediately around them. Here were numerous quarries to attract attention. By the side of one of them the Club assembled at the sound of the horn for the transaction of business. An alteration of the Rules, to the effect that the Officers of the Club should be elected at an Autumn meeting of the preceding year, instead of at the annual meeting in Spring, of which due notice had been given, was unanimously carried. The following gentlemen were elected members, viz.:—Col. Symonds, of Pengethly, Bernard Matthews, Esq., of Ludlow, and Mr. W. Price, of the Vern; and some other gentlemen were proposed for election at a future meeting.

Dr. BULL thought it might be interesting to the members who came from a distance if he took that opportunity of drawing their attention to

EWYAS HAROLD, ITS NAME, ITS CASTLE, AND ITS PRIORY.

The district was not only beautiful as they could see, but it presented much that was interesting to the historian and to the antiquary. One of our members present, the Rev. W. C. Fowle, has done more than any one else to create this interest by the very able paper he had read at the meeting of the Cambrian Archæological Association at Hereford two years since. Mr. Fowle had begun with the name itself, and had endeavoured to unravel the mystery which hung over its origin. "Ewyas" or "Ewis" as it was more anciently spelt, and as it is to this day commonly pronounced, has long been a puzzle to antiquaries. Mr. Fowle could not satisfy himself upon it, and passing by the British "*Glàs*," as well he might, seemed to think that it might possibly be derived from the Saxon "*Ea*" water. Another member of our Club, Mr. Flavell Edmunds, who has for many years past devoted much study to the origin and derivation of names in this district, has arrived at a very different conclusion, and one much more interesting in the view of natural science. Mr. Edmunds' solution of the difficulty is entirely original, and he has kindly commissioned me to lay it before you to-day. He derives the name "Ewyas" from the British "*Yw-ys*" pronounced "*Ewis*," the yew place. The whole district, he thinks, was formerly called the "*Ystrad Yw*" the district of the Yew trees. The *Ystrad-yw* was probably that part of the district about Crickhowell; the *Yw-ys* seems to have been the eastern part, which included the Llanthony valley and the country eastward of the Black Mountain to Ewyas Harold. The Hundred of Ewyas Lacy, which is the only other example here of the occurrance of the name "Ewyas," stretches from Rowlestone to Cusop, embracing this side of Herefordshire and part of the Black Mountains. Ewyas Harold, though clearly a part of *Ewis* in former times, is now in the Webtree Hundred. Giraldus Cambrensis speaks of the Abbey of Llanthony as situated "in the deep vale of Ewyas," and an old writer of the 12th century, Caradocus of Llancarfan, speaks also of Crickhowell as situated in the "*Ystrad Yw*," all facts tending to show how extensive the district of Ewis was in days long gone by. This derivation is certainly well borne out by the abundance of yew trees growing at this time throughout the whole district—that is, yew trees apart from churchyards—and it was their free and general growth in the woods and on the hill sides here and in some parts of Monmouthshire that gave the Rev. Mr. Woodhouse an argument in favour of the yew tree as being truly indigenous to Britain, in the paper he read before the Club in 1866. The only other combination in which "Ewyas" occurs is "Teffont-Ewyas" (spelt here Evias) in Wiltshire, and this Mr. Edmunds thinks may be explained by the fact that the Norman Lords often carried with them the names of their chief property appended to their Saxon names, and a knight "de Ewyas" may have removed to Teffont, in Wiltshire. In this instance a lady may possibly have taken the name there, for it is curious that Ewyas Harold has so distinct a connection with Wiltshire that the name there may possibly be thus explained. The male descent of the Lords of Ewyas ended with the third lord, whose heiress, Sibille or Sybilla Ewyas married Robert de Tregoz, of Lydiard-Tregoz, in Wiltshire.

The difficulty with the other half of the name lies in an opposite direction; there are too many sources of derivation. Harold is clearly from the Lord of the Castle, but there are several Harolds in the field. He was the natural son of "Kynge Harold" according to Leland, of Fitz-Osborne Earl of Hereford, according to Dugdale, of Ralph Earl of Hereford, according to Gough, and lastly Mr. Freeman, the talented author of "the History of the Norman Conquest," makes him to have been the son of Drogo Fitz-Pontz, mentioned in the Domesday Survey as owning considerable property in the Hundred of Vlfei (Wolphey), in this county. Whoever he was, he was a natural son, as is proved by the frequent use in old documents of the word "Map-Harold," from "Mab," a natural son, the British equivalent of the Norman "Fitz." The fact of illegitimacy was always clearly marked from most ancient times, but its stigma has been greatly changed. William the Conqueror himself was but the son of Arletta, the tanner's daughter, who captivated his father, Duke Robert of Normandy, when washing her pretty feet in the stream of Falaise, and he hesitated not occasionally to sign himself "Guliemus bastardus," nor is there any proof even of the existence of the *bend sinister* in Heraldry until the fifteenth century. The stigma of Illegitimacy would not therefore stand in the way of any man of mark in those times, but none of those last named Harolds seem to have been men of mark or to have done anything worthy of giving their name to the lordship,—and it seems more probable therefore to believe with Leland—whose minute description is of great value—that this Harold was the natural son of "Kynge Harold, and of this Harold part of Ewis was named Ewis Harold" (Itin. vol. viii. p. 84). The son of King Harold, and it may be (to throw a little poetry on the dry facts of history) of the fair Edith, *Edeva pulchra*, of the old Saxon writings, the swan-necked and beautiful Edith descended from Royal Norse blood, his second cousin, and therefore "ower sibbe," as the Saxons say, that is "too near akin" for the church to permit of marriage. "The fame is," says Leland, "that the castle of Map-Herald was builded of Harold afore he was Kynge; and when he overcame the Walsche men," which was two years before he came to the throne. Certain it seems that at the time of the Conquest there was already a castle there, and which at the time of the Doomsday Survey (1080-6) was in possession of Alured de Marleborough who had refortified it. Mr. Flavell Edmunds has given the following passages from the Survey which refer to Ewias, with the appended translations and notes :—

The references to Ewias in Domesday Book are two, each of which is full and suggestive. The first of these is Section x., and is curious as giving the ancient name of one of the Hundreds, which has long been disused, viz., "Cutestorn." This would seem to have been partly, if not wholly, identical with the modern hundred of Webtree, itself an early Saxon name, meaning the trees or woodland of Wiba, some Anglian thegn who has left his name also to the place on which he resided, at "Wibelege," now Weobley. The tenth in the list of Herefordshire landowners whose possessions are given in Domesday Book is Roger de Laci, who seems to have been son of the founder of the branch of that great and powerful family which was settled in Herefordshire. The list of his possessions in Cutestorn hundred is headed with the following description of Ewias :—

EXTRACT.

In Cvtestorn hd.

Terra Rogerii De Laci.

X. In Castellaria *(a)* de Ewias ded. Wills *(b)* com. Walterio de Laci. iii. carucatas *(c)* træ. wastas.

Rogerius de Laci fili. ei. tent. eas. Wills. Osbn. de eo.

In dnio. hnt. ii. car. iiii. Walenses reddies. ii. sectar *(d)* mellis. hnt. i. car. ibi hnt. iii. servos. ii. bord *(e)* h. tra. val xx. sol.

Isd. Rogs. ht. una. tra. Ewias dicta in fine Ewias h. tra. n. ptnt. ad Castellaria. neq. ad Hvnd. De hac tra. ht. Rogs. xv. sectar. mellis. xv. porc. qdo. hoes. sunt. ibi. placita sup. eos. *(f)*

TRANSLATION.

In Cutestorn hundred. The lands of Roger de Laci.

In the castlery of Ewias Earl William gave to Walter de Laci four carucates of waste land.

Roger de Laci, son of him, holds these (lands). William Osborne (holds) from him.

In dominion they have two carucates. Four Welshmen rendering two sectars of honey have one carucate there. They have three slaves. Two bordars have lands value 20s.

The same Roger has one land called Ewias, on the boundary of Ewias. This land does not pertain to the castlery nor to the hundred. Out of that land Roger has fifteen sectars of honey. Fifteen swine, when men are there, are required from them.

NOTES.

(a) Castellaria—I have coined the word castlery, as best expressing the tract of land immediately appertaining to a castle.

(b) This Earl William was probably the Earl of Hereford who was killed by falling from the tower of St. Peter's church. (See Duncumb's History.)

(c) A carucate was as much land as a team of oxen could plough in a year.

(d) The exact amount of a sectar of honey I have been unable to ascertain, and shall be glad to be informed.

(e) The bordar was a man who held a small plot of land on the condition of doing work at stated times on the farm of the lord or of his tenant

(f) When the swine-herds were occupying the woodlands of their lord beneficially they paid 15 swine as rent.

The only other reference to Ewias in Domesday Book is Section XIX. In this case the name of the hundred is not prefixed :—

EXTRACT.

Terra Alvredi (*a*) de Merleberge.

XIX. Alvred. de Merleberge tent. Castellu. Ewias de W. rege.

Ipse Rex eni. (*b*) concessit ei tras. quas Wills. comes ei dederat. qui hoc castellu. refirmauerat. hoc est v. carucatas træ ibide. ad mannum (*c*) alias. v. carucatas. Terra q.q. Radulfi de bernai ccessit. ei rex quæ ad castellu. ptnebat.

Ibi ht. in dnio. ii. car. ix. Walenses cu. vi. car. reddies. vii. sectar mellis. xii. bord. opantes. una die ebdomad.

Ibi iiii. bouarii. un. ho. redd. vi. denar.

Quinq. milites ei Ricard. Gillebi. Wills. Wills. Harnold. hnt. v. car. in dnio. xii. bord. iii. piscarias. xx. uacs. p. (*d*.)

Duo alii Wills. Radulf. tent. tra. ii. car.

Turstan tent. tra. reddie. xix. den. Warneri. tra. de v. sol. hi. hnt. v. bord.

Hoc castellu. Ewias val. x. lib.

TRANSLATION.

The land of Alured of Marlborough.

Alured of Marlborough holds the castle of Ewias from King William.

The King himself truly conceded to him the lands which Earl William had given to him (Alured), who this castle rebuilt (or strengthened): That is, five carucates of land in the same. As to the remaining five carucates of land of Radulf de Bernai, which had pertained to the castle, the King yielded them also to him (Alured).

There he has in dominion two carucates ; nine Welshmen of him holding six carucates, returning seven sectars of honey ; twelve bordars working one day in each week. There are four bovarii (cattle-keepers). One man renders sixpence.

Five soldiers (belonging) to him, viz., Richard, Gillebi, William, William, and Harnold, have five carucates in dominion ; twelve bordars, three fisheries, and twenty cows pertaining.

Two others, William and Radulf, hold lands, two carucates.

Turstan holds lands rendering 19d., and of Warner lands of 5s. (value). These have five bordars.

This castle of Ewias is worth £10.

NOTES.

(*a*) There are several Alureds mentioned in Domesday Book, but we know nothing of their history. Of the Alured in the text we only know that he was not lord of Marlborough, in Wilts, the castle and manor so called being a royal demesne—that is an estate kept in the king's own hands—from the Conquest down to the time of Henry VIII.

(*b*) I read "eni.," as a contraction of *enim;* Plautus has *enim me nominat.*

(*c*) The word is not very clear in the original, but it may be intended for *mannum*, an ambling nag, or palfrey, and the whole sentence would thus imply that the king gave the lands referred to in consideration of the gift of a palfrey. Such tenures were common in feudal times.

(*d*) The two concluding words of this paragraph are not wholly legible, part of the first letter of "uacs" being effaced, and the latter word being doubtful. I take it for *pertinentes*, unusually contracted to fit the space, as it comes at the end of the line.

F. E.

Leland described the extent of the Lordship of the Castle in more understandable terms as "a myle in breadth wher it is narrowest, and most in length two myles. It hath good corne and grasse and woode." (Itin. vol. viii., p. 83.)

How Alured de Marleborough became possessed of the Castle of Ewyas the Survey tells. It was King Harold's property granted by William. The same Alured also received the grant from William of the following manors, which it is distinctly stated in the Survey "Herald tenuit," viz.: Hope, Manetune, Brochevrdie, Edtune, Penebrvge, Burgelle, Stratford, and Cvvre. How he lost Ewias Harold, history sayeth not. He may possibly have sold or had to resign it to the particular Harold who rebuilt the castle at the end of the century. Supposing this to have been King Harold's son restored to his father's possession, the origin of the name would be clear enough. Leland writes (1530) "greate parte of Map-Herald Castell is yet standynge, and a Chapelle of Seint Nicholas in it. Ther was sumetyme a Parke by the Castell. The Castell stondythe on a mene hill." Nothing remains of it now but the mound and the fossa.

From Harold, the history becomes much better known, and can be traced down with much greater certainty. Mr. Fowle's paper gives all these details; I will only add in Leland's words, "Ther is a village by the Castell caullyd *Ewis Haralde*, in the whiche was a Priorie, or cell of Blake Monks, translatyd from *Dulesse* village, a myle and upper on the broke. Dules village longed to Harold. *Filius Haraldi* foundyd this at Dules: Robertus Tregoz translatyd it from Dules to Mapheralt: It was a cell to Gloucester." (Itin. vol. viii. p. 84). This monastry is supposed to have been removed to Ewias Harold about the year 1100, and remained there until the year 1358, when it was reunited to Gloucester. There are no remains of the Priory, and "its very site," says Mr. Fowle, "cannot now be identified." The Cartulary of the Priory, extending through the whole of its existence is still extant, and for a sketch of it, and for many other interesting particulars relating to Ewyas Harold I must refer you once again to Mr. Fowle's paper. Let me in conclusion ask Mr. Fowle, or any other gentleman present, if they see any objection to Mr. Edmunds' derivation of the word "Ewyas" from *Yw-ys.*

The Rev. W. C. FOWLE said that the origin of "Ewyas" had completely puzzled that excellent antiquary, the Rev. John Webb, to whose kindness he had been indebted for the copy of the Cartulary of the Priory, upon which his paper was founded. To say that he had failed himself was nothing after this. He was quite prepared to give up *Ea*, which had never seemed satisfactory to him, but would rather leave *Yw-ys* to Welsh scholars. He would say, however, that the abundance of yew trees in the district at the present time was certainly remarkable.

J. E. LEE, Esq., said that *Ea* must certainly be given up.

JAMES DAVIES, Esq., said he doubted very much whether *Yw-ys* could be considered the right derivation of Ewyas, and gave references to some early writings to show that the form of spelling at first adopted was *euas.*

Some one asked whether early spelling was much to be depended upon, and thought that w, y, u, v, and even i, seemed to be used synonymously at times (laughter).

The origin of Pontrilas was then named. The first syllable being derived from the Latin *pons*, a bridge, there being no Welsh word for a bridge, and probably no bridges until the Romans came and taught the people to build them. The numeral *tri* three, and *glâs* bluish green—the colour of water standing for water itself. The bridge of the three streams :—of Dulâs, from *du* black, and *glâs* from its darker water ; and of Honddu from *Afon*, a river, and *ddu* the feminine "black"—the dark river.

WILLIAM ADAMS, Esq., the president of the Cardiff Naturalists Society, said that he thought the *las* in Pontrilas would be derived rather from *lais*—the bridge of the three murmuring voices ; and Dulas in the same way with the numeral *di* for the origin of the first syllable, "the two murmuring voices"; and Mr. Rhys Jones agreed with him.

The President, afraid apparently of entering too far on the troubled waters of Gallic derivations, called upon Dr. M'Cullough to give a description of the quarry before them. Dr. M'Cullough then pointed out the peculiarities presented by the cornstone of the quarry, and at the next quarry on the top of the common —the quarry in which he had found last year that unique fossil, the *Pterygotus taurinus* (Salter). He gave an address

ON THE GEOLOGY OF THE DISTRICT.

By Dr. M'Cullough.

Gentlemen,—We are now placed not far from the centre of that great mass of the Old Red Sandstone which forms the principal part of the counties of Hereford, Monmouth, and Brecon, and from the point where we now stand on Ewyas Harold Common we can see nothing except that formation. The higher portions, though not quite the highest, are seen in the Black Mountain on the west and the Skyrrid on the south, while to the south-east and east, we see the lower ranges of the Graig, Garway, and Saddlebow. In the few remarks I am about to make I shall confine myself to the geology of the district we visit to-day. We are placed on one of a series of hills which run somewhat parallel to the Black Mountain. You observe that the sides of the hill are steep; the cause of this is evidently the power of resisting denudation of that great bed of Cornstone which, as you have just seen, is close to the surface, and produces the flatness of the plateau over which we have just passed. We shall presently see that Ewyas Harold Castle stood on a similar plateau at the end of the King-street hill.

Now with regard to defining the position of the beds which we see exposed here, I may remark that in this formation, as displayed in this district, we are placed under great difficulties, both from the paucity of organic remains and the similarity of the rocks, compared, for instance, with the Silurian. The divisions of the Old Red Sandstone are consequently very vague. Usually it is divided into an upper or Conglomerate, a middle or Brownstone series, and a lower or Cornstone series, and to these is sometimes added a fourth division, the Ledbury shales. These, however, with the exception perhaps of the last. are general and indefinite divisions, and it appears to me that a great step would be gained if we could establish one or more zones, and break up this great mass into more definite divisions. I am not now in a position to propose such divisions, but merely to make some suggestions which future observations may show to be practicable or not. The Cornstones are usually spoken of collectively and indefinitely, without any distinction as to essential differences. Last year I pointed out that there were two great classes of Cornstone, which I called the Concretionary and the Conglomerate, the former quite unfossiliferous as far as I had observed, the latter often containing fossils. Further observation has strengthened my belief as to the essential difference of those deposits. If we look at the geological map, we see no series of the blue lines indicating Cornstone along the sides of the Black

Mountain, and another and more abundant series along the hills on one of which we now stand, the latter evidently occupying a zone lower than the former. The former are the irregular conglomerate-looking calcareous strata which often contain remains of our Old Red fish ; the latter indicate that great bed of limestone which you have seen to-day, and in which I have as yet failed to find any trace of organic remains. This is no mere local deposit, but a bed which, where it has escaped denudation, may be traced for miles in the hills on either side of the Golden Valley. Whether it may ever have been continuous with the similar beds found elsewhere, as for instance that which we saw last year around Dinmore Hill and near Leominster, is a point which I could at present only venture to suggest. Now, if further observation shows that this is not a mere "irregular course of mottled red and green earthy limestone called Cornstone," as described by Murchison, but a definite geological formation extending over a wide area, it would prove a most valuable landmark or zone.

From repeated observations which I have made with the aneroid barometer, I have calculated that the point where we now stand is about 270 feet above the Pontrilas railway station, or in round numbers about 500 feet above the sea level. The point, however, to which I wish especially to direct your attention is, that we are 135 feet above the bed of Cornstone, which we passed just now on our way up the hill, yet here we find Pterygotus, the fossil known as *Parka decipiens*, so commonly associated with it, and believed to be the egg packet of that crustacean, and the round bodies called *Pachytheca sphærica*, and believed to be the seeds of Lycopodiaceous plants. Now all these, where they come up into the Old Red Sandstones at all, are only known to exist in its lowest portions, and they thus afford proof of the very low position of this bed of Cornstone. The other organic remains found here are portions of fish spines and a plant bed, but in the present state of our knowledge these do not afford much assistance in determining our position. The most important of the other quarries which we shall visit to-day is that at Rowlestone, where that unique fossil, the *Stylonurus Symondsii*, figured in the last volume of our transactions, was found. I have not yet satisfied myself as to the exact position of that quarry, but I believe it to be higher than this at which we now stand, but as I have found there *Cephalaspis* and *Parka decipiens*, it is probably not very much higher, and I have no doubt whatever that it is much lower than the upper series of Cornstone, which, as I have pointed out to you on the map, is seen along the sides of the Black Mountains.

Above the upper series of Cornstone the Old Red Sandstone is remarkably barren in organic remains, the only thing I have found being some plant markings, until we come to the very top of the system, which occasionally yields fish remains. In all the quarries which we shall visit to-day you will observe that the sandstones are much less red than in the middle portions of the formation, most of them being gray, greenish, or yellowish.

Those who consult the geological map will observe that the Cornstone is not laid down on this hill, or at any of the numerous points where it is worked near

Ewyas Harold, these quarries not having been opened, I suppose, at the time of the survey.

Last year, in describing what I called the concretionary Cornstones, I spoke of them as formed entirely of nodules or concretions, not being then aware of the appearances presented in the quarries we have just inspected, where at the bottom of the bed there is a solid deposit of pure limestone about four feet thick, above which the limestone is found for a depth of six feet in the nodular form, the nodules gradually becoming smaller towards the top. In a quarry which I shall point out to you presently close to Ewyas Harold Castle, the bed of Cornstone about eight feet in thickness, contains two solid strata separated by a layer of nodules. These transitions and alternations seem to indicate a variation in the supply of lime, the solid strata being apparently formed when the water from which the lime was deposited was nearly free from other minerals, the nodules resulting from such a mixture with earthy matter as to prevent the lime forming a solid stratum.

Those of you who know anything of the nature of chemical analysis will readily understand that a complete analysis of a mineral substance, can only be performed by those who give special attention to such pursuits, and who have a laboratory at their command. It may be of use, however, to describe a simple mode of ascertaining the amount of earthy impurities present in such limestones as we have seen to-day. I take a known weight of the specimen to be examined, say 100 grains, and dissolve it in hydrochloric acid; then filter through a paper filter of known weight, wash the filter until it is free from acid, then dry the filter and weigh it. The increase of weight of the filter gives approximately the amount of earthy impurity in the limestone, this impurity consisting chiefly of silica and alumina, or sand and clay, the deficiency on soluble portion being carbonate of lime, with perhaps a little carbonate of magnesia. In a specimen from the solid bottom bed which I have examined, the insoluble residue amounted to 3·3 per cent., and in a portion of one of the nodules to 6·3 per cent.; the soluble portion, chiefly carbonate of lime, being in the former case 96·7, and in the latter 93·7 per cent.

The discoveries made on the present occasion were confined to a specimen or two of the egg-packets which have been termed *Parka decipiens*, and plentiful tracings of a dark substance in the stones which seemed very like carbonaceous matter, but in which Dr. M'Cullough had not yet been able to detect any organic structure with the microscope.

"St. Martin's well" was next visited—a picturesque well of excellent water, and a high renown for its virtues in restoring weak eyesight; and then under the guidance of the Rev. W. R. Lawrence the descent to the village was made. Here the church was kindly thrown open, and its restoration fully appreciated by those who chanced to visit it with the Archæologists two years since.

There is an interesting effigy in the chancel under a carved canopy. It is supposed to represent the Lady Clarice Delawarre, the eldest daughter of John de Tregoz, through whom the castle and domain of Ewyas Harold passed to the family of Delawarre. It is supposed—indeed it was ascertained on moving the stone some years since by Mr. Fowle—to be a case of heart burial; the lady dying away sent her heart for interment here. She seems to hold it in her hands on the effigy.

The site of the castle was next inspected. It was admirably chosen, and in the days of bows and arrows would be a strong place. The large artificial mound on which the keep was built tempts to assault in these days . . . . . . by pic-nic parties, for the views are peculiarly rich and beautiful.

Time was now getting on, and after some consideration by the leaders it was decided to leave the King-street quarry and make at once for that which has proved so much more interesting in its results, the Sandstone quarry at Rowlestone, in which the *Stylonurus Symondsii* was found. The walk there, of nearly two miles, was beautiful throughout, and an hour was passed pleasantly there in the search for organic remains; they are not plentiful in this quarry, but such as have been found possess remarkable interest and differfrom anything found elsewhere. The rumour ran that Dr. M'Cullough had one to produce, which bore this character, and this served to stimulate a little the zeal of the geologists present; but few fragments however had rewarded the search on this occasion when the horn sounded the retreat.

Another pleasant walk through the fields in friendly converse, varied here and there by some botanical "find"—now of the Woad-waxen, or Dyer's Green weed, *Genista tinctoria*, which was very plentiful—now of the Sweet-scented Orchis, *Gymnadenia conopsea*—and again of a very beautiful clover exquisitely rose-tinted, which it was thought might be new but which turned out on examination to be merely a variety of the common *Trifolium pratense*, made delicate and graceful by the boggy undrained land on which it grew.

Mr. Lawrence, of Pontypool directed attention to a number of grass-covered heaps freely scattered over a pasture-field passed through. They might have been heaps of earth neglected to have been scattered, but they were not so. He had often observed them in neglected pastures of the Old Red Sandstone formation, and he believed them to be the joint work first of the moles, and secondly of the ants upon the molehills. When both tenants ceased their occupation, time and the changes of season soon converted their habitations into simple mounds of earth.

Right glad were all parties to reach the Scudamore Arms and refresh themselves after the fatigues of the day. Ample provision had been made, and well filled was the room. Here is a list of the company:—James Rankin, Esq., M.A., the President; Arthur Armitage, Esq., Dadnor, and Dr. McCullough, Vice-presidents; Wm. Adams, Esq., F.G.S., President of the Cardiff Naturalists' Society and R. Rhys Jones, Esq., the Honorary Secretary; the Rev. H. C. Key; Richard Hereford, Esq., Sufton, and the Rev. Robert Hereford; J. E. Lee, Esq., Caerleon ; Canon Hawkins, Llandaff ; Dr. Bull ; the Rev. R. H. Williams, Byford Col. Cunningham ; the Rev. H. T. Hill, of Felton, and Mr. Walter Hill ; the Rev. W. C. Fowle, Brinsop ; the Rev. B. S. Dawson, Yazor ; E. J. Stone, Esq., Chambers Court, Worcestershire ; the Rev. Thomas Phillipps, Dewsall, and Mr. Jacob Phillipps ; the Rev. E. Du Buisson ; T. Curley, Esq., F.G.S. ; the Rev. D. J. George, Trelough ; Colonel Symonds, Pengethly ; the Rev. C. J. Westropp ; the Rev. Thos. West, Fownhope, and C. H. Gardiner, Esq. ; the Rev. J. Jones Machen ; the Rev. Arthur Gray, Orcop ; James Davies, Esq., Hereford ; the Rev. A. G. Jones, Yarkhill ; D. R. Harrison, Esq., Holmer Hall, and Joseph Seymour, Esq. ; E. B. Fitton, Esq., of the Malvern Club ; Dr. J. H. Wood, Tarrington ; Wm. Aston, Esq., and J. T. Owen Fowler, Esq., Hereford ; the Rev. W. R. Lawrence, Ewyas Harold ; the Rev. Bernard Marshall, Blakemere ; David Lawrence, Esq., Pontypool ; J. Carless, Esq., Town Clerk, Hereford ; the Rev. Alfred Phillipps, Abbey Dore ; E. J. Husbands, Esq., and Mr. E. Tibbetts Husbands, Pontrilas ; the Rev. J. P. Bellingham ; Mr. James W. Lloyd and Mr. Brothwood, Kington ; Masters Ernest, Alexis, and Henry Power Bull ; and Mr. Arthur Thompson.

When dinner was over, the President called upon Dr. M'Cullough to exhibit some fossils to the meeting from the quarries they had visited.

NEW FOSSILS.

Dr. M'Cullough first showed a large specimen of the *Pterygotus taurinus* (Salter), which had been found in the upper quarry on the common. This was the only specimen that had been found. It had not yet been fully described, but he trusted that it would be shortly.

He then exhibited a crustacean of still higher interest, which he had obtained a few days before from the Rowlestone quarry. So far as could be judged, it was quite different from any fossil before found. The upper surface was sulcated, and thickly studded with tubercles, and at the sides the swimming feet were well seen in section. The carapace was very distinct. An exact and scientific description will doubtless be shortly given. When this is done, and the creature has received its name, it will be introduced again to the notice of the Club.

THE NEST OF A KING-FISHER *(Alcedo ispida)*

Was then sent round for examination. It consisted of a quantity of small fish-bones rejected from the gullet of the bird. Dr. M'Cullough had found the nest in a bank on the Monnow having frequently observed the old birds in the neighbourhood. A cow had unfortunately put her foot on the earth above the nest, crushed it in, and killed the four young birds it contained. The hole in the bank in which it was built was some six feet above the ordinary water-level of the river. It was made in the perpendicular bank, a foot below the surface of the soil, was about two feet in length, and sloped obliquely upwards to within about two inches of the grass ; here a wider space, some six inches in diameter, was hollowed out, in which the nest was placed, if a loose mass of small bones could be so called. The entrance-hole was carefully examined. It was oval, 2¾ inches from above, and 2½ inches from side to side, and was made so directly inwards that not a mark was to be seen in the soil around it. Many authorities speak of the Kingfisher forming its nest in the hole of the mole or water-rat, but this could not have been the case here, for the face of the bank receded below the hole, and no rat could have reached the entrance. There could be no doubt that it was made by the bird itself, and it certainly bore a strong resemblance to the hole made by the woodpecker in a tree.

The Rev. R. H. WILLIAMS thought Kingfishers never made nests, and that the bones they threw up were scattered about the hole, that is that they were ejected accidentally as it were, and without any design of their forming a nest. The holes he knew always sloped upwards.

Dr. BULL said that though the bones were loose or only slightly adherent together, no one could see them in the place scooped out to receive them without the conviction that they were there designedly. They did not form any true nest, and he was certainly reminded on examining it of MacGillivray's observation that it was easy to tell whether there was a Kingfishers' nest in a given hole by the stink which proceeded from it. He would like to ask members present one or two questions about this beautiful bird, whether first their observation led them to believe that it was becoming more scarce than formerly. He had recently been told to his great satisfaction by a gentleman living on the banks of the Wye that he thought that they had certainly increased in numbers during the last few years. He would also like to know whether there were any traces in this district of the poetry which of old attached itself to this bird. The presence of a Kingfisher was formerly thought a safeguard against thunder and ensured the peace of families. The possession of its feathers gave courage to those who wore them, and ensured affection. To this day it is said the Tartars and some Eastern people carry a skin about them as an amulet against every ill. The dead bird was thought, too, to have some magnetic power, and when held up by a string from the beak that its breast would invariably turn to the north.

The Rev. D. J. GEORGE said that he could speak very decidedly with reference to the Monnow; that they had certainly very much decreased in numbers since his boyish days. He was not aware that any superstitious belief existed with regard to them.

The Rev. ARTHUR GRAY was afraid that the ladies' hats were partly the cause of their lessened numbers, and if its feathers had such powers he did not much wonder at it (laughter).

R. RHYS JONES, Esq., honorary secretary to the Cardiff Naturalists' Association, said that he thought that the kingfishers sometimes changed the localities they frequented; within his own knowledge the birds had become much more common, and the nests more numerous upon the Rhymney river within the last six years, more especially on that part of the stream flowing through Col. Tynte's estate of Cefnmabley. Upon the river Taff, during the same period, the bird had become more rare. The bones which form the nest of this bird are not so far macerated as those found near the nests of hawks and owls, but are, nevertheless, much mingled and dissolved. The kingfisher in Glamorganshire is still frequently hung up by the beak to serve as a weather prophet.

Arthur Armitage, Esq., thought the kingfishers would follow a supply of the food they lived on. Near his house he had cleaned out a pool and stocked it with perch. It was a long distance from the river, and there had been no fish in it for years—but the kingfisher, to his surprise, soon found it out—for one morning his daughter brought one which had been choked by the fish it had eaten.

FUNGUSES.

The day's walk had been singularly unproductive so far as Funguses are concerned, although it had been over promising ground. This was probably owing to the cold nights from the easterly winds that have lately prevailed. But one single specimen was found, and that was a young *Polyporus sulfureus* on a gatepost, made probably of yew tree, which is the tree this fungus more especially affects. Some interesting specimens had, however been forwarded for exhibition. Mr. Hereford, of Sufton, had sent a

LYCOPERDON GIGANTEUM, the Giant Puff-ball,

nearly two pounds in weight, which was sent round the room that the members might observe its smooth white surface—like kid leather—and so be able to recognise a very common and very excellent edible fungus. It often grows to a much larger size than the one shown, but if this one had been recently gathered, it would have been cooked and very gladly welcomed at their table to-day. Simply cut in slices half an inch thick, with yolk of egg over the surface, and fried with fine herbs, it makes delicious omelettes—such omelettes as are to be met with and enjoyed every day on the Continent, but which our English cooks do not sufficiently appreciate. Perhaps it is the cost of eggs that causes their rarity here, but then the slices of puff-balls supply their place, and hence it is that this fungus has been called "the vegetable egg." Should the requirements of the table, however, demand a sweetmeat instead of an ordinary omelette, the vegetable egg is equal to the occasion. Let it be fried simply with the yolk of egg, and a little white sugar be sprinkled over it, and an excellent dish is at once produced.

Another fungus of a very singular and fanciful appearance was then shown. It had been sent by Arthur Armitage, Esq., Vice-President, and grew at Cubberly, near Ross. It was as rare as it was peculiar and interesting. It was one of the stellate puff-balls, the

GEASTER QUADRIFIDUS. *Pers.*—The Arched Puff-ball.
(Geaster Fornicatus—*Fr.*)

In its young state it is a small puff-ball, with a short stem enclosed in a double membrane (or peridium), like a ball. As it grows, these wrappers are opened with a cross split, and the inner one becomes arched up, raising up with it the small puff-ball. It then presents itself as a small globe, supported on four arched rays, which rest by their points on the four points of the outer wrapper, which forms an inverted arch, and is usually below the surface of the soil in which it grows. These characteristics distinguish it from every other form of stellate puff-ball, and when once it has been seen it can never afterwards be mistaken.

MEDICAGO MACULATA. *Sibth.*—Spotted Medick.

Specimens of this British plant were next shown. It is not uncommon as an occasional weed in the middle and south of England, but it has recently been introduced into the neighbourhood of Hereford rather extensively, and in a very peculiar way. The scrapings from the sheep skins imported from South America have lately been sold as manure from the skin yards. The heaps of this refuse, when mixed with lime and other materials for dressing the land and left to ripen, have been found to be covered with what was called "a new kind of clover with a yellow blossom"—or, where the manure has been used, it has sprung up in the fields and grown most luxuriantly.

In the summer of 1867 a gentleman near Hereford manured for swedes with this skin-yard refuse. The swedes were eaten off, and barley and clover sown in the spring of 1868. The hot dry summer of last year made the clover miss, and in the autumn, after harrowing, the scarlet trifolium (*Trifolium incarnatum*) was sown over it. This spring the ground has been well covered, but the trifolium only formed one-fourth of the crop; the other three-fourths was formed by this "foreign clover," and in some places it was growing so luxuriantly as to be estimated at nearly two tons to the acre. In this instance it answered very well, but where the manure has been used in hop-yards and with some other crops, the Medick has been most troublesome. In South America it is one of the most common weeds, and an examination of the seed vessel explains readily enough how it becomes attached to the wool of sheep, and when once attached how difficult it is to get rid of it. The seed vessel is arranged in a spiral manner, so as to form a small compact ball, the size of a large pea, and it is fringed with long bristles pointing alternately different ways. Its leaflets are inversely heartshaped, and from the black spot in the centre of each, the plant takes its distinctive name.

Some fine cells of a solitary Mason bee,

OSMIA BICORNIS (*Réaumer*),

were next sent round the table for inspection. Each one consisted of sand and earth in masses or pellets, agglutinised together when moist, so as to form an oval cell, perfectly smooth internally but with a rough external surface.

"Is there not *art* through all the works of Nature?"

They were taken from beneath the tiles of an outhouse at Haven, in the Forest of Deerfold. The cells were empty, that is, they merely contained the remains of the cocoon, of a gum-like silk, spun by the larva. This particular kind of Mason bee is a scarce one.

TRICHIUS FASCIATUS. *Linn.*—The Bee Beetle.

Dr. M'CULLOUGH exhibited several specimens of this interesting beetle taken from rotten alder stumps on the banks of the Monnow. It was formerly a great rarity, and its habitat was "South Wales," but it has become common in collections since the favourite station for it at Rannoch, in Perthshire, was discovered. It exists there in abundance.

R. RHYS JONES, Esq., of Cardiff, said he had found the larvæ four years since on decayed alder and willow stumps on the banks of the Ely and Taff, near Cardiff, and had afterwards obtained the perfect insect in the same locality.

ON THE SPECIES OF SCOLYTUS, A GENUS OF BARK BEETLES, FOUND IN THIS DISTRICT.

By T. ALGERNON CHAPMAN, M.D., Abergavenny.

The genus *Scolytus* belongs to the family *Hylesinidæ*, which has also, from that circumstance, been called Scolytidæ, the best English equivalent of which is Bark-beetles. The typical species, *Scolytus Destructor*, was called *Hylesinus Scolytus* by Fabricius, and its specific name was applied to the whole genus by Olivier, who substituted that of Destructor. The several species have a strong resemblance to each other. They have a quaint, stilted appearance from the bending down of their heads, and the truncation of their elytra and terminal segments; and they run in a rapid, jerky manner. They all have a rounded, shining, black, somewhat punctated thorax, with indications of reddish marking in some specimens. The reddish elytra form a more or less square, flat surface, and are longitudinally striated, the peculiarities of the striæ forming the characters which are most readily seized for the discrimination of the several species.

There are six British species, one of which, *Scolytus Ratzburgii*, Jans., has been taken, on only one occasion, in Perthshire. I have failed to find it in this district. It is a Birch feeder, and I have little doubt is to be met with wherever that tree is plentiful, but I don't know of any such place near Abergavenny. I have met with the five other species, and of these I show you both living and mounted specimens.

Scolytus Destructor Ol. is the largest of these, and the most common one. Its habitat is the bark of elm. The size of the timber it affects makes it difficult to exhibit good specimens. It may be found at this season (June) making its galleries of oviposition in any elm trees felled during last winter, and usually in such numbers as to ensure the destruction of the bark. I do not recollect to have seen it in timber smaller than 8in. in diameter. The female makes her way along the bottom of some crack in the bark, often by widening it for some distance, before commencing to burrow, so that the real opening of the gallery is some distance from where the little heap of out-turned frass lies which marks its orifice. The male is present for only a brief interval, viz., after the burrow is well commenced, but before any eggs are laid. The burrow is usually about three inches long (very rarely five), almost always close to the wood, and slightly on encroaching it. Its construction occupies about three weeks. The eggs are laid along either side close to the bark, the cavities in which they lie being somewhat irregular, not nicely fitting the egg as with *Hylesinus.* The eggs in a burrow number about 100, but I have met with more than 160 in one. They are covered by a rather thick continuous layer of frass which also lines the floor of the burrow, and extends partially on to the roof. The young larvæ starting at right angles to the parent gallery, which is parallel with the axis of the tree, form a very regular 'typograph,' at least in those somewhat rare instances in which contiguous broods do not interfere with each other. Most of the larvæ are full-fed in August, and I dare say that, in favourable seasons, there are sometimes two broods in a year. A certain proportion assume the pupa state at the end of the larval burrows, become perfect and emerge during the latter part of August, but what becomes of the beetles that thus emerge I do not know. I find no trace either of their ovipositing during the autumn, or of their hybernating, for though *Scolytus Destructor* begins its burrows earlier than the other *Scolyti*, it is several weeks later than the *Hylesini* and other bark-beetles that pass the winter in the perfect state. The greater number of the larvæ when full fed burrow about half an inch into the wood, where they form a little longitudinal chamber, the entrance of which is tightly filled with frass, and in this they pass the winter in the larva state, completing their transformations in this cavity in the spring, and emerging about the end of May. In trees with tolerably thick bark, they sometimes form these hibernacula in the latter.

The object, though not the cause, of this difference in instinct between the beetles emerging in autumn and those remaining as larvæ until the spring is obvious. The bark, especially when riddled by *Scolytus*, soon becomes loose from the action of the weather during the winter, and when it falls off birds and numerous other enemies quickly remove all exposed larvæ, but those buried in the wood are quite safe; the little circles of frass marking their openings, when the wood has lost the slight staining it receives from the decomposing bark, are hardly visible; the little patches of white wood frass in the removed bark are, however, very conspicuous.

Scolytus Destructor has a reputation, undoubtedly founded on fact, for attacking and destroying living elm trees. I do not remember having seen a *felled* elm trunk that it had not attacked, frequently whilst it was still trying to throw out shoots, yet I have never seen a trace of it in healthy growing trees. One point that is to be observed is that all, or nearly all, recorded instances, and they are by no means few, of its attacking living trees, have occurred near towns, and (in England) especially near London.

From this circumstance, it appears extremely probable that the trees in question, though apparently thriving, were really more or less sickly. The trees have also been observed in some instances to have been injured in the first place by the beetles boring into the bark for food, these being probably the autumnal specimens in search of hibernacula, just as I have observed the species of

Hylesinus do. *Hylesinus Fraxini* and *Hylesinus crenatas* readily burrow into sound trees to hibernate, but as a rule, leave them in spring for timber more suitable for oviposition ; but it has been noted, especially in some pine feeding species, that, when a quantity of felled timber has been left near some isolated trees, so that a large number of beetles enter the latter for hibernation, they are very apt to destroy these in the spring by ovipositing in them. So that in these cases, we might paradoxically say that the beetle itself was the disease that induced its own attack. Were healthy growing trees at all suited to *Scolytus Destructor*, it is so abundant and so prolific, that in a few years there would not be an elm tree left in the country, yet in this district I have searched in vain for one so attacked.

Healthy living trees are supposed to resent and repel the attacks of the Hylesinidæ by pouring out sap into their burrows, and in the case of *Scolytus Pruni* I have observed burrows of less than an inch long, some of them with a few eggs already laid, which had been abandoned uncompleted by the beetles, and which contained a fluid which must have been sap, as no rain had fallen to account for it, these burrows had been formed in bark that was still nearly healthy, though beside some dying bark which had doubtless attracted the beetles.

Scolytus multistriatus (Marsh) also lives in elm, and of the remaining species is perhaps the most nearly allied to *Scolytus Destructor*, from which it differs by being much smaller in size; the striæ of its elytra are very close and consist of uniform rows of puncta, while in *Destructor* the rows are not so close together, and the alternate rows of puncta are very slightly marked, the others being proportionately deep. *Scolytus multistriatus* also posesses a blunt spine or tubercle on the centre of the second abdminal segment beneath and directed backwards. It is usually to be found in the same logs as *Destructor*, and also in smaller ones down to four inches in diameter. It is much more scarce than *Scolytus Destructor*, one burrow of *Scolytus multistriatus* being found for fifty of *Scolytus Destructor*. The burrows, similar to those of *Scolytus Destructor*, start from the bottom of a crevice in the bark. They take a longer diagonal course on entering the bark before assuming the typical longitudinal direction, and though usually do not always lie close to the wood. Though much smaller in diameter than those of *Scolytus Destructor*, they are nearly as long, and I have seen one four inches in length. The number of eggs laid in a burrow is about a hundred. They are deposited behind a continuous layer of frass, which does not encroach on either the floor or roof. The period of oviposition is about a week later than that of *Scolytus Destructor*. I have several times found a male and a female beetle in the burrow when it was less than half an inch long, and before any eggs had been laid, but never after that period. The larvæ form their hibernacula in the thickness of the bark, hardly ever in the wood. *Scolytus multistriatus* is a much less hardy insect than *Scolytus Destructor*, and of all the species of *Scolytus* I had in captivity last winter *multistriatus* is the only species of which I failed to rear even a single specimen.

Moreover, I have observed that in a state of nature but a comparatively small proportion arrive at maturity, which to some extent accounts for its rarity. I have never observed any indications of autumnal specimens.

Scolytus Pruni, Ratz. is the scarcest of the species I have observed. Superficially it much resembles *Scolytus Destructor*, but is rather smaller and much more shining, especially as to its elytra which are sometimes nearly black. The thorax is less strongly punctated, and the elytral puncta are disposed in uniformly faint striæ. I have met with this beetle in apple and pear, and have found its abandoned burrows in apricot. It is said to affect various fruit trees. The apple trees in which I have found it had been slowly dying, successive strips of the bark from top to bottom of the tree had died year after year, and it was in the last strip that *Pruni* had burrowed, and completed the death of the tree. I have met with traces of its having more sparingly attacked the previous strips. A specimen I show you is a portion from one of these trees. Unlike the other species of the genus, which make nearly uniformly cylindrical burrows (there is often a trace of a diverticulum near the entrance of *Destructor's* burrow), the first part of the burrow of *Scolytus Pruni* is a nearly square chamber, as if two burrows had for so far been placed side by side. I have found the male beetle in this cavity in burrows little more than begun, and in others nearly two inches long, and have no doubt that it is formed by the male beetle, who eats the removed material as food; in none of the other species have I found the male residing in the burrow for more than a very brief period. The remainder of the burrow is from two to four inches long, and slightly encroaches on the wood. The eggs are covered by a layer of fine frass, which usually forms merely a series of detached patches filling up the egg cavities to the level of the wall of the gallery. The larvæ almost invariably bury themselves in the wood for hibernation, and the beetles do not emerge till spring. They are the last of the genus to appear, and are only now (June 25) coming out, whilst *Destructor* has been out for several weeks. This species is by no means hardy, for a large proportion of the broods die, but it is not so delicate as *S. multistriatus.*

Scolytus rugulosus, Ratz. is the smallest of the genus. Its elytral striæ are so marked, and run into each other so freely, that the elytra might rather be called shagreened than punctated. Like *Pruni*, it feeds on fruit trees, and especially on apple. Though hitherto accounted rather rare, it must always be commoner than *Scolytus Pruni*, because it is a much hardier species, and whilst *Scolytus Pruni* prefers large trunks, and does not enter wood smaller than three inches in diameter *Scolytus rugulosus* burrows in all, even in branches which are mere twigs, and so finds abundant pabulum, where *Scolytus Pruni* would starve. I have never detected *rugulosus* in the living tree, and do not believe that either it or *Scolytus Pruni* is injurious to orchards. It comes out about a week before *Pruni*, but later than the other species of the genus. It is coming out abundantly at present (June 25), whereas *Pruni* is only beginning to emerge, and the other species are now fully engaged in ovipositing. This insect is notable amongst the *Hylesinidæ* for not hiding the entrance of the gallery of oviposition. In a stick invested by it, the openings may be readily seen, whereas usually they are well hidden in some crevice of the bark, as for example, as is the case with *Scolytus Destructor* and *Scolytus multistriatus*, in neither of which can the opening be detected, except during its formation, and then by the frass lying at its entrance. This results partly perhaps from the bark of the sticks it inhabits being usually smooth. The gallery is longitudinal and rather more than an inch in length, and is lined all round with white frass from the wood, on which the burrow slightly encroaches, and not with frass from the bark as in the other species, making the gallery when opened very conspicuous against the dark coloured bark beside it. The eggs are laid on either side behind this frass; their number seldom reaches eighty. When not crowded together the larvæ make a tolerably regular "typograph" and burrow into the wood to hibernate, sometimes to a depth of nearly half an inch. When the bark is thick they sometimes, like *Destructor*, hibernate in its thickness.

Scolytus intricatus, Ratz. is, after *Destructor*, the most common species, and cannot be considered scarce. It is not so closely allied to the other species as they are to each other. Its outlines are more rounded, and it has less of the quaint truncated form they have. The elytra are closely striated, nearly as intricately as in *rugulosus*, so that in both these insects they have none of the lustre of the three other species. It feeds on oak, and differs from the other species in habit by making a transverse instead of a longitudinal gallery of oviposition, which in comparison with the size of the beetle is also much shorter than theirs, being often only about an inch in length. The eggs are laid along the sides and covered by a layer of frass, which is continuous over the roof of the burrow. The eggs are fewer than in the other species, seldom exceeding sixty and averaging much less. The larval burrows often lie perfectly parallel with the fibres of the wood, for nearly their whole length of about six inches. The larva does not follow the usual instinct of the genus of burrowing into the wood to hibernate, but is satisfied with making a tolerably deep depression, so it is exposed on removing the bark, and I observed last winter that the birds did not wait for the weather to remove the bark, but picked it off themselves to secure the dainty morsels within. The only oak wood in which I have observed it, has been in branches broken off by the wind, and not in all these. I have never seen it in felled timber or in the growing tree. It is probable that to suit *intricatus* the wood must have been cut (or blown down) for some particular time, and as the beetle oviposits in the middle of June, only that wood is attacked, which was separated from the tree at a later period than that at which oak is usually felled.

An aberration of instinct of this species in confinement is worthy of notice. I placed a number of beetles with some oak sticks, and several of them formed galleries of oviposition, but one of them formed the gallery longitudinally as the other species of the genus do, which it never does naturally, and another assumed a habit of still more widely separate species of the

Hylesinidæ, by making its burrow in the solid wood, the eggs and frass were disposed as in the normal burrow, excepting that several eggs were placed beneath the frass of the roof. In no case did I observe both beetles in a burrow, and from what I saw I have no doubt that pairing occurs after the burrow is commenced but without the male entering it.

In all the species the female beetle dies in the burrow after oviposition is completed.

All the species have a fashion of placing their foreheads against other individuals and giving a thrust by pushing forwards the jaws. They employ this process to remove another beetle from a station they desire to occupy; it appears also to be an expression of anger, and sometimes two beetles have an encounter in this way. They use the same movement in recommending themselves to the other sex.

Destructor, *intricatus*, and *Pruni* are able to squeak audibly by a rapid movement of the abdomen against the elytra. *Intricatus* makes the loudest sound. The specimens in the tubes may be provoked by a gentle tap of the tube to emit this squeak, which may be heard by placing the mouth of the tube to the ear.

The Scolyti are much infested by parasites, especially by Hymenoptera of the family Chalcididæ. I have put in the box a few specimens of these that I have bred this spring. *Scolytus Pruni* and *intricatus* lose a large proportion of their broods by their attacks, but *Scolytus rugulosus* was of all the species bred the most copiously attacked. On removing a piece of bark from a stick containing them, numerous larvæ of the parasites were visible, which had devoured the larvæ of the beetles, before they had entered their hibernacula in the wood, all those that had escaped the parasites having done so. The parasites represented at least half the broods; I bred from them half a dozen species of Chalcididæ, *Cheiropachus Quadrum* being much the most numerous. The greater liability of *Scolytus rugulosus* to attacks from parasites has probably a close connection with the fact I have already mentioned, that the entrance of its galleries of oviposition are very obvious.

(This paper was admirably illustrated by the insects themselves alive and at work on the bark, and by the prepared insects with their parasites arranged in a case.)

The next communication was a paper on

AN OAK TREE STRUCK BY LIGHTNING.

By the Rev. ARTHUR GRAY.

Two days ago I went to see an oak on Whitfield lawn, which had been struck by lightning during a recent thunderstorm. It was a remarkable sight. The upper part of the tree was shivered into splinters, large branches broken off and thrown to the ground; the tree, in fact, had become a perfect wreck. Only the lower part of the trunk was standing, and this was completely stripped of the bark. I observed pieces of bark thrown to a considerable distance; and I also remarked longitudinal fissures in the standing portion of the trunk.

There was no appearance that I could discern of anything like combustion. The whole gave the notion of a violent explosive force acting from the centre of the oak, forcing open the cracks in the surface wood, and blowing off the bark in fragments, this being but slightly attached to the tree, and hence offering feeble resistance.

The object of this paper is to offer my ideas as to the proximate cause of these effects. I am not aware whether there is any novelty in them, as similar notions may have occurred to others. It is usual to say that the effects in question are caused by the electric fluid. But this is obviously a vague expression, conveying no very definite idea. Without entering into any discussion as to the nature of electricity, what is the *immediate* cause of these phenomena? I assume, what is generally allowed. that the tree acts as a conductor of electricity from the thunder-cloud to the earth. If the tree were a *good* conductor, like a metallic wire or lightning rod, no particular effect would be produced: the electricity would pass harmlessly to the ground. But though it is capable of conducting, a tree is not a *good* conductor. Perfectly dry wood, entirely free from moisture, would hardly conduct all: but living wood, being full of sap, is able to conduct after an imperfect manner. The current of electricity then does not pass down the tree freely as it would down a metallic rod, but is *retarded*; and the denser the nature of the wood, such as an oak, the more it is retarded. Now, electricity is well known to be convertible into *heat* under such circumstances. I conceive, then, that a portion of the electricity, in its passage down the tree, being converted by the retardation into heat of an intense character generates steam, or superheated water-vapour from the moisture of the sap. The powerfully-expansive agency of this is familiar to us all. May it not be considered as sufficient to explain the destructive effects which I have described—the splintering of the thinner portion of the tree—the deep fissures in the more resisting trunk and the forcible projection of the bark.

The subject is an interesting one, and I should be glad if these remarks should elicit discussion upon it.

A considerable discussion did arise upon it of a general nature, in which many gentlemen took part. Numerous instances of lightning-struck trees were mentioned, and the liability of certain kinds of trees to be struck in preference to others was also brought forward. The most practical observation was perhaps the one named by Mr. Hereford, that the trees in certain districts were much more liable to be struck than those of other districts, and as an example he said that the trees in the neighbourhood of the Moor, near Hereford, had almost all been struck at one time or other, the poplar and elm trees in particular. The district lies low, and until recently presented a considerable space of undrained land about it.

Speaker after speaker called in question the opinion offered in the paper as to the mode in which the effects were produced on the Whitfield tree, and the general feeling of the meeting was well expressed by the President, who said that the wonderful powers of the electricity was shewn equally whether the objects struck were organic or inorganic, whether it might be a tree, or a church steeple, and therefore the ingenious explanation offered by Mr. Gray, failing any positive proof as it did, that steam had actually been generated, could not be considered either as satisfactory in itself, or as necessary to explain the results produced.

Dr. Bull distributed roots of the Asarabacca (*Asarum Europeum*) from Deerfold Forest to all who wished for them.

The Rev. R. H. Williams then exhibited some plants which he had brought from Somersetshire, which were all more or less interesting. The *Plantago Coronopus*, Bucks-horn Plantain, common by the sea-side ; the *Iris fœtidissima*, Stinking Iris, a very local plant, but not uncommon in the South-West counties. It grows freely at Breinton camp, near Hereford. The *Smyrnium Olustrum*, or Alexanders, which is generally found in the neighbourhood of Roman encampments, and is supposed to have been introduced as a pot herb by the common soldiers ; the *Lathyrus Nissolia*, the crimson grass-leaved vetchling ; the *Vicia gracilis*, the slender many seeded tare, a very rare plant ; and *Anthyllis vulneraria*, Ladies' fingers, or Lamb-toe.

> "The yellow Lamb-toe I have often got,
> Sweet creeping o'er the banks in sunny time."

This plant forms an excellent pasture for sheep, who are very fond of it, and has been strongly recommended for cultivation. It is well worthy of it.

There were some other plants, but time was up, and the short walk to the station ended a very enjoyable day's excursion.

The Woolhope Naturalists' Field Club.

MEETING AT LUDLOW AND DOWNTON CASTLE,

TUESDAY, JULY 20TH, 1869.

"I'll teach thee miracles! Walk on this heath
And say to the neglected flower, '*Look up*
And be thou beautiful!' If thou hast faith
It will obey thy words." *Barrington.*

The "Ladies' day" of a Naturalists Field Club is generally attractive —special ground is chosen, and special pains are taken to make the arrangements complete. That doubtful element, the weather, is always an uncertainty to the last, but on the present occasion it was as little so as it could be. At the railway station it was at once seen that the meeting would be a full one, and some little delay was occasioned by the necessity for extra carriages. It was not however until they had alighted on the platform at Ludlow that it was really evident how many ladies had honoured the club with their company.

Here is the goodly company who assembled: James Rankin, Esq., Bryngwyn, the President, and Mrs. Rankin; Arthur Armitage, Esq., Vice-President; Col. Broadley Harrison and Miss Harrison, Kynestone Court; the Rev. J. T. Parsons and Miss Parsons, Dewchurch; Robert Lightbody, Esq., F.G.S., Ludlow; the H. Cooper Key; Colonel Colvin, Mrs. Colvin, the Rev. J. W. Colvin, Miss Colvin, Miss Josephine Colvin, and Miss Helen Colvin, Leintwardine; Miss E. C. Baker, Leintwardine; Miss Rücker and Miss M. Rücker, Wandsworth; Dr. Algernon Chapman, Abergavenny; the Rev. Thomas Phillipps, Mrs. Phillipps, Miss Agusta Phillipps, Miss Penelope Phillipps, and Mr. Jacob Phillipps, Dewsall; E. G. Stone, Esq., Chambers Court, Tewkesbury, and Mrs. Stone; Capt. Roberts and Miss Roberts; Mrs. Davidson and Miss Symonds, Pendock Rectory; the Rev. John Evans, Penn Grove, Mrs. and Miss Evans, and Miss Wayne, Aberdare; W. H. West, Esq.; Lieutenant-Colonel Symonds, Mrs. Symonds, and Miss Coates, Pengethly; the Rev. H. J. Stillingfleet, Mrs. Stillingfleet, and Miss Amphlett, Hampton Bishop; the Rev. W. H. Purchas and the Rev. J. W. Alington, Gloucester; Alfred Purchas, Esq., Ross; T. Curley, Esq., F.G.S.; the Rev.

E. Du Buisson, Mrs. and Miss Du Buisson, and Miss Edith Du Buisson, Breinton; J. F. Symonds, Esq., and Mrs. Symonds, Broomyhill; Miss Symonds and Mr. Reginald Symonds; Miss Gibson, Clifton; Mrs. Strode, Hagley; the Rev. F. T. Havergal; the Rev. Robert Dixon, Nottingham; Dr. Bull and Master Henry Power Bull; the Rev. A. G. Jones, The Castle, Yarkhill, and Mrs. Hedger; the Rev. J. F. Eld, Worcester; W. Odell, Esq., Miss Odell, and Miss Eyre, Coventry; the Rev. E. J. Owen, Tretire; Mrs. Pechell, Springfield, Ross; T. M. Fisher, Esq., and Mrs. Fisher, Trebandy; the Rev. H. T. Hill, Felton; Marcellus Newton, Esq., Misses Emily, Anina, and Laura Newton, Sugwas Court; Colonel Cunningham, Grosmont; Mrs. Cunningham, Miss Cunningham, Miss Octavia Cunningham and Miss Garratt, Hereford; Charles Fortey, Esq., Haven, Deerfold Forest; the Rev. T. M. Beavan, Much Birch; Mr. Meredith and Miss Meredith, Clifton; D. R. Harrison, Esq., and Mrs. Harrison, Holmer-hall; Thos. Turner, Esq., Mrs. Lingen, and Miss Blanche Lingen, Hereford; Dr. A. R. Smith and Mrs. Smith, Hereford; J. Greaves, Esq., and E. B. Fitton, Esq., Malvern; W. E. Hyde, Esq., Mrs. and Miss Hyde, Miss F. E. Sale, and Miss S. H. Sale, Leominster; Mrs. Geo. Hanbury, Hereford; Humphrey Salwey, Esq., Mrs. Salwey, Miss Salwey, Mr. Theo. J. Salwey, and Miss Wilson, the Cliffe, Ludlow; the Mac Gillycuddy, Miss Mac Gillycuddy, Miss Anne Mac Gillycuddy, Mrs. O'Connor, and Mr. O'Connor, Ludlow; Miss Hattfield, Whitaven; Miss Lewis, Ludlow; T. S. H. Jackman, Esq., and Mrs. Jackman, Leintwardine; the Rev. J. Causer, Burrington; Chas. Hodgson, Esq., and Mrs. Hodgson, Bromfield; Miss Hodgson, Staunton Lacey; Geo. Cocking, Esq., Ludlow; O. Shellard, Esq., and Mrs. Shellard, Hereford; Mr. John Pitt, Freetown; Miss Palmer, Miss Giles, and Miss Garnet; Mr. Hall, Garford; Frank Owen, Esq., and Mr. Edward Owen, Swainshill; Mr. James W. Lloyd, and Mrs. Lloyd, Kington; Mr. Arthur Thompson, Miss C. Thompson, Miss Bedford, and Miss S. A. Bedford, Hereford.

Mr. Cocking, of Ludlow, was waiting at the station to receive them. He had most kindly taken the trouble to make the necessary arrangements, and came himself to give every explanation required. Carriage tickets were there, and minute directions were given of what was to be done and seen, albeit a little in the fashion it seemed of the old Highgate oath, the precise arrangements were to be followed unless they preferred to follow their own, with the little conditions that the carriages would start at a definite time, and the trains would wait for no one.

"The towne of Ludlow," says old Leland in his Itinerary, "is sett upon a hill, soe that those coming to it may every way ascend. It is well walled, and by estimation a myle in circumference. There be in the wall 5 Gates, Broad Gate, that leadeth to Broad-street, the largest part of the towne, Old Gate is alsoe towards Teme as Broad Gate is but not so near, Gaolford Gate, Corve Gate, Mill Gate. The Castle hemmeth in a part of the towne, and standeth on a strong rocke, well ditched betwixt Corve Gate and Mill Gate."

Up the hill into the town, in gay and scattered columns, they proceeded, the majority going at once to the magnificent ruins of the Castle, and visiting the very beautiful church afterwards, where they had the advantage of listening to the fine tones of the organ. The President and leading members of the club —accompanied, too, by some of their lady visitors—went to the excellent Museum to transact there the ordinary official business of the meeting. The following gentlemen were elected members of the club :—viz., David Lawrence, Esq., Pontypool; the Rev. J. Rees Jenkins, Cwmbran, Newport; Charles Truscott, Esq., Trevarrick, St. Austells, Cornwall; and the Rev. Alfred Phillipps, of the Rectory, Abbeydore. Some new members were also proposed, and other matters settled.

Time passed too quickly on. It admitted only of a hurried look at the many interesting objects the Museum contains, when the way was taken to the Feathers Hotel, the first general *rendezvous.* The carriages were taken from here, and drove off in succession as the places in them were filled up, for an agreeable ride of six miles through Bromfield to Downton. For the most part they set down their occupants at the end of the short lane leading to Forge Bridge. The scenery here is exceedingly picturesque, and comes upon you with pleasant surprise.

"The best approach to every beauteous scene
Is where it's least expected or foreseen;
Where nought occurs t' anticipate surprise,
Or bring the landscape piecemeal to the eyes."

Richard Payne Knight.

To those who were the first to arrive, for time admitted not of unavoidable delay, the following paper was given :—

SOME ACCOUNT OF BRINGEWOOD FORGE AND FURNACE.

By Dr. BULL.

> " Next add the sylvan shades and silent groves
> (Haunt of the Druids) whence the earth is fed
> With copious fuel. . . . .
>
> . . . .
> Why should Chalybes or Bilboa boast
> Their harden'd iron, when our mines produce
> As perfect martial ore?"—PHILIPS CIDER.
>
> *Book I. on the Oaks of Herefordshire.*

There seems to be no record of the first establishment of Bringewood Forge. It is known to have been in existence in the reign of Queen Elizabeth, and certainly it may have been much earlier, inasmuch as the iron ore of the Clee Hill had been known and worked for centuries, and doubless the fine slopes of Bringewood Chase had been covered with timber from time immemorial.

The information about the Forge, now laid before you, has been obtained from private sources and some little research. It may, perhaps, be best arranged under its several dates.

1584.—In this year a lease of Brindgewood forge and farm was granted by Lord Craven to Francis Walker. It must therefore have been in existence for some time before.

1604.—Sir Robert Harley was made Forester of Brindgwood *alias* Bornigwood Forest and custodian of Prestwood Chase, and its general management remained in the hands of the Harley family for many years.

1623.—The rent paid by Francis Walker to Lord Craven was now £66. 13s. 4d. per annum for the forge, and £170. 19s. for the land.

1663.—Sir Edward Harley, K.B., and Samuel Baldwin, of the Inner Temple, Esq., agreed with William, Lord Craven, for a lease for 21 years of the forge and furnace of Bringwood, and of the several lands theretofore let to Francis Walker, and they afterwards relinquished the agreement in favour of the said Francis Walker, to whom a lease was granted, and who afterwards assigned the term to his son Richard Walker.

1684.—Another lease was granted by Lord Craven to Jacob Walker, and probably for the same period of twenty-one years.

1690.—William Earl of Craven granted a new lease (sixteen years of the old one being unexpired) of all that ironwork, consisting of a forge and furnace, and other things thereunto belonging, to Jacob Walker, of Wooton, and all houses anciently engaged with the ironworks before the inclosing of the Forest and Chase of Brindgewood, and also the liberty to get ironstone and limestone in the chase of Bringewood, else Prestwood and Rushton hath anciently been used. Lease for 21 years, at the rent of £60. From some cause or other this lease came to an end in eight years.

The ironstone alluded to in this lease most probably means the spherical balls of ironstone found in the Shale at Burrington, the size of cannon-balls. Mr. Richard Knight at a later period smelted them, but it did not answer, the amount of metal obtained was found to be too small to pay the expenses.

1698.—In this year Richard Knight took a lease of the property from Lord Craven for twenty-one years, and from this period the iron from the forge and furnace of Bringewood rose rapidly in repute. Richard Knight was a man of great energy and practical ability. He had been connected for many years with the works at Coalbrooke Dale, Morton Corbet, and some others, and thoroughly understood the manufacture of iron. He must, too, have possessed considerable skill as an engineer, since he is said to have first suggested the air chimney for ventilating the works at Coalbrooke Dale. With experience well matured, for he was forty years old when he took Bringewood Forge, he saw at a glance the great advantage of such an abundant supply of fuel in such close vicinity of the ore, and threw all his energy into the works. He at once introduced all the most recent improvements, the rolling and splitting mill of Brindley, the blowing cylinder, and iron helves. So little known then were these improvements, that tradition gives him the credit of inventing them, and it is quite possible that he may have adopted them with some special modifications of his own.

1723.—In this year Mr. Richard Knight bought from Lord Craven the Manor of Leintwardine, the Chase of Bringewood, and the Forest of Mochtree, a property consisting of several thousands of acres.

In an old pamphlet showing the quantity of iron produced by all the Forges in England about 1714, Brindgewood is said to have formerly produced 350 tons yearly, but at that time only 300 tons.

A private paper gives the charges of bringing charcoles to Brindgewood Forges and Furnaces from X-mas 1714 till Lady-day 1719: Doz. sacks weighed 4,517, and cost £7,504. 14s. 4d.; and another memorandum presents an inventory of stock taken at Brindgewood Forges, 1733—

	£	s.	d.
Stock of iron in pig castings	864	19	6
Bar iron	1452	19	0
Charcole	792	9	9
Iron stone	292	9	9
Old stock, including hammer, beams, timber, &c.	216	7	10
Old iron at £14 per ton	29	4	0
Pd. wood cording and cutting	210	9	4
Do. on mining	354	1	0
Iron carriers	36	1	6
Colliers and carriers	187	10	2
Debts	3816	13	0
	£8,253	5	10

This inventory appears to have been made when Mr. Knight let the Bringwood Forge to his two sons Edward and Ralph. Edward at this time had also the Forge of Wolverley, and he lent his elder brother a large sum of money for the purchase of Croft.

1742.—Mr. Richard Knight purchased from Jenks "all that mountain or waste ground known by the name of the Clee Hill, heretofore the property of Somerset Fox, with right of digging for minerals," and he lets it in 1744 to his son Edward Knight, of Cokesley, for £12 per annum. Mr. Richard Knight has also considerable property in Forges and Furnaces at Charlecote, Whittington, Wolverley, Mitten, and Stourport, and several of these were managed by one or other of his sons.

1745.—Mr. Richard Knight died. He was an eccentric man, as industrious as he was able and energetic. A characteristic anecdote is told of his first competition for a Government contract. It was customary then for the Government agent to meet the ironmasters at Bristol to let by tender the several contracts for iron, and it had also become the custom for the masters to meet together the night before and arrange amongst themselves for a division of the contracts. Mr. Knight knew all this and resolved to compete himself, but he knew also that he should have no chance at the private meeting. Two days before the appointed time, dressed in his ordinary Forge-superintending attire, and mounted on a favourite old mare, chosen rather for safety and endurance than for good looks, he set off for Bristol. On the pommel of the saddle was fastened an old nail-bag with various pattern nails outside, and behind him was the small valise of the period, which in this instance had seen much service. At the hour fixed Mr. Knight appeared, his tender was accepted, but when his sureties were demanded, he said, "There was no one he could ask to be surety, but perhaps the deposit of the money would do as well." "Certainly," said the agent, and from the old nail-bag Mr. Knight at once counted out the guineas on the table.

Mr. Richard Knight at one time lived in the village of Downton, at a house now the house of one of the farms. A silver punch-bowl which belonged to him is preserved at the Castle. It will hold more than a gallon and has a very jovial look with it.

1783 is the next date found of information relating to Bringewood Forge and Furnace. It was now let by Mr. Richard Payne Knight to William Downing, of Pembridge, and Richard Giles, of Hope, on a lease for 31 years, at £110 a year. The descendants of Richard Giles held the Forge for many years until within a short time of its being finally abandoned in the year 1814 or 1815. One of the occupiers of this family (Mr. Benjamin Giles) met with a melancholly end. He was returning from a yeomanry parade ; when on the bridge now before you his horse suddenly shied and fell over into the river. Mr. Giles was drowned, and what added very much to the horror of the accident was the fact that before the body could be recovered it had been carried down by the mill-race and much mutilated by the great wheel of his own mill.

The real cause of the closing of the works was the discovery by Sir John Winter more than 150 years before (1656) of the means of making coke from coal and the improvements afterwards made in its application to the smelting of coal, and in particular the supplying air to the furnace previously heated, "hot blast" as distinguished from "cold blast" furnaces.

Bringewood Forge and Furnace was one of the very last Forges in which iron was smelted by wood charcoal, and this fact itself is a great tribute to the character of the iron it produced. It had a very high repute, and was supposed to be equal to the best Swedish iron.

It is still within the memory of man that bands of mules, or pack horses, in single file, carried iron ore down the steep slopes of Bringewood Chase, in the direct route from the Clee Hill to the Forge by the river; or that the jingle of their tinkling bells was pleasantly heard in the distance as when laden with charcoal from the remote parts of the forest they made their way through the trees. There are still those who can remember the busy scene at the Forge with all its life and activity; and who can recall vividly the picturesque effects produced the column of sparks rising high above the woods, brightly reflected from the river below, with the deep shade of the trees around it, as seen from a distance on a winter's evening.

To a later period still the ruins of the Forge remained; but these are now gone. The Tin Mill has disappeared also, and though abundant proofs of their existence remain for those who search for them; to a superficial observer they will all be overlooked in the beauty of the scenery around him, and then the name of the bridge before you, "The Forge Bridge", alone remains to carry its memory to future ages.

Such is all the information now procurable of Bringewood Forge and Furnace, but justice would not be done to our Club if a passing tribute were not paid on this occasion to those gifted grandsons of the great ironmaster,

RICHARD PAYNE KNIGHT

AND

THOMAS ANDREW KNIGHT,

sons of the Rev. Thomas Knight, who lived at Wormisley Grainge. Their early years were passed in the seclusion of its beautiful scenery, and they imbibed that love of nature, which would have made them fully appreciate the objects of a Naturalists Field Club. They were both self-educated men—life students—and both became distinguished for their great ability and high mental culture.

Richard Payne Knight succeeded to the Downton Estate on the death of his father in 1764. Shortly after succeeding to the property he took up the study of Greek, entered into the subject with great enthusiasm, and soon published works on Greek Literature. He travelled into Italy and made a very valuable collection of antiquities and works of art, Greek bronzes, and coins, &c. He was member of Parliament for Leominster from 1780 to 1784, and was then returned for Ludlow and represented that town for 22 years. But it is as a lover of Nature that this notice is given of him. He took up the subject of Landscape Gardening with his usual energy and originality of thought. With his friend, Sir Uvedale Price (then Uvedale Price, Esq.), of Foxley, he attacked the prevailing taste of the day—represented by Repton, the pupil and successor to "Capability" Brown. He published a poem in three books "The Landscape," dedicated to Sir Uvedale Price, and another work called "An Analytical Enquiry into the Principles of Taste," in which he vigorously attacked the artificialism then in fashion, and enters fully on the best means of producing and varying picturesque effects. Had the lively efforts of "Our Own Commissioner" been produced in those days, they would have had to run the risk of a fierce attack in "A Didactic Poem in three books," for Mr. Knight was of the combative order of men and delighted in the effort to hold his own views.

Richard Payne Knight built Downton Castle, which was completed in 1778. He died in 1824, bequeathing his works of art to the British Museum, when they were valued, it is said, at £50,000. He carried his originality one point too far, for he made his own will and worded it so ambiguously as to give rise to a lawsuit, which lasted for several years.

Thomas Andrew Knight succeeded to the Downton Estates on his brother's death, though he had lived at the Castle for many years before. He was a great lover of nature, a clever, original thinker, and followed out with great perseverance the subject of experimental physiology nd horticulture. He was at Baliol College, Oxford, and intimate there with Dr. Baillie the celebrated physician of the last century.

The friend of Sir Joseph Banks, and Sir Humphry Davy, and the President of the Royal Horticultural Society for the last 27 years of his life, he had ample opportunity of promoting horticultural science, and he never failed to do so to the utmost. Ingenious in his own experiments, he was quick to appreciate and recognise those of others, and thus he obtained a well-deserved popularity. The want of an early scientific education was a serious drawback in the path of practical physiology which he laid down for himself, and caused him to waste much of his energy in experiments which were necessarily futile. Notwithstanding this great difficulty, his great natural talents, his extraordinary memory and his untiring perseverance, could not fail to obtain considerable success. He was the first man to prove by actual experiment the impossibility of propagating in perpetuity by grafting any particular kind of apple. He was the first man also, or amongst the very first, to practice the artificial hybrydizing of plants, which has since been carried to such successful results. Perhaps no amateur ever grew a greater number of seedlings of all kinds of fruits and trees under his own immediate supervision for the pure love of science and for the benefit of mankind. Some well-known examples of his success in this way may be mentioned. The Wormisley Elm, which Lindley thought worthy of being a separate species, rather than a variety; and his Weeping Elm is the source of many of the finest examples of this graceful tree now in existence. He introduced many varieties of fruit, as the Elton Pine, and Downton Scarlet Strawberries, the Elton Cherry, the Downton Pippin Apple, and the Wormisley Grainge Pippin (one of the very best cooking apples of the present day), and many others.

Mr. Thomas Andrew Knight published a work on "The Culture of the Apple and Pear," which went through several editions. Several of his papers are published in the Transactions of the Royal Society, and he received the gold Copley medal. Had Thomas Andrew Knight been alive in these days it may safely be said that the Woolhope Club would have had his most cordial support (applause).

POSTSCRIPT.

One other circumstance must yet be mentioned, for it is one that has thrown a gloom over this lovely valley, that will only disappear with the generation that witnessed it—the melancholy death of Mr. Andrew Knight's only son. On the 28th of November, 1827, all was gaiety at Downton. A large party of visitors had assembled at the Castle, and at Ludlow that evening a grand ball was to take place, at which the younger Mr. Knight was to be the president. He was pheasant shooting with some of the party in the dingles of Bringewood chase when a single shot glancing from a tree struck him in the eye. The terrible nature of the accident was not at first apparent. "You've spoilt my dancing," was his first remark, and for the two short hours that consciousness remained to him he did his utmost to alleviate the distress of the friend from whose gun the fatal shot had fled. The next day he was dead. Who shall picture the deep sorrow of his family, or represent the painful shock that pervaded all classes of society. Even now, after a period of 42 years, the writer of this notice has been called upon in a way he cannot refuse to express it once more.

Mr. Knight's sudden death was indeed a great loss. He fully inherited the family talents, and combined in a remarkable manner the literary ability of his uncle, with his father's love of Natural Science; and he possessed moreover very strikingly that tender regard for the feelings of others which also distinguished his father, and which made him so beloved by all about him. He died at the age of 32. His death caused the lawsuit, which had begun before, to be carried on more actively, until, by the decision of Lord Langdale in the Rolls Court, which was confirmed by the House of Lords, the estates descended to a sister's son, Mr. Andrew Rouse Boughton Knight, the present possessor.

The geologists then crossed the Forge Bridge, whose curious turrets were, appropriately enough, connected by a thick iron bar running along the top—"a proof of the abundance of iron," one gentleman thought, but Mr. Cocking mentioned a greater proof still, which is the existence of iron slabs, cast at the Forge, in the place of tombstones, which are to be found in the neighbouring churchyards.

A quarry of Downton Sandstone was first inspected. The lower strata afford excellent building stone, but the thick upper one is useless, and immense blocks of it lay scattered about in picturesque confusion. A pretty walk of half a mile brought them to the site of the Tin Mill. Nothing remains of it now but certain artificial walls and ground works. The object was not to see them but to examine a very interesting geological formation admirably explained in these

NOTES ON PASSAGE BEDS, AT TIN MILLS, DOWNTON.

By Robert Lightbody, Esq., F.G.S.

The section we see before us here, is a very fair illustration of the Passage Beds between the Silurian, and Old Red formations; but, as there are no doubt passage beds between most of the other formations, wherever the deposit was continuous, it becomes needful to select some distinctive name to indicate this particular series. Mr. Salter calls them *Ledbury Shales*, from the section at the mouth of the railway tunnel at Ledbury, where the sequence of them, from the Ludlow rocks to the Old Red, is better exhibited, probably, than elsewhere. I should, however, have preferred to call them *Tin Mill Shales*, as they do not show at Ledbury their usual lithological character of olive shales, but are generally red or yellow. They contain, however, there, similar grey grit beds to those found here, and in other places, but thicker, and the same prevalent fossils, such as Cephalaspis, Auchenaspis, Pterygotus, Eurypterus, Lingula, and Beyrichia, but I have found *here*, a peculiar, and very solen shaped Orthonota, which I believe is at present unique. Also, I have found a small Modiolopsis here, and between Onibury and Norton, which I have not seen elsewhere.

I am not aware that we find anywhere, but at Ledbury, the full sequence of these beds,—probably from the softness of the beds immediately succeeding the Downton sandstone admitting of their being easily washed away, and forming hollows, covered by a thick soil,—but in some places owing to the occurrence of faults. At any rate, we have not yet traced the connection between the Downton sandstone in the quarries we saw on our way from the bridge and these beds. Nor yet is it visible in the road from Onibury to Norton, about half a mile from Onibury, where there is a tolerable section through these beds. Nor is it seen at the place of its original discovery at the south-east mouth of the tunnel at the Ludlow Railway Station, where it appears to be cut off by a fault bringing in the Old Red marl on its horizon.

Another place in this neighbourhood where these beds are found, though rather differing lithologically, is on the right bank of the Teme, between the flour mill at Ludford, and a point opposite what was once a paper mill, and there they are likewise observed at the same point as here.

The only other place where we have found them, is in the bed of the Ledwyche brook, near Caynham Camp, where they are seen at each side of the great fault that throws up the Silurian ridge of Tinker's Hill and Caynham Camp. On the N. side of the fault they are seen at the footbridge leading to Caynham Camp, and on the S. side, at the weir below Poughn-hill bridge.

It would be well if those members of the club, who live near the mapped junction of the Ludlow beds, with the Old Red, would try and work out the connection in those places, and perhaps something more might be made out.

Our great guide, Sir R. Murchison, has, I think, fallen into a mistake in reference to these beds, classing them with his tilestones, as Upper Ludlow ; but when he first saw them with me at the railway section some years since, in company with Messrs. Ramsay and Avelin, he would not at all admit of my suggestion that they were Silurian. His present error arises, I believe, from a misnomer by one of our members. Many years ago, we were in the habit of considering the Downton Sandstone (being arenaceous) as the link between the Silurian and the Old Red, and called it *Transition Beds.* Our friend Mr. R. Banks, as we well know collected a very fine series of fossils, most of them new, from the Downton Sandstone of Bradnor Hill. These he generously presented to the Jermyn Street Museum, but as these Passage Beds had been found about that time, and had acquired some celebrity under that name, Mr. Banks seems to have thought that as Transition and Passage mean the same thing, the beds respectively so called must be the same ; indeed he always has considered the Downton Sandstone as not belonging fairly to the Silurian, and he sent his specimens labelled *Passage Beds.* Sir Roderick Murchison, finding, on examination at the Museum, the very same fossils in both Downton Sandstone and Passage Beds, not unnaturally classed them together in the Silurian formation. This, I think, ought not to be done, but the Passage Beds should take their place where Sir Roderick Murchison and Mr. Wm. Symonds first placed them, viz., 200 or 300 feet up in the bottom of the Old Red.

Time was sadly wanted here to work at these beds, but it was "the Ladies Day," and there was nothing for it but to get quickly back to Forge Bridge. Here they fell in with many groups of pretty naturalists, and all wended their way along the south bank of the beautiful river which ran murmuring along beneath. Sometimes they stopped to pluck a fern, or stooping at a rill side would gather

> "That blue and bright-eyed flow'ret of the brook
> Hope's gentle gem, the fair Forget-me-not."

A charming walk of nearly a mile ; much too pretty to be thought long, brought them to Downton Bridge, immediately below the Castle, and passing through a wicket gate, the gorge of the Teme was entered. Here Mr. Richard Payne Knight studied to conceal the care with which he laid out the walks so as to ensure their greatest picturesque effects.

The sun by this time had come out in full brilliancy, the river was in perfection, and whether the walks had been visited or not before, none could fail to be pleased with the loveliness of the scenery; its richness, its wildness, the rugged banks, and the rushing river, the beautiful combination of rock and foliage, of light and shadow, as seen, now from the gloom of a rocky cavern, and again from an open glade. Well might a lover of the picturesque grow more and more enchanted with the views. Well might Mr. Richard Payne Knight dwell on them with enthusiasm.

"Let me, retir'd from business, toil and strife,
Close amidst books and solitude, my life;
Beneath yon high-brow'd rocks in thicket rove,
Or, meditating, wander through the grove;
Or from the cavern view the noontide beam
Dance on the rippling of the lucid stream,
While the wild woodbine dangles o'er my head,
And various flowers around their fragrance spread;
Or, where, 'midst scatter'd trees, the op'ning glade
Admits the well mixt tints of light and shade."

"There is nothing to be done in bees here," said an entomologist present, who had perseveringly waved his net throughout the day, so I am afraid in the matter of "fragrant flowers" the poet has taken a little license in the description. For ferns and mosses the place is renowned: they abound here. Few visitors seemed to be aware of the moss cavern below the grotto, where the liverwort, *Marchantia polymorpha*, spreads its broad leaves over the damp rocks, amidst mosses of many kinds. The majority of the ladies chose fern-hunting. The delicate oak fern, *Polypodium dryopteris*, abounds here, and many were the roots carried off. The *Cistopteris fragilis*, the brittle fern, in its ordinary form, and in the variety *dentata*, was found pretty freely. The pretty and graceful shield ferns, *Polystichum aculeatum*, in its variety *lobatum*, and *Polystichum angulare*, were eagerly welcomed by the fair botanists, and others were plentiful enough; and so, too, was the Maidenhair Spleenwort, *Asplenium Trichomanes*. One lady had set her heart on a lady fern, *Athyrium Filix-fœmina*, and as a fine specimen was given to her, she evidently thought with Calder Campbell—

"But not by burn, in wood, or dale,
Grows anything so fair
As the plumy crest of the emerald pale,
That waves in the wind, or soughs in the gale,
Of the Lady fern when the sunbeams turn
To gold her delicate hair."

Many other more ordinary ferns were there—the *Asplenium Adiantum nigrum*, and *A. Ruta muraria*, the *Blechnum boreale*, the *Polypodium vulgare*, the handsome Hart's Tongue, *Scolopendrium vulgare*, the sweet-scented mountain fern, *Lastræa Oreopteris*, the *L. dilatata*, the ever-abounding *Lastræa Filix-mas*, and the common brake, *Pteris aquilina*. And about them all there was the great pleasure and advantage that take freely as you might, the permission to take may still generously be yielded, for a single season will amply fill again the vacancies.

Some of the votaries of science looked for grasses, the word melick grass, *Melica uniflora*, the *Aira cæspitosa*, and the *Festuca sylvatica* made very elegant bunches, and the Rev. W. H. Purchas was very charmed with the discovery of the spreading millet-grass, *Milium effusum*, which he thought new to the county, and therefore a prize of the day, albeit it is not a very uncommon grass.

The nettle-leaved Bell Flower, *Campanula Trachelium*, was abundant, and some ladies thought it could scarcely be wild; the shining Crane's bilt, *Geranium lucidum*, several of the St. John's worts, *Hypericum dubium*, *H. Pulchrum*, and *H. Androsæmum*—the *Œnanthe crocata*, and several other more ordinary plants, were slso obseived.

Thus pleasantly loitering, the green at the Hay Mill, at the far end of the Walks, was reached in due time according to programme, at half-past two o'clock, but as each party got there, it was only to learn that the cart with the hampers had not arrived. Happy they who carried with them their provender! It had been heard of, however, "inquiring the way," as some one merrily observed. So sending off messengers in search of it, the President ordered the signal of concentration, the whistle, to be sounded, that the business of the day might begin, and thus occupy the minds of the visitors.

The Rev. W. H. Purchas then exhibited some fine specimens of the pretty wild pink that was seen to be growing so freely on the walls of Ludlow Castle in the morning. It was the *Dianthus plumarius*, and many there were greatly pleased to get a specimen. He also distributed specimens of the *Milium effusum* already mentioned. He then produced from his herbarium some rare and interesting plants which he had brought with him from Gloucester, the *Lepidium draba*, *Melilotus arvensis*, *Nasturtium amphibium*, several varieties of *Sedum Fosterianum*, one from Borrer's own garden, the *Sedum rupestre*, the Bristol stonecrop, from St. Vincent's Rocks, Clifton, and its greatly magnified self from Cheddar.

Dr. Algernon Chapman then took the eager attention of all present by the exhibition of some magnificent American moths. They had been sent as pupæ from New York, and had emerged as moths at Abergavenny.

CERATOCAMPA REGALIS.

The curiously spiny or horned larva of this moth feeds on Hickory and Walnut leaves. It is an object of fear to the negroes of the Southern States of America, and has been called the Hickory Horned Devil. The moth is nearly six inches in expanse of wing; it rests with its wings in penthouse fashion, and is a very beautiful object. The body is clothed with long fur, marbled red and yellow; the wings have a deep neutral tint as a ground colour, which displays to advantage the patches of rich yellow on the wings and the red markings along the nervures.

CERATOCAMPA IMPERIALIS,

Called the Emperor, must be distinguished from our English Emperor Moth, to which it is not at all allied. It feeds on Sassafras, &c. It is rather smaller than *Regalis*, of a rich yellow, dotted with black, and with two red fasciæ, expanded into blotches in the male. It rests with its wings extended.

.. male *C. Imperialis* and a female *C. Regalis* were exhibited alive, though they had unfortunately somewhat injured themselves by having been kept alive for several days, and brought in a tin box. They are not silk producers, but bury themselves in the earth to undergo their transformations.

BOMBYX ANGULIFERA.

Some specimens of this moth were also shown which were bred from cocoons sent from New York. This insect is rare in the States. It belongs to the family of silk-producing moths, but is not likely to be useful for that purpose.

BOMBYX YAMA MAI.

Mr. J. W. Lloyd, of Kington, next exhibited some larvæ of the oak feeding silkworms, first the *Bombyx Yama Mai*, the Japanese silkworm, a fine fat fellow in his last skin, and some cocoons of the same insect; and secondly, some caterpillars in their fourth and fifth skins of the *Bombyx Pernyi*, a Chinese oak feeding silkworm.

Mr. Lloyd also showed a white mole, *Talpa Europœa*, from Titley. It was stuffed and had been captured with another white one in 1866, and it is remarkable that four other white moles were trapped on the same farm about two months since. The man who caught them says there are other white ones there, so that it would appear to be a regular variety in colour.

FUNGUSES.

Dr. Chapman brought with him a small specimen of the rare fungus *Lentinus lepideus*, which had been found by Dr. M'Cullough growing from the timbers supporting a railway bridge near Abergavenny,—and the President brought a *Polyporus squamosus.* Not a fungus was seen in the day's walk, nor is it likely there will be any until the prevailing dry weather is at an end.

A very able address was then given, entitled

A SKETCH OF GEOLOGICAL TIME,

By ROBERT LIGHTBODY, Esq., F.G.S.

Ladies and Gentlemen,—I am directed by our President to address you on some interesting geological subject suitable to the character of the scenery, in the midst of which we are to-day, and I much regret that he has not selected some one much better able to do justice to it than I am. However, I must do the best I can, trusting to your favourable consideration, and I propose to select the subject of *Geological Time*, as one which may be made obvious to those who examine the various strata of which the earth is composed.

I hardly know how, or where to commence so vast a subject,—the more so as the ladies in general are not supposed to take much interest in the pursuit of Geology, though I see around me some zealous exceptions, who are not afraid of carrying a hammer,—and using it too. Ladies and Gentlemen,—The science of Geology is second only to that of Astronomy in the vastness of its extent, dealing with immeasurable time, both past and future. To human appreciation this seems to differ little from eternity, for the finite senses of man cannot conceive the infinite either of time or space, and are lost for want of something to rest on. Do not be shocked, I beg of you, when I tell you that though this earth we stand on no doubt had a beginning, yet it is quite impossible to arrive at the slightest idea when the Almighty Creator first formed it; but as far as we can read its records in the various strata under our feet, it must have been millions of ages ago. Not only so, but constant destroying and constant reparation appear to be still going in endless succession, making it equally impossible to estimate its future duration as its beginning. I hardly know at which end of the long series of formations to begin in order to give you some slight idea of the amount of time necessarily required by them; but perhaps the most intelligible way will be to take the last first and work backwards.

You must bear in mind that, setting aside the Volcanic and Plutonic rocks, all others, with very trivial exceptions, have evidently been formed under water, either salt or fresh, as is proved by the remains of fish and shell fish, and other inhabitants of water, abundantly found in them. These are consequently called sedimentary formations, and must have been deposited in the same manner that we see still going on at the bottom of seas, lakes, rivers, &c., and we know how slowly these are formed from year to year. Examine a piece of the rock about you, and count the number of different layers in an inch, and multiply this by the thickness of the beds, and thus estimate the time occupied in their deposit, and whether you calculate by years, or floods, or even by tides, you will find that they required years beyond calculation.

All these deposits require and result from the destruction of other and older deposits, by the action of atmospheric agents, such as rain, frost, running water, and ice or glaciers. Now the ground we stand upon, nourishing grass and trees, requires a long time for its accumulation by almost imperceptible degrees, through the decay of lichens, mosses, and such scanty vegetation on the surface of rocks, sands, and clays left by the waters. By slow degrees the barren surface is covered by a bed of some inches of dark brown soil, or loam as we call it, which is capable of cultivation. But below this soil we come to the sedimentary deposit of the district, whatever that may be. The most recent forms of this are seen in deltas at the mouths of great rivers, such as the Nile, or the Mississippi, and on the margin of such coasts as have been raised above the sea in comparatively recent times.

I ought to have mentioned that though the sedimentary strata have all been originally horizontal, or nearly so, yet by a beneficent disposition of Providence the action of earthquakes and volcanoes, or other causes which are not yet sufficiently understood, has elevated portions of them, and tilted them more or less upon their edges, thus exposing them to the action of weather and water, which have removed vast thicknesses of them, and thus enabled us to obtain coal, which is so essential to us, but which was originally covered by too vast a thickness of other beds, to be attainable by man. Indeed he could never have known of its existence, without this elevation.

These recent sedimentary beds contain in many places the remains of man, together with those of existing animals, but yet are of very great thickness in some places, such as the Nile, and must have required vast time to accumulate, since we must refer them back to the age of the earliest Egyptians at least. In other cases we find deposits of this age in the form of drift or gravels, as in the valley of the Somme at Amiens, where it forms a terrace, elevated 300 feet above the present level of the river; and in the deposit of glacial drift on the top of Mount Tryfaen, in Carnarvonshire, at the height of 1,400 feet above the sea. Many of these old gravels and river deposits contain the remains of quadrupeds which are now extinct, such as the great Irish Elk, the Mammoth, &c. Indeed I have myself a molar tooth of the Mammoth, which was found in the gravel at Wooferton Railway cutting. You must admit that the date of the existence of these animals must have been long ages past, yet these formations are called recent, or post-tertiary, and the shells contained in them are all of existing species.

Below these recent beds come a long series of formations, deposited in many places successively upon one another, which are denominated Tertiary, and which are divided into three great classes—the Pliocene, or most recent,—the Miocene, or less recent,—and the Eocene, or dawn of existing life. In the Pliocene, we find from 10 to 40 per cent. of shells of extinct species; in the Miocene the proportion of extinct shells varies from 60 to 80 per cent.; in the Eocene almost all the shells are unknown at the present time in our seas, and the remains of plants found indicate a tropical climate. What an immense length of time must have elapsed since that state of things existed! And yet this is but the skin as it were of the globe. We have not yet got to the flesh, yet these beds have an aggregate thickness of several thousand feet, and are each of them subdivided into a number of minor divisions, each containing a different set of fossils.

But now we come to the next great division or Secondary rocks, in which no traces of existing forms of life are found. This division contains the great Chalk formation, which many of you may have seen in the South and East of England, and which is of very great thickness in this country, and still thicker abroad, since many beds are found there which were either not deposited here, or were afterwards denuded. Below this comes the Oolite formation, which you see well developed round Bath and Cheltenham, and which is also of very great thickness. Below this is the Lias, and below that again the Trias, or New Red Sandstone, which is found of very great thickness in Shropshire and Cheshire.

We now come to the Primary Strata, which I may call the Rock masses "par excellence," as they are many of them very hard, and all but the first are of very great thickness. They are divided into seven great formations, the most recent of which is the Permian, which was formerly classed with the Trias, but was afterwards found to contain a distinct set of fossils. York Cathedral and the Houses of Parliament are built of this. Then comes the great coal or carboniferous series, on which the wealth of England depends. We know this formation, to a very small extent, in our own neighbourhood on the Clee Hills; but in some parts of the world it attains a thickness of many thousand feet. It contains in its lower beds the Mountain Limestone, which forms the romantic hills of Derbyshire, the cliffs of the Orm's Head, and also the quarries at Oreton, near Cleobury Mortimer.

Below this, again, we arrive at the Devonian or Old Red Sandstone, which we see at Whitbach and Hayton's Bent, and forming the base of the Clee Hills, but which is much more largely developed in South Wales, where it forms the fans of Brecon and Carmarthen, the Skyrrid, and the Black Mountain. The higher beds of this series are found largely in the North-West of Scotland, though, I believe, they have never been found in England, and they abound in a great variety of fish, quite different from those found in our lower beds in this neighbourhood. Indeed, this, together with the coal series seem to have been the great fish formations, as their remains, though scantily found in the top of the next lower formation, occur in shoals in some parts of those.

We next come to the rocks among which we now stand—the vast Silurian Formation,—more than 20,000 feet thick, which at one time was fancied to be destitute, or nearly so, of fossil remains, but was elevated to its proper dignity by Sir Roderick Murchison, who has the credit of having worked it out, and rendered it intelligible to anyone who studies it under his guidance. The Upper Silurian is the most recent series of this formation, and is subdivided into Upper Ludlow, having at its top the Downton Sandstone (named from this locality); the Lower Ludlow, containing at its top, in some places, the Aymestry Limestone, which we see here above Bow Bridge; and the Wenlock Limestone and Shales, which are seen a little higher up, about Burrington.

Below these lie the Middle Silurian, or May Hill and Llandovery beds, though some geologists believe that the Upper Llandovery, or May Hill Sandstone, as seen at Norbury and May Hill, might more fairly be classed with the Upper Silurian, and the Lower Llandovery with the Lower Silurian.

Then comes the tremendously thick series of beds called Lower Silurian; the first subdivision of which, named Caradoc, from Caer Caradoc, near Stretton, is estimated to be 12,000 feet thick, is well seen in the valley of the Onny, above Strefford Bridge. It contains many very beautiful fossils, particularly the *Triuncleus concentricus*, with its perforated fringe to the head. We must now go again out of our own district to find the next lower formation,—the Llandilo, Upper and Lower, which is of very great thickness (chiefly from the quantity of volcanic ashes and lava which is interbedded with it), and is well shewn in the Stiperstone district, and also at Builth and Llandrindod.

Below these come the Upper and Lower Cambrian strata including the Tremadoc slates and Lingula flags (both which, however, Sir R. Murchison classes with his Lower Silurian), and lastly the Longmynd series, which alone is supposed to be 6,000 feet thick. This last deposit, in Carnarvonshire, produces the celebrated Bangor slates—the best in the world—though at the Longmynd it is fit for nothing but road metal.

Last of all known sedimentary rocks we find in Canada, and on the north-west coast of Scotland, a series of beds, estimated to be 30,000 feet thick, denominated Laurentian, from the river St. Lawrence; but these beds have only yielded as yet, one fossil remain—the *Eozoon Canadense*, though in the Longmynd beds, which were formerly considered to be destitute of any signs of life, and therefore termed azoic, the researches of my friend, Mr. Hicks, at St. David's, have recently brought to light the remains of several species of Trilobites, some of them of large size.

Now let us take notice that each of these formations contains a different series of fossils, but few being found in two consecutive beds,—and not only so, but each of these formations has been subdivided into several subordinate divisions, each of which contains fossils peculiar to itself. Then, remembering the thousands of years that have elapsed since man first appeared on earth without any material change in animal life, as is proved to a great extent by the paintings and sculptures of the early Egyptians and Assyrians depicting our existing animals. Reflect what an inconceivable time must have passed away ere these various destructions and renewals of forms of life could have been brought about. Perhaps it may aid you in conceiving the duration of time thus occupied to refer to the accounts given by Sir Chas. Lyell and Dr. Dawson, of the section of the coal-bearing strata of the carboniferous formation seen in the lofty cliffs called the South Joggins, on the Bay of Fundy in Nova Scotia. The cliffs are from 150 to 200 feet in height, and the beds dip at an angle of 24°, enabling you as you walk along the shore to examine every bed, as you would the books on a library shelf. In a thickness of 2,500 feet, measured at right angles to the stratification, Sir C. Lyell counted 19 seams of coal, varying in thickness from two inches to four feet.

Ten of these seams had erect trees of sigillaria standing up out of them as they grew, and remained preserved in the sandstone, to the height of six or eight feet above the coal, but one trunk was 25 feet high and 4 feet in diameter. Sir Wm. Logan afterwards, making a more detailed survey of this line of cliffs, found erect trees at 17 different levels, extending through a vertical thickness of 4,515 feet and he estimated the total thickness there of the carboniferous formation, with and without coal, at no less than 14,570 feet. Dr. Dawson and Sir C. Lyell afterwards examined a portion of these strata 1,400 feet thick, where the coal seams are most frequent, and found evidence of root-bearing soils at 68 different levels. Remember that each of these root-bearing soils must (after vegetation and trees had grown long on it) have been submerged, and beds of sand or mud have been deposited upon it, destroying the life of its vegetation, but preserving evidence of its former existence for our information. After one or more beds had been thus deposited upon it, the surface had again got above the water, which enabled another crop of vegetation to grow, this again being submerged, after trees from four to five feet thick had grown upon it, and thus successively throughout the whole series.

Looking, then, at the fossil evidence I have brought before you, about which there can be no mistake, and at the immense thickness and numbers of the beds, am I not justified in telling you that inconceivable ages must have elapsed since life made its first appearance on the earth, or beneath its waters? And does it not also justify my parallel of Geology with Astronomy, which shews us by means of the stars, immeasurable distances, as the telescope opens out to our view remoter and remoter orbs? And who shall tell us that this study of the infinite works of our Creator, and the wonderful adaptation of all His handywork to the wants of His creatures, does not tend to make us revere His power and bless His goodness? No revelation can more unmistakeably make known to us our Almighty and beneficent Father than that which His own finger has written in His works. The text remains there perpetually for our use, and though it may be temporarily misunderstood, it can never be permanently perverted by any mis-transcription or mis-translation.

The paper was much applauded, though the patience of the lecturer must surely have been greatly tried, for in the middle of it the missing hampers began to arrive, and it was not in the nature of all his hearers to remain patient unto the end.

Saponaria Vaccaria

SAPONARIA VACCARIA.—*L.*

COW-WORT.

Gypsophila vaccaria.—SIBTH. AND SM.
Vaccaria pyramidata.—RCHB.

Stem.—Stiff, erect, smooth, leafy below, ending in dichotamous panicles, with a single flower stem from the division—the joints are enlarged.

Leaves.—Sessile, ovate, and slightly connate below, becoming more lanceolate and acute above, of a pale glaucous green.

Flowers.—Rose coloured, numerous, on long stems, and loosely panicled.

Calyx.—Membranaceous, pyramidal and swollen, smooth, with projecting angles of a brighter green and five equal teeth.

Carolla.—Limb oval and slightly five-toothed without scales, half the length of the calyx. *Stamens*, ten. *Styles*, two.

Capsule, a round oval one-celled opening with four valves at the top.

Seeds, round and black—nearly smooth externally.

The whole plant is smooth and hairless, of a pale glaucous green. It is an annual, and grows from 18 to 36 inches in height.

The *Saponaria vaccaria* derives its specific name from the fact that cows are fond of it, and it is said to increase the quantity of milk they give.—For the same reasons the English name "Cow-wort" is now given to it.—It is a weed of the cornfields, and common throughout Continental Europe, particularly in France, Germany, Switzerland, and the Levant. It is said also to be common in Central Asia.

It has been several times observed in Britain as a weed of cultivated land, introduced as is supposed, with the seeds of clover, vetches, flax, &c.—The earliest record of its occurrence is in Cowell's "Floral Guide to East Kent" where it is stated to have been found in 1832 by Mr. Francis at a spot east of the pier at Herne Bay. It was gathered on a newly repaired towing path near Ware mill in 1841, and plentifully about Ware, by Mr. Ansell in 1845. (Flora Hertfordiensis). In July, 1842, Mr. Wilson detected it in a field of flax at Alves, in Morayshire, along with *Camelina Sativa.* (Botanical Chronicle). The Rev. W. M. Hind found a single plant in a chalk-pit at Pinner in 1862. Mr. Buxton found it in 1863 on a rubbish heap four miles from Southport in Lancashire. In July 1864 it was found growing in a field of vetches between East Malling and Town Malling. (Botanical Chronicle). In 1865 it was found at Mitcham and Wandsworth, in Surrey, by Dr. Henry Trimen, F.L.S. Mr. W. Bean found a few plants in a cultivated field near Scarborough, Yorkshire (no date). Watson's "Cybele Britannica" says it has occurred in Berkshire (no date): and in Surrey it is stated to have been "plentiful for several years" about Wandsworth and Battersea. In Herefordshire it was first noticed by C. G. Martin, Esq., about three weeks since, growing in considerable abundance over a field of vetches near Widemarsh Common, Hereford. It has also been found this year growing at St. Austell, in Cornwall, by Miss Coode.

It is now, as you see, in full seed and since it ripens its seed so readily there seems good reason to believe that it may become perfectly naturalised in England.

It is not included in the London Catalogue of Plants, nor is it even alluded to in the beautiful Edition of Sowerby's "English Botany," by Mr. Boswell Syme, now nearly completed.

The illustration opposite is very kindly presented to the Club by Mr. Martin.

*1. Petal. 2. Ovary, stamen, & pistils. 3 Section of Ovary.
4. Transverse section of Calyx & Ovary. 5. D^o. ripe.
6. Longitudinal section of ripe ovary.*

SAPONARIA VACCARIA. *Linn.* COW-WORT.

THE OCCURRENCE OF RARE BIRDS IN HEREFORDSHIRE AND THEIR NIDIFICATION IN THE COUNTY.

By ARTHUR ARMITAGE, Esq., Vice-President,

And the Rev. CLEMENT LEY.

In attempting to give some account of the occurrence and nidification of the more uncommon birds in Herefordshire, it will be desirable to follow as a guide, in the matter of arrangement, the usual order of ornithological classification, not as the most technical (for technicalities will be as far as possible avoided in the following paper), but as affording the most obvious and convenient course. It is intended to give a short account of the visits of the rarer species, so far as they have come under personal observation, and of some particulars relative to the nests and eggs of birds, which it is hoped may be found interesting.

Commencing then with our birds of prey: Besides a few stragglers of the rarer falcons, such as the Peregrine *(Falco peregrinus)*, a specimen of which was taken last year in the neighbourhood of Ross, Herefordshire can boast of some rather uncommon regular visitors and residents. The Hobby *(Falco subbuteo)*, though nowhere numerous, may frequently be seen in the summer months in that neighbourhood, and probably in other of the more wooded portions of the county, and a summer never passes without our occasionally seeing a pair of these beautiful falcons, soaring with their narrow bow-like wings and rapid flight over our larger woods. The eggs have been taken in the woods on Aconbury Hill.

The little Merlin *(Falco æsalon)* is still to be found, or was a year or two since, on the Black Mountain, and the eggs exhibited, we took ourselves from a nest in the heather on the Fwddog Mountain 10 years ago, in the month of May.

The Kite *(Falco milvus)* is almost a bird of the past in our county, though once or twice we have noticed it, and the Common Buzzard *(Falco buteo)* is becoming yearly more uncommon.

It may be mentioned that only last week, in the parish of Sellack, we had a fine view of a pair of these birds, which continued to circle round for a quarter of an hour nearly over the same spot.

In the woods that border the Wye valley between Ross and Monmouth, they may still be seen, but are rapidly disappearing under the ruthless persecution of the gamekeeper.

In a few years the sight of one of the larger birds of prey, which used to be such an ornament to our landscapes, will be as unexpected a pleasure as the discovery of a Dodo or a Megatherium. However, they are not all quite gone yet; a few years since a male Honey Buzzard *(Falco apivorus)* was killed in the neighbourhood of Ross, and within a few days of the occurrence a female was shot from her nest in Newent wood, not improbably the mate of the former victim. The nest contained three eggs, two of which, together with the parent bird, are in the possession of Mr. Skyrme, of Ross, and the other is here exhibited side by side with that of the Common Buzzard *(Falco buteo)*.

The Hen Harrier *(Falco cyaneus)* is occasionally seen on the wooded banks of the Wye; one was shot sometime since in the parish of Bridstow in this county.

The Tawny Owl *(Strix stridula)* is still abundant throughout the county, and the Barn Owl *(Strix flammea)* is pretty numerous. We may mention that we once found a Starling's nest and twice the nest of the Blue Tit in the same hollow tree with, and in close proximity to, the young family of the tawny owl, an awful situation one would imagine for the little Tit to have selected, where he could daily look down on the headless carcases of a number of small birds, including very probably some of his own species, storing the Owl's larder, but Tommy is probably not given to moonlight expeditions, and the big owl can make nothing of the small chink in which his pert little neighbour resides.

Besides our common Redbacked Shrikes *(Lanius collurio)*, the Great Gray Butcher Bird *(Lanius excubitor)* pays us now and then a passing call, and we have ourselves met with a small flock of these birds in winter time on the Black Mountain.

A few words on the Merulidæ. The Dipper or Water Ousel *(Cinclus aquaticus)* is plentiful enough in the western and northern portions of Herefordshire, and the Ring Ousel *(Turdus Torquatus)* tolerably abundant on the Monmouthshire and Shropshire Hills and in the parish of Ewias Harold in Herefordshire. We have found their nests as frequently on the ground, amongst the heather, as on a rock or in a bush—all the other birds of this family seem to take it into their heads occasionally to desert their usual bush-loving habits and to build upon the ground. Last year we found a Missel Thrush's *(Turdus viscivorus)* nest, on which the female was sitting, placed on the ground on the top of a bare mass of stone, and presenting an almost ludicrous appearance. We have several times found the nest of the blackbird *(Turdus merula)* built on the level ground in the middle of a wood, and remember to have found the nest of the Redwing *(Turdus iliacus)*, in Norway, in the midst of high grass in the shade of a birch tree. But why should not birds be whimsical sometimes in their architectural fancies as well as ourselves?

The Stonechat *(Sylvia rubicola)*, which is not nearly so numerous as the Whinchat *(Sylvia rubetra)* in Herefordshire, builds a nest that is very difficult to find; like some others of the same family, they frequently return to the same spot for nestling purposes, and we have found the Stonechat's nest for several years following in the same clump of furze. Still more difficult to find is the nest of the Wheatear *(Sylvia œnanthe)*, which we have discovered on the Black Mountain, hidden beneath a flat stone upon the ground amongst the heather. (The eggs of the Stonechat, Whinchat, and Wheatear, with drawings of the birds themselves, are exhibited).

One of our rather uncommon species is the Grasshopper Warbler *(Sylvia locustella)*, which is, however, much more numerous in some seasons than others. Last year they were plentiful, and this year they appear to be very scarce. With regard to the nests of this species, we have often sought for them to no purpose in the localities in which they are commonly said to be found, but have been successful in meeting with them in the middle of clover and grass fields in the month of June. They are commonly placed on the ground, but the nest exhibited is interesting, as having been, flimsy structure as it appears, built around the stalks of clover, with its base some inches above the surface of the earth, just as the common Reed Warbler *(Sylvia arundinacea)* suspends its nest on the stalks of the bull-rush. The latter species mentioned, the Reed Warbler, we have only seen in the northern and western portions of our county, but they are especially numerous at Llangorse Pool. Nothing can be more diverse in appearance than the nests of this species, varying in material from coarse grass to the soft white down of the willow catkin, of which one of the nests taken at Llangorse was entirely composed. Some nests which we took in the garden of Magdalen College, Oxford, were placed in shrubs, one at the height of 15 feet above the ground, and in these situations they were comparatively shallow; but when built in the usual position around the pliant and waving stems of the reeds, they are made of great depth, to prevent the eggs from rolling out under the agitation of the wind.

The Sedge Warbler *(Sylvia salicaria)* is plentiful in Herefordshire.

The Lesser White-throat *(Sylvia curruca)*, though not nearly so abundant as the Greater White-throat *(Sylvia cinerea)*, is a common bird throughout our county; its comparative shyness (for though often heard it is not frequently seen) may have occasioned its repute for rarity, which is certainly undeserved, as few days pass in spring when its well-known rattling song may not be heard.

Some ornithologist may probably be able to give us more information than we possess relative to the Fire-crested Wren *(Regulus ignicapillus)*, of which four years ago a pair were seen at Sellack; it is difficult on such occasions to refrain from the use of the gun, for a pair of these beautiful little birds, side by side with the Golden-crested Wren *(Regulus cristatus)*, would be an interesting cabinet ornament, but unless the principle of sparing our rarer birds is rigidly adhered to they must all be soon annihilated.

Among the birds which are less uncommon than is usually supposed, the Cirl Bunting *(Emberiza cirlus)* should be enumerated. This species is native in Herefordshire, and not merely an occasional visitor in the winter months. In two successive springs we noticed a male bird perched on the same identical tree in the parish of King's Caple, near Ross, and by his anxiety and often repeated call note it was plain that his mate was not far distant upon her nest; the spot was thoroughly rummaged to no purpose, and the only inference was that the nest probably occupied a situation similar to that of the Corn Bunting *(Emberiza miliaria)* in one of the neighbouring wheat fields.

The Lesser Redpole *(Fringilla linaria)* is an uncommon bird in Herefordshire, remarkably so considering its pretty general distribution throughout the Midland counties; its nest, which we took this year, but not in Herefordshire, is exhibited, and is one of the smallest of the nests of British birds; unlike that of the common species it is built in low trees, or in the uppermost branches of a high hedge, much in the situation usually chosen by the Chaffinch. (The drawing exhibited was taken from a specimen shot in the early spring of 1853, being one of a small party of seven or eight seen feeding upon the young shoots of larch trees in a plantation at Moraston, near Ross).

The Mountain Finch *(Fringilla montium)*, of which a drawing is also exhibited, was observed in a thicket called the Flann Rough, in the parish of Peterstow, where a small flock of them associated with the Chaffinches and other small birds for some time in the month of March, 1855.

While the rarer species of birds are generally speaking rapidly on the decrease in this country, one or two kinds appear to be becoming from some unexplained cause more numerous than in former years. Among these may be included the common Crossbill *(Loxia curvirostra)*. Of late years this very interesting species has frequently visited our gardens and fir plantations. Since July of last year flocks of these birds have repeatedly made their appearance in the neighbourhood of Ross, and last June was the only one out of twelve successive months in which we have failed to see them in the garden at Sellack vicarage in small companies of from two to seven together; they rarely remained above a few hours at a time and were usually a mysterious odd number—three, five, or seven—exhibiting no sign of pairing, nor can we from personal observation throw any light on their nidification. Most curious birds they are, and very interesting it has been to watch their parrot-like motions as they clamber from bough to bough of the spruce fir trees, frequently breaking off a spray with the cone attached to it, which they grasp in their claws while they extract the seeds, producing a loud snapping noise with their powerful bills; among those which visited us last summer were several young males of the year, whose brilliant rosy plumage formed a striking contrast to the almost sooty hues of their companions.

The eggs of the common Green Woodpecker *(Picus viridis)* we have found subject to some remarkable varieties of size and form: two of these with a specimen of the common type are exhibited, with those of the Greater and Lesser Spotted Woodpecker and Wryneck, to which they approximate in dimensions. One of our most handsome species is the Great Spotted Woodpecker *(Picus major)* which is, however, a comparatively rare bird in Herefordshire. We have noticed both this and the Lesser Spotted variety in larger numbers in the immediate neighbourhood of Hereford than elsewhere. Our Lesser Spotted Woodpecker *(Picus minor)* exhibits a curious trait of instinct in the selection of the spot for its excavations. In choosing a decayed branch in which to perforate the cavity for its eggs (for this species has not a bill powerful enough to pierce the green and growing wood), the little Woodpecker always selects the remains of a bough which has been cut off, or had its top broken by the wind, and proceeds to bore its hole a foot or so below the broken part; it is thus almost secure from the branch breaking off at the part excavated, which would be very likely to happen in a gale of wind if the hole were at a distance from the extremity of the branch: we have alway found the nests in this situation.

The Wryneck *(Yunx torquilla)* will lay many eggs. From the nest, out of which the two eggs exhibited were taken, a neighbour extracted 40 in all, by taking a fresh egg each successive day.

And now for a few words about the ways of the Cuckoo (*Cuculus canorus*), a hackneyed subject in ornithology, but one which we presume to say has not been completely exhausted. The female Cuckoo has the reputation of being a bad mother, and we shall not attempt to advocate the principle she adopts of putting out her children to nurse; but there are few characters about whom nothing favourable can be said, and next to supporting them herself is the duty of finding an efficient nurse, who will not be likely to make mistakes about their diet. Now all the Cuckoos of our acquaintance have shown the greatest powers of discrimination in the performance of this latter obligation. Of a large series of eggs which we have taken none had been deposited in the nests of the conical billed birds, whose diet is of a harder nature such as grain and seeds of various kinds and only partially of insects; we have only found the eggs of the Cuckoo in the nests of those birds which, like itself, are insect eaters. And here arise two questions which have been repeatedly asked, and too frequently met only with ridicule for answers. Does the cuckoo ever transport her egg in her throat or beak in order to deposit it in a suitable nest? We might suppose that she invariably lays it in the nest like any other bird, but it has long been known that her congener, the didric or gilded cuckoo of Caffraria, conveys her egg in her beak, or rather throat, to the nest selected; and if we may be allowed to express an opinion on the subject, we should say that undoubtedly our British visitor does the same. We have ourselves on four or five different occasions found the egg of the cuckoo in nests which were placed in the cavities of trees or banks, the apertures of which were indisputably too small to allow the cuckoo to do more than insert its head and neck. The question might, perhaps, be settled by shooting several female cuckoos in May in the early morning, which is the period of the day in which they usually deposit their eggs, and then proceeding to examine their throats.

The other question we have heard stated in rather a ludicrous form, in which it can of course receive only a negative answer—"Can the cuckoo lay an egg of whatever tint or colouring it chooses?" Some observers have noticed that the eggs of the cuckoo which are found in the nests of the titlark are of a hue approximating to those of that species of bird, while those found in the nest of the hedge-sparrow are more green, and those in that of the pied wagtail are grey in colouring, and that there is, in fact, a peculiar resemblance between the egg of the cuckoo and those of the nest in which it has been deposited. The statement appears *a priori* to be highly improbable, but the progress of research sometimes converts unbelief into credence, and we shall hope to have some light thrown on the subject by ornithologists! Our own observations on the whole are in favour of the accuracy of the statement. Perhaps, if it be found to have a foundation in fact, it may receive an explanation in some degree from the theory already suggested, that the cuckoo transports her egg from place to place in her throat until she finds the most suitable repository, in colour as in other respects, and we shall not be compelled to have recourse to the extraordinary idea that the sight of the eggs contained in the nest selected affects the colouring of her own egg before it is laid, after the mysterious analogy of Jacob's Cattle.

The Kingfisher *(Alcedo ispida)*, we need not say, is still plentiful enough upon the banks of the Wye and its tributary streams, and a great ornament to them. Long may its rather shy habits and arrow-like flight serve to protect it from the clumsy sportsman. We must admit, however, that we have not personally contributed to its increase, having destroyed a large number of its retreats, partly in order to settle the old question, whether the Kingfisher actually constructs a nest of fish bones, or whether the bones with which the eggs are found surrounded are merely an accidental accumulation of the indigestible portions of food, which, like the Owl, the Kingfisher disgorges. The fish bones were arranged in a similar manner in all the holes examined, and in a particularly neat and careful manner in those cases where the parent birds had only commenced laying thus in some holes examined only in the present season, in which only two or three eggs had been deposited, the circle of fish bones was found complete, though in nests examined later there was certainly a greater accumulation.

In connection with our notice of the Kingfisher we may mention a curious incident that occurred illustrative of the intelligent instinct by which birds are led to discover and obtain their food under circumstances unlooked for by ourselves. It happened that in the dry summer of 1866 we had a pond cleaned out, which for many years had contained no fish in consequence of the water being poisoned by the drainage of a farm-yard. The buildings having been removed the water again became pure, and in the autumn of that year the pond was stocked with a number of small perch. In November of the same year a Kingfisher having discovered its food, ventured within 100 yards of the house, and was picked up dead upon the margin of the pond with a perch in its throat, as represented in the drawing exhibited. The fish had stuck up his back fin in the act of being gorged, and had thus revenged itself upon its enemy by choking him.

The Fern Owl, or Nightjar *(Caprimulgus Europæus)*, appears to be much more numerous in the northern than in the southern portions of this county, and may be constantly both seen and heard among the low wooded copses in the neighbourhood of Aymestry and Shobdon. The habit of this bird, when in repose, of squatting longitudinally upon the rough bark of trees, of a similar colouring to itself, frequently secures it from the observation of a passer-bye of which the bird seems conscious, as it will frequently remain on its resting place until within a few feet of the hand that may be directed towards it.

Passing over the Columbidæ and others, we now find ourselves among the marsh and water birds, the former of which have become more and more scarce in consequence of their food being taken from them by means of the universal application of drainage in cultivation. One of their last strongholds upon the Berrington estate, near Leominster, is now about to be taken from them, a drainage contract, it is announced, having been entered into.

We must not trespass further upon your time and attention than merely to enumerate the names and produce drawings of several rare specimens which the hard winter of 1854-5 tempted to make an exploration of the Wye in the hopes of refreshing themselves on their passage from a northern to a more southern shore of our sea-girt isle: such as the wild swan, both Hooper's *(Cygnus musicus)* and Bewick's *(Cygnus minor)*, the Pochard Duck *(Anas ferina)*, the Tufted Duck *(Anas fuligula)*, the Red-throated Diver *(Colymbus Septentriónalis)*, a Norwegian bird, the Cormorant *(Carbo cormoranus)*, the Goosander *(Mergus merganser)*, male and female, and some others, but we believe the most remarkable specimen of all to be found in this inland county, is that of the Manx Shearwater *(Procellaria puffinus)*, which was captured in a turnip-field in the parish of Peterstow, near Ross, by a party of sportsmen in the first week of September, 1867. There had been storms of rain, thunder, and wind a few days before, and the bird was exhausted when taken: but those who are familiar with the charming descriptions given by Yarrell in his account of the British birds, may well be surprised at finding this specimen here, when he says that this member of the Petrel family rarely alights upon terra firma save to deposit and sit upon its eggs on the rocks and caves of our south-west coasts.

We cannot close the recital of this paper without acknowledging the fact that although the names of two persons are announced as the authors of it, the greater part is due to the pen of one, the Rev. Clement Ley, curate of King's Caple, near Ross, who, but for this explanation, might well have said, "Hos ego versiculos feci tulit, alter honorem;" as also he may still exclaim, "Sic vos non vobis nidificatis aves!"

It was admirably illustrated by very beautiful drawings in water colours by Mrs. Armitage, and at the same time the eggs of several of the species were shown by Mr. Ley.

The following interesting paper was afterwards read:—

NOTES ON THE OCCURRENCES OF RARE BIRDS IN HEREFORDSHIRE AND RADNORSHIRE.

By MR. JAMES W. LLOYD, Kington.

Peregrine Falcon *(Falco peregrinus)*.—A young bird of this species was shot, about the end of the year 1866, in a wood near Leominster. The woodman who killed it believed it had been bred in the wood as there were two others in company with it. This bird was exhibited in the window of Mr. Saxby, of Leominster, in December, 1866.

Hobby *(Falco subbuteo)*.—I have two specimens of this rare and beautiful little falcon, shot a few years back in Brampton Brian park in this county. I believe they are both females.

Kite *(Falco milvus)*.—This rare bird still breeds on Radnor Forest. Two young birds were obtained in 1868, one is now kept in the gardens of Eywood, perfectly tame.

Kites were formerly pretty common on the forest, numbers being trapped at the Rabbit Warren, Water-break-its-neck. The warren has been recently destroyed and the birds are consequently less common.

The kite has nested in Brampton Brian Park, in this county. The park-keeper found a nest, and after patient watching managed to kill the male bird; the female I believe found a new mate and returned to share the same fate. One or more of these birds are preserved in the Ludlow Museum.

Buzzard *(Falco buteo)*.—Buzzards were also frequently trapped at the Warren on Radnor Forest, and doubtless breed there.

I have a fine specimen killed at Brampton Brian.

One was killed at Eywood about two years ago, and his body adorned (?) the gamekeeper's scaffold there for some time.

Short-eared Owl *(Stryx brachyotus)*.—A specimen of this owl was shot close to the town of Kington some few years back.

Great Gray Shrike *(Lanius excubitor)*.—In March, 1865, I saw a fine bird of this species which had been shot in Radnorshire, near the town of Builth.

Dipper, or Water Ouzel *(Cynclus aquaticus)*.—This pretty bird is common on the streams near Kington, and a favourite nesting place with it is upon the ledges of the iron girders of the railway bridges. It is also frequent on the Lugg in the centre of the county at Hampton Court, as noticed on the visit of the Club there last year.

Ring Ouzel *(Turdus torquatus)*.—This bird occurs on Radnor Forest where it probably breeds, but this I have not been able to prove.

Brambling (*Fringilla montefringilla*).—A large flock of these pretty birds occurred in the winter of 1866, near Eywood. Numbers were taken in nets at night in the shrubberies there. I kept a pair in a cage for some time, but from some cause the male bird lost nearly all the feathers off the head and back.

Their note is harsh and disagreeable, and their appetite insatiable.

Tree Sparrow (*Fringilla montana*) —Numbers of these birds breed in the holes of pollard willows on the banks of the Arrow.

Hawfinch (*Fringilla coccothraustes*).—The Hawfinch is occasionally seen in this part of the county in winter.

One specimen came into my possession about five years ago.

Siskin (*Fringilla spinus*).—Flocks of Siskins associate with lesser Redpoles, or "Izzard Linnets" as they are called in this district, on the alder bushes, near Kington, in winter.

Crossbill (*Loxia curvirostra*).—These birds are apparently more abundant lately. Eight or nine adults, principally males, were unfortunately shot near Kington in May last.

I have not yet been successful in finding a nest, but as specimens have been seen and obtained in May, July, August, October, and during Winter it is pretty conclusive that they are residents in this part.

I have brought four specimens, not very good ones, to show, one an adult female, shot in July last year, three others a male, female, and young one, shot in August, 1866.

A nest containing three eggs, which resemble those of the greenfinch, was found last year in the beginning of June about four miles from Bedford (see "Science Gossip" for December, 1868).

These birds are early breeders in Norway and Sweden, nesting generally in March, eggs being rarely found so late as April.

The fact of these birds being in flocks in May and the instance of a nest with eggs in June show them to be late breeders with us which is curious.

Raven (*Corvus corax*).—A pair of Ravens have bred for many years on Stanner Rocks, near Kington, but I have been unable as yet to obtain their eggs, from the difficulty of reaching the nest.

In August last year I saw three or four *young* ravens near the rabbit warren on Wapley, near Titley.

Some years ago one of the old birds at Stanner was shot in the breeding season, the other left the rocks and returned in a few hours with a new mate.

This pair always leave Stanner in the early part of the autumn, accompanied by their young brood, returning in about three weeks alone.

Great Spotted Woodpecker (*Picus major*).—A few specimens of this Woodpecker have come under my notice, chiefly from Radnorshire.

On the 16th of June last two young birds fully fledged were taken from a nest at Knill, in this county, and brought to me. I fed them for three days upon yolk of egg and lean beef, when they commenced to feed themselves, and to the present time they are doing well, flying about a small room, the floor of which being old is already shewing the effects of the strong beaks of these birds for they are tapping almost constantly, the noise being heard at some distance.

Mr. Bartlett, of the Regent's Park Zoological Gardens, informs me that he has frequently reared the Great Spotted Woodpecker, and kept them for a short time, but they have always died sooner or later, generally in fits.

[*Postscript.*—One of my birds died early in August; the other I set at liberty in the grounds at Moorcourt.]

Lesser Spotted Woodpecker *(Picus minor)*.—This pretty little bird occurs in the neighbourhood of Kington, but I have only seen one myself, which was shot in June last year.

Rock Dove *(Columbia livia)*.—Breeds at Stanner Rocks.

Bittern *(Ardea stellaris)*.—A specimen of this bird was killed some few years back at Stanton-on-Wye, and is, I believe, in the possession of Sir H. Cotterel, Bart.

Little Bittern *(Ardea minuta)*.—One of these rare birds was shot at Shobdon Court in the spring of 1838. (See Morris's British Birds).

Water Rail *(Rallus aquaticus)*.—This bird occurs occasionally on the streams near Kington in the winter, two or three specimens having come under my notice.

Egyptian Goose *(Anser Œgyptianus)*.—A specimen of this handsome bird was shot by Mr. C. P. Evans, at the Hengoed, Huntington, near Kington, about a year ago.

Pochard *(Anas ferina)*.—Killed on the river Arrow, near Staunton, by Captain De Winton a few winters back.

Tufted Duck *(Anas fuligula)*.—Two specimens of this duck were killed in Radnorshire about four years ago and were preserved by a bird-stuffer in Kington.

Cormorant *(Carbo cormoranus)*.—One specimen killed at Eywood some eight or ten years ago.

Common Tern *(Sterna hirundo)*.—One specimen killed on the Wye, near Hay, about 1864 or 1865.

The Lessor Tern, or Sea Swallow *(Sterna minuta)*.—A specimen was shot in the parish of Marden, by Hugh Jenner, Esq., when partridge shooting, the first week in September, 1869.

Kittiwake *(Larus tridactylus)*.—Specimens of this gull occasionally occur this district in winter. One was picked up dead in a field in the parish of Earlisley in 1866. Two were shot in March last at Sarnesfield.

Storm Petrel *(Tornus Pelagica)*.—One of these birds was shot near Shobdon Court in September, 1867. It was seen by a party of gentlemen, when partridge shooting, flying at a great height and was thought to be a hawk.

The President then read the following interesting paper:—

ABSTRACT OF A PAPER ON BATS.

By JAMES RANKIN, Esq., M.A., President.

I. The Order of Bats, on account of their nocturnal habits and peculiar aerial mode of progression, is perhaps less known than many orders which are in reality less common. I therefore propose to make a few brief remarks upon these very interesting animals.

On looking at any Bat, the first thing which strikes one is the curiously-extended arm and fingers and the membrane supported by them, forming what is called the wing. On examining this structure closely, we find that this membrane is double, being in fact an extension of the cuticle of the upper and under sides of the body.

The fore-arm is much lengthened, and the radius does not rotate upon the ulna, thereby gaining strength for the stroke of the wing. The thumb or pollex is always short and clawed, the four fingers immensely elongated.

The hind limbs are of proportionate length to the size of the body, and the toes are always free from the membrane and clawed ; the membrane extends between the hind legs, and in those species which have a tail the membrane usually extends as far as the end of that member.

The hind limbs of Bats perform the functions of the fore limbs of most other animals which use their hands or paws for grasping, and in relation to this change of functions we find in Bats a very curious change in the plan of rotation of the hind limbs ; these members are in fact turned round so far as to appear to be set on the body backwards, that is to say the knee joint acts backwards like the elbow, and the feet are turned with the soles upwards and the big toe outside, which arrangements are the reverse of what is found in other animals.

It should be noticed, however, that the muscles, bones, &c., are those of the hind limbs, and not those of the fore limbs, showing that although their functions are altered, yet their homological relations are preserved.

Looking now at the body of a Bat, we find it more like a mouse or shrew than any other animal. Bats vary considerably in size, but the common English Bat is about $2\frac{1}{2}$ inches long. The head is long and the ears are large, and in one kind of Bat (the long-eared *Vespertilio Auritus*) the ears are half as long as the body.

The brain is smooth, and the cerebral lobes do not cover the cerebellum. In this respect Bats agree with the Insectivora and Rodentia.

The teeth of Bats are sharp-pointed and numerous, and usually there is a gap between the incisors or cutting-teeth of the upper jaw; this peculiarity is shared with the Lemurs, and also with some of the Insectivora, as for instance the hedgehog.

In the muscular system the chief peculiarity is the great enlargement of the pectoral muscles; this of course is in relation to the function of flight.

Bats have the ordinary five senses, and are not blind as is sometimes supposed; the eyes are, however, very small and much obscured by hair. The sense which seems to be most developed in Bats is that of touch; and it is reasonably supposed that the whole of the extended membrane conduces to the perfection of that sense.

Having now briefly run over the most marked structural features of Bats, we may pass on to consider for a few moments their true position in the animal kingdom.

Amongst old writers Bats were frequently classed among birds, for the simple reason that they, bats and birds, could fly; the most cursory inspection of a bat and a bird would show however their dissimilarity. Thus, a bird's wing is formed of feathers growing out of the skin of the arm and fingers; the hand, again, of birds is reduced to two fingers which are joined together; bats have teeth; these, and a thousand other differences, would at once show that bats and birds were widely separated from each other.

In the Reptile Class, there does, or rather there used to, exist a creature which must have presented some external resemblance to the Bats of the present day—I mean the Pterodactyle. This animal, whose remains are found in the Oolite Strata, had a membrane something similar to that of Bats, but an essential difference in the construction of their wing from that of Bats consists in that only the fifth digit of the hand is elongated, the other four being free and clawed. Also the number of bones in the fingers increases from the thumb outward to the fifth digit; this is a character never found in Bats or any other Mammals.

Without going further into the details of structure we have seen enough to prove that although there may be considerable functional analogy between Bats, Birds, and Pterodactyles, yet there is no real homology of structure.

There is no doubt, therefore, that Bats are true Mammals; but what rank they may take among other Mammals is rather a difficult question to decide.

All naturalists are, now-a-days, agreed in classing Bats as a distinct order by themselves, under the name of Cheiroptera (wing-handed), but some place this order next to the Quadrumana or Monkeys on account of the resemblance which exists between Bats and Lemurs, especially in the teeth; whilst others arrange the Bats in a division with the Rodents (Rabbits, Mice, &c.) and the Insectivora (Shrew, Mole, Hedgehog) on account of the similarity of their brains, and teeth, and other internal parts of their structure. This latter arrangement seems almost the best, and Bats seem most naturally placed next to the Insectivora, being in fact Insectivora themselves.

There are other animals which partake in some degree of the power of flight amongst some of the orders of mammalia; thus the Pteromys or flying Squirrel is a Rodent having an expansion of the skin between its fore and hind legs which serves as a sort of wing, and enables them to take immense bounds from tree to tree. Among the Marsupial animals another example of this kind is found in the Petaurista.

These animals however both clearly belong to different orders, and their approach to the conformation of Bats is only an external resemblance in order to allow them better to pursue their habits of life.

Of Bats, there are two kinds—frugivorous (fruit-eating) and insectivorous (insect-eating). The former of these kinds are the largest Bats, but none live in England; British Bats being all insect-eaters.

The number of species of British Bats is very variously given by different naturalists, and there is little doubt the same species has often received different names.

Of British Bats, there are two kinds — those that have a leaf-like appendage to their nose, and those that have none. Of the first kind, only one genus is known, which is called the Horse-shoe Bat. This Bat has a peculiar foliaceous membrane above its nostrils, which is thought to bear some resemblance to a horse-shoe. This Bat is about the size of the common Bat, but of rather darker colour.

Of those Bats without a nose appendage, there are about six tolerably well-known sorts. These are all species of the Genus Vespertilio, and are named as under:—

1. Pipistrelle, or Common Bat...	*Vespertilio*	*Pipistrella.*
2. Noctule, or Great Bat	,,	*Noctula.*
3. Long-eared Bat	,,	*Auritus.*
4. Serotine Bat	,,	*Serotinus.*
5. Mouse-coloured Bat	,,	*Murinus.*
6. Barbastelle	,,	*Barbastella.*

Of these No. 1, the Pipistrelle, is the most common, and may be seen any evening flitting about; it is about two inches long, and its expanded wings measure about eight inches. Its colour is reddish brown.

The Long Eared Bat is also pretty common, and is at once recognised by the great length of its ears, which are half as long as its body.

The largest British species is the Noctule, which measures three inches in length, and the expansion of its wings is 14 or 15 inches.

I will conclude this abstract by a few very brief remarks on the habits, &c., of Bats.

The food of Bats consists of nocturnal insects, moths, &c., and Bats seem to play the same part in the animal economy at night as swallows do in the day; Bats will also eat meat.

Bats live in roofs of old buildings and holes in trees and other out-of-the-way corners, and only emerge after dark. There are great peculiarities in the mode of flight of these animals; the Noctule for instance flying very high, and the Pipistrelle flitting about like a moth.

The cry or voice of Bats is peculiarly shrill and acute; so much so that some people's ears are not able to take in the souud at all, and it somewhat resembles the scraping of two keys one on the other.

The distribution of the genus Vespertilio is almost universal; and it is to be observed that Bats are found in insular positions where there are no other native mammals, showing that their powers of locomotion, being superior to most other small mammals, have enabled them to migrate to greater distances and to more inaccessible positions than other mammals, and thus giving strong confirmation to the theory of centres of creation and subsequent migration therefrom by natural means (applause).

The PRESIDENT then proposed a vote of thanks to A. R. Boughton Knight, Esq., for so kindly throwing open his grounds for the club, which was most cordially agreed to.

It was now time to return to the carriages, which had been directed to be in attendance near the Castle. The majority of the visitors took the north bank of the river, and after a pleasant walk, now up a sharp and slippery ascent, and now by a steep precipice, with ever varying views of the narrow valley below and the beautiful slopes of Bringewood Chase beyond, the Castle itself came in sight.

The Castle was built by Richard Payne Knight (1774-8) after his own ideas. He describes it himself, five-and-twenty years afterwards, as

"A house ornamented with what are called Gothic towers and embattlements without, and with Grecian ceilings, columns, and entablatures within; and though his example has not been much followed, he has every reason to congratulate himself upon the success of the experiment, he having at once the advantage of a picturesque and of an elegant and convenient dwelling."—*Analytical Inquiry into the Principles of Taste.*

In short, it is a Castle for ornament, but built to live in. It stands admirably, some 100 feet or more above the river, with a south front, and with an admirable prospect.

The carriages were rejoined here, and quickly conveyed the visitors to the station for the return train, some making for Bromfield to save time, and some, loth to depart from such lovely scenery, stopping still longer at Downton, with the late train in view.

The hamper cart was again behind time in its perversity, and so it remained for after trains to set matters right. No greater misadventures befel the visitors, and the day has passed into history with a happy remembrance.

The Woolhope Naturalists' Field Club.

MEETING AT USK,

FRIDAY, SEPT. 3RD, 1869.

"A castle there in Uske doth yet remaine,
A seate where kings and princes have been borne;
It stands full on a goodly pleasant plaine;
The walls whereof, and towers are all to torne."

Churchyard's Worthines of Wales.

Dismantled and ruinous though they be, the walls of the old castle are still the glory of Usk. From them and about them the town is seen at a glance, the rich and fertile valley it occupies, and the hills on all sides undulated and well wooded. Usk and its neighbourhood never looked more neat, and clean, and pretty, than it did on that lovely day of sunshine and cloud which was spent there by the Woolhope Club. Not for the beauty of its scenery, however, nor yet for the romantic history of the castle that still happily commands it, nor yet again for the excellent salmon fishing its river affords, was the visit made. Usk has great attractions of a geological kind, its rocks abound in fossils, and in one particular layer of shale here—and in one other place only in the wide world, so far as is known—the *Homalonotus Johannis* is to be found. This interesting fossil is not very easily to be got, for the rock in which it is preserved is only to be met with in the bed of the river itself, and cannot be reached unless the water is very low, nor even then without wading for it. Twice before has the club held a meeting here, but each time in vain; a wet day and a full river have securely guarded the approach to the *Homalonotus* bed, and the Naturalists had to fall back on other objects of interest. On this occasion, however, things looked more promising. The river has never been known to be so low for 40 years, the weather was beautiful, and he who first made known the discovery of the fossil, and after whom it was named by Mr. Salter—John Edward Lee, Esq., of Caerleon—was in attendance to direct the search of his brother members of the Club.

The attendance was as numerous as could be expected, former disappointments and the commencement of partridge shooting being duly considered.

Here is the list: James Rankin, Esq., president; Dr. M'Cullough, and the Rev. James Davies, of Moorcourt, vice-presidents; J. E. Lee, Esq., Caerleon; R. Lightbody, Esq., Ludlow; the Rev. J. D. La Touche, of the Caradoc Club; Elmes Y. Steele, Esq., and Mr. Steele; John Lloyd, Esq.; Dr. Bull; J. J. Merriman, Esq., Kensington; Thomas Cam, Esq.; the Rev. R. H. Williams, Byford; the Rev. W. P. Stanhope, Holm Lacy; John Lambe, Esq.; C. G. Martin, Esq.; Wm. Aston, Esq.; the Rev. J. E. Jones Machen; the Rev. Bernard Marshall, Blakemere; the Rev. Geo. Metcalfe; Edgar Williams, Esq., London; David Lawrence. Esq., Pontypool; the Rev. J. H. Jukes; the Rev. W. Taprell Allen, St. Briavels; the Rev. J. G. Ash, Beachley; Mr. Andrews, Bosbury; and Mr. Arthur Thompson.

The road for Garcoed was taken at once from the station, and in pleasant converse it was quickly reached. Garcoed is a steep bank composed of Wenlock Shale and covered with wood. Mr. Lee lead the way by a shady walk to the locality where the now well known *Homalonotus Johannis* is found. A labourer, named Crotty, who had repeatedly been similarly employed, had for an hour or two previously been busy collecting from the river bed masses of the rock ready to be closely examined by the members. Hammers and chisels were at once at work, and even a saw might be noticed as a very useful tool in the reduction of some of the larger slabs.

It was nearly an hour before a trace of the *Homalonotus* could he found, but at length the first specimen fell to the careful hammer of R. Lightbody, Esq. Mr. Lee soon came upon another portion, and in the course of the next hour the steady perseverance of a young naturalist, Mr. Elmes Steele, who remained there still at work when all the others had left, was rewarded by the discovery of some excellent specimens, the best that were found during the day.

The *Homalonotus* was first discovered by a labourer at Usk a few years since, who mentioned it to Mr. W. H. Nicholl, then residing at that town, and he brought it before the notice of Mr. Lee and other geologists. The specimen drawn in the last volume of our Transactions by the late lamented Mr. Salter, and now in the collection of Dr. Holl, is the finest which has yet been found.

This locality also produces a large *Mytilus*, one or two species of *Pterinea*, *Phacops caudatus* and *P. longicaudatus*, an *Illænus*, and several *Brachiopoda*.

After an hour's work, many of the party advanced along the bank a few hundred yards and commenced an active search for the beautiful *Ischadites*, which are found chiefly in this locality. Success, however, did not reward the members, as no specimen was found; in fact Mr. Lee, who acted as guide, stated that he had been there probably nearly thirty times, but that only once had he succeeded in obtaining *Ischadites*. A few yards further west there is a bed filled with *Atrypa tumida*. Some of the specimens are full of limestone, but in many cases the interior is hollow, being only partially filled with crystals of spar which cover not only the inside of the shell but also the spiral appendages well known to belong to these bracheopoda. If the fracture is fortunate, the dark spiral, or rather the section of it, is beautifully seen ; and Mr. Lee stated that if microscopically examined in a very thin section, there is every appearance of this spiral having been itself a tube. Corals are rather abundant here, and one of the members was fortunate enough to find the head of a small *Illænus*, which is by no means common.

A further advance westward brought the party to the foot of a small cliff, above which is the camp of the Gaercoed. The beds of Wenlock shale in the cliff here seem all but horizontal, while a bed of limestone or harder shale, of no great thickness apparently, and which lies in the bed of the river, has been pushed up in a singular manner, as if by a heavy weight above, and forms segments of two if not three circles, the stones all pointing outwards and upwards at a low angle, apparently from some point in the centre. This is the place where *lituites* are usually found, but here again the members were unsuccessful, as no specimen was procured, and they had to content themselves with collecting the smaller brachiopoda, which are rather abundant just beyond this cliff; amongst them is a very pretty *Spirifer.*

By the river side the rocks were broader and the reach very beautiful and picturesque. The President summoned the members around him, and after electing Mr. Hall, of Garford, and Capt. Pechell, of Springfield, Ross, as new members of the Club, he called upon the Rev. J. D. La Touche to read the following paper.

SPHERODIAL STRUCTURE IN SILURIAN ROCKS.

By the Rev. J. D. LA TOUCHE.

It will hardly be necessary to remind those who have studied the Silurian strata that spheroidal masses are met with in them of almost every size, sometimes deeply imbedded in the stone, at others, an entire mass of rock is arranged with reference to a spherical contour. Sometimes the imbedded nodule is a hard calcareous kernel; at others, especially where it is of great size, it differs but little from the surrounding rock.

It may be desirable to specify these varieties of structure more accurately.

The Wenlock shale affords a very marked example of it. In this formation, either a multitude of smaller nodules are found irregularly dispersed throughout, or, as at Wenlock Edge and elsewhere, long lines of them are arranged with the regularity of bricks in a wall.

These nodules are more or less calcareous. They give the impression of an original uniform deposit of limestone having been broken up or rather rearranged in that form. That fossils have determined their position may be doubted from their great regularity and because it is rare to find any trace of organic remains in them.

We must not omit to observe here, those remarkable accretions of limestone found at Wenlock Edge, Dudley, and elsewhere, locally called ball-stones, which are so extensively used for the iron works of the neighbourhood. They vary in size from a few feet to some hundreds of yards, and are, for the most part, of irregular shape. Sometimes, in process of formation, they have evidently caused a disturbance or dislocation of the adjacent rock. In all instances that I have had occasion to examine them, this has been the case. They generally extend too far below the exposed surface to enable the underlying strata to be seen, but the overlying rock is invariably arched and pushed up out of its natural position by them, and where it can be examined, the subjacent rock is found to be so also. In many cases the rock on each side of them is seen to enter the mass of ball-stone and its stratification to be, as it were, lost in it.

In the above instances the nodule consists of a different kind of stone to its matrix, having, for the most part, a high per centage of lime. In the examples which follow, such is not so strikingly the case, although there is no marked line of demarcation between the two kinds of structure.

I have before me a piece of lower Caradoc sandstone, a few inches square. The central part consists of a bluish grey micaceous and somewhat argillaceous sandstone, of an oblong rounded shape, and around it are three rings of alternately yellow and blue coloured sandstone; apparently the yellow bands are somewhat more sandy and micaceous than the blue ones. The discolouration corresponds generally with the surface of the fragment, but is more spherical towards the centre, and upon again splitting open one of the two pieces into which the whole was divided, a nodule, corresponding in shape with the weather stain, was exposed to view.

Secondly, there are instances in which there is no apparent difference whatever between the character of the nodule and the surrounding rock, and yet its spheroidal structure is not less distinctly marked.

At the southern extremity of the Longmynd range, in the construction of the railway from Craven Arms to Bishop's Castle, a considerable cutting exposed a most interesting section of the lower purple Wenlock beds. Some four or five years have elapsed since then and the strata are to be seen at the present time in a state of semi-decay. Before long they will have assumed the monotonous slope of the usual railway embankment. In the meantime the projecting masses of shale present a very interesting object of study as regards their structure. It may be observed that before entirely falling to pieces these blocks of stone almost invariably become spheroidal. In some cases the original sharp edges and angles of the rock are yet preserved, in others some portions have been removed, while in others a perfect spheroid has been exposed to view; the origin of which may however be traced in other as yet undecayed blocks stretched out as it were in fine lines on the surface of the stone.

In every direction may be seen in this railway cutting the indication of a nodular structure embedded in large cubical masses of rock, sometimes of the diameter of two or more feet, sometimes of as many inches. Like the statue which the sculptor imagines to be imprisoned in the shapeless marble, and which he hastens with skilful chisel to reveal, these spheroidal masses exist in the primeval rock awaiting the inevitable hand of time to bring them to light.

Now the question remains to be considered what is the cause of this structure? It does not, as far as I am aware, exist where slaty cleavage is very marked, but where the general character of the rocks is rhomboidal, there it seems to abound. In many of the instances last referred to, the joints of the stone are continued through the spheroids unaffected by their curved structure; in some cases this curved structure assumes the form of concentric layers, like the coats of an onion, and yet the general stratification of the external rock is continued through them when not interrupted by the lines of curvature. This is seen in a very beautiful example on the Whitcliffe, near Ludlow. Here it would seem that the position of the three more prominent spherical masses was determined by the occurrence of the somewhat parallel faults which run obliquely from the top of the right-hand side of the section to the bottom of the left.

Has this peculiar structure been the result of an accumulation of calcareous matter at particular spots when the whole stratum was deposited, or is it the result of subsequent action?

The occurrence occasionally of a hard calcareous kernel in the centre of a spheroid, might lead to the inference that the diffusion of its lime has in some way determined a fresh arrangement of the particles of the whole, but such centres are frequently altogether absent and the larger nodules often show no appearance of having ever contained any exceptional quality of organic remains.

Especially observable is the fact that the shape of nodules is found frequently to depend on some external features of the masses of stone in which they occur, such as faults or joints. In a word, the weather staining seems to foreshadow the nodule. Besides, there is some reason to think that the colouration accompanying weather staining is sometimes accompanied by a physical as well as a chemical difference, such as that between sand and clay, between calcareous and argillaceous stone.

Do not these facts point to an external origin of this spheroidal structure, and suggest the probability that the infiltration of moisture from all points of the surface of a block of stone may, together with some accompanying chemical or molecular action, drive inwards the more soluble constituents of the mass, and thus arrange the whole in concentric layers, and produce in many cases a central nodule?

Do they not suggest that where some crystallizable substance, such as carbonate of lime, is diffused through a mass of stone it may be gradually concentrated at one spot, either by the action of some external agent, like water soaking through the pores, or by some internal molecular attraction? Another link may thus be obtained in the proof of that constant energy which is ever working in the apparently unalterable crust of our earth, re-arranging its constituents and even in some cases accumulating the metals in certain veins and nodules.

(The paper was well illustrated by a series of clever sketches.)

Mr. Lawrence, of Pontypool, and one or two other gentlemen present, had observed instances of spheroidal structure in rocks, and the question was asked as to whether the common nodules of ironstone were due to the same action?

Mr. La Touche thought they might be so, and after some further explanation, he said that he had sent a copy of his paper to the Rev. Professor Haughton, of the Dublin University, who had kindly returned the following answer :—

"I am familiar with similar ellipsoidal structures in our Irish coal shales in Queen's County, but they do not seem to be so well developed as those shown in your drawings. I believe that all rocks when formed and subjected to varying pressure from the surrounding mass have developed within them a *latent* ellipsoidal structure ; this is shown by the distortion of fossils and other considerations. I published a paper in the *Philosophical Magazine* some years ago on this subject (1856 or 1857), and showed how the ages of the ellipsoid might be calculated from the shape of the distorted fossils. The *weathering* of the rock developes the *latent* structure, in a manner like that of the structure developed by weathering at the angles of the basaltic columns. I shall have pleasure (with your permission) in laying your sketches and letter before the Geological Society of Ireland in November next."

Leaving the geologists at the search for fossils, a strong detachment, under the guidance of John Lloyd, Esq., set off to visit the Craeg-y-gaercyd Encampment and the Trostre Weir. Proceeding up the river to the high beetling rock, which forms the natural defence of the encampment on this side, they took a short steep pathway through the wood to the citadel above. Here, amidst a tangled mass of coppice wood, brambles, broom, and heath, the outlines of the camp could still be seen. Mr. Lloyd with the aid of a sketch pointed out the line of the entrenchments. In many places they are 30 feet deep, and near the north-west corner are several tumuli, some of which are from 15 to 20 feet in height. The whole camp forms an irregular triangle, of which the river is the base. This shape does not in the least indicate a Roman character, and some think that it may have been an entrenchment thrown up during some of the repeated attacks on the castle of Usk in Owen Glendower's time. Probably, however, it was a British fortress made long anterior to those times. There are apparently three entrances to the camp, one on the south-east in the direction of the town of Usk, another smaller one leading to the river, and a third on the western side.

The height of the lower part of the camp is 70 feet above the river, of which full 50 feet is a rocky precipice. Its Welsh name, "Craeg-y-gaercyd," the rocky height of the wooded camp, aptly describes its situation and present condition. From its strong defences, natural and artificial, and as a post of observation on the opposite camp of Camp-wood, and possibly on the castle of Usk, this fortress would often find tenants in the olden time. Monks, we know, always built their abbeys near famous salmon rivers, and with the Usk close at hand supplying

"Sammons all the yeere
"So fresh, so sweete, so red, so crimp withal,
"That man might say, loe! sammons here at call,"

possibly some British prince might have made this camp his fishing box!

We must say little, however, about fishing until we get to Trostre Weir, and it is somewhat doubtful if we ever get there. The tangled brake on the camp, thanks to a friendly path, was passable, but here we are in an apparently interminable withy bed, and occasional glimpses of each other are only caught at intervals, when the waving plumes of the lithe osiers nod to the summer's breeze.

Having fought their way through, a short walk brings the party to the Weir, and of this it may be said that it was once a most formidable barrier on the river. Those who live on the banks of the Wye, a river now unimpeded in all its lower course by a single weir, have forgotten all their ancestors did to free it from these obstructions. About the year 1700 the great sweep was made, when the County of Hereford gave £30,000 for the purpose, and in 1814 the Duke of Kent's Weir at New Weir, the last remaining on the Wye, was taken down. On the Usk, however, no friendly Navigation Acts existed to effect such good deeds, and up to the year 1846 this Weir at Trostre, with its fishing boxes, monopolised the salmon produce of the river. Previously to that year the capture of a clean salmon in the upper waters of the Usk during the fishing season was an event almost entirely unknown; while in the lower waters the number of fish had become very small in consequence of the limited extent of spawning ground, In the summer of that year the late Mr. Stretton observed, to his great surprise, a number of fresh-run salmon leaping in his pool at Danypark, and a net being procured, about 2cwt. of salmon in excellent condition were brought to shore in the presence of a large number of spectators. On inquiry the mystery was explained. A recent flood had created a breach in Trostre Weir, and the fish had then a free run up. The landed proprietors on the Usk saw the value that would accrue to their properties from the salmon fisheries, and at once took steps to obtain the control of the Weir. They succeeded in this and became the lessees with power to take away the fishing boxes, and in lieu thereof to place open passes or runs in the weir. From that day to this the fisheries have gradually improved, and the result has been that the Usk may now claim to stand among the first salmon rivers in the Southern part of Great Britain.

A further step has been taken by the landowners this spring. Their tenure of the weir was precarious, and at the same time a considerable outlay was needed on the repairs of the mill and weir. Under these circumstances the Board of Conservators resolved to purchase all the rights attached to the weir, and to pull it down. This has been accomplished at a cost of over £700, raised chiefly by subscription, and at this time the waters of the Usk flow through a breach in the weir full 30 feet wide.

The history of the Usk as a salmon river is written in that of this weir, and when we now find throughout England many rivers, even finer than the Usk, utterly destroyed by such weirs, the example of this river may serve to show the wisdom of giving a free passage to salmon through all weirs, and ultimately perhaps bring about the same beneficial result in those barren rivers.

The Weir runs diagonally across the river, and is about 250 yards long, and 3 feet 9 inches high. It is made of pitching-stones, stakes, and wattling, and has a sloping apron of about 20 feet wide. There has long been a great controversy about the best forms of fish-passes, and those in this weir being thoroughly successful, have attracted much attention. The large pass has now disappeared, having expanded into the breach, but from previous measurement we are able to give its size :—

	ft.	in.	
Depth	3	4	At upper entrance.
Width............	3	9	
Length	22	6	

The height of the Weir being 3 feet 9 inches, this pass represents little more than a transverse opening or cut. The salmon's ascent was not, however, made a bit too easy, as the water rushed through the pass with tremendous force.

And what shall be said of the river Usk itself, with its beautiful reaches, and its well-wooded banks. To some who saw it then for the first time, it was inexpressibly beautiful. Low as its waters were said to be, rapidly as its stream was flowing, the great surprise was that its pools were so wide, so frequent, and so deep. The Wye and the Severn are sedate in comparison; they move more silently and at leisure. The Usk water, so bright and so clear, seems pure as crystal, and runs rippling, murmuring, dancing along with a peculiar grace and cheerfulness. Vaga and Sabrina have charms of their own; but Isca is a siren, entrancing all who stay to listen to her voice, tempting them almost to envy the salmon for whose good pleasure she would seem specially to provide. That any dwellers upon the banks of the Usk can be other than devoted fishermen seems almost a marvel; but mankind is perverse; the inhabitants of peaceful villages fill the ranks of the army; inland dwellers take a violent fancy for the sea; and the quiet happiness of the country is readily yielded for the strife and turmoil and trouble of a city existence. Human life would be dull indeed and monotonous, if all were amenable to the same impressions; and so, beautiful siren! there are many who can resist your charms, and doubtless some who would greatly prefer the practical usefulness of a dull and dirty dead level canal.

The next important move was to cross the river, but this at first seemed by no means an easy one. The ferry boat was on the other side, and the united exertions of some dozen pair of stout lungs failed to call forth the ferryman, or to induce one or two rustics on the opposite bank to render any assistance. One gentleman at last waded across and deserved the ovation he got for rescuing his friends from their dilemma. The zig-zag path to the keeper's house was soon ascended, and by a pleasant walk through the meadows the prettiest of all the towns on the banks of the Usk was soon reached. Some gentlemen found time to pay a hurried visit to the castle ruins, whilst the rest prepared themselves to enjoy the good things provided by the attentive hostess of the Three Salmons Hotel.

After dinner the following admirable paper was read :—

ON METEOROLOGY: ITS PRESENT PROGRESS AND FUTURE PROSPECTS

By BALFOUR STEWART, L.L.D., F.R.S., Director of the Kew Observatory.

Meteorology, or the Phenomena of the Earth's Atmosphere, may be studied from two points of view, which are in reality quite distinct from one another.

We may in the first place desire to investigate those atmospherical conditions which render certain places on the earth's surface suitable for a certain class of organised beings. Thus for instance, we may have a cold climate or a hot one, a dry climate or a moist one, a climate that varies very little from day to night—from summer to winter, or one that varies in these respects a great deal.

Now some of these climates may be suitable for a certain class of persons, but not for others; and some of them may be favourable towards the growth of a certain class of plants, while other varieties may not thrive therein. Indeed, it is universally acknowledged that animals and plants are influenced to a very large extent by considerations of climate.

Nevertheless, I am not aware that physiologists have ever set themselves seriously and systematically to investigate the precise relations which [subsist between climate and health. As an example of this we may take the element of moisture. It has been the custom to express the state of the air with regard to this element by means of the proportion subsisting between the amount of vapour which the air at any moment contains, and that amount which it is capable of containing while it remains at its present temperature. Thus, if air at 60° Fahrenheit contained half as much vapour as it was capable of holding at this temperature, we should represent the relative saturation by $\frac{1}{2}$; if it only contained one-third of the whole amount we should call the saturation $\frac{1}{3}$; while if it contained all the vapour it was capable of holding at that temperature we should represent the saturation by unity, which thus denotes complete saturation.

But has complete saturation at all temperatures the same effect upon organized beings? thus, for instance, when the temperature is very high will not its effect be greater than when there is only a moderate heat? We may ask the question, but no answer has yet been furnished, nor as far as I know has any joint action been taken by meteorologists and physiologists with the view of investigating this important question.

But important as a knowledge of the effect of climate upon health undoubtedly is it does not yet constitute the main problem of meteorology. To know the physical conditions of the earth's surface, including the elements of motion of those portions which are moveable is surely a study of very great interest and importance, and while the former branch may be considered an application of physiology, this latter branch belongs more properly to physical research.

We have thus two great branches connected with our subject, namely :—

(1) *The effect of climate upon organized beings.*

(2) *The physics of the earth's surface, and more particularly of the earth's atmosphere,*

And the complete and frequent meteorological observations now made in many places may tend to throw a good deal of light on both of the above questions, but the system of reduction necessary to give an answer to the one question is not the same as that calculated to answer the other.

The two points of view are perfectly distinct, and it is a great misfortune that in meteorological reductions this distinction has not been properly recognised. This confusion of two separate objects in the minds of meteorologists has in my opinion undoubtedly hindered the progress of knowledge, for what as a matter of fact do we really know of the effect of climate upon organized beings, and how little do we know of tho motions of the earth's atmosphere.

Dismissing, therefore the physiological effect of climate as one regarding which we are all profoundly ignorant, and which at the same time belongs more to the physiologist than to the physicist, permit me to make a few remarks on the present state and prospects of Meteorology, regarded as that science which investigates the physical condition of the earth's surface. These remarks will naturally divide themselves into three heads, namely :—1. The progress already made in the construction of instruments. 2. The progress in the accumulation of facts of importance. 3. Suggestions and remarks regarding the future.

THE PROGRESS ALREADY MADE IN THE CONSTRUCTION OF INSTRUMENTS.

Meteorological instruments are now in a very forward state. In the first place the velocity of the wind's motion, as well as the direction in which it moves, may be continuously recorded by means of an instrument called the Anemograph. Mr. Crossley and others have made an electrical arrangement by which that part of the instrument which *receives* the wind may be placed at a distance from that which *records* the results. Thus, for instance, the one part may be placed on the summit of a mountain and the other in an observer's study.

The temperature, the pressure, and the vaporous condition of the atmosphere may all be recorded continuously by photography, and Sir Charles Wheatstone has invented an ingenious electrical arrangement by which the temperature or the pressure may be recorded at a distance.

Thus we may read off in our chamber, at any moment, the temperature or the barometer pressure at the top of a mountain, or, if we choose so to arrange it, we can have the values of these elements as they are at sea.

The electric state of the atmosphere can likewise be photographically recorded.

It thus appears that we do not want for instruments and those of great accuracy, but if we proceed to investigate the facts that have become known to us by means of instruments we shall find that these are neither very many nor very important.

PROGRESS MADE IN THE ACCUMULATION OF FACTS OF IMPORTANCE.

One of the most important steps made in this direction has been the theory of the Trades and Anti-trades in which we see how, through the influence of the sun upon the equatorial regions, we have an upward current tending from the equator to the poles, called the Anti-trades, and a lower current, tending from the poles to the equator, called the Trades.

The theory of the Monsoon, or the prevailing winds in the Indian ocean, may here be considered. While the system of Trades and Anti-trades is due to the equatorial regions, as a whole being hotter than the polar, the Indian Monsoon is due to the fact that during summer the continent of Asia is much hotter than the Indian ocean. The tendency of land to become hotter than water during the day, and colder during the night, gives rise also on a smaller scale of time to the phenomena known as the land and sea breezes. With regard to disturbances of the atmosphere or storms, we know that these are caused by inequalities between the pressure of the air at different places, and this inequality of pressure is in its turn caused by the effects of heat or of cold upon the atmospheric pressure, to which we may add the change of pressure produced by sudden condensation of vapour. Of course, the tendency is for a rush of air to take place from an area of high to one of low pressure, but Dr. Buys Ballot has shown that this is generally materially modified by other considerations; so that, in fact, in our part of the world at least, if we suppose a district of low pressure to lie to our left, and one of high pressure to our right, and stand facing the two districts, then the wind will blow from our back.

This law holds not only in cyclones but in storms of different kinds.

An important observation was made by the late Admiral Fitzroy that European storms generally travel from the west, and this observation has been made much use of by the Meteorological department in London who receive telegraphic intelligence from the south and west of Ireland of atmospherical disturbance the moment they show themselves there. A warning is then sent to those ports to which it is imagined the storm may extend in its progress eastward. So desirable is it to have early intelligence of a storm that the suggestion has been made to have a floating station two hundred miles out in the Atlantic!

Meteorologists throughout Europe are now much engaged with the study of storms, and Mr. Meldrum, of the Mauritius observatory, has investigated with much success the storms of the Indian ocean.

Before leaving the subject of wind, I may mention maps of the prevailing winds in different seasons in different parts of the ocean as a desideratum to mariners which has of late years been partly supplied through the labours of Maury and others who have analyzed and discussed the logs of many vessels in order to obtain this information.

With regard to the subject of temperature charts of various kinds have been constructed exhibiting the distribution of this element on the surface of the earth.

I have only time, under this head, to mention the theory of dew and the relation of heat to vapour as subjects that have been advantageously studied and conclude by saying that notwithstanding the varied items of information which we have obtained, we are in great ignorance as to the atmospherical conditions which precede and give rise to storms and of those which precede and give rise to long continued tracts of peculiar weather.

SUGGESTIONS AND REMARKS REGARDING THE FUTURE.

At the present moment a great deal of attention is given to Meteorology, and there is reason to suppose that the interest in this science will increase as the immediate practical importance of the results obtained becomes more and more recognised. But yet it is doubtful if the labour bestowed will ever assume that character and extent necessary to bring such a complicated set of phenomena within the domain of accurate knowledge, for the great deficiencies of meteorological observations have hitherto been their desultory character and their limited extent.

Each man has done what seemed right in his own eyes, without any regard to what his neighbour was doing, or indeed, without any knowledge of the efforts of others. Then with regard to the discussion of observations, I do not think that meteorologists have set about this with a sufficiently definite object in view. The physiological element of the science, or that which relates to the connection between climate and health, has become mixed up in their minds with the physical, or that which relates to the motion of the atmosphere, and the result has been that in neither direction have their efforts been crowned with any considerable success.

As a notable example of this I may instance the case of a Cyclone, for at this present moment meteorologists are in doubt whether the air in motion in this phenomena moves round and round the centre or whether it moves spirally inwards, advancing from the circumference to the centre. Now this can surely be remedied by adopting a system of reduction framed for the express purpose of obtaining a knowledge of the motions of our atmosphere.

Let us suppose, for instance, that at each meteorological station we set up as it were two imaginary apertures one foot square each, one facing north and south, and the other facing east and west. Let us guage hour by hour the mass of dry air and the mass of vapour which passes each of these apertures, and we have at once the best elements which we can hope to obtain for ascertaining the motives of our atmosphere; to instance which I need only refer to the case of the cyclone already mentioned. Suppose, for instance, that we have a sufficient number of stations in the passing of a circle, and suppose also that a cyclone is passing at any moment. It is evident that by a system of guaging such as has been mentioned we can tell whether the imports of air within the area of the circle are greater or less than the exports out of it, and can easily settle the question of an in-draught. So in like manner we can settle the question as to whether there is an upward current in the heart of a cyclone; for if, on the whole, there is a carriage of air from the circumference to the centre, and if at the same time the barometer at the centre continues to fall, it is quite clear that air is carried away by an upward channel, for this would otherwise add to the atmospheric pressure.

Perhaps we may hope by degrees to obtain greater co-operation in observing, and also improve our system of reduction, but it is more doubtful if meteorological observations will ever be sufficiently general to meet the necessities of science. Let us take the ocean, for instance, and we find a very complete meteorological knowledge of certain tracts of highways, along which our traffic passes, but large districts remain comparatively or wholly unexplored. And unless a scientific spirit can be infused into the British navy sufficiently intense to induce captains to cruise about in desolate ocean tracts for the purpose of adding to our store of knowledge, there is little hope of our ever obtaining a complete ocean meteorology.

A knowledge of what passes in the upper strata of the atmosphere is yet more hopeless. We cannot, I think, expect that any great or permanent advantage to meteorology will accrue from occasional observations in balloons, and there is at present no ground for supposing that the air will ever be successfully navigated.

On these accounts it would appear unlikely that we shall ever attain an extremely complete knowledge of the motions of our atmosphere, and even if we could it is very unlikely that we should ever be able to reason from the present to the future to the same extent as we do in Astronomy. Nevertheless a great many useful and important laws may be found out, and all of these will be of immediate practical benefit as well as of scientific interest.

There is therefore sufficient encouragement to persevere, and as there is some ground for supposing that the meteorological disturbances which take place in the sun are connected with phenomena in the earth's atmosphere, we begin to realise an indefinite widening of the field of research.

This excellent paper was very attentively listened to, and warmly applauded. It gave rise to an interesting discussion, in which the President, Dr. M'Cullough, J. E. Lee, Esq., R. Lightbody, Esq., the Rev. J. D. La Touche, and John Lloyd, Esq., took part.

Elmes Y. Steele, Esq., then read the following paper:—

ON THE CHRYSIDES PARASITIC ON ODYNERUS SPINIPES.

By ELMES Y. STEELE, Esq.

Gentlemen,—I have been set down in our programme to read this paper as a sequel to the account given of "Mason Wasps and their Parasitic Bees" in our Transactions of last year. The press of other occupations having deprived me, at the proper time in the present season, of the opportunity for pursuing further the study of these insects, I must depend entirely, for the information I desire to give you, upon the observations of our friend Dr. Chapman, who has kindly furnished me with the materials for this paper. I am thus compelled to resign the pleasant honour of authorship into the hands of one far better qualified than I am, as an experienced entomologist, and as a most acute, diligent, and careful observer, for the accuracy of whose notes, knowing him as I do, I am prepared to vouch.

Before reading these notes, it will, perhaps, be desirable that I should remind you that *Odynerus spinipes* is one of those mason wasps referred to; that it burrows in sandy soil wherein it constructs a series of cells into which it deposits eggs, together with a supply of living food for the forthcoming larvæ. That the *Chrysididæ* are a family of insects, somewhat resembling bees in outward appearance, though smaller in size and refulgent with the brightest colours. That these latter propagate their several species with the aid of one of the most curious of the many remarkable instincts that are revealed to us by the study of entomology. You will find specimens of these different insects with cocoons set up in the box which I hand round for your inspection. Now I shall read from Dr. Chapman's notes:—

Though the *Chrysididæ* have long been known to be parasitic, any details of their economy that could be relied on for accuracy have been wanting. The species of the genus *Chrysis* appear, so far as is known, to be parasitic on wasps and bees. *Chrysis ignita*, the most abundant species of the genus, will lay her eggs in the nest of almost any kind of wasp or bee to which she can obtain access, and occasionally she visits the burrows of *Odynerus spinipes*, but the two species which arc specially attached to this wasp, whilst they have not been recorded as accompanying any other insects are *Chrysis neglecta* and *Chrysis bidentata*. These two are common wherever *Odynerus spinipes* abounds. *Chrysis fulgida* has also been recorded as attached to *O. spinipes* but I have never met with it, and I suspect it to be the proper parasite of some other and rarer species of *Odynerus*, its occurrence with *spinipes* being accidental in the same sense as that of *C. ignita* may be said to be so. When making our researches last summer with a limited supply of materials, we were unable to detect the eggs or larvæ of *Chrysides*, though we felt satisfied that one or other must be present in a certain proportion of cases. What was sought for, we being guided by what was then known of their history, was a *Chrysis* egg beside a feeding larva of *spinipes*, or the larva of *Chrysis* attached to the latter. This we were unable to find simply because such a state of matters at no time exists, yet we found cocoons of *Chrysis*, and one of these, which we now know to be that of *C. neglecta* is figured in last year's Transactions of this club. During the winter a number of nests of *Odynerus spinipes* were investigated with the result of finding three different kinds of cocoons of *Chrysis*. These cocoons were in the proportion of one to three of those of the wasp, giving the measure of the destruction caused by these parasites. Three-fifths of these cocoons were similar to that figured, and they produced *Chrysis neglecta*. Each compact oval cocoon was enveloped in loose silk filling up the space space in the cell of *spinipes*, the only fragments observable being those of the little green grubs which are stored by the wasp after her egg has been laid. Two-fifths gave birth to *Chrysis bidentata*, and these cocoons were of a much more curious structure, each being contained in a cocoon of *spinipes*, clearly showing that the *Chrysis* larva did not destroy the wasp larva until the latter was full fed and had been spun up. The cocoon proper occupied the lower half of the cell, its roof being an almost mirror-like diaphragm across the centre of the cocoon of *spinipes*, the walls of which above the diaphragm were also covered by a layer of silk spun by the larva of *Chrysis*. The third kind of *Chrysis* cocoon was a solitary specimen out of more than a hundred, and produced *Chrysis ignita*. This cocoon is longer and slighter than that of *Chrysis neglecta*, and of a darker colour.

Following up the clue afforded by these cocoons, I have this summer succeeded in observing the whole economy of *Chrysis bidentata*, much of that of *Chrysis neglecta*, and by a lucky accident some of that of *Chrysis ignita*.

Chrysis neglecta begins to emerge from the pupa state at the same time as *Odynerus spinipes*, namely, about the middle of May, and by the first week in June all of both species of insects have emerged. On examining a bank abundantly colonized by *Odynerus spinipes* at this period the cocoons of the previous year are found empty, but *Chrisis neglecta* will often be found hiding away, if the day be dull, in the empty cocoons of *spinipes* and usually two in each cocoon. When the sun is out *spinipes* is busy constructing her canals and granular tubes and *Chrysis neglecta* actively running and flying about the burrows. *Chrysis bidentata* is not to be seen, and on careful examination it will be found that the cocoon of this parasite of the previous year still contains the perfect *Chrysis bidentata*, which does not emerge until the last of the *spinipes* brood are coming out, about three weeks later than *Chrysis neglecta*. I have not seen the egg of *Chrysis neglecta*, and do not know where it is laid, but it supplants that of *Odynerus spinipes*, probably because being laid by the side of that of the wasp the larva to which it gives birth destroys the *Odynerus* egg. This is, however, only conjecture, but, what I can vouch for, is, that a few days after the mother wasp has closed her cell stored with green grubs, it contains a young larva of *C. neglecta* busily eating that store, whilst no trace remains of *O. spinipes* larva. Early in July the larvæ of *O. spinipes* and of *C. neglecta* are to be found in separate cells full fed and spinning their cocoons. As the season advances the later-stored cells appear to escape the attack of *C. neglecta*, for in the middle of July, whilst *O. spinipes* is still busy in storing, there are few or no specimens of *C. neglecta* to be seen. On the other hand, *C. bidentata* is now abundant, though its oviposition has hardly begun. As my observation of *C. ignita* throws some light on the economy of *C. neglecta*, I shall here relate some of the facts it has brought to light. On July 17th I observed a nest of *O. parietum* with one cell open, containing a nearly complete supply of lepidopterous larvæ. A *Chrysis ignita*, flying about, settled beside the cell, and, after a brief examination with her antennæ, wheeled round, and, introducing her abdomen into the cell, rested for about twenty seconds, doubtless in the act of oviposition. I now regret that I did not then examine the contents of the cell in order to ascertain the fate of *Odynerus parietum's* egg. Three-quarters of an hour later *O. parietum* had closed the cell with the usual earthen pellets. I examined this cell on the 19th, two days after, when I found a larva of *C. ignita* a quarter of an inch long, together with several of the lepidopterous larvæ stored by the wasp, but found no trace of either egg or larva of the latter. On the 23rd, six days from the date of oviposition, the *chrysis* larva had eaten all the store and was full-fed. I obtained evidence of its having cast its skin three times whilst under observation, and from the analogy of *C. bidentata* I believe it had done so four times altogether. The stored larvæ had all been devoured, their heads alone remaining, just as when eaten by the wasp grub. The larva then spun a cocoon, which I knew to be typical of *C. ignita.* The rapidity with which it had fed up was extraordinary. None of my *neglecta* or *bidentata* fed up so rapidly, but the warm sunny wall on which *parietum* had built her nest may partly account for this, my larvæ of the other two species having been kept comparatively cool. Towards the end of July, *spinipes* and *neglecta* are represented only by odd specimens which have survived the mass of their brethren, though *bidentata* is still to be found somewhat plentifully.

Chrysis bidentata when about to deposit her eggs searches for a full-grown larva of *O. spinipes*, either just before or immediately after it has spun up. *O. spinipes* on the completion of her burrow fills up the mouth with clay long before the most accessible cells can contain full-grown larvæ ; but it happens that, in a large proportion of cases, the wasp meets with some accident and her burrow remains uncompleted, the latter cell of which is thus only protected by the diaphragm of clay which was to serve as a party wall between it and the succeeding cell had the wasp lived to complete her work. Such slightly-protected cells are those chosen by *Chrysis bidentata* for her oviposition I once found satisfactory evidence of *Chrysis bidentata* having burrowed through half-an-inch of the clay stopping placed by the parent wasp. The parasite was in the burrow covered with the dust brought down by her excavation to form an entrance, a passage too small for the wasp to enter, but just large enough for herself, and in the cell thus reached by her were to be seen her eggs freshly deposited.

On another occasion, a *Chrysis bidentata* alighted on a spot I was examining, and where I had partially exposed some *spinipes* cocoons, she commenced to carefully investigate them with her antennæ and now and then scratch away some earth partly covering them; she did not, however, deposit any egg. When a cocoon contains eggs of *bidentata* there is often to be found at the upper end of it a minute aperture through which the ovipositor of this *chrysis* has been thrust. At other times this aperture is wanting, simply because, as I believe to have happened, the larva of *spinipes* had not completed its cocoon when the *Chrysis* came to deposit her eggs within it. One of the most remarkable points in this history which I can neither understand nor explain, except it be another instance amongst so many of the fecundity of nature which provides for miscarriage through accidental injury, is that this *Chrysis* does not deposit a single egg only in the cocoon of *odynerus*, but actually drops in from six to ten of them. These do not appear to be placed in any particular position, but simply fall on the enclosed larva, and the excess in number may obviate the destruction caused by the latter, especially when its movements are still active before the completion of its spinning operations. In the instance above-noted, when I found the *Chrysis* in the burrow of *spinipes*, the cocoon of the latter contained five eggs in good condition. The wasp larva had ceased to spin, but had not yet shrunk to those smaller dimensions which it rapidly assumes soon after. In various other instances I found two healthy eggs of *bidentata*, but often only one, the shrivelled cases of from four to eight others being found with the healthy eggs. I never found any evidence of the hatching of two eggs of *bidentata* in the same cell, which, though it may seem a likely thing, would certainly be an awkward circumstance. *Chrysis bidentata* remains longer than *C. ignita* in the egg-state. Of a number of eggs reared by me most were hatched two days after they were collected, but one remained three, and another did not hatch until the fifth day; and from the time of hatching the larvæ were eleven days in becoming full-fed. They changed their skins four times, at tolerably equal intervals during their growth. The eggs of *bidentata* are 1.5 millimeters in length, white, cylindrical, and very slightly arched, those of *Spinipes* are larger, two or three milimeters in length, rather more arched, and of a yellow colour. As doubtless the eggs of the two other *Chrysides*, *neglecta* and *ignita*, closely resemble those of *bidentata*, the above description will serve to discriminate between them and those of the wasp should they be observed in the nest of an *Odynerus*. The young larva of *bidentata* when hatched seizes that of *Odynerus* with its claws and contrives to extract fluid nutriment from it without apparently making any aperture in the skin until it approaches to mature growth itself. I have very carefully examined a *spinipes* larva that was thus half sucked away, I cannot say eaten, and I could find no mark at the spot whence I had just removed a *Chrysis* larva. I have several times squeezed the *spinipes* larva firmly without any fluid exuding except one out of several trials, in which I squeezed the larva almost to bursting, when a drop of clear fluid exuded. Nor is the *Chrysis* larva particular as to where it seizes the *Odynerus*, any point that may offer itself to its jaws being attacked. When the devourer is nearly full grown and the victim has beccome very flaccid, a process that may be called eating takes place, and the *spinipes* larva almost entirely disappears. The manner in which *Chrysis neglecta*, *C. ignita*, and *spinipes* itself eat the little green sawfly grubs is precisely similar; that is the larva of each when consuming its prey takes one grub after another, at first sucking the juices through the skin, and when further advanced in growth returning to devour them skins and all, the heads alone, which are horny in texture, being rejected.

I have already remarked that *Chrysis bidentata* casts its skin four times. It does so at tolerably regular intervals of two days or rather less. I have twice seen this process in operation, when the skin splits down the back of the anterior segment and the corneous covering of the head splits into two lateral halves, which remain attached to the skins when the shedding is completed. As compared with the larvæ of Lepidoptera and of Coleoptera, they feed up so rapidly that one marvels how they have time to change their skins so often, many a Lepidopteron requiring four or five days for the process of once changing its skin, while *Chrysis ignita* is fed up in six days, during which it has found time to change its skin four times. What astonished me much was the great similarity between the larva of a *Chrysis* and that of an *Odynerus*, a similarity that I believe to be a true and not merely a superficial one. Throughout its existence the larva of *spinipes* is yellow, its viscera are tolerably visible through the integument, especially portions of a yellow tortuous duct in the lateral dorsal region from the fifth segment backwards. In *Chrysis* the larva is white, and its interior is more masked by masses of white fat. The first spiracles, which properly belong in most larvæ to the third segment, are in *Chrysis bidentata* at the anterior margin of that segment, but in *Odynerus spinipes* are actually in the second segment. The form of the head and the parts of the mouth are very similar in both. This resemblance of the two larvæ is closer than that between the larva of *spinipes* and of the common wasp *(Vespa vulgaris)*, and curiously enough, in those points in which the larva of *Chrysis* least resembles that of *spinipes*—as form of jaw, distinctness of viscera as seen through the skin, and colour—it more nearly resembles the larva of *Vespa vulgaris* than that of *spinipes*. Like the larva of *spinipes*, and other hybernating Hymenoptera, that of *Chrysis* shrivels to a certain extent after it has spun its cocoon, the skin becomes loose and thrown into very fine folds, the head is bent down on to the front of the body, and the lateral and subdorsal prominences which, in the tense skin of the full fed larva can hardly be detected, are very distinct—as do the other hymenoptera, the *Chrysides* before passing from the larval to the pupal state spin a cocoon.

C. neglecta having fed up in the cell built by *O. spinipes* and upon the grubs stored up for the nourishment of the young wasp, which it thus supplants, spins its cocoon in this empty cell, and as a perfect insect, emerges from the cocoon by cutting off a lid.

C. bidentata, on the other hand, having spun within the cocoon of *O. spinipes* and shut off by a mirror-like diaphragm the extra space not required for its smaller body, first cuts away that diaphragm and then opens a circular hole in the wasp cocoon through which to emerge.

Thus end the notes of Dr. Chapman, and I believe you will concur with me in thinking that they exhibit many points of striking interest calculated to enhance our admiration for Nature's marvellous works, at the same time giving ample proof in the observer of a patience in investigation and a zeal in the pursuit of knowledge which are the distinctive marks of the true philosopher. He has enabled us to correct some errors fallen into last year from lack of means at that time to test the accuracy of our observations. For instance: In the plate which illustrates my paper in the last volume of our Transactions the *Chrysis* cocoon represented is described as that of *C. ignita*, or *C. bidentata*, whereas actually it is that of *C. neglecta*. It is *not* made in the *cocoon* of *spinipes*, but in the cell, the silk about the cocoon proper having been spun by *C. neglecta* itself.

Then again we gave a figure of *Chrysis ignita* which, though the commonest of the Chrysides, is but an occasional parasite on *Odynerus spinipes*, whilst we omitted any representation of the two species which are its specially appointed satellites.

A box of the creatures themselves in every stage of their existence, and beautifully mounted, served to illustrate the paper. It was listened to with great interest, and a vote of thanks to Dr. Chapman was cordially awarded for his valuable contribution to science.

PLATYSAMIA CECROPIA.

Dr. Chapman sent a box of nearly full-fed larvæ of this beautiful North American *Bombyx*. They were very fine fellows, nearly four inches long and as thick as a finger. They have a delicate blue green colour, with small yellow and blue tubercles, those on the back of the third, fourth, and fifth segments being red, and larger than the others. This larva spins a very large cocoon of a strong coarse silk more adapted for carding than for winding purposes. A few of the cocoons were exhibited, and also a pair, male and female, of the moths, with an expanse of wing nearly six inches across and very wide proportionally. Their markings resemble somewhat those of the native Emperor moth. This insect appears to be perfectly hardy in our climate and is easily reared on the leaves of the apple, plum, or hawthorn.

SATURNIA CARPINI.

Dr. M'Cullough brought a cocoon of this—the Emperor Moth—from Dartmoor. It is the only native silk producing insect, and occurs frequently on all our moors. It spins its cocoon with an open end, or rather with a thin membrane closing tho smaller end, protected by a prolongation of the chief substance of the cocoon left open; this is doubtless an arrangement for the more ready escape of the moth. The cocoon contains a very large quantity of gum in proportion to the silk, and is therefore useless as a silk producer.

BOTANY.

The chief plants observed during the walk were large masses of the Soapwort, *Saponaria officinalis*, on both sides of the river;—the golden heads of the Tansy, *Tenacetum vulgare;* the Gipsy-wort, *Lycopus Europæus*; the Tutsan, *Hypericum Androsæmum;* the Alder Buckthorn, *Rhamnus frangula;* the Alkanet, *Anchusa officinalis; Linaria minor, Nasturtium sylvestre*, and many other more ordinary kinds.

The Rev. J. E. Jones Machen brought several specimens of the littlo orchideous plant, *Spiranthes autumnalis*, the Autumnal Lady's Tresses, for distribution. It has been common in many places this year. Mr. Harrison, of Holmer, also sent specimens.

Dr. M'Cullough had brought with him from the coast of Cornwall, a sea side plant, not very uncommon, but still always interesting from its associations, the Rock Samphire, *Crithmum maritimum.* Shakespeare has immortalized it in King Lear, where Edgar is supposed to be leading Gloucester along the White Cliffs of Dover.

> "Come on, Sir; here's the place; stand still. How fearful
> And dizzy 'tis to cast ones eyes so low!
> The crows and choughs that wing the midway air
> Seem scarce so gross as beetles. Half way down
> Hangs one that gathers Samphire; dreadful trade;
> Methinks he seems no bigger than his head;
> The fishermen that walk upon the beach
> Appear like mice."

The green leaves of Samphire makes an excellent aromatic pickle. It was much used in old Gerarde's time (1597), and Culpepper laments that it should have gone out of fashion.

The meeting now broke up, for it was time to set off to the station, and thus terminated a very successful, enjoyable day in the Vale of Usk.

The Woolhope Naturalists' Field Club.

MEETING AT HEREFORD,

FRIDAY, OCT. 1ST, 1869.

THE FORAY AMONGST THE FUNGUSES.

"The turf
Smells fresh, and rich in odoriferous herbs
And fungous fruits of earth, regales the sense
With luxury of unexpected sweets."—*Cowper*.

The last meeting of the Woolhope Club of the season for the special study of Funguses took place at Hereford, on Friday, and was very well attended. Fungus-hunting and pheasant-shooting interfered somewhat with each other' but on this occasion it might not be otherwise.

The last meeting of the Club has now become an important one, for by an alteration in the rules, which came this year for the first time into operation, the officers for the ensuing year have to be elected, in addition to the usual business of the concluding meeting,

A little after nine o'clock the members began to arrive, bringing with them baskets of Funguses to learn their names and characters for their own satisfaction, and to exhibit them for general information. Whilst they were being arranged upon the tables, the President opened the business of the meeting. The names of several gentlemen were proposed as new members; and then the following gentlemen were elected unanimously as office bearers for the year 1870 :—

PRESIDENT :

The Rev. HENRY COOPER KEY, M.A., Stretton Rectory, Hereford.

VICE-PRESIDENTS :

The Rev. W. C. FOWLE, M.A., Brinsop Rectory, Hereford.
The Rev. ARTHUR GRAY, M.A., Orcop, Ross.
JAMES RANKIN, Esq., M.A., Bryngwyn, Hereford.
ELMES Y. STEELE, Esq., Abergavenny.

CENTRAL COMMITTEE OF MANAGEMENT:

Dr. BULL, Hereford.
T. CURLEY, Esq., C.E., F.G.S., Hereford.
JOHN LLOYD, Esq., Huntington Court, Hereford.

HONORARY SECRETARY:

Sir GEORGE H. CORNEWALL, Bart., Moccas Rectory, Hereford.

TREASURER AND ASSISTANT SECRETARY:

Mr. ARTHUR THOMPSON. St. Nicholas-street, Hereford.

Dr. Bull, as Chairman of the Central Committee, then announced that the Rev. W. H. Purchas was prepared to publish at once the Second Part of the Flora of Herefordshire. Mr. Purchas was unfortunately prevented from attending the meeting, but he had sent the result of his inquiries with reference to the best means of publishing it.

The subject was then discussed at considerable length, and it was eventually left in the hands of the Central Committee and Officers of the Club, to confer with Mr. Purchas, and with full power to proceed with the publication as soon as possible. It was also decided to continue the Illustrations of the Edible Funguses, and the series of Photographs of the Remarkable Trees of the county.

By this time the carriages had arrived, and a little before 11 o'clock the members set out for the day's exploration. The first stoppage was made at Merryhill Common, an excellent locality for rare funguses. A large fairy-ring, almost complete, and fifteen yards in diameter, was observed. It was formed by *Agaricus (Tricholoma) subpulverulentus*, and greatly to Mr. Lees delight, several mole-hills were close to it. The ring had slightly increased in size since last year, when it first came under observation. Near a clump of Scotch fir trees, *Lactarius deliciosus*, was gathered, *Agaricus disseminatus*, in large patches and at every stage of growth, and also *Gomphidius viscidus*, *Russula vesca*, *Ag. arvensis*, *Ag. humilis*, *Hygrophorus virgineus*, and an abundance of *Boletus granulatus*. A mole run, which had been observed when fresh made, and which formed a considerable arc of a circle, was then inspected. Its position could just be observed by a slightly increased freshness of the grass, but it was not occupied by funguses.

The carriages were then taken for Haywood Forest, which was to be the chief hunting ground for the day. Here it was that the rare fungus, *Strobilomyces strobiiaceus*, had been found last year. The very fact that it had been found once again in Britain had created a lively interest amongst the leading mycologists, and specimens were ardently coveted. Mr. Edwin Lees, who had been the lucky finder thereof before, was present. He had carefully marked the spot, and on alighting from his carriage made for it with all the alacrity of scientific zeal. The search however was made in vain. It was not to be found there again. Other discoveries however quickly lessened the disappointment. The curious fungus *Coprinus picaceus*, the magpie Coprinus was growing close at hand—as rare and interesting as it is venomous and ill smelling. Clusters of *Ag. fascicularis*, its equally poisonous companion *Ag. sublateritius*, and others of *Ag. melleus*, and the graceful *Ag. infundibuliformis*, attracted the attention of beginners. *Boletus luteus* was very plentiful, *Boletus scaber* was there, and some very fine specimens of its close red-capped ally *Boletus versipellis* were gathered, *Boletus piperatus*, and *B. laricinus*.

The members scattered themselves throughout the wood, and, by hallooing from time to time, kept open the communication with each other in a lively manner. A change in the energy and intonation of the call announced "a find," and this often happened. Dr. Bull came upon a most beautiful group of the Fly Agaric, *Agaricus muscarius*. They were seventeen in number, forming part of a ring, and were in great perfection—a sight not to be forgotten.

" The pillar stem, the table head,
As with a silken carpet spread,
Inlaid with many a brilliant dye
Of Nature's high-wrought tapestry."—*Bishop Mant.*

Dr. M'Cullough lighted on the interesting little *Sphærobolus stellatus*, which throws out its sporangium with wonderful power considering the smallness of its size. Mr. Worthington Smith found a small white club-shaped fungus, growing parasitically on decaying branches of the Brake, *Pteris aquilina;* an especial acquisition. Though very plentiful here, it is a rare species, founded by Berkeley under the name of *Pistillaria puberula*. The Rev. W. Houghton found *Agaricus (Pholiota) radicosus*. The Rev. J. E. Jones Machen, called attention to a fine specimen of the bright scarlet *Peziza aurantia*, and many others were soon found.

" Scarlet tufts
Are glowing in the green like flakes of fire,
And wanderers in the prairie know them well,
And call that brilliant plant the painted cup."—*Bryant.*

And many other funguses were observed—*Paxillus involutus*, *Cantharellus cibarius*, *Agaricus lacrymabundus*. *Ag. capnoides*, *Ag. granulosus*, *Ag. fumosus*, *Ag. laccatus*, *Ag. æruginosus*, *Marasmius urens*, *M. peronatus*, *Ag. fastibilis*, *Ag. radicosus*, *Ag. rutilans*, *Ag. grammopodius*, *Ag. odorus*, *Ag. butyraceus*, *Ag. spadiceus*, *Lactarius torminosus*, *Lactarius vellereus*. *Cortinarius callochrous*, *Cantharellus aurantiacus*, *Xylaria Hypoxylon*, *Cortinarius purpurascens*, *C. glaucopus*, and the edible *Cortinarius violaceus*, *Ag. mucidus*, from a decaying beech tree. *Tremella mesenterica*, *Tubercularia vulgaris*, *Spathularia flavida*, &c

A heavy storm of some twenty minutes duration made the shelter of the wood desirable. It was time however to take a more satisfactory refuge in the covered carriages that were waiting at the gate hard by. This was quickly done, but it was then discovered that two gentlemen were missing, and they gave no responsive call to the united shouts that were sent forth. Both were strangers to the place, and we have the highest poetical authority for the dangers they incur, who lose themselves here, for

> " Within the navel of this hideous wood,
> Immured in cypress shades, a sorcerer dwells,
> Of Bacchus and of Circe born, great Comus,
> Deep skilled in all his mother's witcheries ;
> And here to every thirsty wanderer,
> By sly enticement gives his baneful cup,
> With many murmers mixed, whose pleasing poison
> The visage quite transforms of him that drinks
> And the inglorious likeness of a beast
> Fixes instead—unmoulding reasons mintage
> Charáctered in the face".

Haywood Forest is thought by many to have been the scene of the incident which so happily gave rise to Milton's beautiful poem of "Comus." Tho Lady Alice Egerton with her brothers Lord Brackley and Mr. Thomas Egerton, in riding from Gloucester to Ludlow to join their father the Earl of Bridgewater, then (1634) Lord President of the Marches, residing at Ludlow Castle, lost their way in the forest, got separated, and were benighted. It may easily be supposed that they took the old British road for Wales as far as Wormelow Tump, wishing perchance to avoid the city of Hereford ; and thus this forest would become their direct road. It is true that Haywood, near Ludlow disputes this claim to the site, but the introduction of "Sabrina" by the poet as—

> " A gentle nymph not far from hence,
> That with moist curb sways the smooth Severn stream,"

shows that it is mere supposition in both cases. Had it been "Vaga" or "Tamesis," the matter would have been more clear,—but precision of locality would mar the dignity and grace of the poem. It rises far superior to the incident ; the wood is the world and purity of mind and thought is the true safeguard against its sins and temptations—

> " Virtue may be assailed, but never hurt,
> Surprised by unjust force, but not enthralled."

Happily, it was mid-day instead of midnight—and scouts sent out soon fell in with the wanderers, who deep in fungous lore, had been sheltering themselves from the storm under a single umbrella. Thus it came to pass that, clothed in the purity of the Science the Club promotes, all its members made their way in safety

> "Through the perplexèd paths of this drear wood,
> The nodding horror of whose shady brows
> Threats the forlorn and wandering passenger."

The next stoppage was made to examine the cluster of grand old oaks by the house of the Haywood Farm. They are, perhaps, the only remaining trees of the Forest of olden times. The finest tree—"The Haywood Forest Oak"—(*Quercus rober*) is still a very noble object. 20ft. 7in. in circumference, at 5ft. from the ground, and rising to the height of about 50ft., sending out gnarled and naked branches from amidst its foliage in the most picturesque way. It was decided on the spot to have this tree photographed for the next volume of the "Club's Transactions." Another very fine tree in full luxuriance, measured 19ft. 4in. in circumference. It was of the variety *intermedia*. There were four other trees more aged still, whose trunks were hollow, and whose boughs had been rent off by the storms of countless winters; a *Q. sessiliflora* measuring 19ft.; a *Q. pedunculata* measuring 15ft. 9in., and a *Q. sessiliflora* 16ft. One fine bole lay prostrate—a hollow shell—some 21ft. in circumference in its dry state.

> "Some have left
> A splintered stump, bleach'd to a snowy white;
> And some memorial none, where once they grew."—*Cowper.*

On the surface of this decaying tree, later in the autumn, a very rare fungus was found. It was the *Hydnum Erinaceus*, the Hedgehog fungus—one seldom seen but very unmistakeable. It was beautiful in its tints of colour, from pale yellow, though orange, to scarlet. It is agreeable in smell and pleasant to taste, Trattinnick and Roques to wit. If it were but more common its edible virtues would cause it to be more highly esteemed.

On some roots left in the ground Mr. Cam found two specimens of *Fistulina hepatica* just beginning to grow; and on another Dr. Bull hit upon a small species of the little yellow fungus of some rarity, *Calocera cornea*, closely allied to the Clavarias.

The carriages were now taken for Mynde Park, and a ride of three miles brought the scientific visitors to this "happy hunting ground." On entering the park an excellent well marked, well filled ring of *Boleti* was observed round an oak tree, and the same thing was noticed afterwards again and again, which seemed to show clearly enough that the cause of some "fairy rings" at any rate, was the "drop" from the trees' branches.

The Rev. William Houghton gathered here some fine specimens of the brown, chesnut-coloured variety of the common field mushroom, *Agaricus campestris*, of excellent flavour, and its ordinary form was abundant enough, as were also fine specimens of the Parasol Mushroom, *Ag. procerus*, *Ag. cristatus*, *Hygrophorus coccineus*, and *H. niveus.*

Taking the walk round the large piece of water, the place under the trees at the far end, where many rings of *Agaricus prunulus* had been observed to grow in former years, was visited, but none were found. Its own sister, or perhaps—for there is a doubt upon the point—its own self in variety, *Agaricus orcella*, had been found in the Forest, and was afterwards found more abundantly on the Mynde and Bryngwyn slopes. It was always growing in scattered thin clusters, and seemed to have an inclination for the neighbourhood of oaks.

On some old stumps here *Panus torulosus* was growing well, and some beautiful clusters of *Agaricus squarrosus*, and under the oaks on the hill *Russula fragilis*, *R. alutacea*, *R. heterophylla*, and *R. furcata.*

On the rising ground of Bryngwyn, Dr. M'Cullough found some scattered specimens of a very curious little agaric known as *Agaricus incanus.* It presents a singular aspect with its yellowish-green colour, its striate and often ragged margin, and the beautiful deep verdigris tint at the base of the stem. It is remarkable for its strong and persistent smell of mice, and some amusement was created by the persevering way in which some of the members went on to convince themselves time after time of its disagreeable odour.

Agaricus pascuus was also gathered here, *Agaricus appendiculatus*, and *Ag. semilanceolatus*, and so too was the *Boletus edulis*, and many other species of agarics previously noticed were passed by, for time was getting short. Bryngwyn was visited, and the President kindly took the members over the handsome mansion now in course of erection on the opposite bank.

The carriages were rejoined, and a ride pretty and interesting throughout, was brought to a satisfactory conclusion by the arrival at the Green Dragen.

The opportunity was now taken to examine the collection of Funguses which had been brought to the meeting. Several ladies honoured the Club by bringing Funguses, and coming to see the exhibition themselves. The Edible Funguses seemed to attract the greatest interest, and they were placed in the centre of the table. There was a fine specimen of a white Truffle, *Mclanogaster variegatus*, found by the Rev. W. Houghton in the Lilleshall Woods, Shropshire. A couple of specimens of the *Lycoperdon giganteum*, or Giant Puff-ball, "the vegetable egg," as it has been termed from its light and excellent behaviour under culinary treatment; one of them was sent by Captain Hereford from Sufton. The *Fistulina Hepatica*, or vegetable beef steak, was there; *Lactarius deliciosus*, or orange-milk Agaric, good as its name denotes; *Agaricus orcella*, or vegetable sweetbread; *Hydnum repandum*, "good as oysters," says Dr. Badham; *Cantharellus cibarius*, the Chanterelle; *Coprinus comatus*, the maned agaric; *Agaricus rubescens*, the brown warty agaric; *Russula alutacea*, the buff gilled sweet Russula; *Marasmius oreades*, the Champignon or Fairy-ring Fungus; *Agaricus procerus*, the Parasol agaric, and its close allies *Ag. excoriatus* and *Ag. rachodes*; an abundance of the ordinary mushroom *Agaricus campestris* in at least three varities; and a superabundance of the *Agaricus arvensis*, the large field, or Horse Mushroom, for just at that time it was so abundant and so fine that everybody brought or sent it.

Amongst the ordinary funguses exhibited there were some of great botanical interest. The *Lactarius controversus* which was published for the first time as a British species in the last volume of the Transactions of the Woolhope Club. It was discovered by Dr. M'Cullough, at Abergavenny, and has since been observed to grow very commonly beneath black poplars in many Herefordshire localities. Several specimens were shown. Another fungus, quite new to the British flora, the true *Cantharellus carbonarius* of Albertini and Schweinitz, was also exhibited. It was found by the Rev. W. Houghton on charcoal in the Lilleshall Woods, Shropshire, in company with *Agaricus carbonarius*, which is itself a recent addition to the flora of the country. Mr. Houghton also brought a specimen of *Polyporus varius* of unusual size, and several specimens of *Agaricus giganteus*, an enormous agaric having the good reputation of being edible. There were huge specimens of *Polyporus squamosus*, *P. dryadeus*, *P. rufescens*, *P. perennis*, *P. cæsius* and *P. annosus*, the latter found by Mr. Griffith Morris amongst larch trees at Dinedor Camp. *Lenzites betulina*, *Dædalea quercina*, *Bulgaria inquinans*, *Lac-*

tarius quietus L. subdulcis, and *L. fuliginosus*, *Cantharellus aurantiacus*, *Hypoxylon concentricum*, *Russula rubra* and the following Agarics—*muscarius*, *spectabilis*, *rutilans*, *cristatus*, *geophyllus*, *dryophyllus*, *cervinus*, *violacea*, *Phalloides*, *radicatus*, *Boletus subtomentosus*, &c., &c.

There was also an interesting little *Nidularia*, or bird's nest fungus, *Cyathus striatus*, brought by Dr. M'Cullough, from Abergavenny; and others too numerous to mention. Indeed, the exhibition, as a means of instruction to students in Mycology, was most interesting and successful.

The following gentlemen took part in the day's proceedings :—The President, James Rankin, Esq.; Arthur Armitage, Esq., Dr. M'Cullough (Abergavenny), and the Rev. James Davies (Moorcourt), Vice Presidents; Edwin Lees, Esq., F.L.S., Vice President of the Worcester and Malvern Field Clubs; the Rev. Wm. Houghton, M.A., F.L.S., Master Houghton, and Mr. Charles Sleigh, Preston, Shropshire; Worthington G. Smith, Esq., F.L.S., London; Dr. Bull; Rev. R. H. Williams, Byford; Thomas Cam, Esq.; the Rev. Thomas Phillipps and Mr. Jacob Phillipps, Dewsall; T. Curley, Esq., F.G.S.; the Rev. J. E. Jones Machen; Lilburn Rosher, Esq., Trewyn; J. E. Smith, Esq., Hay; Robert Archibald, Esq.; the Rev. A. Gray, Orcop; J. Griffiths Morris, Esq., R. D. Harrison, Esq., Holmer Hall; C. Lingen, Esq.; the Rev. H. W. Phillott and Master Phillott, Staunton-on-Wye; C. G. Martin, Esq., the Rev. W. C. Fowle, Brinsop; Henry Courtenay, Esq., Tillington; J. Carless, Esq., Town Clerk; Flavell Edmunds, Esq.; Mr. With, and Mr. Arthur Thompson.

The dinner took place at half-past four o'clock, being absolutely rendered late by the interest excited in the exhibition of Funguses.

The turbot and cod fish were no sooner dismissed than the specialities which require notice—the Funguses—were served separately as *entrées*, not that it was most favourable to them by any means, but that the taste of the members might be more critically exercised upon them.

The following Funguses were served. The Maned Agaric, *Coprinus comatus*, called "The Agaric of Civilization," because it requires not the undisturbed and airy pasture essential to so many kinds, but springs up on road sides or new ground at our very doors. It was simply cooked with the ordinary condiments of butter, pepper, and salt, and served on toast.

The next was a Giant Puff-ball, *Lycoperdon giganteum*, sliced, and fried with yolk of egg and fine herbs.

The third was the Vegetable Sweatbread, *Agaricus orcella*, which with the fourth, The Champignon, *Marasmius oreades*, was served in white sauce.

It is difficult to ascertain the exact estimation of the several dishes, but it is certain that they were very generally partaken of, and the success, so far as could be judged, was very decided. Three gentlemen thought the cook had not done justice to the white-maned agaric—a satisfactory proof that they at least had discovered its merits through the account published in the Transactions of last year. Several thought the *Orcella* and the *Oreades* excellent, but the chief merit was unquestionably awarded to the Puff-ball.—"How do you recognise it?—Can you be sure of it?—How was it cooked? &c., &c., were questions asked over and over again. It was fortunate that on the table a small specimen still remained to show them how easy it was to distinquish it from every other kind of fungus.

Immediately after dinner the following paper was read :—

EXPERIMENTAL ILLUSTRATIONS OF THE VARIOUS FORMS OF ELECTRICAL DISCHARGE.

By Mr. WITH.

Mr. President and Gentlemen,—A short discussion which took place at our Pontrilás meeting, concerning the probable cause of the remarkable manner in which certain trees are split into shreds when struck by lightning, has led me to believe that the following experiments on facts concerning electrical discharge may not prove uninteresting to you.

In Nos. 34 and 35 of that excellent periodical "Scientific Opinion," are two extremely interesting papers on "Researches" made by Dr. Richardson with the large Induction Coil recently constructed by Mr. Apps, of the Strand, for the London Polytechnic Institution.

Dr. Richardson's experiments were made with a view to the determination of the various forms of lightning discharge, and the specific effect of each form upon the animal frame.

Being possessed of a fairly powerful Induction Coil, I have been able to re-produce the forms of discharge described by Dr. Richardson, and, doubtless, had I felt justified in the experiments, could have verified his results in other directions, which include destruction of animal life.

My intention *now* is simply to illustrate, on a small scale of course, the various forms which the lightning discharge assumes, and to state the ascertained effects in Dr. Richardson's own words.

I will, with your permission, entirely confine myself to experiment and fact, leaving theory for your private consideration.

I wish in the first place to direct your attention to the means at hand for producing electric power. I have here a voltaic battery of five cells (Grove's) with a coil containing $7\frac{1}{2}$ miles of secondary wire. I now show you the ordinary spark.

Lightning discharges may assume four forms. To obtain that variety of discharge which Dr. Richardson calls No. 1, we must place the terminals of our coil about $1\frac{1}{2}$ inches apart.

Let me now call attention to the peculiar nature of the spark here produced. Observe its centre is a fine thread of blue light surrounded by a flaming atmosphere which may be blown aside, and is intensely hot. Wood was lighted from it to show its power of ignition.

Now increasing the distance between the discharging points we obtain our flashes at a slower rate, but with an increased intensity. This Dr. Richardson calls discharge No 2. It is simply a variety of discharge, No. 1, being a little less burning, and slightly more intense. Now I connect the coatings of this large Leyden jar with the terminals of the coil—one terminal with the inner, and the other with the outer coating. On making the discharge we observe a singular alteration in the nature of the flash, which has become short, dense, brilliant, and is accompanied with much noise. If we wish to increase the *quantity* of forçe passing in each flash, we must either increase the size of our jar, or so connect two or more jars that they operate as one.

But in order to increase the *Tension* of these discharges we must proceed in a somewhat different manner.

If we take two or more insulated Leyden jars, and connect them in such a way that the exterior coating of No. 1 shall be in metallic communication with the *in*terior coating of No. 2, and the exterior coating of No. 2 with the *in*terior coating of No. 3, and so on—connecting the inside of No. 1 with one terminal of our coil, and outside of the last jar with the other terminal—we obtain a flash of remarkable power and quality.

I have here a series of sheets of glass, each sheet coated on both sides with tinfoil; each sheet is virtually a Leyden jar.

These flat Leyden jars, if I may so call them, are connected as I have just described, one side of a sheet corresponding to the inner, the other to the outer coating of a Leyden jar.

I now place the two ends of this system in communication with the discharging terminals of the coil, and excite the coil.

You see we obtain by this means a long, dense, brilliant flash accompanied with loud detonations.

This is Dr. Richardson's No. 4 discharge. This spark possesses almost no heating power, unless much resisted.

Now, as to the physiological effects of these four kinds of electric discharge.

Discharge No. 1 burns, and sometimes stuns.

No. 2 burns and stuns.

Neither 1 nor 2 destroys life.

No. 3 stuns, or kills, according to its intensity, and produces much convulsion and distortion of the body, together with bruising.

No. 4 discharge is always *fatal*. Dr. Richardson says: "It kills straightway, excites scarcely any motion, and leaves the body life-like, to a degree which must be seen to be accredited." Making the experiment, Dr. Richardson says: "We take a pigeon, place it on a stand, pass the negative terminal to one of its feet and direct the point of the opposite terminal towards its back. The discharge is made, and the animal, life-like as it seems, is fatally struck. It sits as it did before, the head is erect, its eyes are open, and its feathers are smooth. But it is actually dead."

Again, quoting Dr. Richardson :—"These facts, one and all, connect themselves with death by lightning stroke."

Every one of the phenomena we have traced here has its natural counterpart in the phenomena of nature. We may henceforth, when we see a person who has been struck by lightning, know accurately from the effects produced the character of the discharge to which he has been subjected.

Has he been scorched and stunned—he has received a discharge, the analogue of which is in the flaming spark of our coil.

Has he been struck and left distorted, rigid in parts or bruised,—he has received from the cloud the discharge, the analogue of which is in our Leyden jar.

Has he been struck and left free of all mark of burn or destortion, left in such serenity of death, with such persistent brightness of eye, calmness of expression, and ease of limb, that you could almost accost him as though he were in life and could deceive yourself that he did yet breathe? He has received from the cloud the analogue of the discharge which has just been illustrated (applause).

Mr. Lingen then made some remarks on Dr. Richardson's experiments.

Mr. With received the thanks of the meeting through thePresident, and was proposed as an Honorary Member of the Club by Dr. Bull and the Rev. A. Gray.

The President then called upon Dr. Bull to continue his—

ILLUSTRATIONS OF THE EDIBLE FUNGUSES OF HEREFORDSHIRE.

By Dr. Bull.

(Continued from page 203 of the Volume of Transactions for the year 1868.)

"There's none stands under more calumnious tongues."
—*Shakespeare, Hen. VIII.*

The experience of the present year would afford ample proof—if proof were wanted—that Funguses could not be depended upon as a regular source of food for the people. The rainfall in Herefordshire has been considerably less this summer than it was in 1868. The actual rainfall of the two years at Hereford, for the months of June, July, and August, is given by E. J. Isbell, Esq., as follows:—

	1868.		1869.
June	0.455	....	0.947
July	1.231	....	0.300
August	5.187	....	0.843
Total	6.872	....	2.090

It will be remembered that at the Ledbury meeting of the Club in May, *Agaricus gambosus*, *Agaricus arvensis*, and *Marasmius oreades* were gathered and eaten, but no Funguses were met with at any of the succeeding meetings.

Notwithstanding these unfavourable circumstances the progress of Fungology has been most marked and satisfactory. The address of the Rev. M. J. Berkeley at the Society of Arts, followed up by the proceedings at the Royal Horticultural Society last year, have been very successful in creating a general interest in the study of this neglected branch of natural history. Old books on the subject are being bought up, and new ones are frequently announced. The Naturalists Field Clubs are taking up the study of Funguses with more or less energy, and dinners are held where the merits of those that are edible are practically tested; nor yet has that additional proof of success been wanting, an increased effort to excite still more the prejudice against them.

The Woolhope Club has taken a leading position during the last three years in promoting the study and utilisation of Funguses, and has perhaps had some little influence in creating this interest in them. Be this as it may, the Club would be so little likely to underestimate the amount of progress towards the result they wish to obtain, that it will be better on the present occasion to direct attention to what has been said in opposition to them.

Light banter and pleasant ridicule has been plentiful, and those who desire to extend the right of appreciation of Funguses are grateful for it. It has drawn much attention to them ; it has kept them in memory ; and is proving with them, as it does so constantly prove in other matters, the incentive to a desire for further information. This is all that is required. A student has only to take up the subject, and the Funguses themselves will secure his continued interest, by their beauty, their edible virtues, their poisonous qualities, or by the endless variety and peculiarity of growth which they present.

There has, however, been one serious and laboured attack on their edible virtues which requires a more exact notice. In a Medical Review of the front rank, " The British and Foreign Medico-Chirurgical Review," for January of the present year, 1869, a prominent place is given to an article, some seven pages long, on Dr. Valenti-Serini's work on Suspected and Poisonous Funguses of the Territory of Siena—" Dei Funghi sospetti e velenosi del territorio Senese," per Franceso Valenti-Serini—published under the authority of the Royal Academy of Medicine of Turin. The book has an introduction of only twenty pages, and, notwithstanding this, it embraces the whole subject of the origin, nature, and chemical analysis of Poisonous Funguses, the symptoms they produce, the means of treatment, and the facts observed after death. There are 56 plates of the size of nature and coloured.

The Reviewer gives the work throughout unqualified praise ; and in an article, the whole tenor of which is directed against Edible Funguses, dwells minutely on the effects of the Poisonous ones, and says that particular attention ought to be called to this work, now that the Society of Arts is engaged "in collecting and diffusing information to show that our fungi, with few exceptions, and these easily discriminated, may safely be eaten." No such statement as this was made by the Rev. M. J. Berkeley at the Society of Arts, and had the writer known anything of Funguses himself he could not have supposed that so absurd a statement would be made. The article bears internal evidence of this ignorance of the subject, not only in its guarded expressions—its inverted sentences—and its indiscriminate praise, but also by the fact that it is chiefly made up by translations appropriated but not acknowledged, and by long avowed quotations. In short, it has been simply written to order, and is really very discreditable to the character of the Review in which it appears.

These remarks are severe, but they are just. There is one point on which you can test for yourselves the Reviewer's assertion of "the extreme value of this book to science and humanity" on the present occasion. Here are two Funguses—*Lactarius deliciosus* and *Coprinus comatus*, which have been gathered in our excursion to-day. Here are the coloured representatives of them from the Transactions of the Woolhope Club ; and here are the plates given in Dr. Valenti-Serini's book (laughter). It is but common charity to suppose that the reviewer has never seen any of the many excellent English coloured plates of Funguses.

As a work of science Dr. Valenti-Serini's book has its value—though it is certainly very weak and disappointing here—but as a work for general information, which it professes to be, it is worse than useless.

"Io credo. se non isbaglio, che questo sia il mezzo piú adattato perchè il popolo si formi di queste piante una idea se non chiarissima, approssimativa almeno, per regolarsi quando vada in cerca delle medesine"—p. xii.

Carry the same argument on which this claim to public utility is founded into any other class of plants and its absurdity will be transparent. Ought we to abstain from potatoes because it is the only wholesome product of a poisonous family until we have thoroughly learnt all the dreadful effects of the other members of the family? Must we not eat celery or parsley until we have studied all the many and common umbelliferous plants which are poisonous?

Mr. Worthington G. Smith and some friends had pulled up a plant of the Hogweed, or Cow-parsley, with a root like the parsnip. They thought it tasted like sweet chesnut, but luckily eating it cautiously they found their throats begin to burn, and escaped with this discomfort only. You will doubtless remember also this spring seeing the account of three gentlemen in the island of Jersey, who, tired with a long walk, sat down to rest themselves. One of them pulled up a succulent plant with a root something like a carrot. It was the deadly nightshade. He ate some of it, and was dead in six hours. His two friends, who had merely tasted it, were made very uncomfortable. May we not eat parsnips or carrots until we have carefully learnt all about *Heracleum sphondilium* and *Atropa belladonna?*

When Science wishes to teach the people it should do so by simple conclusions, and not by terrifying arguments they cannot follow. There is no royal road to learning. Nature has no fixed outlines, and all natural objects require individual study. Here is an example of the errors committed when Science would be too precise. In works of school Botany it used formerly to be stated that all plants with papilionaceous flowers, as peas, beans, &c., are wholesome and nutritious. A young housekeeper, at the time studying Botany, met with this statement, and finding the Laburnum to have papilionaceous flowers, gathered the pods, had them sliced as French beans, and then boiled for the table. Luckily they were not nice, so the young people ate sparingly. but one elderly lady, who partook of them more freely, very nearly lost her life, and all who tasted them were made ill.

For the sake of condemning Funguses altogether, the author quotes, and the reviewer re-echoes in the same spirit, the old Latin axiom—"Sunt bona mixta malis, Sunt mala mixta bonis," entirely overlooking its general application. Evil is everywhere mixed with good, and in food, as in all other things, it is an object of life to learn to choose the good and to reject the evil. True science will ever be at hand to aid in the selection, and that science must be false which teaches the rejection of both for no better reason than this.

Dr. Valenti-Serini, after stating that Funguses are much used in the north and in Italy as an article of food during Lent, and that by careful cooking many suspicious ones are constantly eaten, adds that in spite of the Ammonita and other dangerous species being most abundant, cases of poisoning rarely occur.

"Ad onta che qui vi siano abbondantissime le ammonite ed iltre specie periculose, gla avvelenamenti sono rari" (p. 25).

Cases of poisoning "rare"! even with this extended use! Pray, what other article of food is there from which accidents do not occasionally happen?

The plain and simple question to be answered after all is this : ARE THERE ANY FUNGUSES, GOOD AND WHOLESOME, WHICH HAVE SUCH DISTINCTIVE CHARACTERS OF THEIR OWN AS TO ADMIT OF BEING READILY DISTINGUISHED FROM ALL OTHERS BY ORDINARY PEOPLE? The Woolhope Club, and all those who know them, who eat, and enjoy them, say plainly and fearlessly, "YES, THERE ARE." The ordinary mushroom is readily enough known by everybody, and certainly there are other Funguses good and wholesome that may be distinguished with still greater ease and certainty.

The preceding volumes of our "Transactions" contain drawings and descriptions of six of them. In this one, the following are given, viz. : *Hydnum repandum :* the Hedgehog, or Spine-bearing Mushroom ; *Fistulina hepatica :* the Liver Fungus, or Vegetable beef-steak; *Agaricus orcella :* "Orgelle, or Vegetable Sweetbread; and *Agaricus prunulus :* the Plum Mushroom.

Hydnum repandum— Hedgehog, or Spine-bearing mushroom.

FAMILY I.—HYMENOMYCETES.

Order 3.—Hydnei.

Hymenium spread over the surface of spines, teeth, persistent papillæ, &c., and not lining impressed pores or tubes.

Genus—Hydnum. *Stem central.*

HYDNUM REPANDUM.—*Linn.*

HEDGEHOG, OR SPINE-BEARING MUSHROOM.

BOTANICAL CHARACTERS.

Pileus: Smooth, irregular in shape, depressed in the centre more or less lobed, and generally placed irregularly on the stem (eccentric); of a pale buff or cinnamon colour; from two to five inches in diameter. Flesh firm and white, when bruised it turns slightly brown. From crowded growth separate lobes of the same funguses, or the pileus of different funguses often unite in growth, become fused as it were, and present a single surface.

Spines: Crowded, awl-shaped, slanting, soft and brittle, varying in size and length, and of a faint cinnamon tint.

Stem: White, short, solid, crooked, and often lateral.

The Hedgehog Mushroom is known by many names in the different Departments of France, as "*Eurchon*" or "*Urchin*," "*Grinace*," "*Rignoche*," *Penchénille*," "*Chevrotine*," "*Chevrette*" or "*Barbe de Vache*." In Tuscany it is known under the name of "*Steccherino*, o *dentino dorato*."

There is no possibility of mistaking the Hedgehog Mushroom; when once seen, it is always to be remembered. Its awl-shaped spines crowded beneath the pileus; its size, and colour, are most marked—it resembles closely, as has been said, a lightly baked cracknel biscuit. It grows in pine or oak woods, or in hedge bottoms, solitarily, in groups, or in rings.

Hydnum repandum is certainly not a common fungus in Herefordshire. It is very local, but where it does grow, in favourable seasons, there is a considerable quantity of it. In Haywood Forest it grows on the south side; and according to Mr. Stackhouse it is found in another locality near Haugh Wood; and the Rev. R. Blight found it in a hanging wood on the hill above Bredwardine.

OPINIONS ON THE MERITS OF HYDNUM REPANDUM AS AN EDIBLE FUNGUS.

"The general use of this fungus throughout France, Italy, and Germany, leaves no room for doubt as to its good qualities." *Roques.*

"It is regularly sold in Austria, France, and Switzerland." *Greville.*

Vittadini places it "among the most delicate of the funguses in Italy."

"When well stewed, it is an excellent dish, with a slight flavour of oysters. It also makes a very good *purée.*" *Dr. Badham.*

"A most excellent fungus, but it requires a little caution in preparation for the table. It should be previously steeped in hot water and well drained in a cloth; in which case there is certainly not a more excellent fungus than it is." *Berkeley.*

"The gastronomic qualities of the Hedgehog mushroom are of a high degree. Its flavour, when stewed, is excellent, and cooked with white sauce it has a decided flavour of oysters." *Miss Plues.*

"A wholesome fungus and not to be despised, but not in the first-class as to flavour, requiring the help of condiments. It has the advantage, however, of growing later than most funguses, and may be found up to the middle of November." *Edwin Lees.*

"A charming addition to the table. Its flesh is very firm and delicious." *Worthington G. Smith.*

"One of the most excellent fungi that grows; its flavour very strongly resembles oysters." *The Rev. W. Houghton.*

MODES OF COOKING HYDNUM REPANDUM.

The Hedgehog Mushroom is dense in structure, and in whatever way it may be cooked, all authorities agree that it must be done slowly at a low temperature until it is tender, and with plenty of stock or white sauce to supply its deficiency in moisture.

26. STEWED HYDNUM.

"Cut the mushrooms in pieces and steep for twenty minutes in warm water; then place in a pan with butter, pepper, salt, and parsley; and beef or other gravy, and simmer for an hour." *Trans. from M. Roques.*

"Stew in a brown or white sauce." *Mrs. Hussey.*

"Cut up in bits about the size of a bean and stew in white sauce, when it will almost pass off as oyster sauce." *The Rev. Wm. Houghton, F.L.S.*

Fistulina hepatica — Liver fungus, or Vegetable beefsteak.

FAMILY I.—HYMENOMYCETES.

Order 2.—Polyporei.

Hymenium lining the cavity of tubes or pores which are sometimes broken up into teeth, or concentric plates.

Genus Fistulina.—*Bull.*

Hymenophorum fleshy. Hymenium inferior, at first papillose, the papillæ at length elongated and forming distinct tubes,

FISTULINA HEPATICA.—*Fries.*

LIVER FUNGUS, OR VEGETABLE BEEF-STEAK.

BOTANICAL CHARACTERS.

Pileus: undivided, lobed, thick, soft and fleshy. At first a dull pale purplish red, it becomes more red and passes, through chocolate, to the black misshapen mass it becomes in decay. The underside when young, is of a cream colour, with occasional minute red points, becoming yellowish red. The flesh, when cut, is streaked, red, and juicy, resembling (more or less) beet-root.

Tubes: very slender, unequal, distinct from each other, scarcely half an inch deep when of full size. They frequently overlap the edge of the pileus and appear on the upper surface when they are short, take the red colour, and give a velvet-like surface. Pores extremely minute, Spores yellow.

This Fungus has received many other names. *Boletus hepaticus*, Schæff., Huds., Pers., Hook, &c. :—*Agaricus porosus rubens*, Ray syn, ; *Fistulina buglossoides*, Bull. ; *Buglossus quercinus*, Wallemb. ; *Hypodrys hépatique*, Roques ; *Fungus pauperibus esculentus*, "The poor man's Fungus," Schæff. Cisalpinus calls it *Linguæ*, and in Italy it is called *Lingua quercina*, or *Lingua di Castagna*. In France it is also called "*Langue-de-bœvf*," "*foie-de-bœuf*," or *glû-de-chêne*."

The "Vegetable beefsteak" is also a Fungus which there is no possibility of mistaking. Its size, its colour, its soft fleshy consistence, its great juiciness when cut, and the streaked beetroot-like section are perfectly distinctive ; when mature it really has a close resemblance to flesh, or liver. It is by no means uncommon in Herefordshire when looked for in the proper localities, that is about the stumps of hollow or decaying oaks, but it is also occasionally found on the chesnut, ash, walnut, willow, or beech trees.

The plate given is drawn to exact size from a very small Fungus, dwarfed by dry weather, and it will be better to consider it as one third of the usual size. The yellowish cream colour of the under surface is only seen under the corner turned up, but it extends beneath the whole of it. It frequently grows to a size from four to six pounds in weight, and often much larger. It attains its full size when the weather is favourable in about a fortnight, and decays in another week.

OPINIONS ON THE MERITS OF FISTULINA HEPATICA AS AN EDIBLE FUNGUS.

Par son volume et sa saveur agréable, ce Champignon doit être mis au nombre des espèces alimentaires les plus utiles. Un seul individu peut fournir amplement de quoi faire un bon repas. *Roques.*

No fungus yields a richer gravy, and though rather tough, when grilled, it is scarcely to be distinguished from broiled meat. *Dr. Badham.*

One of the best things I ever ate, but then it was prepared by a skilful cook. *Berkeley.*

This fungus may be considered—as is usually said of some thing not first-rate—"not bad"—and though it may be eaten in the absence of better things I consider it coarse, and not to be cherished as a delicacy. Quite in the second class. *Edwin Lees.*

When old it becomes rather tough, but in all its stages it affords an excellent gravy, and when young if sliced and grilled, would pass muster for a good beef steak. *M. C. Cooke.*

If it is not beef itself it is the sauce for it. *Mrs. Hussey.*

It is truly a vegetable beef-steak, for the taste resembles meat in a remarkable manner. It is good broiled with a steak and properly seasoned. There is a slight but very perceptible acid flavour with it, that gives considerable zest, and piquancy to the dish, rendering it a "treat for an epicure."—*W. G. Smith.*

It is the best possible addition to a beef-steak, from the excellent gravy it affords, and is a steak in itself when properly cooked.

Address at the Horticultural Society.

MODES OF COOKING FISTULINA HEPATICA.

27.—Stewed Fistulina.

In France it is first washed and dried, then placed in boiling water for a short time, and afterwards stewed with butter, parsley, scallion, pepper and salt; yolk of egg being afterwards added when the stew is ready for the table. —*M. C. Cooke.*

In Vienna it is cut in thin slices and eaten in salad, as we eat beet-root.—*M. C. Cooke.*

28.—Fistulina Gravy.

Slice and macerate with salt, after the manner of making mushroom ketchup. The deep red liquor that is produced should be put into a dish with a little lemon juice and minced shalots, and a broiled rump steak deposited in it.

Mrs. Hussey.

N.B.—This liquor is not catsup, for it has but little of the flavour of mushroom, but is a beef gravy of high virtue.

The best way to dress it, if old, is to stew it down for stock, and reject the flesh; if young, it may be eaten in substance, plain, or with minced meat; in all cases its succulency is such that it furnishes its own sauce. *Dr. Badham.*

Palatable and nutritious when mixed with minced meat. *Mrs. Hussey.*

Agaricus orcella - Orgelle, or Vegetable Sweatbread.

Agaricus prunulus - The plum mushroom.

FAMILY I.—HYMENOMYCETES.

Order Agaricini.

Genus Agaricus.

Subgenus 13.—Clitopilus.

Hymenophorum confluent with the fleshy or fibrous stem; gills decurrent.

AGARICUS ORCELLA.—*Bull.*

ORGELLE, OR VEGETABLE SWEETBREAD.

BOTANICAL CHARACTERS.

Pileus: Thin, irregular, depressed in the centre, lobed, with undulated borders, from two to three inches across. In colour clear white, sometimes tinted with pale brown on its prominences, and occasionally with a grey centre or even lightly zoned with grey. Its surface is soft and smooth to the touch except in wet weather, when it becomes soft and sticky. The flesh is soft, colourless, and unchangeable.

Gills: Crowded, decurrent, at first nearly white, then pinkish grey, taking at length a light-brown tint. Spores pale brown.

Stem: Smooth, white, solid, short, decreasing in size. Central when young, but becoming eccentric from the pileus growing irregularly.

Odour: Pleasant, usually compared to fresh meal, but Dr. Badham and other friends think it resembles more closely the smell of cucumber or syringa leaf.

AGARICUS PRUNULUS.—*Scop.*

PLUM MUSHROOM.

BOTANICAL CHARACTERS.

Pileus: Fleshy, compact, at first convex, then expanded, becoming depressed in the centre, irregulary waved, and slightly pruinose; from two to five inches broad; surface dry, soft, white, or sometimes gray. The flesh thick, white, and unchangeable.

Gills: Crowded, deeply decurrent, at first white, then a pale dull flesh-colour, or yellowish brown. Spores pale brown.

Stem: White, solid, firm, slightly ventricose, an inch or more long, and half an inch thick; naked, often striate, and villose at the base; often eccentric.

Odour: Like that of new meal, but usually too strong to be agreeable.

There has been considerable confusion between the two Agarics *Orcella* and *Prunulus*, some thinking that we have only *Orcella* in England (Dr. Badham) and others only *Prunulus* (Rev. M. J. Berkeley) and others again that they are both the same Fungus differing only in size. Dr. Badham and some others again confuse *Prunulus* with *Gambosus*, the Fungus of early spring, and this has arisen from the French term "mousseron" being often applied to both these Funguses—but they are so essentially different as not to be liable in any way to be mistaken for each other.

Agaricus orcella and *Ag. prunulus* are both placed on the same page in this illustration that their close alliance may be seen at a glance. Fries treats them as separate Funguses "in deference to ancient authority, since their differences are chiefly in degree." These differences are nevertheless so well marked that they are kept separate here. *Orcella* is a smaller and more delicate fungus than *Prunulus*. It is thinner and less fleshy, more undulated in its borders, and has a lighter and more agreeable odour. *Orcella* grows in more open glades than *Prunulus*; it is usually much whiter in colour, sometimes in high situations white and glazed as egg-shell, or even pottery. *Orcella* grows more solitarily than *Prunulus*, in light scattered groups, showing an inclination for the neighbourhood of oak trees, and where it does grow it may be found year after year in the same place, but seldom more than two or three in a spot. This year, 1869, when *Orcella* was pretty plentiful, *Prunulus* was not to be found in the situations where it usually grows abundantly.

Prunulus is the reverse of all this. It prefers more shaded places, is larger, more fleshy, and with a strong odour rather heavy and overpowering. It grows in greater quantities together, and not unfrequently in crowded rings from four to six feet in diameter.

As Edible Funguses they should certainly be kept distinct. *Orcella* is light and pleasant in odour, and excellent in flavour; it is so tender and delicate as to be termed, not inaptly, "Vegetable Sweatbread." *Prunulus*, on the other hand, though always good, is to many people too strong in odour, and more coarse in taste.

OPINIONS ON THE MERITS OF AGARICUS ORCELLA AND AGARICUS PRUNULUS AS EDIBLE FUNGUSES.

"Senza dubbio uno de migliori funghi indigeni." *Vittadini.*

"A very delicate mushroom." *Dr. Badham.*

"The flavour of *orcella* is very delicate, and equal to anything among Funguses, or rather superior to the majority. The same remarks apply to *prunulus*, which I think the same thing. It belongs to the edible Funguses."
Edwin Lees.

"Leur parfum se répand au loin et announce leur presence."

*   *   *   *   *   *

"D'un goût et d'un parfum délicieux." *Roques.*

"Whenever and wherever the mouçeron is found let it be welcomed for its utility still more than its beauty. *Miss Plues.*

MODES OF COOKING AGARICUS ORCELLA AND AGARICUS PRUNULUS.

Orcella being usually found in small quantities, is best perhaps when broiled and served on hot toast. *Prunulus*, growing in greater abundance, will serve also for boiling, or stewing, or both.

"*Orcella* should be eaten the day it is gathered, either stewed, broiled, or fried with egg and bread crumbs like cutlets." *Dr. Badham.*

"However prepared it is most excellent; the flesh is firm and juicy, and full of flavour, and whether broiled, or stewed, or however prepared, it is a most delicious morsel. *Worthington G. Smith.*

"*Orcella* will dry, and may be preserved in this way. It loses much of its volume, but it acquires 'un aroma suavissimo.'" *Vittadini.*

THE DISCUSSION ON FAIRY RINGS.

INTRODUCED BY

EDWIN LEES, Esq., F.L.S., F.G.S., &c.,

Vice-president of the Worcester and Malvern Naturalists' Field Clubs.

The PRESIDENT (James Rankin, Esq.) said that last year Mr. Edwin Lees, of Worcester, had read a paper to the Club on the interesting subject of "FAIRY RINGS," and it was then suggested that members should during the ensuing year make particular observations for themselves, and that the matter should receive full attention at the present meeting. He would, therefore, now call upon Mr. Lees to open the discussion.

EDWIN LEES, Esq., F.L.S., then commencing in a humorous vein, said that he must ask for their kind consideration and candid attention on behalf of the poor and humble client whose interests he had to maintain, who was of such retiring habits that he seldom appeared in public, kept himself secluded from view, and though he was really a public benefactor, yet unfortunately for himself he was generally considered an enemy to agriculture, and the members of his family were consequently butchered unfeelingly by scores, and hung up *in terrorem* upon the branches of trees on almost every farm. As they would all understand, the poor client whose interests he now advocated was the little underground miner called the Mole. Having brought the case previously before them, they might think it would prove as interminable as a Chancery suit, but he hoped that the additional facts and observations that he had to produce, with the arguments founded thereon, would so incline their minds to the view he had taken that he should confidently expect a verdict in his favour. He had hoped that his friend Dr. Bull would have seen his way to accept a "brief" in favour of molar action; but, though whilst he did not ignore his client's merits, he appeared to shrink from a decided advocacy of his claims, wishing to make the circuit of the ring on his own interpretation of Nature if he could. Thus left as sole advocate in the cause, he must do the best he could for the Mole on his own noted facts and experience.

Mr. LEES then observed, that to simplify the case and ensure their assent to the view that he took he would moderate his demands, and though fully believing that the majority of *Fairy Rings* were primarily caused by the operation of the Mole, yet he would not assert that other causes had not their share in making circular brands upon pastures, and though he had traced the hand, or rather paw of the Mole, most indubitably in a number of cases which he had diagramed in the field, yet he would admit that he had met with arcs and rings whose origin was difficult of solution. To obviate an objection made by Mr. Curley and others that Fairy Rings existed in Ireland though Moles were absent from that country, he would on the present occasion give up all claim to the Irish property (laughter), but "without prejudice," not having had an opportunity of examining the sister island, though nothing but assertions had been made, and no authorities appealed to. He would also advance no claim to any part of North America, as he had seen it stated in a volume of "The American Naturalist" that there were no Fairy Rings on that continent, and as he had never heard of any emigration of the Mole family there, that may be taken as negative evidence of no rings in the absence of the Mole, at any rate in America. He would confine himself to Britain and the Continent of Europe, and the numerous rings there apparent, especially in England, would satisfy the moderate requirements of construction and possession he now made on behalf of his client the Mole. He would now briefly sum up the evidence in support of his case in two parts, taking first the remarks of authors and observers, who had gone into the history of the mole, though without reference to the formation of Fairy Rings from them; and, secondly, give the result of his own observations, carried over many years, which had convinced him that the Mole was the primary originator of the curves, arcs, and rings so often seen marking pastures and lawns. In his former papers, printed in the "Woolhope Transactions," he had already quoted the statements of Bell, in his "British Quadrupeds," Jesse in his "Natural History Essays," and the French writer, M. St. Hilaire, all of whom had borne testimony to the gyratory lines made by the Mole in pastures, and Mr. Jesse particularly stated that "coupling runs," as the mole-catchers call them, are made by the male mole in his searches for his partner, and "are as near the surface as possible." The remarks of these writers as to mole-runs are the more important, as they had no theory to support as to Fairy Rings being formed on the tracks of the mole. He had further been led by his friend Rev. J. D. La Touche, of Stokesay, and had the advantage of consulting a professional mole-catcher, and who had told them that these round-about runs of the mole were common enough in meadows, though, as he had only to attend to the catching of moles, he had not paid attention to Fairy Rings themselves as arising from these runs. Mr. Lees then exhibited a considerable number of sketches of *Fairy Rings*, diagrams made by himself in the field, of various figures and dimensions—some circular, others exceedingly wavy and irregular, several of them dotted with Agarics, and others only forming a line of coarse grass, but all of them, as he declared, showing evident traces of the work of the mole. They were from various localities, and one most curious diagram he had taken in a field near Beaumaris, in the Island of Anglesea, only a fortnight since, showed evident traces of two moles running close together in two parallel lines, and forming two rings connected together by a double avenue! He had been particularly attentive to the subject this year, and all his former observations as to molar work were confirmed. But unless they looked close and went into the middle of meadows, the first work of the mole is not so obvious as the verdant or fungus-dotted rings that afterwards were so clearly revealed to view. A clerical friend who had observed some rings of sudden appearance in a piece of meadow-land recently enclosed for a burial ground, had at first laughed at the idea of their being molar work, saying that moles had never been observed near the place, but only a few weeks since had written to him (Mr. Lees) to say that he found the mole was really there, and he was now inclined to the molar theory. Of course the ring continued and the funguses appeared *after the mole had done his work and had gone elsewhere*, and he could not perhaps be found at that moment to explain matters to them; but if they perceived traces of his whereabouts in the same meadow, they might be sure that his was the original work, though the ring, when afterwards occupied by funguses, proceeded on other principles to continue and increase on its own account. But many lines and great arcs in meadows formed by the mole never get occupied by funguses. but they were marked by a fresh growth of coarse grass, arising where the former grass in the arc or ring had decayed, and becoming less visible the succeeding year, they finally died out, and even the ring occupied by the fungi did not exist an unlimited time, frequently disappearing as suddenly as they had shown themselves, while new rings of various sizes presented themselves to view every year. Mr. Lees concluded an argumentative address by referring to the constant activity of Nature in causing phenomena to dovetail into each other, and the operations of a little animal as in this case, which might be thought mischievous, lead to the production of a peculiar vegetation, which wanted a pabulum for the sporules that floated in the atmosphere to imbibe. It was also remarkable that *the molar circle* appeared to be constructed on the same principle as what we all understood by "the family circle;" and it would really appear that the words of the old song,

"Oh! 'tis love, 'tis love, that *makes the world go round*,"

was as truly and more literally understood by the mole as by any member of the human family (laughter and cheers).

D. R. Harrison, Esq., said the moles had a very able advocate in Mr. Lees, but he thought facts were against them. He (Mr. H.) had given a good deal of attention to the subject of moles as affecting "Fairy Rings" this summer and autumn; and he observed, in two meadows adjacent to his house where both abounded, that the moles generally preferred the lower and moister situations, and the fungi the dryer portions. The rings were of various and sometimes complicated forms, as shown in the rough sketch (sketch produced), but in most, if not in all cases, they indicated growth from a centre.

Mr. Lees remarked the sketch was in favour of his theory, as it indicated moles' work.

Mr. Harrison: In early summer the inner side of the ring was marked by a lush growth of the stronger grasses, while the ring itself was crowded with fungi, mainly the St. George's mushroom, *Agaricus gambosus.* At the present time they had a bare appearance, from the decay of the finer grasses; and the *Marasmius oreades* was growing there. He had had several of these rings cut through without finding any trace of the moles' operations; but in one instance he came upon a moles' track passing through the ring towards the centre and had it opened several feet both inside and outside the ring. There were no surface indications of its course, either in the form of fungi or more vigorous vegetation, while the ring—under which there was no indication of a track—was distinguished by both, as described. He also remarked that under the ring the soil was infiltrated with mycelium, which always extended a few inches beyond its outer, but rarely beyond its inner margin. (A specimen of the soil filled with mycelium was produced). This also seemed to him to give support to the generally received theory of growth from a central group. He regretted the facts would not allow him the pleasure of agreeing with Mr. Lees, as he should gladly have found that the scientific world was wrong for once, and that a member of the club was entitled to the credit of setting it right.

He concluded by recommending the members of the Club to mark some isolated group of fungi, and also stake out carefully some of the rings, with a view to a better settlement of the question (applause).

The Rev. WM. HOUGHTON, F.L.S., said that, from the very first, the amatory *molecular* theory of Mr. Lee had for him no attraction. He was convinced that the mole had nothing to do with the formation of "fairy rings." Mr. Lees's quotation from Mr. Thomas Bell's "British Quadrupeds" did not bear him out. Mr. Lees laid great stress upon the circular form of moles' runs; of course, it was necessary for his argument; but what does Mr. Bell say?—"The tracks by which the male pursues his mate are numerous and curiously divaricating." They are termed by the French naturalists *traces d'amour*, and by our English mole-catchers "coupling runs" or "rutting angles." He (Mr. Houghton) had yet to learn that *divaricating* tracks and "*rutting angles*" were synonymous with amatory gyrations. Mr. Lees had abandoned his explanation as far as it related to Ireland; but the absence of moles and the presence of "fairy-rings" in that country are fatal to his theory. He (Mr. H.) also did not agree with Mr. Lees that the operations of moles destroyed the grass. His own experience led him to a different conclusion. The subject of "fairy-rings" was no doubt a difficult one to explain, but he thought that some modification of the centrifugal theory would be the true explanation (applause).

Mr. J. E. SMITH said that after the numerous raps and ponderous blows our friend Mr. Lees has had, he felt very reluctant to give him any more, nor was it his wish to give the sick lion another kick. But he considered that the very foundation of this *molecular* theory was unsound. Mr. Lees stated that funguses find their pabulum in decaying vegetable and animal matter. The mole in his runs destroys parts of the grass, and the decaying grass forms a suitable nidus for the fungi to germinate in. But no fungi are to be found in these mole runs until a year after at least, and surely all destruction of grass and weeds by the mole has been restored by that time by the changing seasons. Where then is the pabulum for the funguses which the mole was stated to have formed? The grass has grown greener, and all dead matter has been taken up by living growth. Mr. Smith had found the *Agaricus arvensis* growing in rings where there was no sign of a mole hill anywhere near. He generally found the soil of the rings much harder than the rest of the field. A friend of his from Scotland had told him that fairy rings were common in Orkney, but the mole was unknown. When Mr. Lees said it was love that made the *mole* go round as well as the *world*, he had in his mind probably the statement of Ovid that the world was once *indigestaque moles* (oh! oh! and applause).

Mr. Flavell Edmunds humerously alluded to the expectation of his friends around him that there would be a battle as the inevitable result of the meeting of his friend Lees and himself, and assured him that it was with reluctance that he rose to say anything against the exceedingly clever and well argued theory which Mr. Lees had laid before them. As a theory it was a taking one, and he should have been glad to adopt it, but it appeared that the facts were against it. His own observations, as well as the more systematic and extensive observations of Mr. Harrison and others, were wholly at variance with the conclusions of their friend Lees. The *molecular* theory, as it had been wittily styled, was in the first place, as their friend had admitted, wholly contradicted by the case of Ireland: he believed two things were generally accepted, first, that Ireland has plenty of fairy rings, and next that it has no moles. On neither point, however, could he speak from observation. As regards this district it was not so as he had examined a great number of instances of fairy rings, and had observed a still greater number of mole works, but had never found them together. Within a couple of miles from the place where they were sitting he could show them meadows where the mole-tracks are abundant, but there are no fairy rings; and other pasture-fields where fairy rings are to be seen in all stages and states, from the mere patch of dark grass up to the curve, the semicircle, and the complete ring, with various kinds of fungi growing upon the ring and nowhere else in the field, yet not a mole-track anywhere near, or any sign that there ever was one. Notwithstanding the argument of their friend, he felt that neither the connection between the fairy rings and the mole, nor even the alleged circular direction of the mole's workings, can be regarded as proved. In almost every instance he had found the mole to work pretty nearly in a straight line. Occasionally *Talpa* seems to change his mind for some reason, and "swerves from the direct forthright," but it is generally a return towards the ditch from which he had begun his mining operations, although in many cases the plan, whatever it was, like too many of our own, was never completed (applause).

Dr. Bull then said that the present year had been so unfavourable foi the development of "Fairy rings," that they were pretty much in the same position as they were last year in reference to the discussion as to the cause of their formation. There had been no "Fairy rings" all through the summer, and it had been impossible therefore to make any practical observations upon them. His friend, Mr. Lees, had brought the subject before the club with great ability, as the result of many years' practical work in the field, and his views therefore were not lightly to be set aside. Something more was wanted than superficial observation or closet speculation. His facts and his diagrams were not to be called in question, although his intepretation of them might fairly be disputed.

He had been observing "fairy rings" himself for the last three years with some care, and he confessed that he did not think the problem of their mode of formation one by any means easy to solve. He had learnt much with reference to them, and he thought that muoh more might still be learnt by carefully watching them.

Mr. Harrison's observation of a mole track crossing a ring was very interesting. The mole himself made the experiment, and yet the funguses so far refused to follow him.

The rings formed by different funguses varied very much from each other, not only as to size, but in other particulars, and he thought he could trace in these variations the origin of some of the different theories of their formation. For example, the rings of the *Agaricus gambosus*, coming as they did immediately after the thunder-storms at the end of April, and presenting the appearance of a burnt surface through the summer, might readily give rise to the electrical theory of their formation, which the original Dr. Darwin, very strongly maintained. He has seen some rings sometimes during the summer which *Ag. gambosus* had occupied in spring and the appearance was exactly as if they had been made with a hot iron stamped upon the grass. Then again, if you examined carefully the usual growth of *Marasmius oreades*, it was first a little group of funguses, then a small and perfect ring, gradually growing larger year by year, and less perfect too, as might be expected, from some partial failure, and lasting for many years. This presented naturally the centrifugal theory, that is, the origin from a single plant, each year exhausting the soil, and growing, therefore, the next year on the fresh ground at the outer margin. He thought it most probable that the different funguses which took this circular form of growth, did so in different ways and fashions, and by carefully observing these differences some general rules might, perhaps, be obtained. He believed it was one general rule that all "Fairy rings" when once formed, if they continued to appear, increased in size year by year. He said when once formed, because he did not himself believe altogether in the commonly-accepted centrifugal theory. His observations had convinced him that "Fairy rings" were often of considerable size on their first appearance. For example, a ring of the *Agaricus geotrupus* 27 feet in diameter had appeared on a well-tended lawn at Breinton three years since, embracing an apple-tree within the circle. The large funguses could not fail to be observed. They were a source of annoyance to the owner, and he stated positively that they had never appeared there before, and he (Dr. Bull) knew they had never been there since. He did not know of the mole-run theory of explanation at that time, and could only say that there certainly were no evident traces of the mole there. The result of his observations, so far as they had gone, he must say were opposed to the mole theory as a general explanation. He knew his friend Mr. Lees was a careful observer in the field, and he had been, and was still, prepared to admit that the moles might account for some "Fairy-rings." He would say that rings of the great puff-ball, *Lycoperdon giganteum*, had seemed to him most favourable to the theory of mole formation, and certainly the fact noticed by Mr. Harrison, that different funguses occasionally succeeded each other in the same ring, showed that for some cause or other, the ground in the ring was specially adapted to their growth. He thought, however, that facts were irresistibly strong against the theory on the side of the Moles, as well as that of the Funguses. As a general rule the mole runs were not circuitous, indeed it was quite the exception when they took the regular form of an arc of a circle. They were irregular, angular, zig-zag, or more or less straight, and he had found a difficulty last spring when he had examined a good many fields with numerous fresh runs in them in finding any that could have formed the regular site of a "Fairy-ring." He thought Mr. Lees had misunderstood M. St. Hilaire and other authors on the subject. The exact circular rings with communicating passages they described, were found immediately around the nest, and were covered by the large mole-heap which protected it. For one superficial mole run that formed the arc of a circle there were certainly twenty that were irregular in shape. All of them were made precisely in the same way, and all of them would therefore offer the same facilities for the growth of Fungus sporules. But Funguses did not follow in the irregular runs, and to believe the mole-theory of the formation of "Fairy-rings," we must believe that the Funguses have the power to select only the circular runs. Then again, general observation showed, as every one must admit, that certain Funguses always grew in a scattered form, and certain others always grew in Fairy-rings, and this in the very midst of mole heaps and mole occupied fields. For instance, to give a couple of examples on each side, the common mushroom, *Ag. campestris*, and the Parasol fungus, *Agaricus procerus*, which so commonly grow in the fields and pastures, grew in an isolated or slightly clustered groups, whilst the large field or Horse Mushroom, *Agaricus arvensis*, and the Champignon, *Marasmius oreades*, equally general with the last, always grew in rings. If you suppose the two first as not adapted to grow in a circular form, or not disposed to take growth in mole-runs, as might be argued. Surely those that do so, the *Agaricus arvensis* for example, if it takes its form of growth from mole tracks, ought most frequently to be found growing in the irregular lines which these mole tracks most commonly take, and this we know is not the case. Then with regard to *Marasmius oreades*, the "Fairy ring" which grow almost on every lawn in the county. It was really trifling with common sense to say that they only grew upon circular mole runs, for the circles were too small and too complete, nor could moles make runs upon fine grass-plats without being detected immediately.

Another fatal objection to the mole theory was the fact that "Fairy rings" were often seen on ground that moles could not work, as on chalk downs, where the rock came close to the surface. And, lastly, not to mention the rings of microscopic funguses, this theory was utterly untenable if moles were not to bo found in Ireland and Orkney, whilst "fairy rings" were common there.

It seemed to him exceedingly difficult to give any solution of the causes of their formation. From his observations three years ago, when rings of that large fungus the *Agaricus Geotropus* were very abundant, he measured carefully a ring at Whitfield, and another small section of a ring in a different place there, and both had a diameter of 27 feet. The very next day, at Breinton, he met with the ring he had before alluded to, and, from its giving the same measurement, he was led to infer that it was the same fungus, and it turned out to be so, although it did not seem to be so at first sight. These observations with some other ring and measurements of different funguses which he made at that time, together with the fact of the sudden appearance of the Breinton ring at full size, suggested to him the hypothesis that the underground plant or mycelium had to grow to a certain distance before it bore its fruit. For instance, to keep to the same illustration, that the distance the *Geotropus* mycelium required to grow, before producing funguses, was thirteen feet six inches. This of course was mere supposition. There was no external indication that it did grow in this way, for the grass within the circles had not been affected. There could be no doubt but that the mycelium of funguses constantly grew in the earth, whether it produced fruit or not. When the season was unfavourable for want of moisture and heat, there were no funguses to prove the existence of the mycelium. When it was favourable, on the contrary, an abundance of all kinds of funguses appeared, shewing that the mycelium was there in readiness to produce fruit, each kind in its season and form. He was afraid that at present no more satisfactory answer as to why certain funguses grew in rings could be given, than that "it was their nature so to do." They were very much indebted to Mr. Lees for bringing this interesting subject before them in the very able and entertaining manner he had done. There was room still for further observation, and he trusted that this was not the last discussion they should hold upon it (applause).

Mr. Lees said that he must claim to say a few words in reply to the various criticisms that had been made in what he had propounded. One of the speakers had said that he must be sore from the basting that he had received from his opponents, but he could say as Homer had said of Hector in the Iliad, after a combat, that he was—

"Alive, unhurt, and vigorous from his wounds."

All his facts had been left untouched, and though every speaker had attacked the theory he had advanced, yet no one had been able to propose any other except the old centrifugal one which he had entirely upset last year, and which Dr. Bull admitted was inadmissable. But in truth he had only stated facts that were indisputable, and the diagrams he had exhibited, not only demonstrated the impossibility of these diversiform shaped rings arising from a central fungus, but presented figures and waving lines that it appeared to him could only be ascribed in their primary formations to the work of that little active miner, the mole. Mr. Edmunds would not believe it unless he saw the mole at work, and thus it was with all objectors; their attention was mostly directed to old rings occupied by funguses, or where there was a ring of brighter verdure in the meadow from their decay. Now, the mole in the first instance turned up the soil close to the surface, making a brown arc or ring, not occupied by funguses until the year after; and this primary brown ring of soil formed by the mole seemed altogether overlooked by his friends on the other side, and to this brown ring of upturned soil he would wish them particularly to look. He had a few days since, when out with the Worcestershire Club, suddenly come upon several of these made by the mole that morning, and the sight of them gained him a dozen proselytes at once! He hoped, therefore, that they would look out for these fresh rings of upturned soil, and carefully examine them "without prejudice." These turned-up lines were undoubtedly molar work, though in after years only a practised eye could trace the run of the mole in them, because either coarse grass or funguses in their growth had filled up the furrow that the mole had made. He had not gone forth into the field to make a theory on Fairy-rings, but had noted everyring that had come under his notice for the last thirty years; and he thought that it would have been more reasonable in the Club to accept his observations and conclusions, from observed facts carried over a long period of time, than to make objections from a very superficial view, with no other proposition to replace his own. Had the circles been all regular and complete, some other mode of growth in the mycelia of the funguses might have seemed possible, but with irregular rings of all sizes, where a perfect and complete ring was rare to find, the probability at least was in favour of animal action; and that the mole did make wavy lines, arcs, and rings of various dimensions in grassy pastures he maintained was indisputable. He would not, however, press his own convictions upon an audience unwilling to accept the very important facts and statements that he had brought before them, and as it seemed clear the Club were very much divided in opinion, and each member had an idea of his own in the matter, he would not call for a formal decision, but leave them to revel in the uncertainty they delighted in, though he was fully convinced in his own mind, and was quite content to leave his ideas to future patient and unprejudiced observation (applause).

The President gave the thanks of the meeting to Mr. Lees. He had fought an up-hill game valiantly, and they were indebted to him for a very interesting discussion (applause).

The Woolhope Naturalists' Field Club.

THE ANNUAL MEETING,

TUESDAY, FEB. 22, 1870.

The Club held its annual meeting at the Green Dragon Hotel on Tuesday last, which was very fully attended. The following gentlemen were present :— James Rankin, Esq., M.A., President, in the chair ; the President-elect, the Rev. H. Cooper Key, M.A. ; the Vice-presidents, Arthur Armitage, Esq., Dr. M'Cullough, the Rev. W. C. Fowle, M.A., and the Rev. Arthur Gray, M.A. the Honorary Secretary, Sir George H. Cornewall, Bart., Moccas ; the Central Committee, Dr. Bull, T. Curley, Esq., F.G.S., and John Lloyd, Esq. ; the Rev. S. Clark, M.A. ; R. Lightbody, Esq., F.G.S., Ludlow ; the Rev. Berkeley L. S. Stanhope ; the Rev. Wm. Stanhope ; W. H. West, Esq., Gliffaes, Crickhowell ; Rev. R. H. Williams ; Evan Pateshall, Esq. ; the Rev. E. Du Buisson ; David Lawrence, Esq., Pontypool ; R. Harcourt Capper, Esq. ; the Rev. C. J. Robinson, M.A. ; J. F. Symonds, Esq. ; the Rev. H. W. Phillott, M.A. ; the Rev. C. J. Westropp ; C. G. Martin, Esq. ; Rev. E. J. Ash ; George Cocking, Esq., Ludlow ; Rev. H. J. W. Stillingfleet, M.A. ; the Rev. F. T. Havergal, M.A. ; the Rev. J. H. Jukes ; the Rev. Bernard Marshall ; John Lambe, Esq., James Davies, Esq., the Rev. T. Thistlethwaite Smith ; Flavell Edmunds, Esq. ; F. Herbert, Esq. ; the Rev. T. M. Beavan ; Henry Moore, Esq., Leominster ; Charles Fortey, Esq., Haven, Forest of Deerfold ; Rev. J. E. St. Maur Russell ; the Rev. Claude W. Nursey ; Joseph Carless, Esq. ; J. Humfrys, Esq. ; Thomas Llanwarne, Esq ; the Rev. J. P. Bellingham ; and Messrs. Carless, Court, Harman, Henry Southall, and With ; and Mr. Arthur Thompson, the Assistant Secretary.

The financial statement was then read, and ordered to be printed. Worthington G. Smith, Esq., F.L.S., of London, and Mr. With were unanimously elected honorary members. J. G. Alexander, Esq., of Leominster, the Rev. Bernard Marshall, Blakemere, and the Rev. T. Thistlethwaite Smith, Hereford, were elected members, and other gentlemen proposed for election at a future meeting.

The following places and days were appointed for the Field Meetings for the present year :—

Tuesday, May 24th—The Forest of Deerfold.
Tuesday, June 21st—Ross and the Wye (Ladies' day).
Friday, July 22nd—Llangorse Lake.
Friday, August 19th—The Longmynd Hills, Shropshire.
Thursday, Oct. 6th—Hereford, for the "Fungus Foray."

A communication was then made that the British Archæological Association intended to hold its congress at Hereford this year, at the end of July or the beginning of August, and invited the members of the club to assist in its investigation of the archæological objects of interest in the city and neighbourhood.

The Chairman of the Central Committee announced that the publication of the *Flora of the County*, by the Rev. W. H. Purchas, had already commenced, and would, he trusted, be steadily continued until completed. He then exhibited some very beautifully coloured illustrations by Worthington G. Smith, Esq., F.L.S., of rare funguses, discovered last year by the members of the Woolhope Club.

The first drawing shown was the *Polyporus annosus*, found last February by Wm. Adams, Esq., F.G.S., president of the Cardiff Club, in a deep unused gallery, or heading, of the Llondu colliery, Parkslip, near Cardiff. It has the peculiarity of being phosphorescent, and when abundant, lights up the dark galleries in a peculiar manner.

The next fungus was the *Lentinus lepideus*, a rare fungus first found by Dr. T. Algernon Chapman growing from between the timbers on the underside of a railway bridge at Abergavenny. It was found also by Elmes Y. Steele, Esq., in another locality at Abergavenny. Dr. Bull found it under the roadway of the Shelwick railway bridge, near Hereford, and it was afterwards observed in several other places, but always growing precisely in the same situation.

The next figures represented a fine golden-coloured fungus, *Cortinarius (Phlegmacium) fulgens*, which was found growing under oak trees at Vennwood in September last. It is not quite new to the British flora, though it is not mentioned in Berkeley's work. It has once before been found in England, by Mr. Broome, the celebrated mycologist.

The last sheet, however, represented a fungus quite new to Britain. It was first exhibited by Dr. Bull, at Kensington, in 1868, and was found by him several times last autumn at Dinedor and in Haywood Forest. It is a striking fungus, of a dark brown gingerbread colour, and its name is *Cortinarius (Phlegmacium) russus*. At the suggestion of Mr. Worthington Smith, and with the kind offer of his assistance, it was unanimously decided that a coloured representation of this new *Cortinarius* should be published in the forthcoming volume of the Transactions of the Club.

The following are the botanical characters of this fungus :—

CORTINARIUS (PHLEGMACIUM) RUSSUS. *Fr.*

(See Frontispiece.)

Pileus—Fleshy, convex, then flattened, obtuse, viscid, glabrous at the disc, fibrous at the margin, brittle, uniformly red. *Veil*—tender, fugacious.

Gills—Obtusely adnate, scarcely perceptably rounded, or with a slight decurrent tooth, crowded, veined, of a red peroxide of iron colour, similar to the pileus.

Stem—Stuffed, then hollow, not bulbous, often curvato-ascending, soft streaked with fine silky fibres, somewhat pruinose at the apex. Flavour, not bitter but nauseous.

Spores—Brown, ·00032" × ·0002."

Explanation of Plate (the Frontispiece).—Fig. 1 and 2, *Cortinarius (Phlegmacium) russus.* Fig. 3, section of ditto. Fig. 4, spores × 700 diameters.

It grows solitarily or in patches in Herefordshire woods, and has been gathered several times in Heywood Forest and Dinedor Wood, near Hereford.

The President then introduced the question of the formation of a museum in connection with the Club, and after a long discussion, in which many members joined, the following resolution was passed—"That the Woolhope Naturalists' Field Club deems it expedient that a committee be appointed to inquire into the practicability of establishing a museum ;" and the following gentlemen were unanimously appointed to it :—Rev. H. Cooper Key, president, Sir George H. Cornewall, Bart., James Rankin, Esq., Dr. M'Cullough, Arthur Armitage, Esq., the Rev. C. J. Robinson, and James Davies, Esq.

The first paper presented to the meeting was—

METEOROLOGICAL OBSERVATIONS FOR 1869.

BY EDWIN J. ISBELL, Esq.

In compiling the Meteorological Tables for 1869, we have followed the plan adopted in the arrangement of those for 1868. Thus the Tables are again four in number, viz :—1st. Barometer and Wind ; 2nd. Thermometers ; 3rd. Rainfall in Herefordshire during the past year ; 4th. Rainfall in Herefordshire from the year 1818 to 1869.

The observations have been made with the best instruments, and the tables have been drawn up with care. We trust, therefore, that these records of the meteorology of our neighbourhood, will be found free from errors of any kind, and worthy of a place in the "Transactions" for 1869.

The range of the barometer (see Table I.) will be found less than that of 1868. The highest 9 o'clock reading (30·412 corrected but not reduced to sea level) was registered on December 6th., and the lowest (28·684) on February 1st. The yearly mean of 9 a.m. readings is 29·764. The barometer cistern is 187 feet above sea level, equal, very nearly, to two tenths of an inch on the barometer scale. The mean barometer reading in England at sea level is 29·95.

The direction of the wind (Table I.) during the past year is given to eight points only. The vane, by means of which observations were made, stands (or rather *turns)* on the clock tower in the High Town. This vane, made and presented to the city by Mr. Dillon, is quite a model of its kind : a flat flin works upon a steel point, and the weight of the arrow point is exactly balanced by the weight of the feather.

The late Mr. Howard strongly recommended this mode of construction, which obviously almost does away with friction, so that the heaviest vane will be made to move by the very lightest breath of air. The clock tower vane is also well exposed to winds for all points of the compass, and the pointers are correctly placed.

We dwell upon these particulars because vanes are generally *home made,* and if ill constructed and badly placed, may lead to some serious errors in a very important branch of meteorological observation.

According to our table the winds were as follows :—N. 21 days ; N.E. 59 ; E. 6 ; S.E. 31 ; S. 33 ; S.W. 99 ; W. 26 ; N.W. 51 ; 39 days uncertain.

The mean temperature of the past year (Table II.) as deduced from the maximum and minimum readings (the Greenwich corrections applied) is 49·67 ; the average temperature at Greenwich, as determined by Mr. Glaisher, being 49·02.

The average temperature for each month, as given by Mr. Glaisher, is as follows :—January, 36·9 ; February, 38·7 ; March, 41·7 ; April, 46·2 ; May, 52·91 ; June, 59·1 ; July, 61·8 ; August, 61·2 ; September, 56·6 ; October, 50·2 ; November, 43·2 ; December, 39·8.

During 1869 the average temperature of January was 41·6 ; February, 45·4 ; March, 38·4; April, 50·7 ; May, 50·2 ; June, 57·6 ; July, 63·5 ; August, 61·3 ; September, 57·7 ; October, 49·9 ; November, 43·2 ; December, 36·1.

In comparing the monthly mean temperature of 1869 with Mr. Glashier's figures, we observe that January and February were much above the average, March below, April above, May and June below, July above, August about the average, September a little above, October a little below, November the average temperature exactly, December below it.

During July and August the temperature was at times very high, and two days in July and four in August quite equalled the hottest days of 1868. On July 17th the temperature in the shade was 92·1 ; on the 18th, 93·8. The heat then moderated a little, but on the 25th of August it again became excessive and reached 91 ; on the 26th, 93·1 ; on the 27th, 95·3 ; and on the 28th, 94.

But if the high temperature from the 25th of August to the 28th was remarkable, the fall which took place on the 29th* was more remarkable still ; for on this day the maximum reading was 62 in the shade, a change of 32° which severely tried the nerves and lungs of the weak, and did not altogether spare the feelings of the strong.

The lowest temperature of the year was registered on December 28th and 29th. The readings were as follows:—

Stand.			Grass.
28th—15·2	...	...	12·1
29th—13·4	...	...	13·4

Our rainfall records for 1869 are even more remarkable than those of 1868; for although the drought of 1869 was much more excessive than that of 1868 yet the total fall for the year was very considerably above the average, at least in this part of England ; the large monthly totals of January, February, May, September, and December more than compensating for the want of rain during the summer months.

The Wye, I believe, did not sink quite so low during the drought of 1869 as it did during that of 1868 ; but this subject I must leave to Mr. J. Lloyd, of Huntington Court. In connection with this subject, however, it will be interesting to compare the following record of the rainfall at Rhayader, in Radnorshire, forwarded by Mr. R. Lewis Lloyd, with Mr. J. Lloyd's river table and with the records of Herefordshire rainfall during the past year, given in Table III. Mr. R. L. Lloyd's monthly totals are as follows :—January, 7·54 ; February, 6·76 ; March, 3·13 ; April, 2·45 ; May, 4·98 ; June, 0·76 ; July, 1·08 ; August, 2·29; September, 8·22; October, 4·05; November, 6·68; December, 7·20. Yearly total, 55·14 inches.

* This remarkable fall of temperature really commenced on the evening of the 28th.

Two tested rain-gauges have been recently placed in the valley of the Wye, but as they have not been long enough at work to measure the rainfall of a complete year, I pass them over in our present report.*

Our greatest fall in twenty-four hours during the past year (at Hereford) was measured on the 1st of October, and is therefore placed to the September account; it amounted to 1·620 inch.

Table IV. is a repetition of a similar table given in the "Transactions" of 1868. In drawing up this table I am very much indebted to Mr. G. J. Symons (so well known as taking the lead in the rainfall department of meteorological science) for some yearly totals which did not reach me by local information, and also for the detection of a few slight mistakes which appeared in the reprint of rainfall tables in the "Transactions" for 1867. I am also indebted to the observers whose names are subjoined for materials for Tables III. and IV.:—Rocklands, J. M. Herbert, Esq.; Hagley Park, Arthur Hutchinson, Esq.; Titley, Miss Boddington; Ross and Leominster, Messrs. H. and E. P. Southall; Sellack, Rev. W. Clement Ley; Stretton, Rev. H. C. Key; Tupsley, Mr. Ballard; Blue School, Mr. With; and White Cross, Mr. Davison. I have also received some rainfall returns which I would gladly enter in the report, but from want of space it has been necessary to print complete yearly returns only.*

Table IV. will enable anyone at a glance to form a judgment respecting the comparative *wetness* or *dryness* of any year from 1818 to 1869. Due allowance must, of course be made for difference of height above the sea-level, and it would have given me much pleasure to have settled this point once and for ever, but more important matters have occupied my time and attention, and I have been unable to render this service to my scientific friends.

This much, however, is pretty certain—Hereford, at the Cathedral yard, is about 190 feet above the sea; Pool Cottage is 300 feet above Hereford, and 5¼ miles south of it; Titley is 16½ miles N.W. of Hereford, and higher than Hereford, but I am unable to give the altitude; Rocklands is situated 14 miles S.S.E. of Hereford, and is said to be 100 feet above sea-level. West Lodge, Leominster, is about 12 miles north of Hereford, and 264 feet above the sea. Mr. Southall's residence at Archenfield, Ross, is, I believe, about 300 feet above the sea (simultaneous barometrical observations are being carried on at present to determine this point), and 11¼ miles S.E. by S. of Hereford. Stretton is about 2 miles W.N.W. of Hereford, and 10 or 15 feet higher. Sellack is 8¼ miles S.S.E. of Hereford, and the churchyard is 50 or 60 feet higher than the Cathedral Close at Hereford. Tupsley is 1¼ mile nearly E. of Hereford, and perhaps 50 feet higher.

It is very important to determine, if possible, the altitudes of our guages above sea-level, as the following sentence from Mr. Symonds' "British Rainfall for 1867" will show:—"In all, except mountainous districts, the amount of rain collected increases about 2½ per cent. per 100 feet of increased elevation; there-

* See Mr. Lloyd's river table.

fore it is evident that in the greater part of England an error of 50 feet in the height above sea, involves an error in the amount of rain indicated of (30in. $\div 100 \times 1{\cdot}25 = 0{\cdot}38$) about four-tenths of an iuch."

I had made various attempts to ascertain the height of our city above sea-level by means of simultaneous barometrical observations, and had come to the conclusion that my garden was 184 feet above the half-tide Ordnance mark at Liverpool, when it occurred to me to write to T. D. Roberts, Esq., C.E., at Brecon, and ask the difference of level between Moorhampton station on the Brecon line and the Barton station at Hereford, intending afterwards to find the difference of level between Moorhampton station and Weobley, as the Ordnance line of levels passes through the latter place and there is a first-class bench mark (bolt) on the church wall. But Mr. Roberts has kindly saved me all further trouble; for he joined the levels of the Brecon line with those of the Ordnance survey at Hay, and then made out and sent me the altitudes of all the stations from Hay to Hereford, thus furnishing us with what has been so long a desideratum to the scientific men of Hereford, viz., *the height of the city above the sea as demonstrated by actual levelling.* According to Mr. Roberts the Moorfield station is 179 feet above the sea, and my garden 182 feet.

Mr. Roberts's altitudes are as follows :—

	FT.
Levels of rails at Hay	254·12
Whitney Station	259·78
Eardisley	230·12
Moorhampton	337·17
Credenhill	251·62
Moorfields	179·12
Barton	175.77
Rails on Bridge over Canal at Widemarsh ...	183·98

As the subject is one of importance to rainfall observers, I subjoin a few altitudes taken from the Ordnance Map and

THE ABSTRACT OF SPIRIT LEVELLING.

		FT.
	Garway Hill	1197·0
	Worcester Beacon	1395·0
	May Hill	973·0
Bench Marks	Eardisley Church	255·884 (bolt)*
Bench Marks	Weobley Church	316·300 (bolt)
Bench Marks	Leominster :	
Bench Marks	Dishley Street	264·355 (bolt)
Bench Marks	Town Hall	250·478 (bolt)
Bench Marks	Leintwardine Church	440·035 (bolt)

By means of two aneroids, reading exactly alike, the altitude of any place within the distance of three miles from any one of the points named may be taken with sufficient accuracy for rainfall observations.

Mr. Symons gives the following directions :—" If the bench mark and the gauge are not more than two miles apart, and their difference of altitude is

* The bolt mark is a kind of *first class* mark ; a *bolt* of copper being driven into the stone instead of a mere mark cut upon it.

under 200 feet, the process is simply this—Place the aneroid or mercurial barometer (if the latter its readings must be corrected for temperature) level with the rain gauge. Read it, say 30·17, then place it level with the bench mark and read it, say 30·01, then take it back to the gauge, and read it again, say 30·15. All that is necessary is to take the mean of readings at the gauge.

Readings at gauge	30·17		
,, ,,	30·15		Ft.
Sum	60·32	Altitude of bench mark	492
Mean ...	30·16	Deduct difference ...	135
Readings at bench mark	30·01	Height of gauge ...	357
	15		
Difference ...	9		
	135 feet.		

and multiply the difference in hundredths between the mean at the gauge and that at the bench-mark by 9; the result will be the difference in feet, which must be added to the elevation of the bench-mark if the barometer there was higher than at the gauge, and deducted if it was lower."*

If, however, great accuracy should be required, standard mercurial barometers must be used, and certain corrections applied as given in Negretti and Zambra's work on meteorological instruments.

Then the work to calculate the height of a hill (Garway, in this instance) will be as follows :—

Barometer at upper station ... ... 28·872
Barometer at lower station ... ... 29·924

Then from Table I. (see Negretti and Zambra's Treatise on Meteorological Instruments, p. 42) take out the following factors :—

	28·872 = 1899·43
	29·924 = 923·12
Tab. II.	976·31
Correction for mean temperature (47·1)	1·031
Tab III.	1006·57561
Correction for latitude..................	·99936
Tab. IV.	1005·9314 &c.
Additive correction	3·
	1008·9314 &c.

Lower barometer 4 ft. 10 in. above ground.
Upper barometer 18 in. above ground.

	1009 feet nearly		
Add	4	10	
	1013	10	
Deduct......	1	6	
	1012	4	Height above Hereford.

* Mr. Symons supposes that the observer has only one instrument.

Two instruments should always be used, and the observations at the upper and lower station should be made and registered at the same time. The temperature of the air at both stations should be also observed with care, as the mean temperature is a most important element in the calculations.

The nearer the two stations are together the more accurate the measurement is likely to be. In the case of Garway we were very fortunate, the air remaining perfectly still both at Hereford and on the Hill during the whole time of our observations; and it proved, from Mr. Roberts's levels, that we were certainly not more than two feet from the truth, although the distance between the upper and lower station was just 10¼ miles in a straight line.

I shall conclude this paper with some very interesting notes sent me by the Rev. W. Clement Ley, of Sellack, near Ross :—"The number of days on which an appreciable fall occurred at this place was a little below our yearly mean. The number of days when 0·50 or upwards was registered, as also the total fall for the year, considerably above it. The year was deficient here in remarkable local phenomena.

The electric display on the night of the 29th of September was the grandest, as seen from here, which I have ever witnessed in England, about 10,000 flashes of lightning, sheet and forked, the latter of the most extraordinary forms, occurring in six hours. At times from 80 to 90 electric discharges occurred per minute. A S.S.E. upper current gale prevailed at the time, and the electricity at the earth's surface was negative.

The Auroral display of the 13th of May was not so brilliant here as in the northern counties. That of Sept. 27th I witnessed to great advantage. I observed a lunar rainbow at 10.40 p.m. of December 13th.

The flood of the Wye on December 20th was as high as any which we have had since February, 1853.

Our highest temperature for the year was 88°.5, August 27th, and our lowest (at 4 feet) 18° on the 2nd of December."

The following are the tables referred to :—

TABLE I.

1869.	BAROMETER.					WIND.							
	Highest reading at 9 a.m., corrected but not reduced to sea-level.		Lowest reading at 9 a.m., corrected but not reduced to sea-level.		Monthly Means of 9 a.m. readings.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.
		DATE.		DATE.		Days.	Days.	Days.	Days.	Days.	Days.	Days.	Days.
January	30·309	9th	28·772	29th	29·764	0	1	0	10	5	14	0	0
February	30·162	15th	28·684	1st	29·763	0	2	0	0	4	12	4	3
March	30·136	23rd	29·011	2nd	29·641	7	10	0	2	0	1	2	6
April	30·184	29th	28·942	16th	29·783	0	7	0	4	4	7	2	3
May	30·077	13th	29·059	8th	29·661	0	11	2	2	1	2	1	4
June	30·130	28th	29·345	14th	29·905	3	9	0	0	1	6	2	2
July	30·223	10th	29·578	26th	29·902	0	4	2	1	3	10	6	1
August	30·247	16th	29·448	9th	29·960	2	8	1	2	1	7	2	5
September	30·251	1st	28·991	13th	29·575	0	0	1	6	6	14	2	0
October	30·324	22nd	29·169	16th	29·858	1	0	0	4	1	7	2	13
November	30·260	18th	29·084	22nd	29·751	3	0	0	0	1	11	3	9
December	30·412	6th	29·100	14th	29·606	5	7	0	0	6	8	0	5
	Yearly Mean of 9 a.m. readings				29·764	21	59	6	31	33	99	26	51

Cistern of Barometer 187 feet above sea-level.

EDWIN J. ISBELL.
WILLIAM COOKE.

TABLE II.

THERMOMETERS.										
1869.	Highest reading in shade ; and date.		Lowest reading in Thermometer-stand ; and date.		Lowest reading on grass ; and date.		Mean of maximum readings.	Mean of minimum readings.	Mean of readings on grass.	Monthly means.
January	55·4	17th	25·0	1st and 25th	24	24th	47·4	36·2	35·7	41·6
February	59·1	5th	30·0	23rd	26·6	19th	51·2	40·5	38·3	45·4
March	55·1	5th	25·9	15th	23·4	15th	46·6	32·8	30·5	38·4
April	82·3	14th	32·7	2nd	29·1	19th	62·7	41·6	39·2	50·7
May	72·9	2nd	33·7	2nd	34	2nd	60·6	43·2	43·4	50·2
June	89·7	7th	37·5	1st	37·2	1st	70·9	48·0	47·0	57·6
July	93·8	18th	40·8	1st	39·5	28th	78·4	52·3	50·1	63·5
August	95·3	27th	33·2	31st	30·5	31st	76·3	49·7	47·9	61·3
September	76·5	4th	37·6	2nd	34·7	1st	67·7	50·4	47·5	57·7
October	75·6	8th	27·0	20th	23·1	20th	58·8	43·0	40·7	49·9
November	60·1	15th	25·1	11th & 12th	21·8	12th	50·3	36·8	35·4	43·2
December	56·4	18th	13·4	29th	12·1	28th	41·0	31·2	30·1	36·1

Yearly Mean Temperature, 49·67.

EDWIN J. ISBELL.
WILLIAM COOKE.

TABLE III.

RAINFALL IN HEREFORDSHIRE.

1869.	Hereford. Richmond-place. 5ft.8in. from the ground.	White-cross, 1 mile from Hereford. 1ft. from the ground.	Hereford. Blue School. 6ft.3in. from the ground.	Tupsley, 1 foot from the ground.	Stretton. 1 foot from the ground.	Leominster. 1 foot from the ground.	Sellack. 3ft.6in. from the ground.	Archenfield, Ross. 1 ft. from the ground.	Rocklands, 1ft. 11in. from the ground.	Hagley Park. 6in. from the ground.
January	5·34	5·45	4·856	4·78	4·99	4·24	5·96	6·16	9·04	3·11
February	3·14	3·48	2·864	3·45	3·04	2·51	3·05	3·15	3·65	3·86
March	1·66	1·62	0·998	1·41	1·53	1·19	1·07	1·56	2·20	1·30
April	1·16	1·03	0·923	1·04	0·91	1·05	1·13	0·90	1·00	0·88
May	4·24	4·87	3·935	5·00	4·46	4·34	4·67	4·43	3·93	4·95
June	0·94	0·97	0·838	1·00	0·59	1·01	0·83	0·95	1·00	1·14
July	0·40	0·35	0·240	0·34	0·46	0·56	0·31	0·54	0·41	0·37
August	0·84	0·85	0·760	0·87	0·85	1·09	1·00	0·91	1·07	0·91
September	5·92	5·91	5·608	6·29	4·28	6·08	5·63	5·85	5·75	5·52
October	1·40	1·56	1·730	1·39	3·19	1.82	1·64	1·98	1·89	1·01
November	2·36	2·44	2·222	1·51	2·47	2·31	2·03	1·78	1·71	2·08
December	3·56	3·68	3·235	3·60	3·71	3.29	4·83	5·04	6·48	2·99
Totals..............	30·96	32·25	28·209	30·68	30·48	29·49	32·15	33·25	38·13	28·12

EDWIN J. ISBELL.
WILLIAM COOKE.

TABLE IV.

HEREFORDSHIRE RAINFALL,

FROM 1818 TO 1869.

Year.	Pool Cottage, Dewchurch.	St. Owen's St., Hereford.	Titley, Herefordshire.	Rocklands, near Ross.	West Lodge, Leominster.	Archenfield, Ross.	Stretton, near Hereford.	Sellack.	Blue School, Hereford.	Tupsley, near Hereford.	Richmond Place Hereford.	White Cross, Hereford.
1818	27·29	..	..	..	..	..	..	..	..	..	..	..
1819	26·78	..	..	..	..	..	..	..	..	..	..	..
1820	22·43	..	..	..	..	..	..	..	..	..	..	..
1821	35·21	..	..	..	..	..	..	..	..	..	..	..
1822	30·26	..	..	..	..	..	..	..	..	..	..	..
1823	33·85	..	..	..	..	..	..	..	..	..	..	..
1824	31·76	..	..	..	..	..	..	..	..	..	..	..
1825	24·56	..	..	..	..	..	..	..	..	..	..	..
1826	25 33	23·37	..	..	..	..	..	..	..	..	..	..
1827	26·96	21·93	..	..	..	..	..	..	..	..	..	..
1828	38·05	31 23	..	..	..	..	..	..	..	..	..	..
1829	28·74	25·49	..	..	..	..	..	..	..	..	..	..
1830	32·87	29·31	..	..	..	..	..	..	..	..	..	..
1831	34·28	31·03	..	..	..	..	..	..	..	..	..	..
1832	26 84	25 23	..	..	..	..	..	..	..	..	..	..
1833	28·63	25·33	..	..	..	..	..	..	..	..	..	..
1834	29·09	(lost)	..	..	..	..	..	..	..	..	..	..
1835	32·13	29·27	..	..	..	..	..	..	..	..	..	..
1836	30·59	28·16	..	..	..	..	..	..	..	..	..	..
1837	30·14	26·20	..	..	..	..	..	..	..	..	..	...
1838	35·64	27·64	..	..	..	..	..	..	..	..	..	..
1839	40·63	34·40	..	..	..	..	..	..	..	..	..	..
1840	24 70	21·38	..	..	..	..	..	..	..	..	..	..
1841	39·78	32·14	35·01	..	..	..	..	..	..	..	..	..
1842	29·90	..	33·38	..	..	..	..	..	..	..	..	..
1843	..	..	35·47	..	..	..	..	..	..	..	..	..
1844	..	..	23·59	..	..	..	..	..	..	..	..	..
1845	..	..	29·69	..	..	..	..	..	..	..	..	..
1846	..	..	30·77	..	..	..	..	..	..	..	..	..
1847	..	..	29·99	..	..	..	..	..	..	..	..	..
1848	..	..	37·85	..	..	..	..	..	..	..	..	..
1849	..	..	28·38	..	..	..	..	..	..	..	..	..
1850	..	..	22·70	..	..	..	..	..	..	..	..	..
1851	..	..	24·58	..	..	..	..	..	..	..	..	..
1852	..	..	43·53	..	..	..	..	..	..	..	..	..
1853	..	..	27 70	30·19	..	..	..	..	..	..	..	..
1854	..	..	21·40	19·42	..	..	..	..	..	..	..	..
1855	..	..	24 60	25·12	..	..	..	..	..	..	..	..
1856	..	..	28·70	32·56	..	..	..	..	..	..	..	...
1857	..	..	29·23	26·18	..	..	..	..	..	..	..	..
1858	..	..	27·93	24 04	22·46	..	..	..	..	..	..	..
1859	..	..	34·20	33·53	28·64	28·14	..	..	..	..	..	..
1860	..	..	..	40·77	29·67	33·01	..	..	..	..	..	..
1861	..	..	..	31·85	25·50	25 94	23·60	..	..	..	..	..
1862	..	..	..	35·27	29·09	29·58	28·36	27·29	..	..	..	..
1863	..	..	..	29·32	22·15	25·26	22·18	23·00	..	..	..	..
1864	..	..	..	22·28	19·43	19·18	18·65	16·82	19·32	..	..	..
1865	..	..	..	32·44	27·10	28·58	27·38	24·89	25 00	23·42	..	..
1866	..	..	..	37·17	31·51	29·16	27·57	26·07	25·90	26·58	..	..
1867	..	..	..	31·55	25 26	29·10	28·17	30·64	26·27	28·20	28 17	.
1868	..	..	33 87	37·13	31·85	29·04	28 98	29·63	25·36	27·38	28.53	30·40
1869	..	..	33·99	38·13	29·49	33·25	30·48	32·15	28·20	30·68	30 96	32·25

EDWIN J. ISBELL.
WILLIAM COOKE.

THE WYE.

Register of Height of River in the year 1869, taken daily at Hereford Bridge at 9 a.m. The datum point is the summer level of the river.

1869.	No. of days wet or stormy.	No. of days dry.	Height of river above summer level.		Average height each day.		No. of days of low water.	RAINFALL. Hereford.	Rhayader.	Llanwrtyd.	Llandrindod.	OBSERVATIONS.
			Ft.	In.	Ft.	In.		Inches.	Inches.	Inches.	Inches.	
January	11	20	126	4	4	1	None.	5·34	7·54	...	...	Height of river on 2nd and 6th, 10 feet; on 31st, 14ft.
February	7	21	157	6	5	$7\frac{1}{2}$	None.	3·14	6·76	...	...	Height on 1st, 13ft. 2in.; 3rd, 13ft. 4in.; 9th, 11ft.
March	10	21	73	10	2	$4\frac{1}{2}$	None.	1·66	3·13	...	...	,, 4th, 6ft. 8in.
April...............	9	21	73	7	2	5	None.	1·16	2·45	...	...	,, 25th, 6ft.
May	14	17	94	3	3	$0\frac{1}{2}$	None.	4·24	4·98	4·39	3·52	,, 16th, 7ft.
June	4	26	15	4	0	6	14	0·94	0·76	1·20	0·80	Dry month. Drought commenced on 1st.
July	0	31	0	3	...		30	0·40	1·08	1·89	1·90	Very dry month.
August	7	24	15	11	0	6	15	0·84	2·29	2·49	0·82	Dry month.
September	10	20	59	6	...		11	5·92	8·22	8·59	5·37	Weather changed on 12th. Height on 16th, 6ft.
October	7	24	60	1	...		5	1·40	4·05	4·33	3·27	Height on 1st, 11ft. 8in.
November	11	19	95	8	...		None.	2·36	6·68	7·90	3·78	Hight on 6th, 9ft.
December........	17	14	168	6	...		None.	3·56	7·20	8·80	7·05	Wet month. Height on 12th, 12ft.; 17th, 12ft.; 18th, 13ft.; 19th, 16ft.—highest flood since 1852.
Totals........	107	258	940	9	...		79	30·96	55·14	39·59*	26·51*	

* Total for eight months only.

Total height in 1868—704 feet 8 inches.

REMARKS ON THE FLOOD-WATER OF THE WYE.

During the past summer the river continued unusually low. In April and May there were several flushes, but throughout June, July, and August (except on a few days), and up to September 12th, the height of the river varied little from low-water level; consequently the salmon fishing season in the fresh-water fisheries has again been an unproductive one. The floods in December have been excessive, though the total height does not equal that of the same month in 1868. The flood of December 19th was 16 feet in height. The only higher floods on record are those of February, 1852, 18 feet 4 inches, and of February 11th, 1795, 20 feet.

Mr. Curley, C.E., has from careful measurements prepared a table showing the number of cubic feet of water passing down per minute, at each foot of height up to 10 feet, and thus it will be easy to compute approximately the quantity of water flowing down the Wye in the year. This table is now placed on the pier of the bridge by the side of the register-plate—a copy is also subjoined. Steps are being taken by one of the members to ascertain the amount of sediment in flood-water. Tables of the rainfalls at three different stations in the upper valley of the Wye are given, as well as that of the rainfall at Hereford.

TABLE REFERRED TO.

Height of River. Feet.	Cubic feet per minute.
1	177·000
2	233·420
3	296·880
4	353·250
5	413·140
6	476·550
7	553·185
8	635·100
9	696·193
10	766·000

Huntington Court, Hereford, Feb. 2nd. JOHN LLOYD.

THE ANCIENT MAPPA MUNDI PRESERVED IN HEREFORD CATHEDRAL.

The Rev. F. Havergal reported to the Club the progress that had been made with regard to the publication of an exact, full-sized, *fac-simile* of the celebrated Hereford Mappa Mundi. During the last twelve months all the arrangements have been made for its reproduction. A beautiful and accurate drawing has been made by G. C. Haddon, Esq., of this city, and it has been placed in the hands of an excellent lithographer at Bruges. The size of the map is 6 by 5 feet. It will be produced in six sections, and not less than thirty-six lithographic stones of the largest size will be required. The first section is most satisfactorily completed, and is now ready for inspection. The preparation of the 4to volume of descriptive letter-press has been undertaken by gentlemen highly qualified for the work, and that too is in a forward state of preparation. This will be illustrated by four photographs from the map itself, which together will represent the whole map and afford the means of testing the strict accuracy of the lithographic *fac-simile.* These photographs have been well taken by Mr. Ladmore, of Hereford.

The time has now arrived when it is desirable to obtain as many subscribers names as possible, that the requisite number of copies may be struck off. The publication of the map in this accurate form has proved both difficult and costly, but he trusted that the members of the Woolhope Club, with whom the first efforts for its publication originated, would exert themselves to make it known and to obtain subscribers. No effort had been spared, and they might depend upon it that none would be spared, to do full justice to this most interesting literary and antiquarian gem; and the price charged for it would not exceed the actual cost of its *production.* At present there were but seven copies ordered by persons resident in Herefordshire, which could only arise, he thought, from want of information about it.

The following prospectus has already been issued :—

THE ANCIENT MAPPA-MUNDI IN HEREFORD CATHEDRAL.

This Map has been an object of interest to Geographers and Antiquaries since the year 1780, when a description of it appeared in Gough's *British Topography* (vol. i. p. 71). At that time it was in the Library of Hereford Cathedral, but for several years past it has been suspended in the south aisle of the choir.

We are informed of the name of the author of the Map in the following lines which appear in one of its corners :

Tuz ki cest estoire ont.
Ou oyront ou lirront ou ueront.
Prient a ihesu en deyte.
De Richard de Haldingham e de Lafford eyt pite.
Ki lat fet e compasse.
Ki ioie en cel li seit done.

The places here mentioned are identified with Holdingham and Sleaford in Lincolnshire. Holdingham is a hamlet in the parish of Sleaford, situated one mile from the town.

Nothing was known by those who first studied the Map either of its connection with the Cathedral of Hereford, or of its date, except what was gathered from internal evidence. M. Lelewel, from the style of its penmanship, conceived that it was executed about 1220. M. d'Avezac, ingeniously comparing the course of historical events in the fourteenth century with the political divisions as indicated in the Map in respect to France, Burgundy and Flanders, concludes its date to have been between 1313 and 1320. English antiquaries have pronounced the style of writing to belong to the twenty years from 1290 to 1310.

But recent researches in cathedral records have fortunately furnished us with sure ground both as to its proximate date, and as to its connection with the cathedral. Richard of Haldingham, having previously held office in Lincoln Cathedral, was endowed with the prebendal stall of Norton in Hereford, and retained his prebend from 1290 to 1310. He was subsequently connected with the chapter of Salisbury, and became Archdeacon of Berks. It can hardly be doubted that the Map was executed while he was prebendary of Hereford, and the period which is thus defined satisfactorily coincides with the conclusion of the English antiquaries from the style of the work.

The Map is drawn in accordance with the notion which, with modifications from time to time, was the prevailing one in Christendom for more than seven centuries, from the time of Orosius and St. Augustin, until travellers in distant regions became more numerous, observant, and communicative. The habitable earth is represented as a circular island, with the "ocean-stream" flowing round it. Jerusalem is placed in the centre. Asia occupies nearly the whole upper (or Eastern) half of the circle, while Europe holds the lower quarter on the left hand, and Africa that on the right.

This arrangement is common to most of the mediæval maps of the world. But the Hereford Map is distinguished from the rest by its great size, its elaborate drawing, its illustrations of objects in natural history and of historical facts, and its numerous inscriptions, many of which are of great interest in an archæological point of view. It may be regarded as the most complete representation in existence of those speculative notions of our forefathers regarding the earth, which speedily gave way upon the advance of actual geographical knowledge in the fifteenth century.

The interest of the Map is greatly increased by the decidedly religious character of its chief illustrations. In a sort of gable over the circular border is a striking and curious representation of the Last Judgment; and in the Map itself, the Eating of the Forbidden Fruit in the Garden of Eden, the Crucifixion on Mount Calvary, and other events in Biblical and ecclesiastical history, are prominently shown. Many of the legends partake of the same character. This fact, together with the peculiar form of the drawing, has furnished ground for a conjecture that it was intended for an altar-piece of one of the chapels of the Cathedral.

A copy of the Map, by no means an exact one, was made for the Geographical Society in 1830 : from this a second copy was drawn for M. Jomard in 1844, which was engraved in Peris. It is from these copies that the map has been studied by Continental geographers, and that portions of it have been copied and discussed in detail by several French scholars. An imperfect copy, from the original, of the part containing the British Isles (which had been previously engraved for Gough's work) was published in 1846 by Mr. W. Saxe Bannister.

The work, as a whole, has been the subject of elaborate essays by the Vicomte de Santarem *(Histoire de la Cartographie au Moyen Age)* and by M. d'Avezac, a former president of the Geographical Society of Paris *(Note sur la Mappemonde Historiée de la Cathédrale de Héréford*, 1861). It has also been briefly noticed by M. Lelewel *(Geographie du Moyen Age*, vol. ii. p. 6). But it is to be regretted that the labours of these scholars have been expended upon imperfect copies, which have misled them in some very important particulars.

The Map is elaborately drawn in colours on vellum. Its author must have been a distinguished caligrapher. Some few words, that can easily be detected, have been inserted by a later and less instructed scribe, who has transposed the names of the continents of Europe and Africa, which had not been inserted by the author. The ravages of time are but too perceptible in the work, and some parts can only be deciphered with difficulty. It is obviously desirable that a very correct copy of it should be made while it is still possible to reproduce the colours of the original, as well as the drawing and the writing. A document so important in its bearing, not only on the history of scientific knowledge but on the legends of the middle ages, should not be suffered to perish, and ought to be placed within easy reach of students at home and abroad.

It is therefore proposed to publish a facsimile, executed with the utmost care in coloured lithography, to be accompanied by a photograph of 15 inches in diameter, by which the critical accuracy of the copy may be perfectly tested with the aid of a glass. Letterpress will be added, which will contain all that is known of the author, copies of the whole of the legends in the Map with explanations, and a critical examination of the Map and of its place in the history of cartography.

It is expected that this work will be published about the latter part of the year (1870).

The Rev. F. T. Havergal, the College, Hereford, will gladly give any further information about it, and receive subscribers' names.

ABSTRACT OF THE RESULTS OF RECENT EXPLORATIONS OF THE DEEP SEA.

By Dr. M'CULLOUGH.

Until a very recent period the nature of the sea bottom beyond a depth of a few hundred feet was almost unknown. About 1843, Professor Edward Forbes, having dredged to the depth of two hundred and thirty fathoms, formed the opinion that animal life probably ceased about three hundred fathoms, and, in spite of facts which militated against this conclusion, his authority caused this opinion to be very generally held. In Sir John Ross's Antarctic Expedition, 1839-1840, dredgings at depths of from two hundred and twenty to four hundred fathoms yielded evidence of animal life in great abundance and variety. Star fishes had at various times been brought up from much greater depths attached to sounding lines. In 185I Lieut. Brooke, of the United Statea navy, brought up by means of an apparatus attached to the sounding line a portion of mud from the bottom of the North Atlantic at a depth of more than two miles. In 1857 the Admiralty sent a surveying vessel, under the command of Captain Dayman, to sound along the route of the proposed American Telegraph Cable, and an expedition was sent out for a similar purpose in 1860 under the command of Sir Leopold M'Clintock, with Dr. Wallich as naturalist. In both these expeditions very many specimens of the bottom sediment were brought up from depths up to two thousand four hundred fathoms. In 1861, when a Telegraph Cable in the Mediterranean was taken up for repair, several living Polyparies and Mollusks were found attached to portions of it which had been submerged to depths of from one thousand and ninety-three to fifteen hundred and seventy-seven fathoms. In 1864 and following years, M. Sars, Sweedish Government Inspector of Fisheries, while dredging off the Loffoden Islands within the Arctic circle, at a depth of three hundred fathoms, obtained results of the greatest interest and importance. These were brought before theRoyal Society, at the instance of Professor Wyville Thompson, and led to the Admiralty granting a vessel for carrying out deep sea operations in the summer of 1868 and again in 1869.

The expedition of 1868, in the "Lightning," was under the direction of Dr. Carpenter and Professor Wyville Thompson, and lasted from August 11th to September 21st. These investigations were directed to the channel between the North of Scotland and the Faroe Banks, and they dredged at various depths up to six hundred and fifty fathoms. In the expedition of the "Porcupine," in 1869, three trips were made. In the first, on the West coast of Ireland, Mr. J. Gwyn Jeffreys dredged up to a depth of fourteen hundred and seventy-six fathoms. In the second cruise to the northern part of the Bay of Biscay, Professor Wyville Thompson dredged at the enormous depth of two thousand four hundred and thirty-five fathoms, or more than 2¾ miles. In the third, Dr. Carpenter again explored the sea bed between the north of Scotland and the Faroe Islands at depths varying from one hundred to seven hundred and sixty-seven fathoms.

The following important additions to our knowledge have resulted from these explorations. First, as to TEMPERATURE. Only two years ago the accepted belief was that the temperature of the sea at great depths was everywhere constant at 39.° The only reason for this belief seems to have been that fresh water attains its greatest density at 39° and the same was assumed of salt water, whereas the latter increases in density down to its freezing point at or below 28°.

Between the north of Scotland and the Faroe Islands a cold area was found, where over a considerable extent the temperature at a depth of three hundred fathoms and upwards was below the freezing point of fresh water. At one place, at six hundred and forty fathoms, the greatest depth found in the cold area, the temperature was 29·6, while at a similar depth at no great distance the temperature was at least twelve degrees higher, the surface temperature in both cases being about 52 degrees. From these observations, it became evident that there are deep currents bringing cold water from the Polar regions to replace the warmer water, which is constantly flowing from the Equator, as well as to make up the loss caused by evaporation in the Tropics; and that instead of the deep sea being still and stagnant, it undergoes as constant, though, perhaps, more regular changes than the atmosphere.

The results, as regards the distribution of animal life, were still more interesting and unexpected. The sediment brought up from great depths in the North Atlantic was almost entirely composed of calcareous skeletons of living organisms. Many specimens were composed chiefly of Foraminifera, sometimes as much as 85 per cent. consisting of one form alone, namely *Globigerina.* Certain bodies, which have been named coccoliths and coccospheres, which are evidently products of organisation, have also been found, the former in abundance. The great interest of these discoveries arises from the fact that some specimens of chalk consist of little else than *Globigerinæ*, identical with the living form, and that coccoliths and coccospheres are also found in the chalk in no respect different from the recent forms, except in their being fossilised.

The deep-sea mud was found to contain great quantities of a transparent gelatinous substance, exhibiting under the microscope a colourless and structureless matrix in which granules and coccoliths are imbedded. Professor Huxley regards this as a distinct creature, and has named it *Bathybius*, and he thinks that the coccoliths are not independent organisms, but that they stand in the same relation to the protoplasm of *Bathybius* as the spicula of sponges or of Radiolaria do to the soft part of those animals.

Another very interesting and suggestive discovery was a Crinoid, the *Rhizocrinus lofotensis*, a stalked starfish, belonging to the Apiocrinidæ, a family which flourished during the Oolitic period, and appeared to have become almost extinct before the formation of the older Tertiaries. It was found originally off the Lofoden Islands, by Sars, and it has since been dredged off the North of Scotland and the coast of Florida. In the expedition of 1869 eight species of Mollusca were found which were supposed to have become extinct during the tertiary period.

Besides these fossil forms, which have an interest of their own, a great abundance and variety of animal life has been found at the greatest depths which have yet been investigated. Considering how fragmentary these investigations have yet been and what mere scraps of the vast ocean depths have been included in them, some idea of the richness of the harvest yet to be gathered may be formed from the fact that in the expedition of 1869, of mollusca alone, one hundred and seventeen species were added to the fauna of the British seas, being an addition of more than a fourth to the number previously known. Of these one hundred and seventeen species, fifty-six were new to science.

These investigations have caused a great change in our ideas on another point—the influence of pressure at great depths on animal life. So far from this pressure being, as was supposed, almost incompatible with it, there seems reason to believe that it has little influence on animals which have no air cavaties but whose bodies consist entirely of solid and liquid parts. Creatures which had been previously known to inhabit depths of forty or fifty fathoms have been brought up from a depth of 2¾ miles, and these not simple forms of life, but highly organised animals. There seems no reason to doubt that varied and abundant forms of animal life will be found at even much greater depths when we are able to explore them.

There is still considerable difference of opinion as to the food of animals in deep water. Plants which convert inorganic matter into forms fitted to sustain animal life are wanting. Mr. J. Gwyn Jeffreys says that in the cruise of the "Porcupine" in the North Atlantic, in 1869, he could not detect the slightest trace of any vegetable organism at a greater depth than fifteen feet. The higher animals no doubt feed on the lower, but whether these in their simplest forms obtain sufficient nutriment from the organic matter derived from the decomposition of animals and plants—and which is found to exist in appreciable quantity in water at all depths—or whether they are able to draw nutriment directly from the inorganic world is still matter of debate.

Connected with this question of food is that of light. It has been assumed that at these great depths there must be profound darkness, but as animals bright in colour, and possessing large and highly organised eyes, have been found inhabiting them, some doubt has been thrown on this assumption.

LIST OF BIRDS OBSERVED AT BREDWARDINE,

DURING THE YEARS 1864-5-6-7-8-9.

BY THE REV. ROBERT BLIGHT.

Falco æsalon	Merlin.*
Falco tinnunculus	Kestrel.
Accipiter nisus	Sparrow Hawk.
Circus cyaneus	Hen Harrier.*
Strix flammea	Barn Owl.
Syrnium aluco	Tawny Owl.
Noctua passcrina	Little Owl.*
Lanius collurio	Red-backed Shrike.
Muscicapa grisola	Spotted Flycatcher.
Cinclus aquaticus	Water Dipper.
Turdus viscivorus	Missel Thrush.
Turdus pilaris	Field Fare.
Turdus musicus	Song Thrush.
Turdus iliacus	Red-Wing.
Turdus merula	Blackbird.
Turdus torquatus	Ring Ouzel.
Accentor modularis	Hedge Sparrow.
Erythaca rubecula	Redbreast.
Phœnicura ruticilla	Red Start.
Saxicola rubicola	Stone Chat.
Saxicola rubetra	Whin Chat.
Salicaria phragmitis	Sedge Warbler.
Curruca atricapilla	Black Cap.
Curruca hortensis	Garden Warbler.
Curruca cinerea	Whitethroat.
Curruca sylviella	Lesser Whitethroat.
Sylvia sylvicola	Wood Warbler.
Sylvia trochilus	Willow Warbler.
Sylvia hippolais	Chiff Chaff.
Regulus cristatus	Gold Crest.

* Single Specimen.

Parus major	Great Tit.
Parus cœruleus	Blue Tit.
Parus ater	Cole Tit.
Parus palustris	Marsh Tit.
Parus caudatus	Long-tailed Tit.
Motacilla Yarellii	Pied Wagtail.
Motacilla boarula	Grey Wagtail.
Motacilla Rayi	Ray's Wagtail.
Anthus arboreus	Tree Pipit.
Anthus pratensis	Meadow Pipit.
Alauda arvensis	Skylark.
Alauda arborea	Woodlark.
Emberiza miliaria	Common Bunting.
Emberiza schœniclus	Black-headed Bunting.
Emberiza citrinella	Yellow Hammer.
Fringilla cœlebs	Chaffinch.
Fringilla montifringilla	Brambling. *
Passer domesticus	House Sparrow.
Passer montanus	Mountain Sparrow.
Coccothraustes chloris	Greenfinch.
Coccothraustes vulgaris	Hawfinch.
Carduelis elegans	Goldfinch.
Linota cannabina	Linnet.
Pyrrhula vulgaris	Bullfinch.
Sturnus vulgaris	Starling.
Corvus corax	Raven.*
Corvus corone	Crow. *
Corvus frugilegus	Rook.
Corvus monedula	Jackdaw.
Pica caudata	Magpie.
Garrulus glandarius	Jay.
Alcedo ispida	Kingfisher.
Hirundo rustica	Swallow.
Hirundo urbica	House-Martin.
Hirundo riparia	Sand-Martin.
Cypselus apus	Swift.
Picus viridis	Green Woodpecker.
Picus maior	Great Spotted Woodpecker.
Picus minor	Lesser Spotted Woodpecker
Certhia familiaris	Tree Creeper.
Troglodytes vulgaris	Wren.
Sitta Europœa	Nuthatch.

* Single specimen.

Cuculus canorus	Cuckoo.
Columba palumbus	Ring Dove.
Columba œnas	Stock Dove.
Columba turtur	Turtle Dove.
Phasianus colchicus	Pheasant.
Perdix cinerea	Partridge.
Vanellus cristatus	Lapwing.
Ardea cinerea	Heron.
Scolopax rusticola	Woodcock.
Scolopax gallinago	Common Snipe.
Crex pratensis	Corncrake.
Rallus aquaticus	Water Rail.
Gallinula chloropus	Moorhen.
Fulica atra	Coot.
Anas boschas	Wild Duck.
Anas crecca	Teal.
Anas penelope	Wigeon.
Podiceps minor	Dabchick.
Sterna hirundo	Common Tern.* †
Larus ridibundus	Black-headed Gull.† ‡

* Single specimen.
† These two were seen after long continued rough weather from N.W.
‡ Flock of 42.

NOTE ON THE LIFE HISTORY OF ABDERA BIFASCIATA, *Marsh.*

By T. ALGERNON CHAPMAN, M.D., Abergavenny.

My attention was one day attracted by a rotten oak stick lying on the ground, from the circumstance that the bark on one side presented numerous minute circular holes, irregularly disposed. My immediate conclusion was that I had come across traces of some *Tomicus*; but on cutting into the stick I found that each hole led into a little *cul-de-sac*, from a quarter to a third of an inch long, lying parallel with the fibres of the wood. This was obviously the work of some insect, but clearly not of any Hylesinidon. I was further puzzled by the inadequateness of the removed material to have fed an insect of the size indicated by the exit aperture.

I have not since met with any stick containing these holes so abundantly as this first one did; but I soon after found sticks similarly perforated, and almost invariably found the holes associated with the presence on the stick of the remains of a fungus; and last spring I succeeded in finding sticks still inhabited by the larvæ of the insect that produces these holes. The reason that my first specimen was so puzzling was that all traces of the fungus had disappeared.

The beetle (for the larvæ in question are those of a beetle) whose history I was thus led to investigate proved to be *Abdera bifasciata*, Marsh., an insect of some rarity.

I have said that I usually found the indications of the presence of the beetle associated with a fungus. The larvæ in reality feed not on the oak wood, but on the fungus, and I never find the fungus in any quantity without indications of the beetle. Though an enthusiastic mycophagist, I cannot lay claim to any knowledge of mycology, and am consequently indebted to Dr. Bull for the knowledge that the fungus inhabited by *Abdera bifasciata* is the *Corticium quercinum*, Fr., and it is only to be found in its proper *habitat*. Its only *habitat*, so far as my observations go, is on those branches of trees from one to three inches in diameter, which die and become rotten on the tree. It grows on the under sides of these branches, and though only I suppose really alive for one season, its dry remains may persist for several years, and when soaked with rain look much like the fresh fungus. Its favourite tree is the oak; I have also found it on the ash. Such rotten branches as the *Corticium* affects are usually broken off piecemeal by the wind, and should they happen to fall when the

Corticium is in suitable condition, the larva of *Abdera* is easily found beneath it. As I have informed several of my correspondents that the *Corticium* grows on the fallen branches after they have fallen, I wish especially to point out that that is not the case, and that although the fallen branches only are available in searching for the beetle, the proper *habitat* of the fungus, and consequently of the beetle is, I have fully satisfied myself, on the tree, and their being on the ground is to be regarded as an accident.

The *Corticium* is a thin fleshy fungus, of a reddish chocolate colour, lying flat against the bark on which it grows, of a tougher consistence than its appearance suggests, and when dry it is a thin, hard, dark-coloured scale, which finally curls up and falls off, leaving the bark little altered in appearance, but no doubt advanced a stage in the process of decay.

Abdera bifasciata is one of the *Melandryadæ*, a family of the Heteromera. The Heteromera are a somewhat incongruous group, and even in the *Melandryadæ* there are species of somewhat differing affinities. *Abdera*, however, appears to be closely related to the typical genus *Melandrya*.

I can give you no information regarding the oviposition of *Abdera bifasciata*, but throughout the winter the larvæ may be found of various ages beneath the *Corticium quercinum*, and clearly feeding on those portions of it nearest the bark. Towards April and May they are full-fed, and each makes its way directly into the wood for a short distance, though sometimes for nearly half an inch, and then makes a little cell of its own length parallel with the fibres of the wood, in which it changes to pupa. The entrance to the cell is protected by being stuffed with the sawdust removed in its formation. The larva turns round with its head towards the opening before assuming the pupal state. The perfect insect emerges in July; in doing so it enlarges the opening of the cell. Though this is the usual habit of the larvæ, it often happens that the fungus begins to peel off before they are full-fed, and then the larvæ make their way into the superficial layers of the bark, in which they seem to find sufficient nutriment, possibly the mycelium of the fungus, to feed them to full growth.

The full grown larva of *Abdera bifasciata* is 5 mm. in length, its general aspect is much that of a longicorn, the second segment, into which the head can be retracted, being the broadest. The head is rather longer than broad. The strong jaws seen from below are gouge or scoopshaped, on the upper side a slight projection is to be seen near the apex, the labrum is as long as the jaws, rounded, with a fringe of fine hairs, and with a line across near its edge, which does not seem to indicate a joint. The maxillæ have each a three jointed palpus, their inner angles are produced into an organ of similar shape to the palpus, and fringed with short setæ towards the extremity of its inner margin; this organ does not appear to be jointed to the rest of the maxilla. The labium, difficult to observe between the maxillæ, appears to be a rounded plate, divided into a basilar half, which seems dotted with obsolete hairs and from whose margin there appear to rise two three jointed palpi, of which the large basilar joints at least are united to the anterior half of the labium, almost hiding it, and the terminal joint is so small that its existence is doubtful; this bears a minute seta. The antennæ are four jointed, the terminal joint bears a stiff bristle. Beside the last joint and in front of it is a rounded body which is either a separate joint or a process of the third joint, which of the two I have not satisfied myself. Behind each antenna is a row of three blackish eye-spots, each emarginate in front, centrally behind these is a fourth, and at a little distance above this a fifth; these two last are blackish circles broadest in front. Near these are several bristles. The body consists of 12 segments; they are so transparent that much of the internal anatomy can be seen, some of it being obscured by regularly disposed masses of white fat. There are three pairs of four-jointed legs, the last joint being a slender brownish claw. Each segment has laterally a stiff-looking hair with two or three smaller ones. The 13th (last) segment has similarly two larger hairs and several smaller ones. There is a slight projection on the ventral surface of this segment, hardly pronounced enough to be dignified by the name of anal tubercle or proleg. There are ten pairs of spiracles, the first is situated below the line of the others at the anterior border of the third segment, the second at the anterior border of the fourth segment. This one is smaller than any of the others, but I have satisfied myself that it is really an aperture and not merely an approach of air tubes to the surface. The others are situated more and more towards the middle of their respective segments, so that the last four or five may be said to be so placed. I shall not add any remarks here on the fact of this larva possessing ten pairs of spiracles, as I hope to make some observations on this and some similar facts in a separate note.

By this time the dinner-hour had arrived. Sufficient provision had not been made for the number of members who attended, since so many came without giving any notice of their intention to do so, and some gentlemen were unfortunately obliged to leave in consequence.

After dinner the President brought forward the distressed state in which the family of Professor Michael Sars, of Christiania, had been left by his unexpected demise. A plate was handed round the table, and £3 7s. was collected, which the president undertook to forward.

Three glass bowls from the fish-hatching apparatus of J. F. Symonds, Esq., Broomy-hill, contained the *ova* and young fry of the salmon, the Great Lake trout, and the common trout. They created great interest, and the circulation through their transparent vessels was afterwards well shown by Mr. With's microscope.

The President then read his retiring address, and, on the proposition of Sir George H. Cornewall, Bart., and Arthur Armitage, Esq., received the thanks of the Club for his exertions in its interest as president during the past year, amidst much applause.

THE ANCIENT FOREST OF DEERFOLD.

BY DR. BULL.

PART I.—TOPOGRAPHICAL AND INTRODUCTORY.

"Lug from the Radnorian plain
At Prestain coming in ; where he doth entertain
The Wadel, as along he under Derfold goes :
Her full and lusty side to whom the forest shows
As to allure fair Lug abode with her to make."

Drayton, "Polyolbion" 7.

The ancient Forest of Deerfold, or Darvold, as it is now more commonly called, is situated in the Northern part of Herefordshire, between Aymestry and Lingen, and between Wigmore and Shobden. It is chiefly contained in the parish of Wigmore, but partly also in that of Aymestry. It is not large in size, about 2,500 acres, and consists of high ground, with one chief valley sloping to the South-east. Its situation is extremely secluded, and its scenery on the Northern side, where it is bounded by a steep descent to the plain beneath, is very fine. The highest portion of the forest is a hill to the South, and it is the highest ground in the district. Six other counties may be seen from it, viz., Gloucestershire, Worcestershire, Shropshire, Montgomery, Radnorshire, and Brecon. The summit of this hill shows the remains of a circular camp, and there are the traces of a ditch which inclosed a much larger portion of the round top of the hill. The inner circle is planted with a row of Scotch firs, which may be about fifty years old.

The Forest has now lost its wild character. It is completely inclosed and for the most part under cultivation. Two centuries ago a traveller could pass through it without leaving the shade of the oak trees which grew there. Now the woods are chiefly confined to the steep hanging slopes of the hills, and thin belts of larch give their character to the landscape. The final inclosure took place in 1818, and the straight roads and formal allotments then made will long disfigure the district. It will be some time too before that sign of a forest district disappears, the remains of the charcoal burner's fires, which the plough turns up in almost every field. These "charking places" are very numerous all over the Forest.

The chief proprietors at the present time are Lady Langdale, who has the largest share, Lord Bateman, the Messrs Fortey and Turner, and some three dozen smaller freeholders.

The attention of the Woolhope Club was drawn to the Forest of Deerfold by the discovery of the new instance of a Mistletoe-oak, the eighth in the list of those remarkable trees known to be in existence at the present time.* A visit to this tree gave rise to the discovery of another rarity, *Asarum Europæum*, the Asarabacca, and an account of both these discoveries was read at the first meeting of the Club this year at Ledbury (see pages 15 and 16). The Asarabacca is a medicinal plant of considerable virtue. It is only known to grow in four or five other places in the kingdom, and always in the neighbourhood of some religious institution. This ecclesiastical association has, singularly enough, been the means here too of opening up an interesting chapter in church history, though of a character very different from what might have been expected.

On the eastern side of the Forest, Juniper (*Juniperus communis*) grows wild. There are a few large bushes there still.

It may be also noticed that the neighbourhood of the Forest has ever been celebrated for its breed of horses. So late as 1660 it was specially so, and it is supposed that they were the descendants of some Spanish stock introduced by Robert de Belesme at the close of the 11th century. Giraldus Cambrensis speaks of their fame in Powys-land in his time, and no doubt the wild nature of the country favoured their breeding. The late Lord Bateman and Lord Oxford, in recent times, were great horse-breeders, and to this day there is a good hors fair at Brampton Brian in the immediate neighbourhood.

The only printed fragment to be found in history with regard to the For of Deerfold is the brief statement in Duncumb's "History of Herefordshire (p. 205) that "in the reign of Queen Elizabeth the Forest of Deerfold was on of the four royal Forests of Herefordshire, the others being those of Aconbury, Ewyas, and Haywood." This is quite true, but it is scarcely enough to satisfy the most moderate enquirer.

This want of any History of the Forest, and the ignorance of its existence even, which generally prevails through the county, render it desirable that all the information that can be procured should be made known. And this, too, is the more important since the poor of the immediate neighbourhood believe that they have still certain rights of common in the Forest, which, beyond doubt, formerly belonged to them ; but which, most certainly, have ceased to do so for st fifty-one years, as will be shown hereafter.

PART II.—THE EARLY HISTORY OF THE FOREST.

"Meery it was in the grene forest,
  Among the leves grene ;
Whereas men hunt east and west,
  Wyth bowes and arrowes kene,
To raise the dere out of theyr denne."

Ballad of "Adam Bell." Percy's Reliques.

The Forest of Deerfold with the adjoining chases of Brindgewood, Prestwood, and Mochtree, formed a portion of that large tract of woodland, then

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* See page 15 for the list of all the known Mistletoe-oaks.

in Shropshire but now in the northern part of Herefordshire, in which Edric, Earl of Shrewsbury, "Edric Sylvaticus," the forester, successfully maintained the Saxon cause for some years after the Norman conquest of England. Edric subsequently swore allegiance to King William ; but owing to some offence given to him by the King, he revolted between the years 1072 and 1085. Ralph de Mortimer was deputed to reduce him, and having with considerable difficulty succeeded in doing so, he was rewarded by William with a large share of Edric's possessions.

At the time of the Domesday Survey (1085) the whole district was little more than a wild chase, and was otherwise wholly unproductive. "In his wastis terris excreverunt silvæ in quibus iste Osbernus venationem exercet, et inde habet quod capere potest, nil aliud." This Osborn was Osborn Fitz Richard, the Lord of Richard's Castle and Ludford, who was associated with Ralph de Mortimer in the overthrow of Earl Edric.

Wolves abounded in these forests, and continued to do so for two centuries later; and the Hundred Rolls abound in curious laws and customs which prevailed in them. "Hugh de Mortimer, a Lord of Richard's Castle, on the death of his step-father, William de Stuteville, in 1259, was an active partisan of Henry III. in his wars with the Barons, being temporarily deprived of his castle by them ; and for his heroism at the battle of Evesham (1265), was granted the privilege of hunting the hare, the fox, weasel, and wild cat in any of the Royal forests of Shropshire."—*Robinson's "Castles of Herefordshire,"* p. 119.

For many a long year these united forests formed the hunting grounds of the Lords of Wigmore. Deer abounded in them, and it is a fair presumption that the Forest of Deerfold owes its name to the fact of the deep narrow vallies on its western side, being favourable to the formation of "Hayes." The "Haie" so frequently mentioned as occurring among the sylvæ in Domesday were ambuscades, into which the game was driven by beating the woods with horns and dogs, and which were so fenced in at the sides and end as to prevent escape when once the animals had entered.

"The dryvars thorowe the woodes went
For to reas the dear ;
Bomen bickarte uppone the bent
With their browd aras cleare.

Then the wyld thorowe the woodes went
On every side shear ;
Grea-hondes thorowe the greves glent
For to kyll thear dear."—*Chevy Chase.*

The narrow vallies on the slopes of the forest near Lingen were admirably adapted for this purpose : and in Domesday vi. (Shropshire), in enumerating the lands of Ralph de Mortimer "at Lingban," it is said "ibi dimidium leuua silve et iii haie capreolis capiendis," there half a league of wood and three 'Hayes,' for taking young deer or kids belonged to him.

Game of another kind was also amply afforded by the Forest of Deerfold. The small streams and marshy pools of the Dickendale meadows and the Haven dingle would be the frequent resort of herons, and it is scarcely possible to imagine a more beautiful district for the noble sport of falconry. One can readily see, in the mind's eye, a gay party of lords and ladies from Wigmore Castle, with the falconer in attendance, taking their station on the camp-hill on a fine autumn morning, and eagerly watching for the appearance of the heron above the trees when started by the beaters in the valley below. They would ride quickly in the direction taken by the quarry; the bird would be allowed to clear the high ground of the forest; when the hood would be taken from some favourite hawk, and rising high in the air he would at once commence the pursuit over the broad valley below. The whole course would be plainly visible from the high ground of the forest, the rapid swoops of the noble bird to seize its prey, and the various efforts made by the heron to escape its enemy, until either the quarry was struck down, or it narrowly escaped by reaching the friendly shelter of some distant wood, as fortune might favour the one or the other. Two falcons might be pitted against each other, or several herons might be flushed together, and so the excitement would be varied, and the rides through this fine scenery be made still more enjoyable. The heron was then a favourite dish at the table, not less esteemed than the bustard or peacock. It was ranked as royal game and protected as such by the laws. Any one who took or destroyed its eggs incurred a fine of twenty shillings, which was a very heavy penalty in those days.

At this distance of time it is not possible to say whether any heronry existed in the Forest itself, but it is well known that a fine colony of herons occupied a grove of lofty oaks, growing in a hill-side dingle at Willey Lodge, about two miles from Lingen, up to as late a period as 1836. There were from one to two hundred nests there, and often several in the same tree. The grove was felled by the owner, and thus unfortunately was destroyed one of the last of the Heronries of Herefordshire.*

* The Heronries of Herefordshire.—It is yet within the memory of man that many Heronries existed in Herefordshire, although they have now become extinct. There was one within a mile of the city of Hereford, on the fine elms at the Moor. It gradually dwindled down to a single pair of birds, and they disappeared about 60 years ago. There was also a large Heronry on elm trees at Newcourt, Lugwardine, about three miles from the city, and some few tenants remained to so late a period as 1853 There was a colony of herons occupying some tall oak trees on the N.W. side of Brampton Brian park at the beginning of this century, but when the exigencies of war caused the oaks to be felled the birds joined their neighbours at Willey Lodge. When the Willey Lodge Heronry was destroyed, as above noticed, the herons were said to have gone to Plowden, near Bishop's Castle, Shropshire, where the number of birds was much increased at the time. This Heronry is still in existence. There was formerly a Heronry, it is said, at the Marsh farm, Eaton Bishop, in the centre of the county, and possibly others. But the Heronry which existed in this county to the latest period was at the Hawkswood, at the Moor, near Hay, where the herons built on some tall oak trees. This Heronry was in the immediate vicinity of a rookery, and here might be seen occasionally a curious border warfare between these very different birds for the possession of some particular tree. This Heronry was a very large one up to about the year 1852, when a large fall of timber disturbed the birds In the year 1856 there were about a dozen nests there, but the herons gradually diminished in numbers until they were reduced to a single pair, which built there as lately as 1863. The loss of Heronries is greatly to be regretted, but it is inevitable. Guns and gunpowder have have become too abundant and cheap for these fine birds to escape. In the open, and with fair play, the heron is a wary bird, and well able to take care of himself, but at the breeding season they can of course be readily approached, and their destruction is chiefly due—alas that it should be so—to shooting them at this time under the name of sport.

The existing Heronries nearest to Herefordshire are the large one of Plowden, Salop; another at Treowen, near Monmouth, where 18 pairs of birds are now incubating (April, 1870); and another large one at Ragley Park, near Alcester.

The name of the hundred in the time of the Conqueror which most closely corresponds with the present Wigmore Hundred, which includes the Forest of Deerfold, was the "Hegetre" or Hightree Hundred.

The Forest of Deerfold attached to Wigmore Castle and Honour formed part of the vast possessions of the Mortimers from the time of their presentation by William. They were twice forfeited for short periods in the reigns of Edward I. and Edward III., but were restored and remained in the possession of the family until they became a royal demesne on the accession of Edward IV. to the throne (1461).

There still exists an old deed without date by which Roger Mortimer, son of Randolph, grants to John his chamberlaine certain lands in the town of Leynthall (now Leinthall Starkes in Aymestry parish), with common of pasture for 12 beasts and 50 hogs free of pannage in his woods and forests, except Gatlithe and Bringewood (and therefore including Deerfold forest), for the yearly payment of a pair of gloves of one penny price at Michaelmas. Witnesses, Dom. Henrico Mortuomari; D. Brian de Brampton; D. Roberto Corbet; Magistro John de Croft.—*Downton Castle Papers.*

Whilst still in the possession of the Mortimers—and before the wild character of the district was altered—the Forest of Deerfold received some visitors, of whom a special account must now be given.

PART III.—THE LOLLARDS IN HEREFORDSHIRE.

"Now, 'goode men,' quod our Oste, 'herkneth me.
I smell a Loller in the wind' quod he,
'Abideth for Goddes digne passion,
For we shall have a predicacion;
This Lollar heer wolde prechen us somewhat.'"
Chaucer. *The Schipmannes Prologue.*

At the close of XIV. and for some time in the XV. century the complete seclusion of the Forest of Deerfold afforded a refuge to some of the earliest and most noted followers of Wycliffe. They must have obtained the permission of the Mortimers and very possibly their protection also, for they remained here for many years comparatively undisturbed, and this, too, is the more probable, since its corresponds with the characteristic policy of the House of York. Roger Mortimer, Earl of March, was the Lord of Wigmore at this time. He spent the chief part of his time in Ireland as the King's Lieutenant, and is not specially known to have been a patron of the Lollards.

That this forest should have been a centre from which the doctrines of the Reformation were thus early spread in this part of England is a fact so little known and of so much interest, that the history of the men who came here, and the circumstances which prove it will be dwelt upon at considerable length.

In 1390, William de Swynderby, or "William the Hermit" as he was at one time called, took up his residence in the Forest of Deerfold with several companions. He made use of a chantry where mass was said a few times in the year, in which he not only preached without any license from the Bishop of Hereford, but also administered the Holy Communion, probably in both kinds, to the laity.

William de Swynderby first comes into notice as a priest in Leicestershire. The earliest and fullest account of him is given in the Chronicles of his contemporary, Henry of Knighton, a canon of Leicester Abbey. Knighton wrote in opposition to the views of the Wycliffites, and some allowance must therefore be made for the tone of his chronicles.

Swynderby was a disciple and personal friend of Wycliffe. He seems to have gone to Leicester in a missionary spirit without any cure of souls, or other church appointment, and was shortly afterwards allowed to reside in the abbey. He preached in the chapel of St. John Baptist without Leicester, near the Leper's Hospital, and in the churches of St. Martin and St. Margaret of that town. He did not remain very long as an inmate of the abbey, most probably on account of the very decided manner in which he adopted and preached the new views on the reformation of the Church.

He was one of the many priests who received the protection of the Duke of Lancaster, John of Gaunt, and lived for several years as a recluse in his park at Leicester. Here he lived a life of great sanctity and self-denial, "refusing the gifts and presents," says Knighton, "which were sent him by some devout people of Leicester," and hence he became known as "William the Hermit." He continued, however, constantly to preach the Gospel "running sometimes into the town and sometimes going into the country."

Swynderby was a man of good abilities and well-educated—probably at Oxford. He was gifted with a good voice, with great natural eloquence, and knew by heart much of the Bible in the vulgar tongue. He was simple and unaffected in manner, earnest and persuasive, and withal so strict and austere in his own life, as quickly to gain for himself considerable influence with the people. Wherever he preached crowds flocked to hear him, whether in the streets or in the market places, like the mendicant friars of the period, or in the churches of Leicester and the neighbouring towns which seem at this time to have been open to him. "By his preaching," says Knighton, "he so captivated the affections of the people, that they said they had never seen nor heard any one who so well explained the truth to them ; and so they reverenced him as another God." (fol. 2667). Swynderby is usually represented as a man of little learning but this is certainly a mistake. Not only the common people but learned men were attracted by him, and he was moreover able to keep them in close companionship for long periods of time. His writings it is true are in English, but this was evidently not because he could not write Latin, but because he made it a point to write in the vulgar tongue that every body should understand him.

Swynderby preached with great boldness and simplicity and yet with a considerable amount of tact and caution. Avoiding the more dangerous topics, he preached against the vanity and pride of the people, against the luxuries and vices of the rich, and denounced openly those sins of the priesthood and the church which though but too common at that time were yet too gross to be capable of defence. "He so provoked the women," says Knighton, "that the good and the grave women, as well as the bad, proposed to stone him out of the place; and but for the Divine clemency he had driven some honest men of the town into despair." His preaching certainly made a very great impression on the people, and it was probably in great measure due to Swynderby's eloquence that "the Reformers's sect," as the chronicle states, "was held in the highest honour in those days, and was become so numerous that you could scarcely see two persons in the highway, but one of them was a disciple of Wycliffe" (Knighton, fol. 2665).

Swynderby seems to have remained in the park at Leicester until John of Gaunt left the country on his Spanish expedition in 1386. In the preface to the edition of the Bible of Wycliffe and his followers, by Forshall and Madden, published at the Oxford University Press in 1850, Swynderby is named as one of the principal associates (with Hereford, Ashton, and Parker) of Purvey in the preparation of the edition of the Bible, which has Purvey's General Prologue. At this time he may have been engaged upon it with these leading Lollards.

He is next heard of in a mandate issued by the Bishop of Worcester against the preaching of Lollards in his diocese, dated August 10, 1387. The following are the names of the Lollards given in the mandate, which describes them as leagued together in an unlicensed college:—"Nic. Hereford, Johan Asshton, duo, Joh. Purney, Joh. Parker, et Rob. Swinderly, insania mentis perducti ac suæ salutis immemores sub magnæ sanctitatis velamine venenum sub labiis in ore mellifluo habentes, zizaniam pro frumento seminantes," &c., &c., (Reg. Wakefield Wigorn, fol. 128; Wilkins, iii., p. 202). The best authorities agree in believing that "Robert Swinderly" is a mistake of the Bishop's notary for "William Swynderby."

On the death of John of Gaunt (1389) an active persecution of the Lollards was commenced. Richard II. issued a commission against the inhabitants of Leicester, and Archbishop Arundel made a visitation there, summoned several of the leading inhabitants before him, and excommunicated them from the high altar of the Abbey Church. Swynderby, who at this time was again at Leicester, did not escape. On the representations of friar Frisby, an Observant, friar Hinceley, an Augustine, and Thomas Blaxton, a Dominican, he was cited to appear before John Bokynham, Bishop of Lincoln, in the cathedral church of that city to answer certain articles drawn up against him. These articles were eleven in number, and were chiefly directed against his attacks on the priests and the church. Swynderby's caution, however, had been so great that his accusers preferred to invent charges against him rather than to bring forward the true ones. "Yis I sey wytnessyng god y^t is in hefen to my wytte ā understondyng, y^t I neur prychyd, helde, ny tauhte yes conclusiones ā articles ye whyche falsly of freres were put upon me . . . to ye bpshoppe of lincoln," writes Swynderby himself to the Bishop of Hereford, "for I was ordeyned be prcesse, yei seyde, of here law by ye byshoppe ā hysse comyssaryes, so as I deneyd hem to brynge my purgacion of XIII prstes of gode fame, ā so I dyde, wt a letter ā twelfe seles yrby, frome ye meyre of leycestr ā from trewe burgeyses, ā thrytty men to wyttenes wt me, as ye Duke of lancastr knywe ā herde, ye erle of Derby ā oyer mony grete yt weren yt tyme (in) ye tone . . . so as I fully forsoke hē ā neur graunted yt I seyde heme, ouer yis yei maden me to swere neure to holde heme, teche hē ne preche hem prueyly ne aptly ā yt I schuld go to certeyn churches to reuoke ye conclusions yt I neur seyde in sclander of me selfe, by gret instaunce of ye freres. And so for dryde of dey (death) ā for fleyshly consail yt I hadde I assented and so I dyd, ā alsso yei maden my to swere yt I schuld not prche, by instaunce of ye freres, wtin (the) diocese, wtouten licence axed ā grauntyd in, neur sethen I dyd." (Reg. Trefnant.)

Knighton gives the result of Swynderby's examination before the Bishop of Lincoln, as follows :—"At length he was publicly convicted of divers heresies and errors, and deserved to have been made fuel for the fire. Then did his followers lament, and strike their hands and heads against the wall, making a mournful noise. For a great many of the town of Leicester accompanied him every time, to give him their assistance; but all was to no purpose. But by chance the pious Duke of Lancaster was at Lincoln the same day, who was always ready to assist all the Lollards, for he believed them to be holy men of God, on account of their fair speeches and assurance, although he was deceived as well as many others. He interposed with the Bishop in behalf of Swynderby, and the Bishop yielded to the Duke's request, and let him off on the condition of his making a retractation" in several churches named. (Knighton fol. 2671.)

Walsingham says :—"When the Bishop of Lincoln had made preparations to correct this man, the mad multitude raged in such a manner as frightened the Bishop and deterred him from proceeding against him." (Hist. Ang. p. 284.)

Swynderby left Leicestershire, and next appears at Monmouth; then in the diocese of Hereford. John of Gaunt held the castle at Monmouth, and Swynderby had very probably visited the town before, and made friends there. The friars, however, followed him up. Copies of the proceedings at Lincoln were sent down to the Bishop of Hereford, who forthwith issued a monitory letter, inhibiting any one to preach in the diocese without his license. The terms of the inhibition are general, but it was without doubt specially directed against the Lollard preachers, and Swynderby in particular. It was served upon him personally at Monmouth early in the year 1390. He is next mentioned as preaching at Whitney on Monday, August 1st, 1390, and at that time had doubtless taken up his residence in Deerfold Forest. The following year he appeared before the Bishop himself, on Wednesday, June 14th, 1391, "in the parish church of Kingeton."

These facts all appear in the records of the Process issued by John Trefnant, Bishop of Hereford, against William Swynderby in the cause of heretical pravity in the year 1391, given in the Episcopal Register.

Swynderby had evidently very powerful friends and supporters in Herefordshire. Under their protection, he seems to have met the Bishop at Kington without any formal citation, and he there agreed to attend again before him—to use the Bishop's words, translated from the Register—"at a day and place for him meet and convenient, of his own choice and free will; that is to say on Friday, being the last of the same month of June next following, assigned to him, at the church of Bodenham, of the same our diocese," to answer certain "cases and articles exhibited to us by many of Christ's faithful people, zealous followers of the Catholic faith."

These articles were 17 in number, and besides the general charges of heresy and schism against him; his attacks on the sins and wicked practices of the priests; auricular confession; limiting the usurped power of the Pope; and preaching without license; they included also his disbelief in the doctrine of transubstantiation (which it is remarkable had not been alluded to in the articles drawn up against him at Lincoln); and then come the two last charges, which refer to Deerfold Forest and the neighbourhood, and which therefore chiefly concern us at this time.

"XVI. Item.—That the same William, unmindful of his own salvation, had many and often times come into a certain desert wood, called Dervoldswood, of your diocese, and there in a certain chapel not hallowed, or rather in a profane cottage, hath in contempt of the keys presumed of his own rashness to celebrate, nay rather to profanate.

"XVII. Item,—The same William hath also presumed to do such things in a certain profane chapel, being situate in the Park of Newton, nigh to the town of Leintwarden, of the same your diocese." (Translated from Bishop Trefnant's Register.)

A copy of these articles was sent to Swynderby, who drew up "A Protestation with his answers to the Articles," at considerable length. The statement is very characteristic of himself. It is written simply, but with considerable ability, and with a constant reference to Scripture throughout. He maintains his opinions with great boldness, and yet with much greater tact and caution then appears on the surface, nor does he hesitate to meet his accusers on their own ground by the introduction of a little evasion and special pleading, when it suits his purpose to make use of either. He exposes the false charges and misrepresentations brought against him at Lincoln; as a priest he claims the right to preach without the license of the Bishop; he points out the practices of wicked priests and friars; justifies non-payment of tithes to such as are so; declares the inefficiency of their services; and finally he maintains that the Pope is antichrist. His caution is very clearly shown by his passing over without notice the articles vi. and vii., which charge him distinctly with holding the heretical opinions on the doctrine of transubstantiation, and thus he avoids the point which afterwards brought so many of the Lollards to the stake.

His answers to the charge of preaching in the forest of Deerfold and

Newton are equally evasive. Here they are, in the language and spelling in which they appear in the register:—

"Ye XII article is yis yt oure Byshopp putes to me yt y mony tymes and ofte haue come, he sais, to a desert wode cleped derwoldeswode of his diocese, and yr in a chapell noght halwed but acurset, sheperdeshulke be myn owne foly, he sais, haue prsumet to syng but rayr to curse in contempte of ye keyes; here to y say yt yis is falsly put upon me of hem yt tolde yow yis for hit is a chapel where a prst synges ctain dayes in ye yere wt gret solempnitee and ctes y song neur yr ynne seth y was born yn to yis world."

"Ye XIII article is yis yt y schuld also prsume to syng in an unhalwet chapel yt stondes in ye park of neuton bisides ye toun of leyntwardy of his same dioceses. Trewly y wot not where yt place stondes." (Reg. Trefnant).

Swynderby attended personally at Bodenham, on the day appointed "about six of the clock," and read his protest and answers to the articles "before all the multitude of faithful Christian people."

They were by no means satisfactory. The Bishop evidently felt that he had been taken at an unfair advantage. He did not know Swynderby's power. He had summoned a large congregation and came himself to hear a retractation, but instead of this had to listen to the defence of the Lollard doctrines by their most eloquent advocate. The Bishop did not like it, but he could not help himself. In his report he goes on to say, with careful precision, "Which thing being done, the same William (without any more with him) did depart from our presence, because that we, at the instance of certain noble personages, had promised to the same William free access; that is, to wit, on that day for the exhibiting of these answers, and also free departing without prefixing of any term, or without citation, or else any other offence or harm in body, or in goods."

The Bishop, however, lost but little time in preparing a formal citation for him. Five days after one was issued, dated July 5th, 1391, from "our house at Whitborn." "And because," says the Bishop, "the said William Swynderby conceals himself and cannot be served personally with it we have caused him to be publickly cited in the places where the said William had been accustomed to officiate." It, therefore, is addressed "to his dear sons our dean of Leamster, to the parsons of Croft, Almaly and Whitney, and also to the vicars of Kington, Eardersley, Wiggemore, Monmouth, Clifford, and of St. John's Altar in our Cathedral Church of Hereford," &c., &c., charging them "to cite or cause to be cited peremptorily, and under the pain of excommunication, William Swynderby, pretending himself to be a priest," &c., "to appear at North Lodebury on the 20th of this present month of July." (Reg. Trefnant).

Swynderby heard of it quickly, and though he did not appear himself, he sent a servant with "a certain schedule of paper, made like an indenture, to excuse him." He was then ordered to appear on the 29th of July in the church of Ponsley, or Pontesbury. He did not appear there, and was pronounced "obstinate," and the 8th of August was appointed for him to appear at Cleobury

Mortemere. He was publicly called for in vain here, and was then ordered to appear August 16th in the parish church of Whitborn. He did not appear, and then was read out the process against Swynderby sent from Lincoln, and witnesses were examined as to his proceedings in the diocese of Hereford, and on the 2nd day of September he was formally excommunicated and the faithful forbidden "to believe, receive, defend or favour the said William, under pain of the law."

Against this sentence Swynderby made a long appeal to the King and his Council: "For the King's court in such matter," he says with some policy, "is aboue the Bishop's court." He contrasts "Christe's law" with "the Pope's law," and says, "that if the Bishop or any man couthe shewe me by God's lawe, that my conclusions, or myne answeres were error, or heresie I would amendet and openlic reuoke yem before all ye peepple." He also sends a letter to the Nobles and Burgesses, which is copied in the Ecclesiastical Register. It is simply a strong sermon on Christian duty, and concludes thus:—

"Deere worshypfull sires in yis world, I beseche you for cristes loue, as ye y^t y trowe, louen godes lawe and trouthe y^t yes dayes is gretly boren-a-bak, y^t ye woln vouchsauf yes thinges y^t y sende yow written to godes worshyp, to late yam be schewet in ye parlement as youre wittes can best conceyue to most worshyp to oure god and to shewing of ye trouthe and amendyng of holy churche my conclons and myn appele and oy^r trewe matters of godes lawe. Yef any man can fynde y^r ynne eith^r falsnesse or defaute p^ruet by ye lawe of crist clerly to c^rstenmennes knowyng y shal reuok my wrong conceyt and by godes lawe be amendet and redy to holde w^t godes lawe openly and p^ruely w^t godes grace and no thing to holde, teche, or maintene yat is contrarie to his lawe.

"Ye poure lege man of ye kynges and
"youre poure p^rst, WILLIA OF SWYNDERBY."
(Reg. Trefnant.)

It was at the beginning of this year, 1391, that the highest tribute was paid to the eloquence and successful preaching of Swynderby. It consists in the fact that a special Inhibition was issued against him by Archbishop Courtney. It is called "An Inhibition of the Archbishop of Canterbury lest any one should presume to listen to the preaching of William Skynderbye, &c.;" and it was "given at our Manor of Maghfeld" May 18th, 1391. (Reg. Courtney, fol. 338a, Wilkins III., p. 215.)

It cites his examination at Lincoln and his retractation afterwards, and threatens all that go to hear him "after this notice and intimation lawfully made" with the penalty of "the greater excommunication." The different spelling of the name is due here as in other places to clerical error.

Swynderby did not live as a recluse in the Forest of Deerfold. He brought with him or was quickly joined by several companions—some of them able and learned men—who, since they do not bear Herefordshire names, very possibly came here to escape the persecution which was then being exerted so energetically by Archbishop Courtney against the Lollards in Leicestershire and elsewhere.

"Are not these woods
More free from peril than the envious court."

His companions in Leicestershire had been Master Richard Waystach, chaplain of St. John's—Peter Patershall, called John of Gaunt's chaplain—William Smith, the metal founder, and many others. Here the names of Walter Brut and Stephen Bell are made known to us by the record of the proceedings taken against them, but "others" are several times referred to.

Walter Brut was a graduate of the University of Oxford (Merton College), and in the processes against him is always styled "a layman and learned." He is a true Briton as he takes care to show. His zeal against the Pope is said to have been aroused chiefly by the impudent pardons and indulgences of Pope Urban VI. granted to Henry Spencer, Bishop of Norwich, to fight against the rival Pope Clement VII. He had adopted fully the views of the Wycliffites, had attached himself to Swynderby, and come with him or joined him in Herefordshire. He was very indignant at Swynderby's condemnation, and did not hesitate to express his opinion about it with the utmost freedom in the city of Hereford to the Canons themselves.

Two instruments were drawn up against him and carried to the Bishop by Master Walter Pride, the penitentary of the Cathedral church at Hereford. "They were exhibited before us," says the Bishop, "sitting in our judgment seat in the parish church of Whitborn of our diocese."

The first instrument stated that "at supper time, on Oct. 15, 1391, in the dwelling-house of the worshipful man Master John Godemoston, canon of the cathedral church of Hereford, in the presence of Mastr Walter Ramesbury, precenter; Roger Hoare, canon; Walter Walle, chaplain (being a vicar of the choral), and certain other witnesses of credit, and in presence of me, Richard le Whylare, clerk of Worcester, being a public notary by the authority apostolic," Walter Brut "stiffly maintained" that Swynderby's condemnation was "naughty, wicked, perverse, and unjust," and that his conclusions were true and catholic, and furthermore that the Pope was the very antichrist. (Reg. Trefnant.)

The second instrument stated that Walter Brut, on January 19th, 1391 (1392 by modern computation) personally appeared before the Lord Bishop at Whitborn and in his presence, and in the presence of Mastr Reginald of Wolston, canon of Hereford; Mastr Philip Dilesk, parson of Llanuwryn (Montgomeryshire); Thomas Guldeffeld, parson of English Bykenore; John Cressit, parson of Whitborn; and Thomas Wallewayne, household servant; especially called and desired as witnesses; and in the presence of me, Benedict Come, a public notary of the diocese of St. Asaph, he did maintain that christians were not bound to pay tithes, nor might lawfully swear by the creator, nor the creature, that Swynderby's conclusions were just, and that he did eat, drink, and communicate with Swynderby, the Bishop's sentence against him notwithstanding.

(Reg. Trefnant).

Walter Brut was served with a series of seven charges against him, which are given at full length in the Register, and he was summoned to appear before the Bishop to answer them. Mr. Brut "partly appearing," says the account in the Register "by his own self before us sitting in our judgment seat, and partly by his witnesses specially appointed for that purpose," presented his answers to the articles and conclusions drawn up against him "on divers scrolls of paper written with his own proper hand," in the form of two "suppositions." This failed to satisfy the Bishop, who pronounced "his writing too short and obscure, and begged him to write more plainly and more at large." Whereupon Mastr Walter Brut, nothing lothe, draws up a "declaration" covering a dozen skins, with small writing, and which may be said to consist of a general argument from Scripture against the Pope and the Romish Church.

The Bishop of Hereford then appointed Friday, October 3rd, 1393, for the said Walter Brut to appear before him, sitting in commission in the Cathedral Church of Hereford, at six o'clock, or thereabouts, having for his assistants in the same place divers prelates and abbots, and twenty bachelors of divinity (whereof twelve were monks and two doctors of the law), accompanied "with many other prelates and worshipful men, and wise graduates in sundry faculties."

The following is the list of the members of the commission, as translated from the Episcopal Register :—

John Grene, prior from Worcester.
John Newton, chancellor of the University of Cambridge.
Everard, a monk, prior of the Monastery of St. Peter, at Gloucester.
William Trewellys, treasurer of the church at Exeter.
Thomas Cranly, warden of New College, Oxford.
William Colvyll, lately chancellor of Cambridge.
John Myddelton, canon of Hereford.
Nicholas Hereford.
John Taclo, rector of Westbury.
Brother John Bromzor, prior of the preaching friars, Hereford.
Brother John Ude, warden of the friars minor, Hereford.
Brother Walter Warde, of the order of minors, Worcester.
Brother John Lendon, of the order of minors of the convent.
Brother (Robert Mayal*) order of minors.
J. Dudley, monk of Worcester.
} Masters in Theology.

Master Ludovie Aber, treasurer of the church of St. David's
Master Adam Uske.
} Doctors of Law.

Brother Walter Chadesley, of the order of St. Augustin.
Brother Philip Gudin, of the order of preachers.
Master (a blank) from Cambridge.
} Bachelors in Theology.

* Name filled in with different ink at a later period.

Master Walter Ramesbury, precentor of the church of Hereford. Master John Malune.	Master of Arts and Bachelor of theology

The discussion and arguments continued "for all that day and the two days following (that is to say, Friday, Saturday, and Sunday, Oct. 3rd, 4th, and 5th)," and so cleverly and well did Master Brut hold his own in this trying ordeal that from his declarations and writings "the monks did gather and draw out certain articles to the number of thirty-seven," which were taken to the University of Cambridge to be confuted by those two learned men Master Colvyll and Master Newton, who sat upon the commission, and they did both labour in the matter to the uttermost of their cunning." These articles are copied into the Register and marked all of them as "heresy" or "error."

Walter Brut, on his part, agreed to make a publick submission to the Church in the following general terms, which are mild as compared with the extreme views of Swynderby :—

"Y, Walter Brut, submtte me pncipaly to the evangely of Jhu criste, and to the determinacion of holy chyrch and to ye general consayles of holy chyrche, and to ye sentence and determinacion of ye four doctors on holy wryt; that ys, Austyn, Ambrose, Jerom, and GG (Gregory). And y meklyilie submtte me to your correction as a sojet ougte to ye byshop."

He read out this scroll "with a loud intelligable voice at the cross in the churchyard, on Monday, that is to say, the sixth of the said month of October, in the presence of the Bishop and his assistants, as also other barons, knights, and noblemen, and clergy, and also a great multitude of people," and immediately afterwards a certain Thomas Cranley, master of divinity, a member of the Commission, made a sermon unto the people, taking the 2nd chapter of Romans for his subject, "Be not over-wise in your own conceits," &c. (Reg. Trefnant.

The following curious contemporary notice of Walter Brut occurs in the "Vision of Piers Plouhman" (page 489) :—

"Behold upon Walter Brut
Whom bisiliche thei pursueden
For he said hem the sothe."

Two very singular anonymous letters appear also in the Episcopal Register of our Cathedral, and that they should have been allowed to do so, certainly says much for the candour of the notary. The first is entitled "a copy of a letter sent to Master Nicholas Hereford, by a Lollard," and is very severe upon that learned divine for deserting the ranks of the Wycliffites. The other is a letter written in the name of "Lucifer, Prince of Darkness, to the persecuting prelates of the Popish Clergy." This is a highly satirical attack on the Pope and the Romish Church. An earlier copy is to be found at Paris of the date of 1385, six years before the examination of Walter Brut. They are noticed here because, although the real authors are unknown, amongst others they have been attributed to Swynderby and Brut.

The Bishop of Hereford, though he condemned and excommunicated the Lollards in Deerfold, felt himself powerless against them. They set at naught his ordinances and continued to teach and to preach with impunity. He next appealed to the Archbishop of Canterbury, to the King, and to the Pope himself.

The King forthwith issued a commission against the Lollards in general, and in particular against "a certain fellow named William Swynderby pretending himself to be a chaplain, and one Stephen Bell, a learned man," who though condemned and excommunicated by the Bishop of Hereford had conveyed themselves by and by unto the borders of Wales, with such as were their factors and accomplices, keeping themselves close." The commission authorises the bishop and his ministers, the sheriffs, bailiffs, and other officers, &c., to arrest the aforesaid William and Stephen, and to commit them "either to our prison, or else to the prison of the same bishop" and there to keep them safe, &c. The commission was dated from Westminster, March 9th, 1392, and signed "Farrington." (Reg. Trefnant, transl.)

The following year the King sends another letter, dated Sept. 22nd, 1393, against Walter Brut and others, which is more interesting for its more special address, which is as follows :—

"Richard, by the grace of God, King of England and of France, and Lord of Ireland, to his beloved and faithful John Chaundos, knight; John Eynefford, knight; Rynard de la Bere, knight; Walter Deveros, knight; Thomas de la Barre, knight; William Lucy, knight; Leonard Haklut, knight; and to the Mayor of the city of Hereford, to Thomas Oldcastell, Richard Nassh, Roger Wyggemore, Thomas Wallewayn, John Skydemore, John Up-Harry, Henry Morton, and the Sheriff of Hereford, sendeth salutations :

"Forasmuch as it is advertised us that one Walter Brut and other such children of iniquity, have damnably holden, affirmed, and preached certain articles and conclusions, being notoriously repugnant against the Holy Scriptures," &c., &c., it calls upon them to make proclamations everywhere to forbid their assembling together in conventicles, and to arrest, imprison, and punish all who do so. (Reg. Trefnant, transl.)

Two years later the Bishop of Hereford appeals to the Pope Boniface IX. for assistance, and receives from him a Bull, inclosing one he had sent to King Richard, against the Lollards, with a scolding to the bishop himself for not having written more boldly to the king about them.

The bull to King Richard states how much the Pope is grieved "at certain heresies which have sprung up and do range without proper restraint at their own liberty, to the seducing of the faithful people," and further on it proceeds to specify that "under the regal presidence of your most Christian government, a certain crafty and hair-brained sect of false Christians are allowed to go on and increase, who call themselves 'The poor men of the treasury of Christ and his disciples,' and whom the common people by a more sound name call 'Lollards'* (as a man would say 'withered darnel,') according as their sins

* NOTE ON THE ORIGIN OF THE TERM "LOLLARD."—Wycliffe and his followers had no sooner attracted the attention of the dominant party in the church than the name of "Lollards" was given to them. It was a party name of contempt and derision, and was at once generally adopted. Its origin has been much questioned, but it was certainly in use before Wycliffe's days as a

require"; and he calls upon the King to expel, banish, and imprison such men, and so that by "severe judgment and virtuous diligence, might, favour, and aid, there may not one spark remain hid under the ashes, but that it be utterly extinguished and speedily put out." (Reg. Trefnant, transl.)

Nothing further appears in the Registers with reference either to Swynderby, Walter Brut, or the others. Swynderby is known to have escaped harmless during the reign of Richard II. Fox thinks he was one of the earliest martyrs, that he was burnt in Smithfield in 1401, in the presence of a great multitude of people: others think "that he in prison died," or that he went

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name for heretics, if we put faith in Du Cange, who says in his Glossary, that certain heretics who arose in Germany and Belgium at the very beginning of the fourteenth century, were called "Lollards" or "Lullards." In the "Genealogia Comitum Flandriæ," 1302, they are called "Lilliards,"

The earliest known mention of Lollards, however, is by Joannes Hocsemius, A.D. 1309, who says: "In that year some circumambulating hypocrites, who are called 'Lollards' or 'Praise-God's,' deceived certain noble women in Hanover and Brabant," &c. Trithemius, in Chron. A.D. 1315, says they were thus called from a certain German, named Walter Lolhard, about whom little seems known, but that he was burnt for heresy at Cologne in 1322.

Another derivation Du Cange gives from Kilianus, "Lollard, Mussitator (Psalm-singer), Mussitabundus, Lollaerd, Lollebroeder, Broeder-Lollard, Lollardus." The word is thus connected with the German "lullen," to hum, and our own "lull" and "lullaby." In Dutch "lollen" is used as to sing psalms. Alexianus Monachus gives "Lollard, the defendant of a wrong faith, or of a false religion, commonly called 'Lollards.' A Waldensian heretic was also called a Lollard."

This German origin of the term "Lollard" does not, however, sufficiently explain its general and immediate adoption, as a party name of contempt in England. It has been suggested, therefore, that by a play upon the word, the common people would naturally think it derived from the English verbal root "loll," after the analogy of laggard, sluggard, drunkard, dotard, and thus "Lollard" would at once convey the idea of a lazy, idle, dawdler who preferred to preach rather than to work, and this view seems to receive support from a contemporary writer—

"And folk of ye order
That lollers and loseles, for leel men halden."
Vision of Piers Ploughman, p. 131.

Another play upon the word Lollard, which was very common, is the one used by Pope Boniface as quoted from his Bull, which treats it as if derived from the plant *Lolium*, the darnel: That as this weed causes great damage to the corn amongst which it grows (*infelix lolium.* Georg:) so the Wycliffites did great injury to the faithful in the church. Chaucer mentions it in this sense, when speaking of the "loller"—

"He wolde sowin some difficultè
Or springen cokkle in our clene corne."

It must be added, however, that there are some, as well thoughtful students in history, as philologists, who believe the term "Lollard" to be purely and simply of English origin; that it was first given to the followers of Wycliffe, and was carried from England into Germany, at the same time as the opinions denoted by it.

The English root "loll," as above noticed, affords its most simple derivation. The Germans adopting the English name, without knowing its origin, or without being able to find any direct root for it in their own language, would be led easily enough to derive it from the name of the chief leaders of the sect.

These gentlemen, therefore, think lightly of the authority and *dates* of Hocsemius, and believe that Walter *the* Lollard, lived at a later period than that usually assigned to him; and also that he takes his own name from his opinions, instead of giving it to them.

abroad. The last solution seems the most probable, for he was far too well known to be burnt anonymously, and the great foresight and caution which stand so prominently forward in the study of his character, create the belief that he would not fail to find some means of escaping his enemies.

It is highly probable that the advantages of the Forest of Deerfold as a safe refuge were pointed out to Swynderby by Sir John Oldcastle, Lord Cobham. He possibly procured for him the protection of the Mortimers, to whom the Forest belonged, and there can be little doubt but that he maintained Swynderby during his residence here, since it was one of the charges against that great and good man, that he supported Lollard preachers at this time in the dioceses of London, Rochester, and Hereford. The church of Almeley, moreover, a residence of the Oldcastle's, was one of those churches in which it is known that he officiated on his first arrival in the county.

There is no proof that Sir John Oldcastle himself spent any time at the Forest, or even visited it; but it is extremely probable that he did so, not only before his own persecution, but also after his escape from the Tower, when it is known that he spent the chief part of his time at no great distance from it.

A small promontory, jutting out from the high ground of the Forest on its western side, between Limebrook and Lingen, is called "Oldcastle." It consists of a few acres of table land, surrounded to the North, West, and South sides by steep wood-covered declivities. It would be a safe refuge, or form an excellent outpost, in a military point of view, in defence of the Forest, and indeed it presents an excellent site for a castle. There are, however, no traces of occupation about it, and not a vestige of castle, mound, or earthwork of any description. How it came by the name of "Oldcastle" is not known. It may be added that the land pays tithe, whereas the adjoining lands belonging to Limebrook Nunnery are exempt.

The Lollards must have remained in the Forest of Deerfold for some considerable time, for though nothing more is accurately known with regard to them here, the enquiries that have given rise to this paper have led to the discovery of an old oak building of a very interesting character, which the name and traditions of the place point out as their chapel. It is the house itself of the "Chapel farm," and from time immemorial has been occupied as a farm-house. In an adjoining orchard are two large yew trees, which tradition states mark the burial ground.

Nothing is known with regard to the site of the chantry in the Forest, in which Swynderby first officiated; but at Newton, where he was also accused of having held services, is a field called the "Chapel Meadow," and in this field the foundation of some sort of building can still be traced.

The accompanying sketches and exact description of the "Chapel farm" house, which may fairly be presumed to have been used by the Lollards as a residence or chapel, or both, have been kindly made for this paper. Whatever its exact object may have been, the building is of extreme interest, both as a specimen of Mædieval design and as showing the enduring nature of our oak timber as a building material.

DESCRIPTION OF THE OLD BUILDING IN DEERFOLD FOREST.

By Thomas Blashill, Esq.

The building stands east and west, and consists of one large room or hall, 44ft. 9in. long by 18ft. 9in. wide internally, with a shed, 18ft. 9in. by 8ft. 6in., attached to the western end. The whole is constructed of oak framing standing on a stone plinth. In the main portion the framing is filled in with very thin stone walling, and the roof is covered with tiles. In the shed the framing is covered with boards, and the roof thatched.

Arrangement.—At the ground level the floor of the main building is open throughout, but there is a chamber over the western end; the stairs by which it was originally reached seem to have been at the north-west corner. The chief entrance was just east of the centre of the south front. A second door at the west end led into the shed; and I infer from the appearance of the framework that there was an external door on the south side of the shed, with a window opposite to it on the north side.

The hall had two windows placed high up on the north side, and one near to the east end of the south side. I suspect there was also another below this last, and there are signs of a very small window in the east end. This last must, however, have opened into a chamber, and has, I think, been used for the object of looking from a chamber into the hall. Immediately beneath this east window there is a break in the masonry of the plinth, 6ft. 3in. in length. If we assume that the building was a chapel, this would show the place of the stone altar.

The chamber over the west end of the hall had three windows, one of which looked into the hall, and another, opposite to it, either looked over the roof of the shed, or, as I believe, into the shed itself. The third window was an external one on the south side.

The above description includes everything appertaining to the arrangement which gives any clue to the uses of the building.

Construction.—The construction of the framed portion is of massive oak sills, posts, and quartering. The posts have a good moulding up their fronts, and their heads are cut to a suitable shape for carrying the roof-trusses. The trusses are quite plain, and, indeed, of a rude and mean design, except as to the under side of the tie-beam, which is moulded to match the posts. Between the main trusses are intermediates, which have curved braces of good design, and the whole carry purlius or side pieces moulded like the other timbers. There are plain square rafters which now carry the modern roof-covering. The whole roof was filled in between the trusses with very handsome curved braces, having cusps with terminal leaves carved on them. The wall-plates are moulded and finished with battlements on the top. The same description applies to the chamber excepting that the wall-plates and the posts below them are plainly chamfered and there are no battlements used.

The remains of the windows are very slight, but I should expect they had simple wooden tracery in the heads as indicated in the interior view.

There are a few ornamental floor tiles remaining of the same manufacture and patterns as exist at Wigmore Abbey and several other places in that part of the country. I saw also in the stone plinth one stone which had a splay cut on it and had been used in a former building, probably many such would be found on careful search.

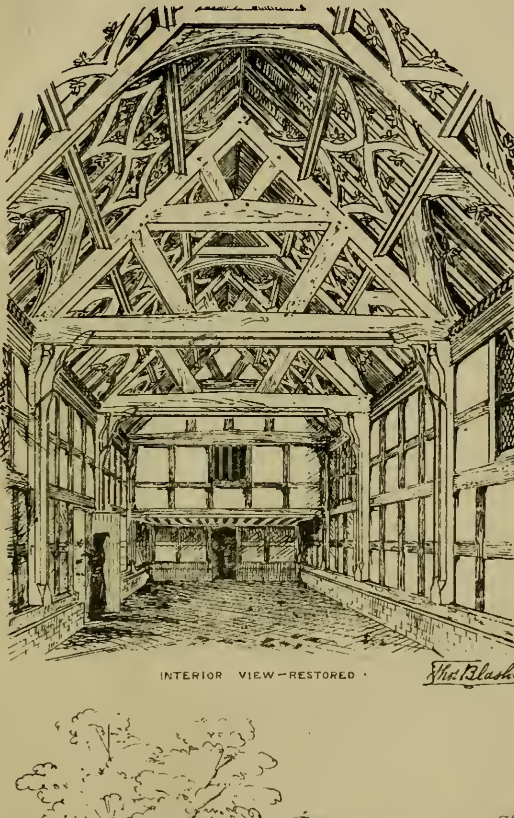
Date.—The building seems to be of the later half of the 14th century.

Nature of the Building.—I came prepared to find the remains of a chapel here—and there are certain reasons for thinking that it was a building of this kind—as

1. It is called Chapel Farm.
2. It stands east and west.
3. The orchard on south side tradition calls "the burial-ground." It would be in a suitable position for such a purpose, and it has two yew trees at the corner some centuries old.
4. There is the break in the plinth at the east end where a stone altar might be expected to exist.
5. There is but one piece of furniture belonging to the house, that is to the landlord, and this exactly corresponds with the old communion tables. It was certainly intended to stand against a wall, and has turned front legs and a loose slab on top. It is of very large size, larger indeed than is common in parish churches.

I am, however, of opinion that the building is the Hall or principal part of a 14th century house, and for the following reasons :—

1. The timber construction though rare in ecclesiastical buildings is common in domestic buildings.
2. The arrangement of a large room with one chamber, if not two looking over it, is unusual with churches, but was part of the regular arrangement with halls where the solar usually had a window of inspection looking down into the hall itself. In the case of chapels where the closet or pew of the master of the house looked into them, the opening was large, so that his family could see also.
3. The curved braces under the roof are more ornamental than we usually find in churches, but they are quite common in halls, the roofs of which were handsomer. But the roof trusses are of a plain design, such as we find in barns and other domestic buildings—hardly ever in a church.
4. I can detect nothing which indicates a chancel or a part more highly decorated than the rest, and the east window cannot have been at all of the usual scale for a church or chapel.
5. I can find no mention of a chapel in the ordinary authorities at or about the time of the Reformation, while if it had so existed and had even



INTERIOR VIEW—RESTORED ·

Thos. Blashill

·EXTERIOR VIEW · FROM S.WEST.

Photo-Lithographed by Whiteman & Bass, London.

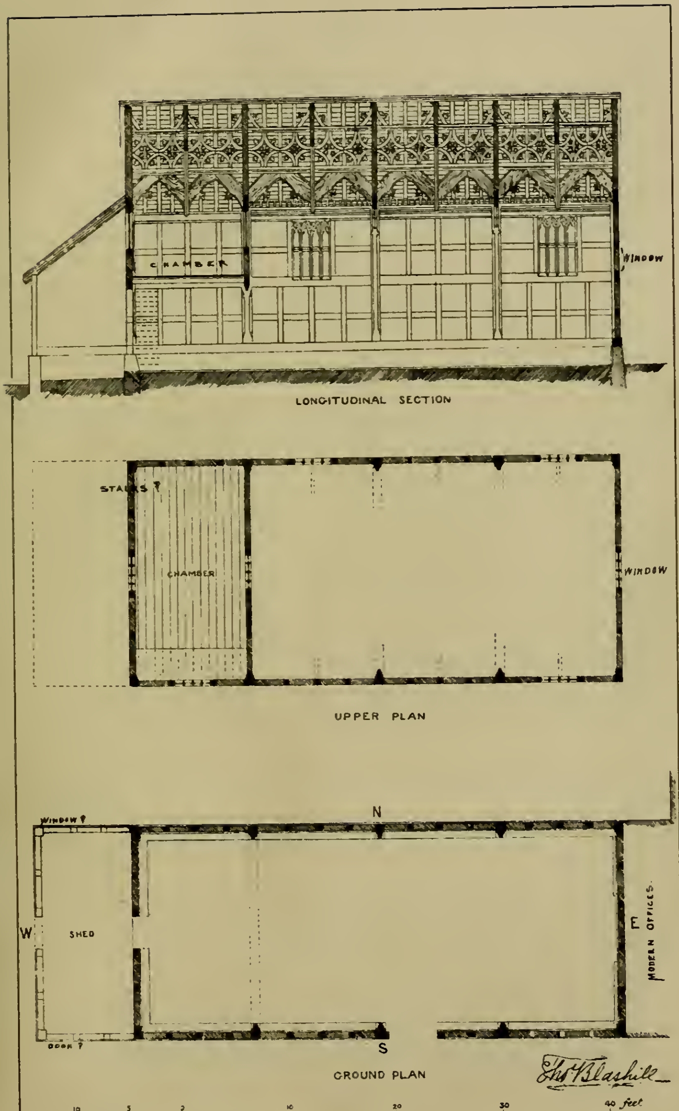


Photo-Lithographed by Whiteman & Bass London

been used afterwards (as the wooden communion table seems to indicate) we must have found something about it.

6. The "graveyard" may just as well—for all I can see—be an old garden.

If this is a chapel there can scarcely be a doubt that it is the one alluded to in the Harleian MS. 6726, where it is mentioned (anno 1655) as "The Chapel of Dervold, a privileged place, now in the possession of one Richards, mentioned in Fox's Martyrology as a place frequented by Lollards, ond so Derevold Forest."

Gough's Camden (1806), speaking of Wigmore Castle, says: "On the summit of the hill behind the castle were two parks, one stocked with deer till the civil wars, now both inclosed and ploughed up ; also a forest called Deerfald, corruptly Darval. In the village of Darval are ruins of a chapel, which some called Lollards chapel, because they were wont to meet at this vill." (p. 79.)

PART IV.—THE FOREST INCLOSURE.

"The race of man is as the race of leaves :
Of leaves one generation by the wind
Is scattered on the earth ; another soon
In Spring's luxuriant verdure bursts to light,
So with our race ; these flourish, those decay."

HOMER. Lib. VI. Lord Derby's translation.

The Forest of Deerfold with the surrounding district attached to the Castle and Honour of Wigmore passed, as has been mentioned before, into possession of the Crown. Edward VI. was the first Lord of Wigmore who was also King of England. One of the few recorded facts of the short reign of his ill-fated son Edward V., is his making the Duke of Buckingham, then the ally but soon afterwards the victim of Richard, Duke of Gloucester, "Constabularius, Senescallus et Receptor" of the Castle, Lordship, and Manor of Wigmore, in the Marches of Wales, as well as of the other possessions of the Crown and of the House of York in the same part of the kingdom. (Grants of King Edward V., p. 8.)

The Castle of Wigmore and its dependencies remained in the hands of the Sovereign during the reigns of Henry VII., Henry VIII., Edward VI., Mary, and Elizabeth.

In the time of the last named princess we find Sir Henry Sidney, when residing at Ludlow Castle, as Lord President of the Marches, applying for permission to cut wood in the Forest of Deerfold for the use of the garrison. He alleges as his reason for doing so, that the supply of wood in the neighbourhood of Ludlow was so much reduced that they were compelled to burn that noxious mineral pit coal.

The Harleian MS. 354 contains the following entry :—"A Suruaey of the Forrestes and Chaces of Bringewood, Mocktree, and Daruole wt the Mannor of Buriton, taken the xxjth daye of Januarie in the first yeare of ye raigne of King

James (1603) taken before Sr. Roger Bodenham, Knight: Sr. Charles Fox, Knight: Giles Foster, Esquire, his Mats. generall receuor: Robert Berry, Esquire, his Mats. generall surueir: Roland Vaughan, Esquire: Willm Layton, Esquire: by vertue of his Mats. commission to them directed."

The Forest of Darvoll being measured, containeth in acres,	2,095
Timber trees at 5d. the tree	22,050
Underwood at 13s. 4d. the acre	399 acres.
	£5,778 10s.
The Forest of Mochtree and Chace of Brindgwood being measured do contain, in acres	5,331
Timber trees, at 3s. 4d. the tree	3,173
	£618 16s. 8d.

(Then follows a valuation of the Iron Works at Brindgwood, after which comes)—

"These forests are stately grounds and do breed a great and large Deer and will keep of Red and Fallow deer two or three thousand at the least."

In an old MS. volume in the office of Woods and Forests, Whitehall-place, is an entry relating to the Forests of Bringwood, Mochtree, and Dorvall to the effect that these forests were formerly part of the Honour of Wigmore, in Herefordshire, and parcel of the ancient possession of the Crown. That Dorvall contained 2095 acres, including the four woods, Wood-wood, Okeley, Knitte, and Purven, all of which were granted by Queen Elizabeth to John Downing and Maurice Kiffen, in the 33rd year of her reign (1591) for 21 years under a rent of £18 2s. 6d. per annum. That the forest next came into the possession of the Earl of Essex, and after him into that of Sir Henry Lindley, by whom it was conveyed back to James I. in the 2nd year of his reign (1605). The three forests were granted March 21st, 13th Charles I. (1638) to Sir George Whitmore, Sir Edward Sawyer, and Wm. Gibson under a fee farm rent of £55 2s. 11½d. per annum, and this fee farm rent was settled on Queen Catherine.

The lease granted to Downing and Kiffen—who worked the iron forges of Bringwood—must have been given up for four years afterwards it was again disposed of.

By Letters Patent, 2nd May, 37 Elizabeth (1595) the Honour, Castle, and Demesne lands of Wigmore, the Manor of Leinthall Earles, the forest, chase wood and wood grounds called Darvold, the Manor of Burrington, the forest and chase of Moohtre, Prestwood, and Bringwood were granted to Sir Gelli Meyrick, Knt., and Sir Henry Lindley, of London, Knt. Sir Gelli Meyrick was attainted for high treason in the Earl of Essex's rebellion, 43 Elizabeth (1601) and executed. On his attainder, Sir Gelli's moiety of the manors above mentioned was granted by the Crown to Sir Henry Lindley, who on the 22nd of January, 1601, sold and conveyed the Honour, Castle and Demesne lands of Wigmore to Thomas Harley, Esq., reserving to himself out of the grant the Forest of Darvold and other property before mentioned.

Sir Robert Harley (son of Thomas Harley) was in 1604 made Forester of Bringwood, *alias* Bornigwood Forest, and custodian of Prestwood Chase, both adjoining Darvold, but which had become separate inclosures made from time to time, as the great tract of woodland was broken up by the advance of civilization and the enormous consumption of timber in the Baron's wars—(Henry III., 1258-65.)

In 1632 a survey of Mochtree and Darvold was made by a Mr. Samuel Parsons, which is alluded to in deeds about to be mentioned. It is as follows :—

Mochtree contains 1,337 acres,
And Darvold 1,330 acres ;

but it only includes the portion of Darvold at that time unenclosed.

Sir Henry Lindley having separated the forests from the Castle and honour of Wigmore conveyed them back to King Charles I., who, by Letters Patent, granted unto the Earl of Lindsey and his heirs, the Chases or Forests of Mochtree, Bringwood, Prestwood and Darvold, at the yearly rent of £55 2s. 11½d., by virtue whereof the Earl entered, intending to improve the same, and after some treaty with the inhabitants of Wigmore Borough, Adforton, Letton, Newton, Stanway, Lymebrook, Dervolds Chappel, the Grange and Peytoe, Walford Overlye, and Netherlye, Sherlye, Lingen and Yeattons, who claimed to have a right of Common in the Forest of Dervold, an agreement dated 2nd September, 1637, was entered into between the said Earl and inhabitants of ye said townships, and signed by Sir Robert Harley, K.B., and Somerset Fox, Esq., that the said Earl should inclose for his own use one half of the Forest of Deerfold, so as the said commoners might have sufficient passage with their cattle to water ; and the other half of the Forest to be to the said commoners, whereof Woodwood to be part, and 200 stubs to be allotted by the Earl to be left in lieu of estovers for the use of the commoners, and Somerset Fox to have the Rowle for his tenants of Letton, Newton and Adferton in lieu of estovers, the tenants for their part referring the division to Sir Robert Harley. The Earl ditched and enclosed his half, but the inhabitants receding from the agreement broke down his mounds and fences and turned their cattle into the Earl's half of the Forest.

The Earl filed his Bill in Chancery against Sir Robert Harley, Somerset Fox, James Lewis, Bailiff of the Borough of Wigmore, John Maddox and others, who appeared and expressed their willingness to abide by the agreement.

The said letters patent were surrendered and another grant thereof made by King Charles to Sir George Whitmore, Sir William Sawyer, and Wm. Gibson, Merchant Taylor, who approved of the agreement and desired to be made parties to the suit, whereupon a decree was made in confirmation of the agreement. No inclosure followed this decree.

Owing to some dispute with the Commons the same year as the grant to Lord Lindsey was made, a grant by which it was agreed that the said Earl should "disafforest and destroye the deer therein," which it was pretended by the Commoners "do great hurt and damage them in their corne, whereby they did acknowledge they should be greatly eased, and their estates preserved and much bettered," and in the same year "the Earl in full manifestation of his full purpose to proceed in the said agreement and to give the owners and inhabitants of the said towns and places a clear manifestation of his real performance thereof, did with all convenient speed destroy all the deer within the said Forests, and did also survey, plot, and measure all the said Forests, and did also cut down much timber and provide all other necessaries for the division thereof, and did spend large sums of money in dividing, ditching and quicksetting the said forests.

After this a dispute arose with Sir Robert Harley and the Earl of Lindsey, which was tried, and the Earl confirmed in his rights by a decree of the Court of Exchequer, November 15th, 1638.

(Copy).

Hereford. } Salop. } Whereas the Right Honourable the Earle of Lindsey hath exhibited this English Bill in this Court against Sir Robert Harley, Knight, Somerset Fox, Esq., William Littleton, Esq., and divers other defendants, for and concerning the enclosure and improvements of the Forests of Mocktree, Brindgwood, Prestwood, and Darvold, in the county of Hereford and Salop, whereof the Earle is the fee farmer to his Majesty, at the yearly rent of £33 12s. 0d., the Courte was this day informed by Mr. Atturney Generell, on behalf of the said Earle, that the said Earle had caused the said premises to be disafforested, and did destroy the deer to the great benefit of the commons, and then the defendants, and all others that claymed any interest of commons in the Forests of Mocktree, and Brindgwood alias Prestwood, have by a mutuall agreement between themselves given their consent to an enclosure and improvements, and have accepted of allotments in lieu of their commons, which are agreed accordingly, and that they by their answer do confesse the . . . to be true, and that there is a decree drawn up by advise of council and agreement of all parties on both sides, and therefore his Majesty's said Atturney prayed that the said agreement and consent might be decreed accordingly.

It is therefore this day ordered that the said agreement and consent shall be decreed if the defendants showe no cause to the contrary.

And for that it was further informed by his Majesty's said Atturney-Generell that all such as claim common on Darvold have likewise—by a mutual agreement betweene the said Earle and them—consented to the division and improvement, and have accepted of an allotment in lieu of their common, and for that the said Earle hath left the commons — oak trees and about — acres of coppice wood in lieu of their — estovers, only these excepted, viz., William Tyler, James Tyler, and Francis Mill, that refractorily stand out. Wherefore his Majesty's said Atturney-Generell desired that the obstinacy of these might not hinder his Majesty's services and the publique good; but that the like decree for Darvold as for the rest might be made, by far greate and maine parte being many hundreds against three, and that the other three might be bound by their consent, and ordered to conform themselves accordingly.

It is therefore further ordered by the Court that the said W. T., J. T., and F. M. shall then show cause why a decree should not be drawne upp, as is desired, and that a *sub pœna* with the tenor of this order be awarded to give all the defendants notice thereof.

Signed, FANSHAWE.

Lord Craven succeeded the Earl of Lindsey in the possession of these Forests. He had lent Lord Lindsey £2,000 on mortgage, and for this sum and £4,000 more he purchased the Estates altogether. (D. C. papers.)

The following petition from the Commoners of Deerfold to Lord Craven is copied from an old deed partially illegible. It is without date, but it doubtless belongs to the middle or end of the 17th century :—

"Wee, whose names are .... many of us his Majestie's poore tenants, subjects, inhabitants within the sev.................... of Wigmore, Atforton, Walford, Letton, Newton, Lye, Leintwardine, Lingen, Shorley (?), and other places adjacent to a certaine waste or wood called Dervold, having (as our ancestors time out of mind did heretofore .... and enjoyed), as appertanent to our severall messuages ....free right of Commons of pasture in the said pasture and wood .... thereof, for all manner of cattel, and commons of Estovers to the greate common support of us, our wives and children and familys ....of so are not able to subsist and undergoe the pay............and duties as are necessarily incumbent upon us .... freedome. May it please your Lordship, wee have .... and .... without any interruption or denyall untill of late for these .... years last past. One Master Whitby, a messenger employed for the gathering of his Majestie's rentes in this county of Hereford, hath severall times come upon the said waste............ cattel and sheep depasturing .... of, destrayning for arrears of rent due unto his Majestie for the same, and thereupon compelled us to the payment of severall sumes of money for the redeeming of the said cattel, so by him driven to very great wrong and damage of us freeholders Commoners .... The said Mr. Whitby does still give out that he will continue driving off the said waste untill his Majestie's rent, with the arrears due for the same, be discharged ; so that wee, the freeholders and commoners, can with noe security depasture our cattell, in such wise as we ought of right to doe : which, unless by some good measure timely redressed, will be to the great impoverishing if not the utter ruine of most of us. Wee are therefore bould to make our humble address to your good Lordship, beseeching you that you will be pleased in pitty and compassion to us, the freeholders and commoners, to order some course of settlement for the payment of his Majestie's rent, with the arrears (if any are yet unpaid), that in the future wee, who are known free commoners, and in no way rightfully liable to the payment of any rent or mulct at all in the relation to the said waste and wood, may quietly and without disturbance enjoy the benefitts and advantages which to us doe of right appertayne .... in the same, according .... usage of us and our ancestors.

"To the Lord Craven."

It may perhaps have been in consequence of this petition that in 1664 the following arrangement was entered into between Lord Craven, the then holder of Dervold, and Sir Edward Harley, K.B., on behalf of himself and the other commoners :—

"Propositions concerning the enclosing of Derfold, in the county of Hereford, consented unto and agreed upon by the Right Honble. William Lord Craven on the one part, and Sir Edward Harley, Knight of the Bath, on behalfe of himselfe and the rest of the Commoners (soe far as lyeth in him), on the other part.

"1. It is agreed that the Lord Craven may inclose for himselfe and his heires the two coppices called Gravely and Powen, containing, according to the survey of Mr. Parsons, 40a. 0r. 10p., and in in the great wast of Dervold 540a. In which number of acres are to be reckoned and included Ffrancis Lowes house and backsyde, Vallowes in Dickendale, the Banck below Dyers house, and all other late erected cottages upon Dervold, except such as by the Commoners shall be judged inconvenient to remayne where they are now erected.

"2. That the Lord Craven and his Trustees and the Patentees for Darvold shall at such tyme and in such manner as councill shall advise, absolutely convey, assume, and confirme unto Sir Edward Harley and his heires (for the reserved benefit of himself the said Sir Edward Harley and his heires, as alsoe of all the Commoners), all the residue of the great wast of Darvold, exceeding the 540 acres consented to be inclosed by the Lord Craven, and alsoe the grounds and lands called Knuckle, by the aforesaid survey 75a. 0r. 20p., and Okely containing as aforesaid 74a. 1r., and Wood-wood containing as aforesaid 75a. 3r. 25p., with all trees, woods, and bushes, which now doe or hereafter shall grow upon the premisses. The sayd Wood-wood to be limited and assigned for estovers to the inhabitants of Wigmore.

"3. That the particular division and assignment of the Lord Craven's part of Darvold, and of the Commoners' part be set forth by Sir Edward Harley, Charles Baldwyn, Esq., and two surveyors indifferently chosen, the one by the Lord Craven, and the other by the sayd Sir Edward Harley, for and on behalf of the Commoners, in such manner that the Commoners' part shall lye convenient to the several townships and sufficiently supplied with water.

"4. That the Lord Craven's part shall be inclosed and soe continually mayntayned at the sole cost and charges of the Lord Craven, and if at any time for want of reparation, or insufficiently of the sayd ffences, the Commoners' cattle shall happen to come or stray into the part soe enclosed by the Lord Craven, then the owner of the cattle not to be impeached, but if such insufficiency of the sayd ffences any damage or trespasse shall be done in any part of Darvold or the part thereof allotted to the Commoners, it shall be lawfull for any of the Commoners to impound or bring action of trespasse.

"5. That the conveyance made by the Earle of Lindsey to Mr. Fox, of the Rowles, be confirmed to Sir Edward Harley by the Lord Craven, and the Patentees for Darvold.

"6. That the cottages upon Darvold, many of which were occasioned by the woodfall in Darvold, be allotted soe much land out of the Lord Craven's part as may enable them to maintayne their famelys, that they continue not a great charge and burthen to the neighbour towneshyps. The proportions of land soe to be layd to the severall cottage, being such as Sir Edward Harley and Mr. Baldwyn shall think fit, and at such rents as other tenants to the Lord Craven's part of Darvold shall pay.

"7. That the Commoners and their parts of Darvold, and the members thereof be secured from the ffee ffarm rent and from all arrears already due, all these particulars to be settled as councill on both sydes shall advise.

"8. If it is found by Sir Edward Harley, Mr. Baldwyn, and the two Surveyors aforesayd, that there is any considerable mistake in Mr. Parson's survey, as to the quantity of the great waste of Darvold, they are to rectify the same on both sides.

"I doe here approve of this agreement and composition, and consent thereunto, and in all things confirm the same.

"(Signed) CRAVEN (and seal).

"Signed and sealed in the presence of { John Baber. Robert Lawes."

(Endorsed: "Propositions concerning Derfold signed by Lord Craven and received from Mr. Lawes, March, 1664.")

From this date until the beginning of the present century the following notes are all that have been obtained:—

Robert, Earl of Oxford, purchased the fee farm isuing out of the Forest of Darvolt, of the Crown.

Richard Knight, of Bringewood, Esq., purchased in the name of Robert Payne, from the heirs of Sir Anthony Craven, deceased, the Lordship of Leintwardine and other lands, including the right of soil of the Forest of Darvolt.

By deed dated 27th June, 1722, Richard Knight and Robert Payne conveyed all their estates in the Forest of Darvolt (except Puley and Graley, which was in the possession of Robt. Weaver, Esq.) to Robert Earl of Oxford in fee.

It would, however, be very tedious, and serve no good purpose to follow down the several properties in the Forest through the different family successors. The accounts given leave the Harleys in possession of the chief part of the Forest, and Lady Langdale, as their descendant, is now, as has been said, the chief proprietor.

The only remaining feature of interest is that which relates to the final enclosure of the open portions of the Forest in the year 1818, and the extinction of the rights of the commoners, which had existed up to that time. That the freeholders and inhabitants of the surrounding villages had the right of forage, or wood for fires, and common of cattle and other animals in the Forest up to the year 1818 is beyond question, indeed it is proved by the deeds already quoted, and how then has it come to pass that they have been lost.

At the commencement of the present century a vast amount of common and open land was enclosed, and the arguments in favour of doing so were strong and unanswerable. The commons land in too many cases were not merely waste, but wasted; where all had the right to cut, nothing was allowed to grow; and so many animals were turned upon them in spring, that the grass was quickly eaten up, and only those could keep animals who had other provender for them as well; and thus the poorer classes of inhabitants got scarcely any benefit at all. These common lands formed a refuge moreover for gypsies, travelling tinkers, and other wandering people of still less reputable habits, who lived on the district for the time they were there, levying contributions, not only on the game preserves of the rich, but also on fields, the hen-roosts, and the folds of the surrounding inhabitants. And thus when the natural increase of population required more land for cultivation, and the advance of civilisation rendered it so much more valuable, the neighbouring proprietors found no difficulty in getting an Act of Parliament to share it between them, and were naturally enough very glad to do so. "Vast quantities of land," says Mr. Fawcett, in a recent article of *Fraser's Magazine*, over which the public possessed invaluable rights, have gradually been absorbed by individual proprietors. Up to the year 1845 commons were enclosed by private bills. All public discussion was thus avoided, and it is now impossible to form an adequate conception of the extent to which individuals were enriched at the expense of the public and the poor. By means of these private bills more than seven million acres of land were enclosed between the beginning of the eighteenth century and 1845. The late Duke of Newcastle (then Earl of Lincoln) once said in the House of Commons—"This I know, that in nineteen cases out of twenty, committees of this House, sitting on private enclosure bills, neglected the rights of the poor." Thus it fared with the common lands of the Forest of Deerfold. Before the Act of Inclosure was obtained due publication of the intention was doubtless made. All the neighbouring proprietors and those who had used their privileges made personal claims and struggled to get the best allotment they could. Their rights as commoners became thus extnguished to their satisfaction by individual compensation. The really poor made no application themselves, and none was made for them. The House of Commons, too, forgot to preserve their rights, and thus as a body the commoners were unrepresented and ceased to exist. The Act of Parliament alienated for ever the privileges which had before undoubtedly existed as rights in common. The whole land is now freehold, and the poor have no more right to the woods of Overlye than they have to cut the shrubs of Yatton Court, or to gather flowers in Lord Bateman's garden at Shobdon.

PART V.—THE PRECINCTS OF THE FOREST.

"There in close covert by some brook
Where no profaner eye may look,
Hide me from day's garish eye."—*Il Penseroso.*

"And did the Lollards bring the Asarabacca to Deerfold?" is it asked. Most certainly not, for this would tell of a peaceful residence and rest that belonged not to them; but within half a mile of the place where it grows so freely are the ruins of the Priory of Lyngbrook, Lymbrook, or Limebrook, as it is variously called, and the existence of the plant there is probably due to the gentle charity of some sister who knew its value, and required it for her daily ministrations with the sick.

The ruins stand in a narrow valley on the western borders of the Forest. The valley is very quiet and secluded, with a noisy brook running through it, crossed by a wooden footbridge just below. The meadow is full of grassy mounds, and these with a few old walls, built of the shaly stone of which the neighbouring rocks consist, and overgrown with roses and wych elms, are the only remains of the Nunnery. A small plain arched doorway leads into an oblong room, about 15 ft. by 10 ft., and there are traces of a room above; but the roof, the windows, and all the upper parts of the walls are gone. Another gray old crumbling wall joins it, pierced by one small and very plain window with a wooden lintel. A plain doorway similarly built leads out into the meadow. The adjoining ground shows some traces of fish ponds, and there are two or three very old yew trees scattered about. Such is all that remains now of the Priory founded by Ralph de Wigmore, Lord of Lingen, in the reign of Richard I. (1189-99). "A place of nunnes," says Leland, "within ii. myles of Wygmore."

In Dugdale's Monasticon Anglicanum amongst the Benedictine Monasteries is—"Lingebrook Priory in Herefordshire. Upon Inquisition taken the 24th Edward III. (1351) the jury found that it was not any detriment if the King did permit Adam Esgar (clerk) to bestow the manor of Brokkeswodepawn on the Priory and Convent of Lingebrook, to be held by them to keep the anniversary of William de Pawn yearly in the s^{d} Priory as the s^{d} Adam should appoint."

"King Richard II. gave leave to the Carthusian monks to purchase the Priory, which it seemed belonged to the Abbey of Aveney in Normandy, and was supported as alien in the Parlement held at Leicester 2nd Henry V. (1415) Joan and Elizabeth daughters of Edmund Mortimer were nuns here in Edward I. time." (Blunt.)

The Priory continued to be occupied until the general suppression, when it had six nuns, and was valued at £22 17s. 8d. per annum (Dugdale), or at £23 18s. 6d. per annum. (Speed.)

"The scite, capital, messuages, &c., and other hereditaments of this in Lymebrooke were granted by the 7th Edward VI. to John West and Roger Gratwich, yeomen, and their heyres." (Blunt.)

At the Archæological Institute of London, June 10th, 1869, Sir Thomas Winnington exhibited a deed of the Nunnery of Lymbrook, Herefordshire, granting the parsonage of Clifton-on-Teme to the rector, A.D. 1527 ; attached to it was the seal of the house, which was before unknown. It had been found recently at Stanford Court.

About a mile north of the ruins of Lymebrook Priory, hanging still on the skirts of the forest of Deerfold, is the site of the ancient castle of Lingen. An orchard inclosed with a deep and wide moat, wet still here and there, and a large and steep mound at the eastern end, surmounted by a picturesque Scotch fir tree, present all that remains of it. If it ever had walls, no trace of them exist, and if it ever was a stronghold, it must surely have been at a time when the flat ground surrounding it was boggy and insecure. The village of Lingen gives its name to one of the oldest families in Herefordshire. Of the Castle and its Lords, its history, and their adventures, it is not necessary to say anything here, for is it not all told in that interesting and valuable contribution to the history of the county, by one of our members—"The Castles of Herefordshire and their Lords," by the Rev. J. C. Robinson, M.A.

Nor, for the very same reason, may the beautiful and extensive ruins of Wigmore Castle, on the other side of the Forest be dwelt upon : the ancient Abbey near the castle ; nor the romantic passages in the history of their illustrious possessors, the Mortimers. It would be more in character with the objects of the Club to speak of the geology of the Forest of Deerfold and its natural productions, but this may not be, for the paper is already very long, and the Club has fixed the first excursion of the approaching season to investigate more thoroughly these very points.

One duty only remains, and it is the very pleasing one of returning thanks to all those whose kind interest in the Woolhope Club has led them to supply the materials which form the groundwork of this paper. The facts of history and legal memoranda are chiefly due to Lady Frances Vernon Harcourt, Mrs. Stackhouse Acton, R. W. Banks, Esq., and the Rev. J. C. Robinson. Thomas Blashill, Esq., of London, has earned much gratitude. His drawings and description of the old house of the Chapel farm shew clearly enough the very great trouble he has taken to render them as accurate as possible. The permission so readily granted to examine the Episcopal Registers and books in the Cathedral library has been most useful in opening up an almost forgotten chapter in the church history of the county. The Rev. S. Clark, the Rev. T. Woodhouse, and some other gentlemen have been more useful than they would perhaps themselves admit ; and lastly the kind and genial hospitality at the Haven in the Forest itself, has given all the visits of enquiry there a pleasant recollection. The Messrs. T. W. and C. Fortey have indeed spared no trouble to give every assistance required, and have clearly proved themselves, in the eyes of our Club, worthy possessors of that most interesting tree—upon whose branches after all this whole story hangs—

THE MISTLETOE OAK OF THE FOREST OF DEERFOLD.

CLAVIS AGARICINORUM:

AN ANALYTICAL KEY TO THE BRITISH AGARICINI, WITH CHARACTERS OF THE GENERA AND SUBGENERA.

By Worthington G. Smith, F.L.S.

(*Read before the Woolhope Club, Hereford, February* 22*nd*, 1870.)

(Plates I.–VI.)

Contents.—1. General Observations on the *Agaricini.* 2. Analytical Key. 3. Characters of the Genera and Subgenera of the *Agaricini.*

1. General Observations on the Agaricini.

In a large group of plants like the *Agaricini*, of which we have in this country some seven hundred representatives, all more or less intimately allied, systematic arrangement is of the highest importance. During the last half-century various attempts have been made in this direction, the last and most successful being that of the illustrious Fries, in his 'Monographia Hymenomycetum Sueciæ,' published in 1856. In this work, although the author does not depart materially from the views expressed in his 'Epicrisis' (1836–38), he separates several species of *Agaricus* into two new subgenera (*Inoloma* and *Stropharia*), removes some *Tricholomata* into the genus *Paxillus*, and makes many minor alterations. Since this work was issued, Fries has continued to write on the subject, and has recently established a third new subgenus (*Pilosace*) of *Agaricus*, making thirty in all. The only work in English that gives descriptions of all the British species is the admirable 'Outlines of British Fungology,' by the Rev. M. J. Berkeley (1860),—which has proved invaluable during the last ten years to students here and in America, where Fries' works are rare. As regards the *Hymenomycetes*, Mr. Berkeley in the main adopts the views of Fries, giving descriptions of many new species.

There is perhaps no test of the value of characters so searching as an analytical key, and, as far as I am aware, no one has hitherto attempted to produce one for the Order *Agaricini.* This want I have here endeavoured to supply. It has been more or less perfectly in manuscript for the last seven years, and has always been used by me in determining new or critical Agarics. At the request of many friends, I am induced to print it; and it only remains for me to say, that the characters given are either taken from the works of Fries or Berkeley or are from my own notes and observations. When the latter have agreed with those of the above-mentioned authorities, I have not hesitated to use their very words; but I have minutely examined between five and six hundred fresh specimens, ranging over the whole Order, and in every instance I have made careful drawings of the plants and their spores, together with dissections. I have also referred to, and retained copies of, more than a thousand published plates, being nearly every species referred to by Fries or Berkeley. The accompanying outlines have been in every case drawn from nature, and the spores of each species have been uniformly enlarged seven hundred diameters with a camera-lucida.

My ideas of the value and sequence of the genera and subgenera of the *Agaricini* differ very little from those of Fries and Berkeley. Had either of these authors applied the test of an analytical key, I have little doubt that, in regard to those small differences, they would have coincided with me. The five great series of Agarics, termed, from the colour of the spores,—1, *Leucospori* (white spores); 2, *Hyporhodii* (pink spores); 3, *Dermini* (brown spores); 4, *Pratellæ* (purple spores); and 5, *Coprinarii* (black spores),—are of the first importance in discriminating species. It is remarkable that, whilst in the first group we have in this country some two hundred and fifty species, the numbers grow gradually less through the pink, brown, and purple series to black, in which latter there are only sixteen.

After thus dividing the genus *Agaricus*, Fries proceeds to the subgenera; but this I consider too abrupt, as each spore-group naturally divides itself into three sections, thus:—

1. Hymenophorum distinct from the fleshy stem. L, Plate I. fig. 2.

2. Hymenophorum confluent and homogeneous with the fleshy stem. P, Plate I. fig. 5.

3. Hymenophorum confluent with, but heterogeneous from, the cartilaginous stem. Q, Plate I. fig. 7.

The arrangement of the subgenera under these sections is shown in the accompanying table (Plate VI.), and it may be considered in its

JOURNAL OF BOTANY.—PLATE VI.

Tabular View of the Subgenera of Agaricus.

	I. Leucospori.	II. Hypo-rhodii.	III. Dermini.	IV. Pratellæ.	V. Coprinarii.
* Hymenophorum distinct from the fleshy stem.	1. Amanita.	10. Volvaria.			
	2. Lepiota.	11. *Chamæota.*		26. Psalliota.	
		12. Pluteus.		27. Pilosace.	
** Hymenophorum confluent and homogeneous with the fleshy stem.	3. Armillaria.		19. Pholiota.	28. Stropharia.	
	4. Tricholoma.	13. Entoloma.	20. Hebeloma.	29. Hypholoma.	33. Panæolus.
	5. Clitocybe.	14. Clitopilus.	21. Flammula.		
	6. Pleurotus.	15. *Claudopus.*	22. Crepidotus.		
*** Hymenophorum confluent with, but heterogeneous from the cartilaginous stem.	7. Collybia.	16. Leptonia.	23. Naucoria.	30. Psilocybe.	
	8. Mycena.	17. Nolanea.	24. Galera.	31. Psathyra.	34. Psathyrella.
	9. Omphalia.	18. Eccilia.	25. *Tubaria.*	32. *Deconica.*	

(*Proposed new subgenera are in italics.*)

favour that it displaces from the order generally adopted only two subgenera, *Pleurotus* and *Crepidotus ;* the former is usually, but apparently without reason, placed after *Mycena* or *Omphalia*, and the latter after *Galera*. *Pleurotus*, as Fries himself says, is closely allied to *Tricholoma* and *Clitocybe ;* it is, in fact, only a *Tricholoma* or *Clitocybe* growing on trees and stumps instead of on the ground. Its proper position, then, undoubtedly is after *Clitocybe*. Its peculiar habit is not sufficient to separate it from this group, as we find a habit precisely the same in *Armillaria*, *Pholiota*, and *Stropharia*. For convenience, it would be well to retain the resupinate species in their present position at the end of the subgenus. In the use of this table it may seem a question whether the sequence of the species should follow the vertical or the horizontal lines; the alliance is certainly greater in the horizontal series. For instance, *Armillaria* is much nearer to *Pholiota* and *Stropharia* than to *Tricholoma ;* in the former the *structure* and the *habit* are the same, the spores only are different in colour. A reference to the characters of the subgenera in part 3 of this essay will show that this is true of *all the other subgenera*. I do not, however, propose to adopt this system, though Fries has used it in arranging the *genera* of the *Agaricini*, for after *Agaricus* he places *Coprinus*, wholly disregarding the spores, and depending on the structure, which resembles *Lepiota ;* then follows *Cortinarius*, resembling *Armillaria*, *Tricholoma*, and their allies (see table); then *Paxillus*, with the gills decurrent as in *Clitocybe;* and so on, in accordance with *structure* and *habit*, to the end of the Order. Had the genera of *Agaricini* been arranged after the manner of the subgenera of *Agaricus*, the sequence would have been:—White spores: *Russula*, *Lactarius*, *Hygrophorus*, *Nyctalis*, *Paxillus (Lepista)*, *Cantharellus*, *Marasmius*, *Lentinus*, *Panus*, *Xerotus*, *Schizophyllum*, *Lenzites*. Pink and brown spores: *Bolbitius*, *Cortinarius*, *Paxillus (Tapinea)*. Black spores: *Gomphidius*, *Coprinus*. It is singular that none of these genera have purple spores, analogous with the *Pratellæ*. So little value does Fries attach to the colour of the spores amongst these genera, that some of the species of his *Paxillus* have *white* spores, others *red*. The genus *Marasmius* is so near the subgenus of *Agaricus*, *Collybia*, that it is sometimes very difficult to determine to which group some species belong. Fries himself is often very uncertain; with some species he has recently put the common *Agaricus (Tricholoma) personatus*, Fr., into the genus *Paxillus*, partly on account of the gills separating from the hymenophorum. See remarks under *Tricholoma*, *Lepista*, and *Paxillus*.

I. LEUCOSPORI, *White-spored Agarics* (PLATE I.).—Without doubt the species bearing white spores are much higher in type than the plants producing coloured spores. Most of the former are firm, and many persistent, whilst as we approach the black-spored Agarics, through the pink, brown, and purple series, there is a greater tendency to deliquesce till we reach the small, ephemeral species of *Coprini*, whose entire lives endure but one hour, and whose whole structure may be destroyed by a breath. The spores of the *Leucospori* are mostly oval in shape, sometimes nearly round (in *Pleurotus* they are usually elongated ovals), generally very regular in shape, but sometimes spinulose (showing an affinity to *Russula* and other genera). The spores vary in size; the *Leucospori* producing the largest as well as the smallest known spores; as a rule they are *small* (and thus opposed to the black-spored groups, where, as a rule, they are *large*), generally white, but sometimes dingy, or with a suggestion of yellow, showing an affinity to *Cantharellus*, etc., or pink, and pointing to *Lentinus*. It is worthy of note that no other Fungus is analogous with the species of the "ringed" section of *Amanita;* it stands quite alone in possessing a volva *and ring*. It is also remarkable that, as a rule, none of the *Leucospori* grow on dung or in rank places, whilst in the darker and black-spored groups these habitats are the rule.

II. HYPORHODII, *Pink-spored Agarics* (PLATE II.).—There is not one quarter so many Agarics bearing pink or salmon-coloured as white spores. The size of the spores varies greatly. A few are very small, others equally large (see Plate II.), whilst the majority are remarkably irregular in shape, resembling the fragments of granite seen in the roads. Some of the species are edible, as in *Clitopilus* (analogous with the white-spored edible species of *Clitocybe*), whilst others are poisonous, as in *Entoloma*, reminding us of such dangerous species of *Tricholoma* as *A. sulfureus*, Bull, etc.

In this section blank places for unrepresented subgenera become apparent. Were the study better prosecuted, and the Agarics from all the world known, most, if not all, these species would probably be filled in. The genus *Pluteus* occupies the only space unrepresented amongst the *Leucospori*, Plate I., but it is exceedingly probable that white-spored Agarics exist with gills perfectly *free* from the stem, and without a ring, though at present none are described.* Weight is added to this opinion by the fact that Fries has lately established a subgenus (*Pilosace*) amongst the *Pratellæ* with these very characters (Plate IV.). Till then *Pluteus* stood quite alone in structure.

Hitherto no subgenus has been recognized amongst the *Hyporhodii* analogous to *Lepiota* among the *Leucospori*, but such a group really exists. In the 'Commentario della Società Crittogamologica Italiana,' No. 2, September, 1861, there is an Agaric described as a doubtful *Pluteus* under the name of "*A. (Pluteus ?) xanthogrammus*, Ces." It greatly resembles *A. (Armillaria) mucidus*, Fr., in aspect, and the stem is furnished with a ring; so that it fills up the vacant space in the *Hyporhodii*. I propose for it the subgeneric name of *Chamæota*. To it also belongs *A. cretaceus*, Fr., *A. echinatus*, Roth, etc. *A. cretaceus*, Fr., should not be referred to as intermediate between *Lepiota* and *Psalliota*. It is singular that, with these unrecognized exceptions, not a single rosy-spored Agaric is described as possessing a stem furnished with a true ring, whilst in the *Pratellæ*, *every species* in every subgenus has a ring more or less manifest.

Some species of the subgenus *Crepidotus* must be removed to the space in the *Hyporhodii*, analogous to *Pleurotus*, as their spores are rosy, and not brown. To this new and natural group I give the name *Claudopus*. Mr. Berkeley's species of *Pleurotus* (?) with *pink spores* belongs to this subgenus. When Mr. Berkeley's book was published, ten years ago, no species of the subgenus *Eccilia* were known to be British; now at least three are on our lists.

III. Dermini, *Brown-spored Agarics* (Plate III.).—In the *Dermini*, the blanks for unrepresented subgenera are more numerous. There are no British species with the hymenophorum free from the

* Since this paper has been in print, I have received from Mr. Charles H. Peck, of Albany, New York (under date March 30, 1870), an interesting note regarding a critical American Agaric. If his description prove correct, the plant he mentions exactly fills the only vacant space amongst the *Leucospori*. He says, in answer to my inquiries, "I have found what I have classed with the *Lepiotæ*, a viscid, cæspitose species, *growing on old stumps close to the ground*, having no trace of veil or annulus, a circumstance in which it does not agree with other species of that subgenus so far as known to me." The *habitat* of this Agaric, leaving out its structural characters, does not agree with any species of *Lepiota*, but is in correspondence with that of *Pluteus*, where the annulus is also absent, and which is probably one of its analogues. The habitats correspond in other analogous subgenera, as in *Lepiota* and *Psalliota*; *Armillaria*, *Pholiota*, and *Stropharia*, etc.

stem; but in *Agaricus (Pholiota) tersus*, Fr., it is so, and the stem is furnished with a fugitive ring, showing a clear analogy between this species and *Lepiota* (Plate I.), *Chamæota* (Plate II.), and *Psalliota* (Plate IV.); neither are any brown-spored Agarics furnished with a volva, unless, indeed, a trace of such a structure is indicated in *Cortinarius* (for *Cortinarius* is certainly allied to *Pholiota* and *Hebeloma*), where many of the species have an adnate volva and arachnoid ring.

Remarks on Fries' new subgenus *Inocybe* will be found under *Hebeloma*. This latter subgenus resembles *Cortinarius* in many respects, even to the lesser groups, into which both are divided, depending on the character of the pileus, whether it is slimy, moist, or squamulose.

The subgenera *Flammula* and *Naucoria* are in a most unsatisfactory condition. They require thorough revision. The species of *Naucoria*, with decurrent gills and depressed pilei (*A. furfuraceus*, P., etc.) I remove to the next position, as analogous in every respect to *Omphalia* and *Eccilia*, and describe under the name *Tubaria*.

IV. Pratellæ, *Purple-spored Agarics* (Plate IV.).—The affinities and characters of all the subgenera are referred to under their respective headings. I have already said that *Pilosace* is not British. As *A. physaloides*, Bull, has decurrent gills and a pileus at length depressed, I remove it to the space corresponding amongst the *Pratellæ* to *Omphalia* and *Eccilia* amongst the white- and pink-spored species; and name the subgenus *Deconica*.

V. Coprinarii, *Black-spored Agarics* (Plate V.).—There is little to be said about these in addition to the observations under the respective subgenera. *Psathyrella* is very close to *Coprinus*, more so than *Panæolus*. In the *Coprinarii* the unrepresented spaces are very numerous. I am unable to offer any suggestion as to filling them, unless by cutting up the genus *Coprinus*, the species of which genus differ exceedingly in many points, especially in the attachment of the gills to the stem. *C. comatus*, Fr., is clearly allied to *Lepiota*; the habit, scaly pileus, moveable ring, change of colour when cut, edible qualities, etc., all point in this direction. The characters of some of the others, as those growing on wood, etc., indicate other affinities; but till Agarics are better known these spaces must remain unoccupied.

2. Analytical Key to the Agaricini.

In using the following key, the first and most important point to be determined in naming an Agaric is to ascertain the colour of the spores. The specimens used for study should always be perfectly fresh and, if possible, young, as in many species the characters, especially of the veil and colour, are evanescent. To beginners the habitat also will be found of considerable importance.* The genera are printed in italics, and the subgenera in Roman type. The numbers prefixed to the subgenera will enable the reader to refer at once to the Plates, where the numbers correspond.

I. Spores white, or very slightly tinted.—*Leucospori.*
  * Plant fleshy, more or less firm, putrescent (neither deliquescent nor coriaceous).
    † Hymenophorum free.
      Pileus bearing warts or patches free from the cuticle . . . . 1. AMANITA.
      Pileus scaly, scales concrete with the cuticle . 2. LEPIOTA.
    † Hymenophorum confluent.
      ‡ Without cartilaginous bark.
        § Stem central.
          || With a ring . . . . 3. ARMILLARIA.
          || Ringless.
            Gills sinuate . . . . 4. TRICHOLOMA.
            Gills decurrent.
              Separating from the hymenophorum 5. *LEPISTA.*
              Not separating from the hymenophorum.
                Edge acute . . . . 5. CLITOCYBE.
                Edge swollen . . . . 11. *CANTHARELLUS.*
            Gills adnate.
              Plants parasitic on other Agarics . 12. *NYCTALIS.*
              Not parasitic.
                Milky . . . . 9. *LACTARIUS.*
                Not milky.
                  Rigid and brittle . . . . . 10. *RUSSULA.*
                  Waxy . . . . 7. *HYGROPHORUS.*
        § Stem lateral or absent . . . . 6. PLEUROTUS.
      ‡ With a cartilaginous bark.
        Gills decurrent . . . . 9. OMPHALIA.
        Gills not decurrent.

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* Being anxious to procure fresh specimens of new and rare species for an illustrated work on the British Hymenomycetes now in hand, I append my address. Each Fungus should be wrapped separately in thin paper to prevent bruising. Under three-quarters of a pound in weight will travel by *sample post* for 3*d*. if no letter is enclosed.

12, *North Grove West, Mildmay Park, London.*

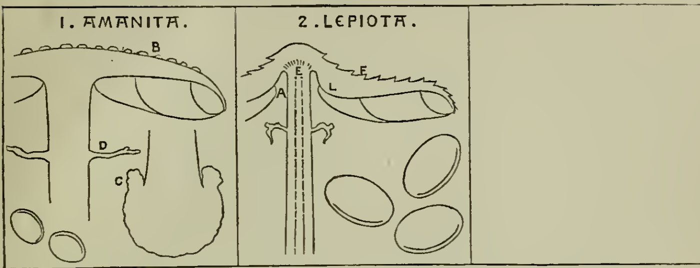
Margin at first involute . . . . 7. COLLYBIA.
Margin at first straight . . . . 8. MYCENA.
* Plant tough, coriaceous, or woody.
† Stem central.
Gills simple . . . . 13. *MARASMIUS.*
Gills branched . . . . 16. *XEROTUS.*
† Stem lateral or wanting.
Gills toothed . . . . 14. *LENTINUS.*
Gills not toothed . . . . 15. *PANUS.*
Gills channelled longitudinally, or crisped . 17. *TROGIA.*
Gills splitting longitudinally . . . . 18. *SCHIZOPHYLLUM.*
Gills anastomosing . . . . 19. *LENZITES.*

II. Spores rosy or salmon-colour.—*Hyporhodii.*
* Without cartilaginous bark.
† Hymenophorum free.
‡ With a volva . . . . 10. VOLVARIA.
‡ Without a volva.
With a ring . . . . 11. CHAMÆOTA.
Ringless . . . . 12. PLUTEUS.
† Hymenophorum confluent.
‡ Stem central.
Gills adnate or sinuate . . . . 13. ENTOLOMA.
Gills decurrent . . . . 14. CLITOPILUS.
‡ Stem lateral or absent . . . . 15. CLAUDOPUS.
* With cartilaginous bark.
Gills decurrent . . . . 18. ECCILIA.
Gills not decurrent.
Gills subdeliquescent . . . . 3. *BOLBITIUS.*
Pileus torn into scales . . . . 16. LEPTONIA.
Pileus papillose, subcampanulate.
Gills membranaceous, persistent . . . . 17. NOLANEA.

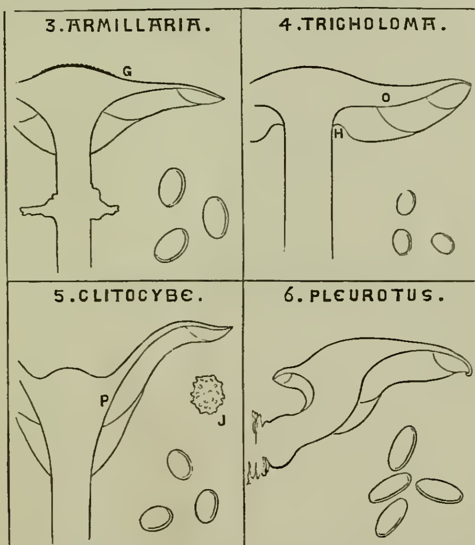
III. Spores brown, sometimes reddish or yellowish-brown.—*Dermini.*
* Without cartilaginous bark.
† Stem central.
‡ With a ring.
Ring continuous . . . . 19. PHOLIOTA.
Ring arachnoid, filamentous or evanescent.
Gills adnate, terrestrial . . . . 4. *CORTINARIUS.*
Gills decurrent or acutely adnate, generally epiphytal . . . . 21. FLAMMULA.
‡ Without a ring.
Gills adhering to the hymenophorum, and sinuate . . . . 20. HEBELOMA.
Gills separating from the hymenophorum, and decurrent . . . . 6. *PAXILLUS.*
† Stem lateral or absent . . . . 22. CREPIDOTUS.

SERIES 1. LEUCOSPORI.—SPORES WHITE.

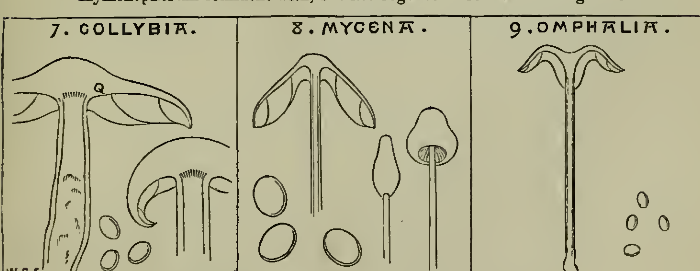
* Hymenophorum distinct from the fleshy Stem.



** Hymenophorum confluent and homogeneous with the fleshy Stem.



*** Hymenophorum confluent with, but heterogeneous from the cartilaginous Stem.

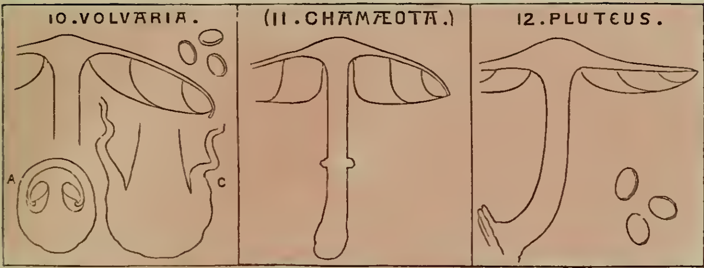


SUBGENERA OF AGARICUS.

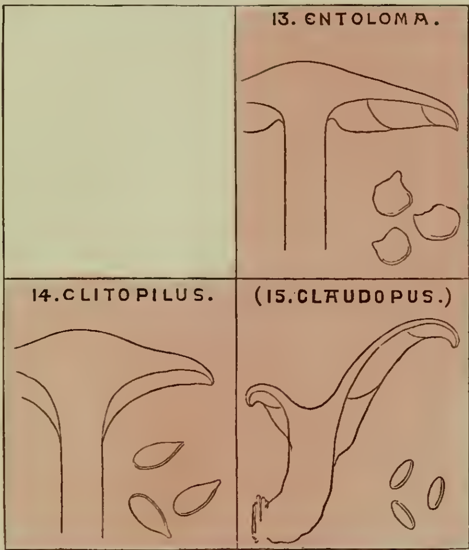
PLATE II.

SERIES 2. HYPORHODII.—SPORES PINK.

* Hymenophorum distinct from the fleshy Stem.



** Hymenophorum confluent and homogeneous with the fleshy Stem.



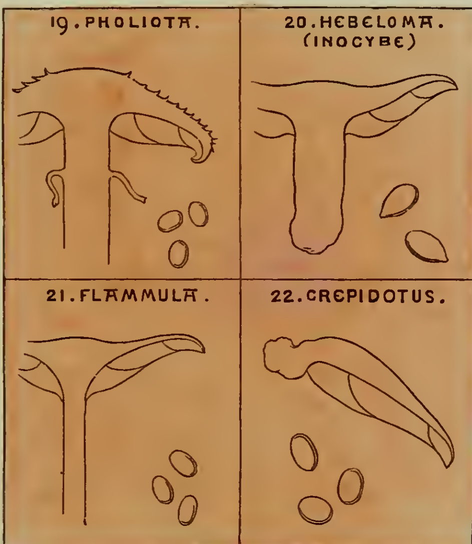
*** Hymenophorum confluent with, but heterogeneous from the cartilaginous Stem.

SUBGENERA OF AGARICUS.

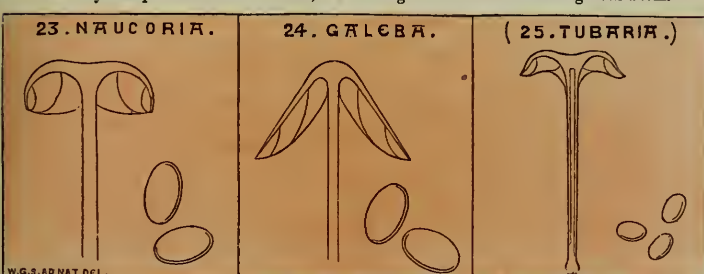
SERIES 3. DERMINI.—SPORES BROWN.

* Hymenophorum distinct from the fleshy Stem.

** Hymenophorum confluent and homogeneous with the fleshy Stem.



*** Hymenophorum confluent with, but heterogeneous from the cartilaginous Stem.

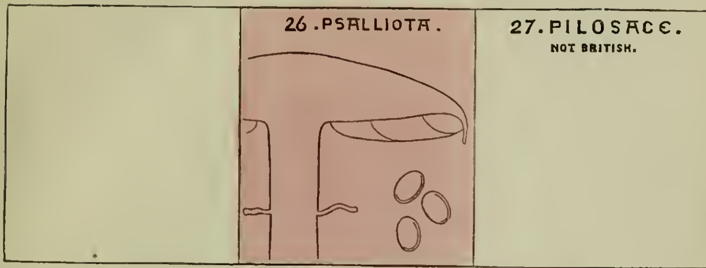


SUBGENERA OF AGARICUS.

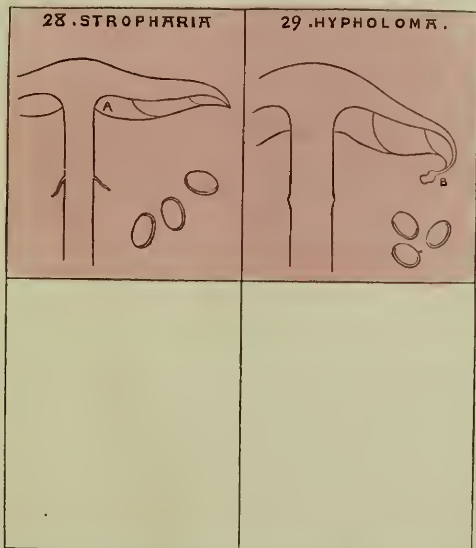
PLATE IV.

SERIES 4. PRATELLÆ.—SPORES PURPLE.

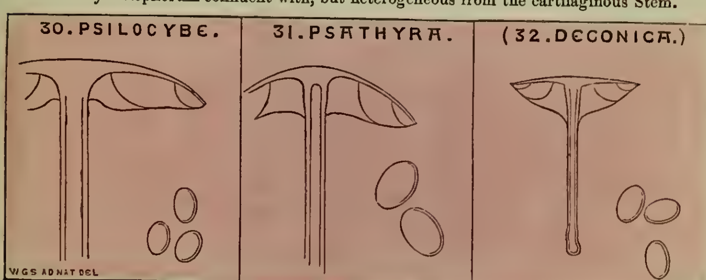
* Hymenophorum distinct from the fleshy Stem.



** Hymenophorum confluent and homogeneous with the fleshy Stem.



*** Hymenophorum confluent with, but heterogeneous from the cartilaginous Stem.

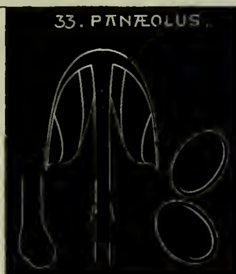


SUBGENERA OF AGARICUS.

SERIES 5. COPRINARII.—SPORES BLACK.

* Hymenophorum distinct from the fleshy Stem.

** Hymenophorum confluent and homogeneous with the fleshy Stem.



*** Hymenophorum confluent with, but heterogeneous from the cartilaginous Stem.

W.G.S. AD.NAT. DEL.

SUBGENERA OF AGARICUS.

* With cartilaginous bark.
Gills decurrent . . . . 25. TUBARIA.
Gills not decurrent.
Margin of pileus at first incurved . . . . . 23. NAUCORIA.
Margin of pileus always straight . . . . . . 24. GALERA.

IV. Spores purple, sometimes brownish-purple, dark purple or dark brown.—*Pratellæ.*
* Without cartilaginous bark.
† Hymenophorum free.
‡ With a ring . . . . 26. PSALLIOTA.
‡ Ringless . . . . 27. PILOSACE.
† Hymenophorum confluent.
Veil normally ring-shaped on the stem . . . . 28. STROPHARIA.
Veil normally adhering to the margin of pileus . . . . 29. HYPHOLOMA.
* With cartilaginous bark.
Gills decurrent . . . . 32. DECONICA.
Gills not decurrent.
Margin of pileus at first incurved . . . . . 30. PSILOCYBE.
Margin of pileus at first straight . . . . . . 31. PSATHYRA.

V. Spores black, or nearly so.—*Coprinarii.*
Gills deliquescent . . . . 2. *COPRINUS.*
Gills not deliquescent.
Decurrent . . . . 8. *GOMPHIDIUS.*
Not decurrent.
Pileus striate, gills not variegated . . . . 34. PSATHYRELLA.
Pileus not striate, gills variegated . . . . 33. PANÆOLUS.

3. CHARACTERS OF THE GENERA AND SUBGENERA OF THE AGARICINI.

ORDER AGARICINI.—Hymenium inferior, spread over easily-divisible gills or plates radiating from a centre or stem, which may be either simple or branched.

Genus I. AGARICUS, Linn. Syst. Nat. (1735).—Spores of various colours; gills membranaceous, persistent, with an acute edge; trama floccose, confluent with the inferior hymenium. Fleshy fungi, putrifying, and not reviving when once dried, hence differing from such genera as are deliquescent, coriaceous, or woody.

Series I. LEUCOSPORI, Fr. Epicr. p. 3.—*Spores white.*

Subgenus 1. AMANITA, Persoon, Syn. Meth. Fung. p. 246 (Plate I. fig. 1).—Veil universal, at first completely enveloping the young plant, distinct and free from the cuticle of the pileus; pileus convex, then expanded, not decidedly fleshy; stem distinct from the hymenophorum,* ringed or ringless, furnished with a volva, free and lax, connate with the base, or friable and nearly obsolete; gills free from the stem. —Hab. On the ground, mostly in woods and uncultivated places.

This subgenus is remarkable for the great development of the veil, which at first entirely envelopes the young plant in a thick clothy wrapper; as the fungus reaches maturity, the veil is naturally ruptured, and part of it remains in scattered and easily removed patches on the pileus (B), and part forms a more or less complete cup or volva at the base (C); when there are no fragments on the pileus, the veil has been ruptured in one place, where the whole mass remains; this is often the case in *Agaricus phalloides*, Fr. Some of the species have the stem furnished with a ring (D), which is part of the veil, whilst three species are ringless (or more properly, *the ring is adherent to the stem*). In some species the veil is thick and greatly developed, whilst in others it is thin and friable, and both volva and patches are evanescent; the higher forms of *Amanita* stand alone; from the stem being furnished with a *volva* and *ring*. Some of the species are edible, others highly poisonous.

Amanita corresponds with the pink-spored *Volvaria*, Plate II. fig. 10. The species figured is *Agaricus (Amanita) muscarius*, L., spores $\cdot00032'' \times \cdot00025''$.

Subgenus 2. Lepiota, Fr. Syst. Myc. vol. i. p. 19 (Plate I. fig. 2). —Veil universal, and concrete with the cuticle of the pileus breaking up in the form of scales (F); pileus never compact, often very thin, the flesh always soft and threadlike, and not only distinct from the stem, but often separated above into a peculiar cup; stem distinct from the hymenophorum,* generally hollow, full of threadlike fibres, rather subcartilaginous than fleshy, different in texture from the flesh of the pileus (hence it is easily removed, leaving a cup or socket at its point of juncture with the pileus E), furnished with an annulus, which is at first continuous with the cuticle of the pileus, often moveable, some-

* Some exceptions may be found to nearly every character amongst Agarics, and this one of a free hymenophorum has two exceptions, one in a variety of *Agaricus (Lepiota) granulosus*, Batsch, where the gills are *adnate* (or even have a decurrent tooth), and the other in an *Amanita* which I have described under the name of *Agaricus adnatus*, where the same condition obtains. The presence of the annulus, too, is not without exception; it is often fugitive, and must then be sought for in young specimens; and it is sometimes absent from the first in *Agaricus (Armillaria) melleus*, Vahl.

times evanescent; volva none; gills free, hence not sinuate or decurrent.—HAB. On the ground, mostly in rich grassy places, and more often in fields than woods.

Lepiota corresponds in structure with *Chamæota*, Plate II. fig. 11, and *Psalliota*, Plate IV. fig. 26; the sections of both subgenera change colour, and they have a common habitat. *Coprinus* is allied to this subgenus. Several species of *Lepiota*, as *A. clypeolarius*, Bull, *A. cepæstipes*, Sow., and *A. cristatus*, Fr., appear in hothouses all the year round. *Lepiota* is readily recognized amongst white-spored Agarics by its *free gills*, annulated stem *without a volva*, and generally scaly pileus. Nearly all are autumnal and edible. The species figured is *Agaricus (Lepiota) procerus*, Scop. Spores ·0006 " × ·00035."

Subgenus 3. ARMILLARIA, Fr. Syst. Myc. vol. i. p. 26 (Plate I. fig. 3).—Veil partial, in infancy attaching the edge of pileus to the upper part of stem, and often forming flocci on the pileus (G); pileus generally fleshy; stem homogeneous and confluent with the hymenophorum, furnished with a ring (sometimes absent in abnormal specimens), below the ring the veil is concrete with the stem, often forming scales upon it similar to the scurfy scales on the pileus; gills broadly touching or running down the stem.—HAB. On the ground or on stumps of trees.

This subgenus corresponds with *Pholiota*, Plate III. fig. 19, and *Stropharia*, Plate IV. fig. 28; it is also allied to *Tricholoma*, *Clitocybe*, and *Collybia*, amongst the white-spored Agarics. Fries subdivides *Armillaria* into groups, depending on their relations to one or other of these subgenera. The species figured is *Agaricus (Armillaria) melleus*, Vahl. Spores ·00035″ × ·00023″.

Subgenus 4. TRICHOLOMA, Fr. Syst. Myc. vol. i. p. 36 (Plate I. fig. 4).—Veil absent, or if present, floccose and adhering to the margin of pileus; in *A. acerbus*, Bull., the margin of pileus extends beyond the gills, exactly as in *A. separatus*, L. (Plate V. fig. 33); pileus generally fleshy; stem homogeneous and confluent with the hymenophorum, central and subfleshy, without either ring or volva, and with no distinct barklike coat; gills sinuate, *i. e.* with a sinus (or small sudden curve) near the stem (H).—HAB. All the species grow on the ground, the larger in hilly woods, and the smaller in pastures.

Tricholoma corresponds with *Entoloma*, Plate II. fig. 13; *Hebeloma*, Plate III. fig. 20; *Hypholoma*, Plate IV. fig. 29; and *Panæolus*, Plate V. fig. 33. Most of the species grow in the autumn, some very late, but a group of which *A. gambosus*, Fr., is the type, is strictly *vernal*, and the species constituting it have long been considered special delicacies; the greater number of the remaining species are also edible, and have a pleasant odour like that of new flour, but a few are rank and suspicious, of which *A. saponaceus*, Fr., is an example. This very large subgenus has been subdivided by Fries in the following manner:—1. Pileus viscid. 2. Pileus flocculose. 3. Pileus rigid. 4. Pileus silky. 5. Pileus spotted or minutely cracked. 6. Pileus spongy. 7. Pileus hygrophanous. In *Hygrophorus*, *Lactarius*, and *Russula*, the general structure is much the same as in *Tricholoma*, but they form well-marked genera. *Hygrophorus* is distinguished by its *waxy* nature; *Lactarius* by its *milky* gills and flesh; and *Russula*, by its rigid brittle gills generally in one series and vesiculose flesh. The species figured is *Agaricus (Tricholoma) terreus*, Schæff. Spores ·0002″ × ·00013″.

Subgenus 5. Clitocybe, Fr. Syst. Myc. vol. i. p. 78 (Plate I. fig. 5).—Pileus, generally fleshy in the disk, obtuse, plane or depressed, hygrophanous or not hygrophanous; stem confluent and homogeneous with the hymenophorum, elastic, with an outer coat, covered with minute fibres; gills acutely adnate, or decurrent. The fibrillose outer coat of *Clitocybe* (and sometimes of *Tricholoma* and *Pleurotus*) must not be confounded with the truly fibrous bark of *Collybia*, *Mycena*, *Omphalia*, and their analogues.—Hab. All are terrestrial.

Clitocybe corresponds with *Clitopilus*, Plate II. fig. 14, and *Flammula*, Plate III. fig. 21. The species are generally small, though some are very large; many possess an agreeable odour, but few only are known to be edible. Most of the species appear late in the autumn or in early winter. In *Cantharellus* the gills are strongly decurrent, but they are reduced to thick veins or folds. The species of *Hygrophori*, with decurrent gills, can be easily separated from *Clitocybe*, by their waxy nature; and *Lepista* is known by the decurrent gills separating from the hymenophorum. The species figured is *Agaricus (Clitocybe) geotrupus*, Bull. Spores ·00028″ × ·0002″, they sometimes have a slight tendency to become echinate; spines are greatly developed in the var. *subinvolutus*, Batsch, a single spore of which is shown at J.

Subgenus 6. Pleurotus, Fr. Epicr. p. 129 (Plate I. fig. 6).—Veil evanescent, or none; pileus fleshy in the larger species, with a smooth margin or ragged from the remains of the veil; substance either compact, spongy, slightly fleshy, or membranaceous; stem mostly lateral (or wanting), when present, confluent and homogeneous with the hymenophorum; gills with a sinus or broadly decurrent tooth.—HAB. Most of the species grow on wood, a few only on the ground.

Pleurotus corresponds with *Claudopus*, Plate II. fig. 15, and *Crepidotus*, Plate III. fig. 22. The species are large, handsome, and polymorphic, but some are small and resupinate; they generally appear late in the year, and return, year after year, to the same habitat more frequently than terrestrial fungi: all are harmless and some edible. All become putrid when old, and never coriaceous or woody; in this they differ from *Lentinus*, *Panus*, *Xerotus*, *Trogia*, *Schizophyllum*, and *Lenzites*. The species figured is *Agaricus (Pleurotus) spongiosus*, Fr. Spores ·0004″ × ·00018″. The elongated shape is characteristic of many species of this subgenus.

Subgenus 7. COLLYBIA, Fr. Epicr. p. 81 (Plate I. fig. 7).—Pileus at first convex, with an involute margin; stem with a cartilaginous bark, of a different substance from the hymenophorum, but confluent with it; gills adnate or slightly attached (not decurrent).—HAB. Most of the species are epiphytal. Usually small and tough, lasting far into the winter; few only are known to be edible, as *A. fusipes*, Bull, *A. esculentus*, Wulf., etc. *Marasmius* is closely allied to *Collybia*.

Collybia corresponds with *Leptonia*, Plate II. fig. 16; *Naucoria*, Plate III. fig. 23; and *Psilocybe*, Plate IV. fig. 30. The species figured is *A. (Collybia) fusipes*, Bull. Spores ·0002″ × ·00013″; the small section shows young plant of *A. (Collybia) maculatus*, A. and S., to show involute margin of pileus.

Subgenus 8. MYCENA, Fr. Syst. Myc. vol. i. p. 140 (Plate I. fig. 8).—Pileus more or less membranaceous, generally striate, with the margin always straight, and at first pressed to the stem (never involute), expanded, campanulate, and generally umbonate (not depressed as in *Omphalia*); stem externally cartilaginous, tubular, not stuffed when young, confluent with the hymenophorum, but heterogeneous from it; gills never decurrent, though some species have a broad sinus near the stem.—HAB. Mostly epiphytal.

Most of the species are small, beautiful, and inodorous, but some which have a strong alkaline odour are probably poisonous; none are known to be edible. They appear after rain in summer and autumn.

Mycena corresponds with *Nolanea*, Plate II. fig. 17; *Galera*, Plate III. fig. 24; *Psathyra*, Plate IV. fig. 31; and *Psathyrella*, Plate V. fig. 34. The species figured is *Agaricus (Mycena) polygrammus*, Bull. Spores ·00035″ × ·00026″. Two forms of a young *A. (Mycena) epipterygius*, Scop., are given on the plate, to show the margin of pileus adpressed to the stem.

Fries, in his 'Monographia Hymenomycetum,' alters the sequence of *Mycena* and *Omphalia* as given in his 'Epicrisis,' and places *Omphalia* first. The arrangement of the 'Epicrisis' seems to me more natural, as *Mycena* is certainly intermediate between *Collybia* and *Omphalia*, the gills being adnate in the former and decurrent in the latter.

Subgenus 9. OMPHALIA, Fr. Epicr. p. 119 (Plate I. fig. 9).—Pileus generally from the first umbilicate, afterwards funnel-shaped, almost always membranaceous or submembranaceous and hygrophanous, margin incurved or straight; stem cartilaginous and tubular, when young often stuffed, confluent with the hymenophorum, but heterogeneous from it; gills generally truly and considerably decurrent.—HAB. Generally epiphytal, and mostly peculiar to hilly regions, preferring a damp, woody situation, and a rainy climate.

Omphalia corresponds with *Eccilia*, Plate II. fig. 18; *Tubaria*, Plate III. fig. 25; and *Deconica*, Plate IV. fig. 32. The species, though small, are many of them beautiful; their properties are not known, and they endure changes of temperature like the hygrophanous species of *Clitocybe*. *Omphalia* is naturally divided into two groups, one, *Collybariæ*, approaching *Collybia* in the involute margin of the pileus, but differing in the deeply decurrent gills and umbilicus, and the other, *Mycenariæ*, pointing to *Mycena* in the straight margin of the pileus, at first adpressed to the stem, but differing in the nature of the gills and pileus. The species included in the last three subgenera might more conveniently be classed in four, thus:—Margin of pileus at first incurved, gills adnate,—*Collybia*; margin of pileus at first incurved, gills decurrent,—*Omphalia (Collybariæ)*; margin of pileus at first straight, gills adnate or sinuate,—*Mycena*; margin of pileus at first straight, gills decurrent,—*Omphalia (Mycenariæ)*. Under this arrangement various analogous species amongst the *Hyporhodii*, *Dermini*, and *Pratellæ*, now so unsatisfactorily placed in such subgenera as *Naucoria*, etc., would fall naturally into proper positions. The species figured is *A. (Omphalia) fibula*, Bull. Spores ·00013″ × ·0008″.

Series II. HYPORHODII, Fr. Epicr. p. 138.—*Spores pink or salmon-colour.*

Subgenus 10. VOLVARIA, Fr. Syst. Myc. vol. i. p. 277 (Plate II. fig. 10).—Spores regular in shape, oval or pip-shaped, pink or salmon-colour; veil universal, forming a perfect volva (A and C), distinct from the cuticle of pileus; stem distinct from the hymenophorum; gills free, rounded behind, at first white, then pink, soft, liquescent.—HAB. Gardens and hot-houses, and in woods and on manured ground, growing on rotten wood and damp ground; one species is parasitic on a white-spored Agaric, *Agaricus nebularis*, Batsch.

The different species of *Volvaria* are very closely allied; some appear in spring and early summer, others later in the year; they are almost all tasteless, and none are known to be edible. *Volvaria* corresponds with *Amanita* (Plate I. fig. 1). Their peculiar habitat, viz. rotten wood, manured ground, etc., and their semiliquescent gills show some affinity with *Coprinus* and *Bolbitius*, but the species of the latter genera have no true volva, and differ in several other respects.

The specimen figured is *Agaricus (Volvaria) volvaceus*, Bull. Spores $\cdot 0002'' \times \cdot 00013''$.

Subgenus 11. CHAMÆOTA, subgen. nov. sp. *Psalliotæ*, Fr. (Plate II. fig. 11).—Spores pale rose; stem distinct from the hymenophorum, furnished with a fugitive ring; gills free.—HAB. On the ground, or on decayed wood.

Corresponds in structure with *Lepiota* (Plate I. fig. 2), and *Psalliota* (Plate IV. fig. 26). The species described under the name of "*A. (Pluteus ?) xanthogrammus*, Ces.," in 'Commentario della Società Crittogamologica Italiana,' n. 2, September, 1861, appears to exactly fill this place. From my examination of *A. (Psalliota) cretaceus*, Fr., and *A. (Psalliota) echinatus*, Fr., I am disposed to place them also here. The species figured is *A. (Chamæota) xanthogrammus*, Ces.

Subgenus 12. PLUTEUS, Fr. Epicr. p. 140 (Plate II. fig. 12).—Spores generally regular in shape, but in some species approaching the irregularity of *Entoloma*, pink or salmon-colour, more or less bright; some approaching in colour the spores of Genus 6, *Paxillus*, others Subgenus 21, *Flammula;* veil none; pileus of the same nature with the stem and gills, smooth, silky, or wrinkled; stem ringless and without a volva, distinct from the hymenophorum; gills free, at first white, then yellowish, at length pink, very crowded, almost cohering, sometimes subliquescent.—HAB. The species almost always grow on, or *close to*, the trunks of trees.

The characters of this subgenus agree with those of *Volvaria*, with the exception of the volva, which is absent in *Pluteus*. Fries appears to think it is doubtful whether the pellicle of the pileus, always fibrous, flocculose, or pruinose, should not be considered as an universal concrete veil, which would give an analogy with *Lepiota*, Plate I. fig. 2. He has recently established a new subgenus of purple-spored Agarics (see Plate IV.) under the name of *Pilosace*, with (excepting the spores) precisely the characters of *Pluteus*. *Pluteus* and this new subgenus *Pilosace* are undoubtedly allied, but, strangely enough, they have no known representatives amongst either the white- or brown-spored groups. The species of *Pluteus* appear in spring, early summer, or late in the autumn. They are tasteless, and none edible. The species figured is *Agaricus (Pluteus) cervinus*, Schæff. Spores ·00023″ × ·00018″.

Subgenus 13. ENTOLOMA, Fr. Epicr. p. 143 (Plate II. fig. 13).—Spores extremely irregular in shape, salmon colour, pink, or more or less approaching bright red or brown; veil, as in *Tricholoma* and *Hebeloma*, "potential rather than definite;" pileus, with a margin at first incurved, never at first umbilicate, fleshy or thin according to the species, viscid, smooth, hygrophanous, dry, silky, or flocculose; stem fleshy-fibrous, sometimes almost waxy, continuous with the hymenophorum, and homogeneous with it; gills sinuated, as in *Tricholoma*, etc., almost free, or more or less adnate, sometimes parting from the stem.—HAB. All are terrestrial.

Allied to *Tricholoma*, Plate I. fig. 4, but, with few exceptions, the species of *Entoloma* are much thinner and often brittle. Many possess the odour of new flour, but none are edible, and some highly poisonous. They appear in summer after heavy rains. Besides corresponding with *Tricholoma*, *Entoloma* agrees in structure with *Hebeloma*, Plate III. fig. 20, and *Hypholoma*, Plate IV. fig. 29. The species figured is *Agaricus (Entoloma) sinuatus*, Fr. (*A. fertilis* of Berkeley's 'Outlines'). Average size of spores ·00035″ × ·00025″.

Subgenus 14. CLITOPILUS, Fr. Epicr. p. 148 (Plate II. fig. 14).—Spores salmon colour, in some species very pale, almost white, pip-shaped, somewhat irregular spheres or altogether irregular as in *Entoloma*, fig. 13; pileus viscid, smooth or pruinose, dull white, cinereous or brownish, generally fleshy; stem fleshy or fibrous, confluent with the hymenophorum and homogeneous with it; gills decurrent, never sinuated.—HAB. All are terrestrial.

With the exception of the gills, most of the characters correspond with *Entoloma*. The odour of the species is more or less mealy; some, however, are oily, some tasteless, others edible. *Clitopilus* is closely allied to *Clitocybe*, Plate I. fig. 5, and differs from *Entoloma* precisely as *Clitocybe* differs from *Tricholoma*. *Clitopilus* agrees more or less with *Flammula*, Plate III. fig. 21. The species figured is *Agaricus (Clitopilus) prunulus*, Pers. Spores ·00045″ × ·0002″.

Subgenus 15. Claudopus, subgen. nov. sp. *Pleuroti* and *Crepidoti*, Fr. (Plate II. fig. 15).—Spores pink, or pale lilac; stem lateral or none, when present confluent and homogeneous with the hymenophorum; gills sinuate or decurrent.—Hab. on wood or the ground.

Claudopus corresponds with *Pleurotus*, Plate I. fig. 6, and *Crepidotus*, Plate III. fig. 22, only differing in the colour of the spores. Mr. Berkeley's fine species, *Agaricus (Pleurotus) euosmus*, *A. (Crepidotus) byssisedus*, P., and other species fall naturally into this subgenus. The spores of *A. prunulus*, Pers., are often quite as pale in colour as those of *A. euosmus*, B., and those of *A. popinalis*, Fr., are hardly to be distinguished from white. The species figured is *A. (Claudopus) euosmus*, B. Spores ·0003″ × ·00013″.

Subgenus 16. Leptonia, Fr. Syst. Myc. vol. i. p. 201 (Plate II. fig. 16).—Spores salmon-colour, irregular in shape; pileus less campanulate than *Nolanea*, and never truly fleshy, cuticle always torn into scales, disk umbilicate, and often darker than margin, which is at first incurved; stem rigid, with a cartilaginous bark, often dark blue, confluent with the hymenophorum, but heterogeneous from it; gills not decurrent, but often with a small tooth or sinus, separating from the stem, variable in colour, at first dirty white, yellowish, greenish, grey, or blue.—Hab. Dry hills, and sometimes marshy places, in July and August.

Most of the species grow in clusters, are small, and of an elegant colour; most common in rainy seasons. Structurally the same as *Collybia*, Plate I. fig. 7; *Naucoria*, Plate III. fig. 23; and *Psilocybe*, Plate IV. fig. 30; and bears the same relationship to *Clitopilus* as *Collybia* to *Clitocybe*. The species figured is *Agaricus (Leptonia) incanus*, Fr. Average size of spores ·00034″. The small sketch, showing incurved margin of pileus, is *A. (Leptonia) chalybæus*, P.

Subgenus 17. Nolanea, Fr. Syst. Myc. vol. i. p. 204 (Plate II. fig. 17).—Spores salmon-colour; pileus submembranaceous (as in

Leptonia and *Eccilia*), subcampanulate, and papillose, not umbilicate, at first straight and pressed to the stem, not incurved as in *Leptonia;* stem cartilaginous, fistulose, sometimes stuffed,confluent with, buthetero geneous from the hymenophorum ; gills not decurrent.—HAB. Generally terrestrial, growing on grassy hills, and in wet places inwoods.

The species are thin, slender, inodorous, and brittle (but some very tenacious), growing in summer and autumn. *Nolanea* corresponds with *Mycena*, Plate I. fig. 8; *Galera*, Plate III. fig. 24; *Psathyra*, Plate IV. fig. 31; and *Psathyrella*, Plate V. fig. 34. Fries, in his 'Monographia,' has not reversed the sequence of *Nolanea* and *Eccilia* to make them accord with *Omphalia* and *Mycena* amongst the *Leucospori*. *Leptonia*, *Nolanea*, and *Eccilia* are very nearly allied by many characters. The species figured is *Agaricus (Nolanea) pascuus*, P. Average size of spores ·0003″.

Subgenus 18. ECCILIA, Fr. Syst. Myc. vol. i. p. 207 (Plate II. fig. 18).—Spores salmon-colour; pileus generally umbilicate, disk homogeneous, margin at first incurved, as in *Leptonia;* stem hollow, confluent with, but heterogeneous from the hymenophorum; gills truly decurrent.

Corresponds with *Omphalia*, Plate I. fig. 9; *Tubaria*, Plate III. fig. 25, and *Deconica*, Plate IV. fig. 32. The species figured is *Agaricus (Eccilia) Parkensis*, Fr., for specimens of which I am indebted to Mr. C. E. Broome. Average size of spores ·00027″.

Series III. DERMINI, Fr. Epicr. p. 160.—*Spores various shades of reddish-brown, brown, red, or yellowish-brown.*

Subgenus 19. PHOLIOTA, Fr. Syst. Myc. vol. i. p. 240 (Plate III. fig. 19).—Spores sepia-brown, bright yellowish-brown, or light red; stem confluent and homogeneous with the hymenophorum, furnished with a ring, persistent, friable, or fugacious.—HAB. All the British species grow on stumps except five, which grow on the ground principally in damp, mossy places.

A few species are said to be edible, but they cannot be recommended. *Pholiota* is analogous to *Armillaria*, Plate I. fig. 3, and *Stropharia*, Plate IV. fig. 28. There is some danger of confusing *Pholiotæ* with *Cortinarii*, but attention must be paid to the spidery veil and the *rust-of-iron* tint of the spores in the latter, and the habitat of the former. The species figured is *Agaricus (Pholiota) squarrosus*, Müll. Spores ·00022″ × ·00017″.

Subgenus 20. HEBELOMA, Fr. Syst. Myc. vol. i. p. 249; with which I include *Inocybe*, Fr. Monogr. Hymen. Suec. vol. i. p. 334 (Plate III. fig. 20).—Spores for the most part clay-coloured, or in *Inocybe* ferrugineo-fuscous; veil of a different texture from the pellicle of the pileus, or in *Inocybe* homogeneous with the fibres of the pileus; pileus fleshy, pelliculose, damp, subviscous, or (in *Inocybe*) fibrous; stem confluent and homogeneous with the hymenophorum, fleshy-fibrous, ringless; gills sinuato-adnate.—HAB. All terrestrial.

All the species are gregarious, and many so similar in appearance as to be with difficulty distinguished from each other. Some are scentless, several smell like rotten pears, and many have a disgusting odour and are poisonous; none are esculent. Fries, in his 'Monographia Hymenomycetum Sueciæ,' has introduced a new subgenus after *Hebeloma*, which he names *Inocybe*, distinguished by the pileus being *silky-fibrous*, and having a few other unimportant characters; but I do not see how such a subgenus can stand, unless, indeed, a similar corresponding subgenus be founded after *Tricholoma*, *Entoloma*, and *Hypholoma*, for all these subgenera have numerous species exactly corresponding with the silky pileus, etc. of *Inocybe*. I therefore prefer to keep to his old views as expressed in the 'Epicrisis,' and keep *Inocybe* as a section of *Hebeloma*. *Hebeloma* corresponds with *Tricholoma*, Plate I. fig. 4, *Entoloma*, Plate II. fig. 13, *Hypholoma*, Plate IV. fig. 29, and *Panæolus*, Plate V. fig. 33. The species figured is *Agaricus (Hebeloma) fastibilis*, Fr. A very common species, closely allied to *A. crustulinoformis*, Bull. Spores ·0004″ × ·0003″.

Subgenus 21. FLAMMULA, Fr. Syst. Myc. vol. i. p. 250 (Plate III. fig. 21).—Spores in most species purely ferrugineous, occasionally approaching yellow ochre, always bright in colour; veil filamentous, often obsolete; pileus fleshy, and, as the subgenus is at present constituted, very variable. It may be,—1, covered with an inseparable and fibrillose cuticle; 2, covered with a more or less viscid and *separable* cuticle; 3, moist, and with *no separable* cuticle; 4, neither pelliculose nor viscid, and broken up more or less into scales or fibrils; stem fleshy, fibrous, confluent, and homogeneous with the hymenophorum; gills adnate, acutely adnate, or decurrent.—HAB. On the ground or on wood.

Fries says the natural affinity of *Flammula* is with *Pholiota*, Plate III. fig. 19, but I consider all true *Flammulæ* should correspond with *Clitocybe,* Plate I. fig. 5, and *Clitopilus,* Plate II. fig. 14. I suspect some of the species of *Flammula* that approach *Pholiota* in structure might with propriety be removed to that subgenus, and *Flammula* proper be restricted to species with more or less decurrent gills. Most of the species are tasteless or bitter, and none edible. They appear in late autumn or early winter. Some species of *Paxillus* may be mistaken for *Flammulæ,* but attention must be paid to the gills separating from the hymenophorum and other characters in *Paxillus.* The species figured is *Agaricus (Flammula) sapineus,* Fr. Spores ·00028″ × ·0002″.

Subgenus 22. Crepidotus, Fr. Syst. Myc. vol. i. p. 272 (Plate III. fig. 22).—Spores dark or yellowish-brown ; veil none ; pileus excentric, dimidiate, or resupinate ; flesh soft ; stem lateral, or wanting, when present, confluent with and homogeneous with the hymenophorum. —Hab. Most of the species grow on wood, a few on moss.

The species are very irregular and variable. They mostly appear late in the autumn, and none are known to be edible. *Crepidotus* corresponds with *Pleurotus,* Plate I. fig. 6, and *Claudopus,* Plate II. fig. 15. As at present constituted, the species of this subgenus produce spores very variable in colour; some, being truly pink, find a fitting place amongst the *Hyporhodii ;* other species having spores so intensely dark, that I suspect they will ultimately have to be removed to the *Pratellæ.* The species figured is *Agaricus (Crepidotus) mollis,* Schæff. Spores ·00025″ × ·00022″.

Subgenus 23. Naucoria, Fr. Syst. Myc. vol. i. p. 260 (Plate III. fig. 23).—Spores various shades of brown, dull or bright; veil absent, or attached to the edge of the pileus in young plants in the form of minute flakes; pileus convex and at first incurved, smooth, flocculent or squamulose; stem cartilaginous, confluent with, but heterogeneous from the hymenophorum.—Hab. Terrestrial or epiphytal.

No subgenus includes so many dissimilar species as this. In size, structure, the nature of the veil, and the colour of the spores, they differ exceedingly. *Naucoria* corresponds with *Collybia,* Plate I. fig. 7 ; *Leptonia,* Plate II. fig. 16 ; and *Psilocybe,* Plate IV. fig. 30. The species figured is *Agaricus (Naucoria) semiorbicularis,* Bull. Spores ·0005″ × ·00032″.

Subgenus 24. Galera, Fr. Syst. Myc. vol. i. p. 264 (Plate III. fig. 24).—Spores ochraceo-ferruginous ; veil often wanting, when present fibrous and fugacious; pileus more or less campanulate, margin straight, at first adpressed to the stem; stem cartilaginous, fistulose, confluent with but heterogeneous from the hymenophorum; gills adnate, or with a decurrent tooth exactly as in *Mycena*, Plate I. fig. 8. *Galera* also corresponds with *Nolanea*, Plate II. fig. 17; *Psathyra*, Plate IV. fig. 31; and *Psathyrella*, Plate V. fig. 34. The most typical species is perhaps *Agaricus sphagnorum*, Pers., with broad gills and decided sinus, but from its rarity I prefer to figure the common *A. tener*, Schæff.—Hab. The greater number of species are terrestrial.

The species are not numerous, and most are slender and brittle, appearing in the autumn. The species figured is *Agaricus (Galera) tener*, Schæff. Spores ·00054″ × ·0003″.

Subgenus 25. Tubaria, subgen. nov. sp. *Naucoriæ*, Fr. (Plate III. fig. 25).—Pileus generally depressed, at first with an incurved margin; stem cartilaginous, hollow, confluent with but heterogeneous from the hymenophorum; gills decurrent.

As in *Eccilia*, there are very few known representatives of this position, either British or foreign, and the note appended to *Omphalia* applies equally to *Eccilia*, *Tubaria*, and *Deconica*. As at present constituted, some species of *Omphalia* are never depressed, but have a pileus more or less hemispherical or even obscurely umbonate from the first; the same applies to *Deconica*. The analogous species of *Tubaria* falling to this place are given in the list.

The species figured as a type is *A. (Tubaria) furfuraceus*, P.; it is strictly analogous, both in structure and habit, with *Omphalia*, Plate I. fig. 9; *Eccilia*, Plate II. fig. 18; and *Deconica*, Plate IV. fig. 32. Spores ·0003″ × ·00016″.

Series IV. Pratellæ, Fr. Epicr. p. 212.—*Spores various shades of brownish-purple, dark purple, or intense brown.*

Subgenus 26. Psalliota, Fr. Epicr. p. 212 (Plate IV. fig. 26).—Spores dark brownish-purple, dark brown, reddish-purple, or pale slate; veil universal, concrete with the cuticle of the pileus, and fixed to the stem, forming a ring; pileus fleshy; stem distinct from the hymenophorum, furnished with a ring; gills free, and rounded behind, at first white, then pink, afterwards intense purple-brown.—Hab. All are terrestrial, mostly growing in rich pastures and on manured ground.

Most of the species appear in the autumn, and several are valued for their esculent properties. *Psalliota* corresponds with *Lepiota*, Plate I. fig. 2, and *Chamæota*, Plate II. fig. 11. The species figured is *A. (Psalliota) campestris*, L. Spores ·00032″ × ·0002″.

Subgenus 27. Pilosace, Fr. (Plate IV. fig. 27).—Agrees in structure with *Pluteus*, Plate II. fig. 12, and has the hymenophorum distinct from the ringless stem; there are no British representatives.

Subgenus 28. Stropharia, Fr. Monog. Hymen. vol. i. p. 409 (Plate IV. p. 28).—Spores intense bright purple-brown, brown or slate-colour; veil, if present, universal, superficial, scaly, or viscid; stem confluent and homogeneous with the hymenophorum; gills adnate, not free and rounded behind, as in the last (*Psalliota*).—Hab. Terrestrial or epiphytal.

Formerly included under *Psalliota*, but now separated by Fries on account of the different habit, different attachment of the gills, and other characters. The species, of which none are edible, have various habits, but most are epiphytal, as are their analogues. *Stropharia* corresponds with *Armillaria*, Plate I. fig. 3, and *Pholiota*, Plate III. fig. 19. The species figured is *Agaricus (Stropharia) æruginosus*, Curt. Spores ·00028″ × ·0002″.

Subgenus 29. Hypholoma, Fr. Syst. Mycol. vol. i. p. 287 (Plate IV. fig. 29).—Spores brownish-purple, sometimes intense purple, almost black; veil woven into a spidery fugacious web which adheres to the margin of the pileus, b. (not properly ring-shaped round the stem); pileus with an inseparable pellicle; stem confluent and homogeneous with the hymenophorum.—Hab. Generally stumps.

Most of the species are gregarious and not edible. *Hypholoma* corresponds with *Tricholoma*, Plate I. fig. 4; *Entoloma*, Plate II. fig. 13; *Hebeloma*, Plate III. fig. 20; and *Panæolus*, Plate V. fig. 33. The species figured is *Agaricus (Hypholoma) lacrymabundus*, Fr. Spores ·0003″ × ·0002″.

Subgenus 30. Psilocybe, Fr. Syst. Mycol. vol. i. p. 289 (Plate IV. fig. 30).—Spores purple, purple-brown, or slate-colour; veil obsolete (or in a few species fugacious, when present not forming a distinct ring); pileus glabrous, at first incurved; stem cartilaginous, ringless, confluent with but heterogeneous from the hymenophorum. —Hab. All grow on the ground.

The species are almost all gregarious, cæspitose, inodorous, with fugitive colouring, and not edible. Fries divides the subgenus into two groups, the *tenacious* and the *fragile*. *Psilocybe* corresponds with *Collybia*, Plate I. fig. 7; *Leptonia*, Plate II. fig. 16, and *Naucoria*, Plate III. fig. 23. The species figured is *Agaricus (Psilocybe) spadiceus*, Schæff. Spores ·0003″ × ·0002″.

Subgenus 31. PSATHYRA, Fr. Epic. p. 231 (Plate IV. fig. 31).—Spores dark purple-brown, approaching slate-colour; veil universal, fibrous, or absent, not forming a ring; pileus submembranaccous, conical or campanulate, margin at first straight and adpressed to the stem; stem fistulose, ringless, cartilaginous, fragile, confluent with but heterogeneous from the hymenophorum.—HAB. On the ground or rotten wood.

All are slender and hygrophanous, with fugitive colouring, and closely allied to the *fragile* species of the last subgenus. *Psathyra* agrees with *Mycena* (Plate I. fig. 8), *Nolanea* (Plate II. fig. 17), *Galera* (Plate III. fig. 24), *Psathyrella* (Plate V. fig. 34). The species figured is *Agaricus (Psathyra) corrugis*, Pers. Spores ·0005″ × ·0003″.

Subgenus 32. DECONICA, subgen. nov. sp. *Psilocybis* Fr. (Plate IV. fig. 32).—Pileus thin, plane, at first incurved; veil obsolete or adhering to the margin of pileus, not forming a ring; stem cartilaginous, hollow, confluent with but heterogeneous from the hymenophorum; gills decurrent.

The typical species figured is *A. (Deconica) physaloides*, Bull.; it is analogous with *Omphalia* (Plate I. fig. 9), *Eccilia* (Plate II. fig. 18), and *Tubaria* (Plate III. fig. 25). Spores ·00034″ × ·0002″.

Series V. COPRINARII, Fr. Epicr. p. 234.—*Spores black.*

Subgenus 33. PANÆOLUS, Fr. Epicr. 234 (Plate V. fig. 33).—Veil, when present, interwoven, sometimes wanting; spores black, oval, plain, lemon-shaped, or echinulate; pileus somewhat fleshy, viscid when moist, shining when dry, not becoming purple or brown, *never striate*, the *margin exceeding the variegated gills*.—HAB. Almost all grow on dung, often near towns, in summer and autumn.

This and the following subgenus differ from all the preceding in their *black spores*, and occupy an intermediate position between *Agaricus* and *Coprinus*, agreeing with the latter in the colour of the spores, but joined more properly to the genuine Agarics by the *gills not* *deliquescing*. Although the veil may be entirely absent in some species, yet they are so allied that they cannot be well separated. It is, however, difficult to place this subgenus in proper connection with the foregoing, but I consider its nearest ally to be *Hypholoma*, Plate IV. fig. 29, and the subgenera in corresponding places on the preceding plates, principally on account of the nature of the veil; and the margin of pileus exceeding the gills as in *Agaricus (Tricholoma) acerbus*, Bull; some of the species are, however, allied to *Psalliota*, Plate IV. fig. 26, and its congeners on the previous plates, with which it agrees well in several characters, such as the habitat, manured ground, etc.; this subgenus (like several others) would probably bear subdivision, which is not at present advisable. *A. phalænarum*, Fr., is said to be edible. The species figured is *Agaricus (Panæolus) separatus*, L. Spores ·0006″ × ·0004″.

Subgenus 34. PSATHYRELLA, Fr. Epicr. 237 (Plate V. fig. 34).—Spores black, oval, plain or echinulate; veil inconspicuous, not interwoven, generally absent; pileus membranaceous, striate, margin straight, adpressed to the stem, *not exceeding the gills;* stem confluent with but heterogeneous from the hymenophorum; gills adnate or free.

The species are all very slender, and the only other subgenus with black spores (*Panæolus*, fig. 33) is readily distinguished by the characters of the pileus; it agrees in every point with *Psathyra*, Plate IV. fig. 31, except the colour of the gills being never brown or purple, and the spores black. It also agrees, more or less, in structure with *Mycena*, Plate I. fig. 8; *Nolanea*, Plate II. fig. 17; *Galera*, Plate III. fig. 24, and also appears to be allied to Genus III. BOLBITIUS, which, however, is at once distinguished by its coloured spores. The species figured is *Agaricus (Psathyrella) disseminatus*, P. Spores ·0003″ × ·0002″.

Genus II. COPRINUS, Fr. Epicr. p. 241.—Spores black; margin of pileus straight, at first adpressed to the stem; stem confluent with or distinct from the hymenophorum; gills at first coherent, and sprinkled with a micaceous scurf, soon deliquescing into a black fluid, trama none.—HAB. Fat and rank places, often on dung, but sometimes on decaying wood.

Readily distinguished by its deliquescent habit.

Genus III. BOLBITIUS, Fr. Epicr. p. 253.—Spores coloured; pileus yellow, becoming moist; stem hollow, confluent with the hymenophorum; gills becoming moist, but not deliquescent, at length losing their colour and becoming powdery.—HAB. Dung or rank earth near towns.

A very natural but small genus, intermediate between *Agaricus* and *Coprinus* on one side, and *Coprinus* and *Cortinarius* on the other; it resembles *Coprinus* in its mode of growth, and ephemeral existence; the species have no known use.

Genus IV. CORTINARIUS, Fr. Epicr. p. 255.—Spores rusty ochre, resembling in colour peroxide of iron; veil universal, of a different texture from the pileus, and consisting of arachnoid threads: a similar veil is found in *Agaricus*, but it is there either entire, partial, or continuous with the cuticle of pileus; stem confluent with the hymenophorum; gills adnate, membranaceous, persistent, cinnamon-coloured and powdery, trama floccose.—HAB. Woods and fields.

This genus, the most natural amongst the *Agaricini*, is readily distinguished by its peculiar habit, but is badly defined by artificial characters; the species are variable in size and changeable in colour: when old, they present a different appearance from their young state, and are very different when dry to when fresh. It has been divided as follows:—

Subgenus 1. PHLEGMACIUM, Fr. Epicr. p. 256.—Pileus with a continuous pellicle, viscid when moist; veil (and consequently the stem) dry, not glutinous.

Subgenus 2. MYXACIUM, Fr. Epicr. p. 273.—Pileus glutinous; veil (and consequently the stem) viscid, polished when dry.

Subgenus 3. INOLOMA, Fr. Epicr. p. 278.—Pileus fleshy, subcompact, perfectly dry, with no viscid pellicle, silky with scales, or innate fibres, not hygrophanous; stem bulbous. The species handsome and easily distinguished.

Subgenus 4. DERMOCYBE, Fr. Epicr. p. 283.—Pileus thin, but fleshy, with no viscid pellicle, entirely dry, not hygrophanous, at first clothed with a superficial down, then glabrous; stem thin, somewhat stuffed, equal or attenuated, not bulbous; gills changeable in colour. The species are polymorphous and defined with difficulty, in consequence of the changeable colour of the gills.

Subgenus 5. TELAMONIA, Fr. Epicr. p. 291.—Pileus moist, hygrophanous, at first glabrous or sprinkled with the arachnoid superficial fibres of the veil, thin or moderately compact in the disk; stem peronate, and annulate from an inferior veil. Mostly large and handsome.

Subgenus 6. HYDROCYBE, Fr. Epicr. p. 303.—Pileus generally thin, glabrous, hygrophanous, but not viscid, cuticle rigid, not fibro-lacerate; stem rigid, subcartilaginous without, never annulated or scaly.

Genus V. LEPISTA, gen. nov.; *Lepista*, *Paxilli* sect. Fr. Epicr. p. 315.—Spores (as well as the whole plant) dirty white; pileus fleshy, with an involute margin gradually increasing indefinitely; stem always central, continuous with the horny hymenophorum; gills fragile, persistent, decurrent, membranaceous, entire, with a sharp edge, supported by the horny hymenophorum.—HAB. All the species are terrestrial.

I have followed Fries' later views in transferring some *Tricholomata* to this position, on account of the absence of a true trama, etc.; as *Tricholoma* is analogous to *Entoloma*, I have sought for the corresponding absence of a trama in the latter subgenus, and from my own notes I find it partially absent in *Agaricus (Entoloma) placenta*, Batsch., and *A. (Entoloma) nidorosus*, Fr. Certain species also occur in the analogous subgenera *Hebeloma* and *Hypholoma* with the trama partially absent, as *A. (Hebeloma) lanuginosus*, Fr., and *A. (Hypholoma) lacrymabundus*, Fr.; the character also pertains to some species of *Coprinarii*.

The value of the trama as a character has not been properly studied, and in future its presence or absence should be invariably given in all descriptions of Agarics. Nylander and Hoffman affirm its presence in *Paxillus involutus*, Fr.; and there certainly appears to be a floccose trama present in *P. pannoides*, Fr., a species which may be as readily mistaken for a *Cantharellus* as *P. porosus*, Berk., for a *Boletus*.

Genus VI. PAXILLUS, Fr. Gen. Hymen. p. 8, *ex parte*.—Spores (as well as the whole plant) ferrugineous; pileus fleshy, seldom entire, generally more or less dimidiate, entirely lateral or sessile, with an involute margin, and gradually increasing indefinitely; stem continuous with the hymenophorum; gills tough, soft, persistent, decurrent, anastomosing behind, branching, or forming spurious pores as in *Boletus*, with a sharp edge, separating from the fleshy hymenophorum, owing to the absence of a trama.—HAB. Generally on trunks of trees, sawdust, etc., but some are terrestrial.

Genus VII. HYGROPHORUS, Fr. Epicr. p. 320.—Spores white; veil, when present, universal; stem confluent with the hymenophorum; gills sharp-edged, trama similar in substance to that of the pileus.—HAB. On the ground, mostly late in the autumn, some in the summer.

Most of the species are handsome and easily recognized. From

Agaricus this genus differs in the trama, the substance of which is similar to that of the pileus; from *Lactarius* and *Russula* by the trama not being vesicular, but subfloccose, and intermixed with granules; and from its nearest ally, *Cantharellus*, by the sharp-edged gills. This genus is also distinguished by the hymenophorum being changed into a waxy mass, and at length detached from the trama. Many species are sapid and edible. In *Cortinarius*, *Paxillus*, and *Gomphidius*, the spores are coloured, and the gills lose their colour.

Genus VIII. GOMPHIDIUS, Fr. Epicr. p. 319.—Spores large, fusiform (often spuriously uniseptate, according to Fries), greenish-grey, becoming black; veil universal, glutinous, terminated on the stem by a floccose annulus; pileus continuous with the stem, fleshy, convex, at length top-shaped; stem confluent with the hymenophorum; gills strongly decurrent, somewhat branched, soft, mucilaginous, often spreading in a continuous membrane.—HAB. Growing on the ground, chiefly in Pine woods, solitary, subpersistent.

Principally distinguished by the mucilaginous nature of the gills. Nearly allied to *Cortinarius*, but at once distinguished by the shape and colour of the spores, and from all the dark-purple and black-spored Agarics by the compact pileus, etc. Properties unknown; none edible.

Genus IX. LACTARIUS, Fr. Epicr. p. 333.—Spores white or very pale yellow, generally echinate; veil none, but in some species the margin of pileus is bearded or pubescent; pileus fleshy, of a floccose or vesiculose (not fibrous) texture, at length depressed in the disk, margin at first involute; stem fleshy, not corticate, often hollow when old, confluent with the hymenophorum; gills milky, in nearly all the species at first white, often changing to sulphur-colour, red, or violet on exposure to the air, subdecurrent, unequal, with an acute edge, trama subvesiculose.—HAB. All grow on the ground.

This genus is nearly allied to *Russula*, but easily distinguished by the milky gills. They vary greatly in taste, being mild, aromatic, bitter, or acrid and burning. *Lactarius* includes delicate and excessively poisonous species.

Genus X. RUSSULA, Fr. Gen. Hymen.—Spores white or very pale yellow, generally echinate; veil entirely obsolete; pileus fleshy, convex, then expanded, and at length depressed; stem stout, polished, not corticate, generally spongy within, confluent with the hymenophorum; gills nearly equal, milkless, rigid, brittle, with an acute edge, sometimes dropping water, trama vesiculose.—HAB. On the ground in late summer and autumn.

This genus agrees with *Lactarius* in size and some other characters, but differs in the absence of milk, and the gills being nearly equal, or in one series. Odour none, or unpleasant. A few species are edible, but most are noxious.

Genus XI. CANTHARELLUS, Adans. Fung. Ord. V.—Spores white; veil entirely absent; pileus fleshy or membranaceous; stem confluent with the hymenophorum, or absent; gills decurrent, folded, more or less thick and swollen, branched, trama floccose.—HAB. Growing on the ground, or on rotten wood, moss, etc.

This genus holds an intermediate place between *Agaricus* and *Craterellus*, some species being close to one, some to the other genus. Some are said to be poisonous, others edible.

Genus XII. NYCTALIS, Fr. Gen. Hymen.—Veil universal, floccoso-pruinose; pileus in the British species fleshy and pruinose or pulverulent; stem confluent with the hymenophorum; gills broad, simple, unequal, thick, fleshy, juicy, or subgelatinous, edge obtuse, not descending on the stem.—HAB. The British species are small and parasitic on other Agarics.

This genus consists of fleshy putrescent Fungi. Some species grow in subterranean passages.

Genus XIII. MARASMIUS, Fr. Gen. Hymen.—Spores white, subelliptical; pileus tough, fleshy, or membranaceous; stem central (in one species absent), confluent with the hymenophorum, but of a different texture; gills thick, tough, and coriaceous, confluent at the base, generally distant, and rarely decurrent, with a sharp entire edge. —HAB. Epiphytal, growing on decayed leaves or the roots of grasses, etc.

This genus, closely alllied to *Collybia*, commences the series of Agarics that are not putrescent, but which dry up with drought, and come to life with rain. This biological character is of great importance; for by its neglect species nearly related have been widely separated. The texture of all the species is tough, distinguishing them from the preceding. The species are mostly small and slender. Some are edible, others have an offensive, fœtid, or alliaceous smell.

Genus XIV. LENTINUS, Fr. El. p. 45.—Spores white; pileus fleshy, coriaceous, tough, hard, and dry; stem hard and often obsolete, when present continuous and the same with the hymenophorum; gills tough, simple, unequal, thin, edge acute, generally toothed; trama none.—HAB. On stumps, rarely on the ground.

A natural but very polymorphic genus, distinguished from *Pleurotus* by its tough and fleshy substance.

Genus XV. PANUS, Fr. Epicr. p. 396.—Spores white; pileus unequal-sided or lateral, tough, fleshy, at length coriaceous, but not woody, drying up, but reviving with moisture; stem the same with the hymenophorum; gills thinner than in the last genus, tough, at length coriaceous, unequal, with an entire acute edge; trama floccose.—HAB. On stumps.

All the species are tough (at first softer), never woody; drying up in decay.

Genus XVI. XEROTUS, Fr. El. p. 48.—Spores white; pileus membranaceous; stem confluent with the hymenophorum, which descends into and forms a trama; gills dichotomous, foldlike, coriaceous, adnato-decurrent, with an obtuse entire edge; in the single British species branched and very distant.—HAB. The British plant grows in peat-mosses.

This genus, which is chiefly tropical, resembles a coriaceo-membranaceous *Cantharellus*, with narrow gills.

Genus XVII. TROGIA, Fr. Gen. Hymen.—Spores white; pileus submembranaceous, soft, tenacious, flaccid, but very dry, flexible, reviving with moisture; gills venose, fold-like, forked, edge channelled longitudinally or crisped; texture fibrous.—HAB. On wood, chiefly from the East Indies.

In the only British species (*Cantharellus crispus* of the 'Epicrisis') the edge of the gills is obtuse (not channelled), but it has the habit, form, and texture of *Tragia*, and is referred to this genus without doubt, by Fries.

Genus XVIII. SCHIZOPHYLLUM, Fr. Observ. Mycol. vol. i. p. 103.—Spores white; pileus not fleshy, dry, sessile; gills coriaceous, branched, split longitudinally at the edge, with the two divisions revolute or spreading, joined to the pileus by a tomentose pellicle.—HAB. Rotten wood.

An easily recognized but very aberrant genus of the *Agaricini*.

Genus XIX. LENZITES, Fr. Gen. Hymen.—Spores white; pileus coriaceous, dimidiate, sessile; gills coriaceous, firm, unequal, simple or branched, and anastomosing behind, edge obtuse or acute, trama floccose; often spuriously porous.—HAB. On stumps, rails, etc.

Chiefly tropical, where the species become woody, with us they are only coriaceous. Allied to *Trametes* and *Dædalea*, amongst the *Polyporei.*

A LIST OF THE BRITISH AGARICINI.

[The species printed in italics are new to this country since the publication of Berkeley's 'Outlines.']

Genus I. AGARICUS, *L.*

Series I. LEUCOSPORI, *Fr.*

Subgenus 1. *Amanita*, *P.*

* Vaginatæ.

1. A. (Am.) vaginatus, *Bull.*
2. A. (Am.) Ceciliæ, *B. and Br.*
3. *A. (Am.) adnatus*, W. Sm.

** Phalloidæ.

4. A. (Am.) vernus, *Bull.*
5. A. (Am.) phalloides, *Fr.*
6. A. (Am.) mappa, *Batsch.*

*** Muscariæ.

7. A. (Am.) muscarius, *L.*
8. A. (Am.) excelsus, *Fr.*
9. A. (Am.) pantherinus, *DC.*
10. A. (Am.) strobiliformis, *Fr.*

**** Validæ.

11. A. (Am.) rubescens, *P.*
12. *A. (Am.) spissus*, Fr.
13. A. (Am.) asper, *Fr.*

***** Denudati.

14. A. (Am.) lenticularis, *Lasch.*
15. A. (Am.) megalodactylus, *B.*

Subgenus 2. *Lepiota*, Fr.

* Proceri.

16. A. (Lep.) procerus, *Scop.*
17. A. (Lep.) rachodes, *Vitt.*
18. A. (Lep.) excoriatus, *Schæff.*
19. A. (Lep.) gracilentus, *Kromb.*
20. A. (Lep.) mastoideus, *Fr.*

** Clypeolarii.

21. A. (Lep.) acutesquamosus, *Wm.*
22. *A. (Lep.) hispidus*, Lasch.
23. A. (Lep.) Badhami, *B. and Br.*
24. *A. (Lep.) meleagris*, Sow.
25. A. (Lep.) clypeolarius, *Bull.*
26. A. (Lep.) cristatus, *Fr.*

*** Annulosi.

27. A. (Lep.) Vittadini, *Moretti.*
28. *A. (Lep.) holosericeus*, Fr.
29. A. (Lep.) naucinus, *Fr.*
30. A. (Lep.) cepæstipes, *Sow.*

**** Mesomorphi.

31. A. (Lep.) granulosus, *Batsch.*
32. A. (Lep.) polystictus, *Berk.*

***** Illiniti.

33. A. (Lep.) gliodermus, *Fr.*

Subgenus 3. *Armillaria*, Fr.

* Tricholomoideæ.

34. A. (Ar.) constrictus, *Fr.*
35. A. (Ar.) ramentaceus, *Bull.*

** Clitocyboideæ.

36. A. (Ar.) melleus, *Vahl.*

*** Collybioideæ.

37. A. (Ar.) mucidus, *Fr.*

Subgenus 4. *Tricholoma*, Fr.

* Tricholomata Limacina.

38. A. (Tr.) equestris, *L.*
39. A. (Tr.) sejunctus, *Sowb.*
40. A. (Tr.) portentosus, *Fr.*
41. A. (Tr.) fucatus, *Fr.*
42. A. (Tr.) spermaticus, *Fr.*
43. A. (Tr.) nictitans, *Fr.*
44. A. (Tr.) fulvellus, *Fr.*
45. A. (Tr.) flavo-brunneus, *Fr.*
46. *A. (Tr.) ustalis.*
47. A. (Tr.) albo-brunneus, *Fr.*
48. *A. (Tr.) pessundatus.*

49. A. (Tr.) frumentaceus, *Bull.*
** Tricholomata flocculosa.
50. A. (Tr.) rutilaus, *Schæff.*
51. A. (Tr.) scalpturatus, *Fr.*
52. A. (Tr.) luridus, *Schæff.*
53. A. (Tr.) Columbetta, *Fr.*
54. A. (Tr.) imbricatus, *Fr.*
55. A. (Tr.) vaccinus, *P.*
56. A. (Tr.) crassifolius, *B.*
57. A. (Tr.) murinaceus, *Bull.*
58. A. (Tr.) terreus, *Schæff.*
*** Tricholomata rigida.
59. A. (Tr.) saponaceus, *Fr.*
60. A. (Tr.) cartilagineus, *Bull.*
61. A. (Tr.) cuneifolius, *Fr.*
62. *A. (Tr.) colossus*, Fr.
**** Tricholomata sericella.
63. A. (Tr.) sulfureus, *Bull.*
64. A. (Tr.) bufonius, *P.*
65. A. (Tr.) lascivus, *Fr.*
66. A. (Tr.) inamœnus, *Fr.*
67. A. (Tr.) ionides, *Bull.*
68. *A. (Tr.) pæonius*, Fr.
69. A. (Tr.) carneus, *Bull.*
***** Tricholomata guttata.
70. A. (Tr.) gambosus, *Fr.*
71. A. (Tr.) albellus, *DC.*
72. A. (Tr.) monstrosus, *Sowb.*
73. A. (Tr.) immundus, *Berk.*
74. *A. (Tr.) tigrinus*, Fr.
****** Tricholomata spongiosa.
75. A. (Tr.) albus, *Fr.*
76. A. (Tr.) acerbus, *Bull.*
******* Tricholomata hygrophana.
77. A. (Tr.) grammopodius, *Bull.*
78. A. (Tr.) melaleucus, *P.*
79. *A. (Tr.) brevipes*, Kl.
80. A. (Tr.) humilis, *Fr.*
81. A. (Tr.) subpulverulentus, *P.*

Subgenus 5. *Clitocybe*, Fr.

* Disciformes.
82. A. (Cl.) nebularis, *Batsch.*
83. A. (Cl.) inornatus, *Sowb.*
84. A. (Cl.) vernicosus, *Fr.*
85. A. (Cl.) odorus, *Bull.*
86. A. (Cl.) cerussatus, *Fr.*
87. A. (Cl.) phyllophilus, *Fr.*
88. *A. (Cl.) pithyophilus*, Secr.
89. A. (Cl.) candicans, *Pers.*
90. A. (Cl.) dealbatus, *Fr.*
91. A. (Cl.) gallinaceus, *Scop.*
** Difformes.
92. A. (Cl.) elixus, *Sow.*
93. A. (Cl.) fumosus, *P.*, var. polius, *Fr.*
94. A. (Cl.) opacus, *With.*
*** Infundibuliformes.
95. A. (Cl.) giganteus, *Sow.*
96. *A. (Cl.) maximus*, Fr.
97. A. (Cl.) infundibuliformis, *Schæff*, var. membranaceus.
98. *A. (Cl.) trullæformis*, Fr.
99. A. (Cl.) geotropus, *Bull.*
100. A. (Cl.) inversus, *Scop.*
101. A. (Cl.) flaccidus, *Sow.*
**** Cyathiformes.
102. A. (Cl.) cyathiformis, *Bull.*
103. A. (Cl.) brumalis, *Fr.*
***** Orbiformes.
104. A. (Cl.) metachrous, *Fr.*
105. A. (Cl.) fragrans, *Sow.*
****** Versiformes.
106. A. (Cl.) difformis, *P.*
107. A. (Cl.) ectypus, *Fr.*
108. A. (Cl.) bellus, *P.*
109. A. (Cl.) laccatus, *Scop.*

Subgenus 6. *Pleurotus*, Fr.

* Lepiotaria.
110. A. (Pl.) corticatus, *Fr.*
111. A. (Pl.) dryinus, *P.*
112. *A. (Pl.) spongiosus*, Lasch.
** Concharia.
113. A. (Pl.) ulmarius, *Bull.*
114. A. (Pl.) subpalmatus, *Fr.*
115. *A. (Pl.) craspedius*, Fr.
116. A. (Pl.) fimbriatus, *Bolt.*
117. *A. (Pl.) lignatilis*, Pers.
118. *A. (Pl.) circinatus*, Fr.
119. A. (Pl.) ostreatus, *Jacq.*
120. A. (Pl.) salignus, *Hoffm.*
*** Holopleurus.
121. A. (Pl.) petaloides, *Bull.*

122. A. (Pl.) serotinus, *Schrad.*
123. A. (Pl.) mitis, *P.*
124. A. (Pl.) tremulus, *Schæff.*
125. A. (Pl.) acerosus, *Fr.*

**** Omphalaria.

126. A. (Pl.) porrigens, *P.*
127. A. (Pl.) septicus, *Fr.*
128. A. (Pl.) mastrucatus, *Fr.*
129. A. (Pl.) atrocæruleus, *Fr.*
130. A. (Pl.) algidus, *Fr.*
131. A. (Pl.) Leightoni, *Berk.*
132. A. (Pl.) cyphellæformis, *Berk.*
133. A. (Pl.) Hobsoni, *Berk.*
134. A. (Pl.) applicatus, *Batsch.*
135. A. (Pl.) striatulus, *Fr.*
136. A. (Pl.) hypnophilus, *P.*
137. A. (Pl.) chioneus, *P.*

Subgenus 7. *Collybia*, Fr.

* Striæpedes.

138. A. (Col.) radicatus, *Relh.*
139. A. (Col.) longipes, *Bull.*
140. A. (Col.) platyphyllus *Fr.*
141. A. (Col.) fusipes, *Bull.*
    Var. *œdematopus*, Fr.
142. A. (Col.) maculatus, *A. and S.*
143. A. (Col.) butyraceus, *Bull.*

** Vestipedes.

144. A. (Col.) velutipes, *Curt.*
145. A. (Col.) stipitarius, *Fr.*
146. A. (Col.) confluens, *P.*
147. A. (Col.) ingratus, *Schum.*
148. *A. (Col.) vertirugis*, Cooke.
149. A. (Col.) conigenus, *P.*
150. A. (Col.) cirrhatus, *Schum.*
151. A. (Col.) tuberosus, *Bull.*
152. A. (Col.) racemosus, *P.*

*** Lævipedes.

153. A. (Col.) acervatus, *Fr.*
154. *A. (Col.) collinus*, Scop.
155. A. (Col.) xanthopus, *Fr.*
156. A. (Col.) dryophilus, *Bull.*
157. A. (Col.) exsculptus, *Fr.*
158. A. (Col.) tenacellus, *P.*
159. A. (Col.) esculentus, *Wul.*
160. A. (Col.) clavus, *L.*
161. A. (Col.) ocellatus, *Fr.*

**** Tephrophanæ.

162. *A. (Col.) inolens*, Fr.
163. *A. (Col.) plexipes*, Fr.
164. A. (Col.) laceratus, *Lasch.*
165. *A. (Col.) protractus*, Fr.
166. A. (Col.) atratus, *Fr.*

Subgenus 8. *Mycena*, Fr.

* Calodontes.

167. A. (My.) pelianthinus, *Fr.*
168. A. (My.) balaninus, *Berk.*
169. *A. (My.) marginellus*, Fr.
170. A. (My.) elegans, *P.*
171. A. (My.) rubro-marginatus, Fr.
172. *A. (My.) coccinellus*, P.
173. A. (My.) rosellus, *Fr.*

** Adonideæ.

174. A. (My.) purus, *P.*
175. A. (My.) Iris, *Berk.*
176. A. (My.) Adonis, *Bull.*
177. A. (My.) luteo-albus, *Bolt.*
178. *A. (My.) flavo-albus*, Fr.
179. A. (My.) lacteus, *Pers.*

*** Rigidipedes.

180. A. (My.) proliferus, *Sowb.*
181. *A. (My.) rugosus*, Fr.
182. A. (My.) galericulatus, *Schæff.*
183. A. (My.) polygrammus, *Bull.*
184. A. (My.) parabolicus, *A. and S.*

**** Fragilipedes.

185. A. (My.) atro-albus, *Bull.*
186. A. (My.) dissiliens, *Fr.*
187. A. (My.) alcalinus, *Fr.*
188. A. (My.) pauperculus, *Berk.*
189. *A. (My.) vitreus*, Fr.
190. A. (My.) tenuis, *Bolt.*
191. A. (My.) tenellus, *Fr.*

***** Filopedes.

192. A. (My.) filopes, *Bull.*
193. A. (My.) vitilis, *Fr.*
194. A. (My.) speireus, *Fr.*
195. A. (My.) acicula, *Schæff.*

****** Lactipedes.

196. *A. (My.) hæmatopus*, P.
197. A. (My.) cruentus, *Fr.*
198. A. (My.) sanguinolentus, *A. and S.*

199. A. (My.) crocatus, *Schrad.*
200. A. (My.) chelidonius, *Fr.*
201. A. (My.) galopus, *Schrad.*
******* Glutinipedes.
202. A. (My.) epipterygius, *Scop.*
203. A. (My.) pelliculosus, *Fr.*
204. A. (My.) vulgaris, *P.*
205. *A. (My.) citrinellus*, P.
206. A. (My.) roridus, *Fr.*
******** Basipedes.
207. A. (My.) stylobates, *P.*
208. A. (My.) tenerrimus, *B.*
209. A. (My.) pterigenus, *Fr.*
210. *A. (My.) sacchariferus*, B. and Br. (*ms.*).
********* Insititiæ.
211. A. (My.) corticola, *Schum.*
212. *A. (My.) hiemalis*, Osb.
213. A. (My.) setosus, *Sow.*
214. A. (My.) capillaris, *Schum.*
215. A. (My.) juncicola, *Fr.*

Subgenus 9. *Omphalia*, Fr.

* Collybariæ.
† Hydrogrammæ. (No British representatives.)
†† Pyxidatæ.
216. A. (Omp.) pyxidatus, *Bull.*
217. A. (Omp.) hepaticus, *Batsch.*
218. *A. (Omp.) affricatus*, Fr.
219. A. (Omp.) sphagnicola, *Berk.*
220. A. (Omp.) oniscus, *Fr.*
††† Umbelliferæ.
221. A. (Omp.) muralis, *Sow.*
222. A. (Omp.) umbelliferus, *L.*
223. A. (Omp.) rufulus, *B. and Br.*
224. A. (Omp.) stellatus, *Sow.*
** Mycenaria.
225. A. (Omp.) campanella, *Schæff.*
226. A. (Omp.) camptophyllus, *Berk.*
227. A. (Omp.) griseus, *Fr.*
228. A. (Omp.) helvelloides, *Bull.*
229. A. (Omp.) fibula, *Bull.*
230. *A. (Omp.) gracillimus*, Weinm.
231. A. (Omp.) belliæ, *Johnst.*
232. A. (Omp.) integrellus, *P.*

Series II. Hyporhodii, *Fr.*

Subgenus 10. *Volvaria*, Fr.

233. A. (Vol.) bombycinus, *Schæff.*
234. A. (Vol.) volvaceus, *Bull.*
235. A. (Vol.) Loveianus, *Berk.*
236. A. (Vol.) Taylori, *Berk.*
237. A. (Vol.) parvulus, Weinm.
238. A. (Vol.) speciosus, *Fr.*
239. *A. (Vol.) gloiocephalus*, Fr.

Subgenus 11. *Chamæota*, subgen. nov.

240. A. (Ch.) cretaceus, *Fr.*
241. A. (Ch.) echinatus, *Roth.*

Subgenus 12. *Pluteus*, Fr.

242. A. (Pl.) cervinus, *Schæff.*
243. A. (Pl.) umbrosus, *P.*
244. A. (Pl.) petasatus, *Fr.*
245. A. (Pl.) leoninus, *Schæff.*
246. A. (Pl.) chrysophæus, *Schæff.*
247. A. (Pl.) nanus, *P.*
248. A. (Pl.) phlebophorus, *Dittm.*

Subgenus 13. *Entoloma*, Fr.

* Genuini.
249. *A. (En.) sinuatus*, Fr.
250. A. (En.) prunuloides, *Fr.*
251. A. (En.) placenta, *Batsch.*
252. A. (En.) elodes, *Fr.*
253. A. (En.) repandus, *Bull.*
254. A. (En.) Bloxami, *B. and Br.*
255. A. (En.) ardosiacus, *Bull.*
256. *A. (En.) ameides*, B. and Br.
** Leptonidei.
257. *A. (En.) jubatus*, Fr.
258. *A. (En.) griseo-cyaneus*, Fr.
259. A. (En.) sericellus, *Fr.*
*** Nolanides.
260. A. (En.) clypeatus, *L.*
261. A. (En.) rhodopolius, *Fr.*
262. *A. (En.) majalis*, Fr.
263. A. (En.) costatus, *Fr.*
264. A. (En.) sericeus, *Bull.*
265. A. (En.) nidorosus, *Fr.*

Subgenus 14. *Clitopilus*, Fr.

266. A. (Cl.) prunulus, *Pers.;* var. orcella.
267. *A. (Cl.) cretatus*, Berk.

268. A. (Cl.) mundulus, *Lasch.*
269. *A. (Cl.) popinalis*, Fr.
270. *A. (Cl.) undatus*, Fr.
271. *A. (Cl.) cancrinus*, Fr.

Subgenus 15. *Claudopus*, subgen. nov.

272. A. (Cl.) euosmus, *Berk.*
273. A. (Cl.) variabilis, *P.*
274. A. (Cl.) depluens, *Batsch.*
275. A. (Cl.) byssisedus, *P.*

Subgenus 16. *Leptonia*, Fr.

276. A. (Lep.) lampropus, *Fr.*
277. A. (Lep.) serrulatus, *P.*
278. A. (Lep.) euchrous, *P.*
279. A. (Lep.) chalybæus, *P.*
280. A. (Lep.) incanus, *Fr.*
281. A. (Lep.) asperellus, *Fr.*

Subgenus 17. *Nolanea*, Fr.

282. A. (Nol.) pascuus, *P.*
283. A. (Nol.) rufo-carneus, *Berk.*
284. A. (Nol.) rubidus, *Berk.*
285. A. (Nol.) Babingtonii, *Blox.*
286. *A. (Nol.) junceus*, Fr.

Subgenus 18. *Eccilia*, Fr.

287. *A. (Ec.) carneo-griseus, Berk.*
288. *A. (Ec.) Parkensis*, Fr.
289. *A. (Ec.) rhodocylix*, Lasch.

Series III. Dermini, *Fr.*

Subgenus 19. *Pholiota*, Fr.

* Humigenei.

290. A. (Ph.) durus, *Bolt.*
291. A. (Ph.) præcox, *P.*

** Truncigenei.

292. A. (Ph.) radicosus, *Bull.*
293. A. (Ph.) pudicus, *Bull.*
294. *A. (Ph.) leochromus*, Cooke.
295. *A. (Ph.) capistratus*, Cooke.
296. *A. (Ph.) heteroclitus*, Fr.
297. A. (Ph.) comosus, *Fr.*
298. A. (Ph.) squarrosus, *Müll.;* var. Mülleri.
299. A. (Ph.) aurivellus, *Batsch.*
300. A. (Ph.) adiposus, *Fr.*
301. *A. (Ph.) spectabilis*, Fr.
302. A. (Ph.) flammans, *Fr.*
303. *A. (Ph.) Junonius*, Fr.
304. A. (Ph.) mutabilis, *Schæff.*
305. A. (Ph.) marginatus, *Batsch.*

*** Muscigenei.

306. A. (Ph.) pumilis, *Fr.*
307. A. (Ph.) Mycenoides, *Fr.*
308. A. (Ph.) Leveillianus, *D. and M.*

Subgenus 20. *Hebeloma*, Fr.

309. *A. (Heb.) punctatus*, Fr.
310. *A. (Heb.) versipellis*, Fr.
311. *A. (Heb.) mesophæus*, Pers.
312. *A. (Heb.) sinapizans*, Fr.
313. A. (Heb.) crustuliniformis, *Bull.*
314. *A. (Heb.) fastibilis*, Fr.
315. A. (Heb.) testaceus, *Batsch.*
316. A. (Heb.) longicaudus, *P.*

(*Inocybe.*)

* Squarrosi.

317. A. (Heb.) relicinus, *Fr.*
318. A. (Heb.) flocculentus, *Poll.*
319. A. (Heb.) plumosus, *Bolt.*

** Laceri.

320. A. (Heb.) pyriodorus, *Pers.*
321. A. (Heb.) scaber, *Müll.*
322. A. (Heb.) lacerus, *Fr.*
323. A. (Heb.) obscurus, *P.*
324. A. (Heb.) flocculosus, *Berk.*
325. A. (Heb.) Hookeri, *Klotzsch.*
326. *A. (Heb.) deglubens*, Fr.

*** Rimosi.

327. A. (Heb.) fibrosus, *Sow.*
328. A. (Heb.) fastigiatus, *Schæff.*
329. A. (Heb.) Curreyi, *Berk.*
330. *A. (Heb.) euthelus*, B. and Br.
331. A. (Heb.) rimosus, *Bull.*
332. A. (Heb.) auricomus, *Batsch.*
333. A. (Heb.) trechisporus, *Berk.*
334. *A. (Heb.) hiulcus*, Fr.
335. A. (Heb.) lucifugus, *Fr.*
336. A. (Heb.) sindonius, *Fr.*
337. A. (Heb.) geophyllus, *Sowb.*
338. *A. (Heb.) vatricosus*, Fr.

Subgenus 21. *Flammula*, Fr.

* Heterogenei.

339. A. (Fl.) helomorphus, *Secr.*
340. A. (Fl.) scambus, *Fr.*

341. *A. (Fl.) floccifer*, Berk.
** Lubrici.
342. A. (Fl.) lentus, *Pers.*
343. *A. (Fl.) gummosus*, Lasch.
344. *A. (Fl.) spumosus*, Fr.
345. *A. (Fl.) carbonarius*, Fr.
*** Udi.
346. A. (Fl.) flavidus, *Schæff.*
347. A. (Fl.) inopus, *Fr.*
**** Sapinei.
348. A. (Fl.) hybridus, *Swartz.*
349. *A. (Fl.) decipiens*, W. Sm.
350. *A. (Fl.) sapineus*, Fr.
351. *A. (Fl.) picreus*, Fr.
352. *A. (Fl.) filiceus*, Cooke.
Subgenus 22. *Crepidotus*, Fr.
353. A. (Cr.) alveolus, *Lasch.*
354. A. (Cr.) mollis, *Schæff.*
355. A. (Cr.) haustellaris, *Fr.*
356. A. (Cr.) rubi, *Berk.*
357. A. (Cr.) chimonophilus, *B. and Br.*
358. *A. (Cr.) pezizoides*, Nees.
Subgenus 23. *Naucoria*, Fr.
* Gymnoti.
359. A. (Nau.) cucumis, *Pers.*
360. A. (Nau.) centunculus, *Fr.*
361. A. (Nau.) horizontalis, *Bull.*
362. A. (Nau.) melinoides, *Fr.*
363. A. (Nau.) nuceus, *Bolt.*
364. *A. (Nau.) sideroides*, Bull.
** Phæoti.
365. A. (Nau.) vervacti, *Fr.*
366. A. (Nau.) pediades, *Fr.*
367. A. (Nau.) semiorbicularis, *Bull.*
368. *A. (Nau.) sobrius*, Fr.
*** Lepidoti.
369. *A. (Nau.) escharoides*, Fr.
370. *A. (Nau.) conspersus*, Pers.
371. A. (Nau.) erinaceus, *Fr.*
372. A. (Nau.) siparius, *Fr.*
373. *A. (Nau.) carpophilus*, Fr.
Subgenus 24. *Galera*, Fr.
* Pluteotropi.
374. A. (Ga.) reticulatus, *P.*
375. *A. (Ga.) aleuriatus*, Fr.
376. *A. (Ga.) pilipes*, Sow.
** Polytropi.
377. A. (Ga.) ovalis, *Fr.*
*** Teneri.
378. A. (Ga.) lateritius, *Batt.*
379. A. (Ga.) tener, *Schæff.*
380. *A. (Ga.) antipus*, Fr.
381. A. (Ga.) confertus, *Bolt.*
382. A. (Ga.) sparteus, *Fr.*
**** Hypnophilæ.
383. A. (Ga.) embolus, *Fr.*
384. A. (Ga.) hypnorum, *Batsch.*
385. *A. (Ga.) sphagnorum*, Pers.
***** Eriodermei.
386. A. (Ga.) mycenopsis, *Fr.*
387. *A. (Ga.) paludosus*, Fr.
Subgenus 25. *Tubaria*, subgen. nov.
388. A. (Tu.) inquilinus, *Fr.*
389. A. (Tu.) furfuraceus, *P.*
390. A. (Tu.) autochthonus, *B. and Br.*
Series IV. PRATELLÆ, *Fr.*
Subgenus 26. *Psalliota*, Fr.
391. *A. (Ps.) elvensis*, Berk.
392. A. (Ps.) arvensis, *Schæff.*; var. angustus.
393. A. (Ps.) campestris.
Var. pratensis, *Vitt.*
villaticus, *Brond.*
silvicola, *Vitt.*
The Cultivated form. { hortensis. elongatus. Buchanani.
vaporarius, *Otto.*
rufescens.
394. A. (Ps.) silvaticus, *Schæff.*
395. A. (Ps.) versicolor, *With.*
Subgenus 27. *Pilosace*, Fr. (unrepresented).
Subgenus 28. *Stropharia*, Fr.
* Viscipellis.
396. A. (Str.) æruginosus, *Curt.*
397. A. (Str.) albocyaneus, *Desm.*
398. *A. (Str.) obturatus*, Lasch.
399. A. (Str.) melaspermus, *Bull.*
400. A. (Str.) squamosus, *Fr.*

401. A. (Str.) stercorarius, *Fr.*
402. A. (Str.) semiglobatus, *Batsch.*
403. A. (Str.) Jerdoni, *Berk.*

Subgenus 29. *Hypholoma*, Fr.

* Fasciculares.

404. A. (Hyp.) sublateritius, *Fr.*
405. *A. (Hyp.) capnoides*, Fr.
406. *A. (Hyp.) epixanthus*, Fr.
407. A. (Hyp.) fascicularis, *Huds.*
408. A. (Hyp.) dispersus, *Fr.*

** Velutini.

409. A. (Hyp.) lacrymabundus, *Bull.*
410. A. (Hyp.) velutinus, *P.*; var. leiocephalus.

*** Appendiculati.

411. A. (Hyp.) Candollianus, *Fr.*
412. A. (Hyp.) lanaripes, *Cooke.*
413. A. (Hyp.) appendiculatus, *Bull.*
414. *A. (Hyp.) egenulus*, Berk.
415. *A. (Hyp.) hydrophilus*, Bull.

Subgenus 30. *Psilocybe*, Fr.

* Tenaces.

416. A. (Psi.) semilanceatus, *Fr.*

** Fragiles.

417. A. (Psi.) spadiceus, *Schæff.*
418. A. (Psi.) cernuus, *Müll.*
419. *A. (Psi.) clivensis*, Berk.
420. A. (Psi.) Fœnisecii, *P.*
421. *A. (Psi.) comptulus*, Berk. and Br.
422. A. (Psi.) areolatus, *Klotzsch.*

Subgenus 31. *Psathyra*, Fr.

423. A. (Psa.) conopilus, *P.*
424. *A. (Psa.) mastiger*, B. and Br.
425. A. (Psa.) corrugis, *P.*; *b.* gracilis, *Fr.*
426. A. (Psa.) bifrons, *Berk.*
427. A. (Psa.) spadiceo-griseus, *Schæff.*
428. *A. (Psa.) obtusatus*, Fr.
429. A. (Psa.) fibrillosus, *P.*
430. *A. (Psa.) pennatus*, Fr.
431. *A. (Psa.) utricæcola*, B. and Br.
432. A. (Psa.) gossypinus, *Fr.*
433. *A. (Psa.) semivestitus*, B. and Br.
434. *A. (Psa.) Gordoni*, Berk.

Subgenus 32. *Deconica*, subgen. nov.

435. A. (Dec.) coprophilus, *Bull.*
436. A. (Dec.) bullaceus, *Bull.*
437. A. (Dec.) physaloides, *Bull.*

Series V. Coprinarii, *Fr.*

Subgenus 33. *Panæolus*, Fr.

438. A. (Pan.) separatus, *L.*
439. *A. (Pan.) leucophanes*, Berk. and Br.
440. A. (Pan.) fimiputris, *Bull.*
441. A. (Pan.) phalænarum, *Fr.*
442. A. (Pan.) retirugis, *Batsch.*
443. A. (Pan.) campanulatus, *L.*
444. A. (Pan.) papilionaceus, *Bull.*
445. A. *(Pan.) cinctulus*, Bolt.
446. *A. (Pan.) subbalteatus*, Berk. and Br.
447. A. (Pan.) fimicola, *Fr.*

Subgenus 34. *Psathyrella*, Fr.

448. A. (Psa.) gracilis, *Fr.*
449. A. (Psa.) hiascens, *Fr.*
450. A. (Psa.) aratus, *Berk.*
451. *A. (Psa.) pronus*, Fr.
452. A. (Psa.) atomatus, *Fr.*
453. A. (Psa.) disseminatus, *P.*

Genus II. COPRINUS, *Fr.*

* Pelliculosi.

454. C. comatus, *Fr.*
455. *C. ovatus*, Fr.
456. C. sterquilinus, *Fr.*
457. C. atramentarius, *Fr.*
458. C. fuscescens, *Fr.*
459. C. picaceus, *Fr.*
460. C. aphthosus, *Fr.*
461. *C. similis*, B. and Br.
462. *C. flocculosus*, DC.
463. C. extinctorius, *Fr.*
464. C. fimetarius, *L.*
465. C. tomentosus, *Fr.*
466. C. niveus, *Fr.*
467. C. micaceus, *Fr.*
468. *C. aratus*, Berk. and Br.
469. C. radians, *Fr.*

470. C. deliquescens, *Fr.*
** Veliformes.
471. C. Hendersonii, *Fr.*
472. C. macrocephalus, *Berk.*
473. C. lagopus, *Fr.*
474. C. nychthemerus, *Fr.*
475. C. radiatus, *Fr.*
476. C. domesticus, *Fr.*
477. C. ephemerus, *Fr.*
478. C. plicatilis, *Fr.*
479. C. Spragueii, *B. and C.*
480. C. hemerobius, *Fr.*
481. *C. filiformis*, Berk. and Br.

Genus III. BOLBITIUS, *Fr.*
482. B. Boltonii, *Fr.*
483. B. fragilis, *Fr.*
484. B. titubans, *Fr.*
485. B. tener, *B.*
486. *B. apicalis*, W. Sm.

Genus IV. CORTINARIUS, *Fr.*
Subgenus 1. *Phlegmacium*, Fr.
487. C. (Phl.) caperatus, *Fr.*
488. C. (Phl.) varius, *Fr.*
489. C. (Phl.) cyanipes, *Fr.*
490. *C. (Phl.) russus*, Fr.
491. C. (Phl.) anfractus, *Fr.*
492. C. (Phl.) multiformis, *Fr.*
493. C. (Phl.) glaucopus, *Fr.*
494. C. (Phl.) callochrous, *Fr.*
495. C. (Phl.) cærulescens, *Fr.*
496. C. (Phl.) purpurascens, *Fr.*
497. *C. (Phl.) dibaphus*, Fr.
498. C. (Phl.) turbinatus, *Fr.*
499. *C. (Phl.) fulgens*, Fr.
500. C. (Phl.) prasinus, *Fr.*
501. C. (Phl.) scaurus, *Fr.*
Subgenus 2. *Myxacium*, Fr.
502. C. (Myx.) collinatus, *Fr.*
503. C. (Myx.) elatior, *Fr.*
504. C. (Myx.) livido-ochraceus, *Fr.*
505. *C. (Myx.) stillatitius*, Fr.
Subgenus 3. *Inoloma*, Fr.
506. C. (In.) violaceus, *Fr.*
507. *C. (In.) camphoratus*, Fr.
508. C. (In.) callisteus, *Fr.*
509. C. (In.) Bulliardi, *Fr.*
510. C. (In.) bolaris, *Fr.*
511. C. (In.) pholideus, *Fr.*
512. C. (In.) sublanatus, *Fr.*
513. C. (In.) areuatus, *P.*
Subgenus 4. *Dermocybe*, Fr.
514. C. (Der.) ochroleucus, *Fr.*
515. C. (Der.) tabularis, *Fr.*
516. C. (Der.) diabolicus, *Fr.*
517. C. (Der.) caninus, *Fr.*
518. C. (Der.) anomalus, *Fr.*
519. C. (Der.) spilomeus, *Fr.*
520. C. (Der.) sanguineus, *Fr.*
521. C. (Der.) cinnamomeus, *Fr.*
522. C. (Der.) uliginosus, *Berk.*
523. C. (Der.) raphanoides, *Fr.*
Subgenus 5. *Telamonia*, Fr.
524. C. (Tel.) bulbosus, *Fr.*
525. C. (Tel.) torvus, *Fr.*
526. C. (Tel.) evernius, *Fr.*
527. C. (Tel.) armillatus, *Fr.*
528. C. (Tel.) limonius, *Fr.*
529. C. (Tel.) brunneus, *Fr.*
530. C. (Tel.) hinnuleus, *Fr.*
531. *C. (Tel.) helvelloides*, Fr.
532. C. (Tel.) periscelis, *Weinm.*
533. C. (Tel.) psammocephalus, *Fr.*
534. C. (Tel.) ileopodius, *Fr.*
535. *C. (Tel.) hemitrichus*, Fr.
Subgenus 6. *Hygrocybe*, Fr.
536. C. (Hy.) armeniaceus, *Fr.*
537. C. (Hy.) dilutus, *Fr.*
538. C. (Hy.) castaneus, *Fr.*
539. *C. (Hy.) rigens*, Fr.
540. C. (Hy.) leucopus, *Fr.*
541. C. (Hy.) Reedii, *Berk.*
542. *C. (Hy.) decipiens*, Fr.
543. C. (Hy.) acutus, *Fr.*
544. *C. (Hy.) Junghuhnii*, Fr.

Genus V. LEPISTA, *gen. nov.*
545. L. nuda, *W. Sm.*
546. L. cinerascens, *W. Sm.*
547. L. personata, *W. Sm.*

Genus VI. PAXILLUS, *Fr.*

548. P. involutus, *Fr.*
549. P. atro-tomentosus, *Fr.*
550. P. panuoides, *Fr.*

Genus VII. HYGROPHORUS, *Fr.*

* Limacium.

551. H. chrysodon, *Fr.*
552. H. eburneus, *Fr.*
553. H. cossus, *Fr.*
554. H. cerasinus, *B.*
555. H. aromaticus, *B.*
556. H. mesotephrus, *B. and Br.*
557. *H. arbustivus*, Fr.
558. H. hypothejus, *Fr.*
559. H. olivaceo-albus, *Fr.*
560. *H. limacinus*, Fr.

** Camarophyllus.

561. H. leporinus, *Fr.*
562. H. pratensis, *Fr.*
563. H. virgineus, *Fr.*
564. H. niveus, *Fr.*
565. H. distans, *Berk.*
566. H. russo-coriaceus, *B. and Mill.*
567. H. ovinus, *Fr.*

*** Hygrocybe.

568. H. Colemannianus, *Blox.*
569. H. lætus, *Fr.*
570. H. ceraceus, *Fr.*
571. H. coccineus, *Fr.*
572. H. miniatus, *Fr.*
573. H. puniceus, *Fr.*
574. H. obrusseus, *Fr.*
575. H. conicus, *Fr.*
576. *H. chlorophanus*, Fr.
577. H. psittacinus, *Fr.*
578. H. calyptræformis, *B. and Br.*
579. H. unguinosus, *Fr.*
580. H. murinaceus, *Fr.*

Genus VIII. GOMPHIDIUS, *Fr.*

581. G. glutinosus, *Fr.*
    β. roseus.
582. G. viscidus, *Fr.*
583. G. stillatus, *Strauss.*

Genus IX. LACTARIUS, *Fr.*

* Piperites.

584. L. torminosus, *Fr.*
585. L. cicilioides, *Fr.*
586. L. turpis, *Fr.*
587. *L. controversus*, Pers.
588. L. pubescens, *Schrad.*

** Limacini.

589. L. insulsus, *Fr.*
590. L. zonarius, *Fr.*
591. L. blennius, *Fr.*
592. L. hysginus, *Fr.*
593. *L. trivialis*, Fr.
594. L. circellatus, *Fr.*
595. L. uvidus, *Fr.*

*** Piperati.

596. L. pyrogalus, *Bull.*
597. L. plumbeus, *Fr.*
598. L. acris, *Fr.*
599. L. chrysorrhœus, *Fr.*
600. L. piperatus, *L.*
601. L. vellereus, *Fr.*, var. exsuccus, *Otto.*

**** Dapetes.

602. L. deliciosus, *L.*

***** Russulares.

603. L. pallidus, *Fr.*
604. L. quietus, *Fr.*
605. L. theiogalus, *Fr.*
606. *L. cyathula*, Fr.
607. L. rufus, *Scop.*
608. L. glyciosmus, *Fr.*
609. L. fuliginosus, *Fr.*
610. L. volemum, *Fr.*
611. L. serifluus, *Fr.*
612. L. mitissimus, *Fr.*
613. L. subdulcis, *Bull.*
614. L. camphoratus, *Fr.*

Genus X. RUSSULA, *Fr.*

* Compactæ.

615. R. nigricans, *Fr.*
616. R. adusta, *Fr.*
617. R. delica, *Fr.*

** Furcatæ.

618. R. furcata, *Fr.*

619. R. sanguinea, *Fr.*
620. R. rosacea, *Fr.*
621. R. sardonia, *Fr.*
622. R. depallens, *Fr.*

*** Rigidæ.

623. *R. lactea*, Fr.
624. R. virescens, *Fr.*
625. R. lepida, *Fr.*
626. R. rubra, *Fr.*

**** Heterophyllæ.

627. R. vesca, *Fr.*
628. *R. cyanoxantha*, Fr.
629. R. heterophylla, *Fr.*
630. R. fœtens, *Fr.*

***** Fragiles.

631. R. emetica, *Fr.*
632. R. ochroleuca, *Fr.*
633. R. fragilis, *Fr.*
634. R. integra, *L.*
635. R. decolorans, *Fr.*
636. R. aurata, *Fr.*
637. *R. veternosa*, Fr.
638. R. nitida, *Fr.*
639. R. alutacea, *Fr.*
640. R. lutea, *Fr.*
641. R. vitellina, *Fr.*
642. *R. chamæleontina*, Fr.

Genus XI. CANTHARELLUS, *Fr.*

* Mesopodes.

643. C. cibarius, *Fr.*
644. C. aurantiacus, *Fr.*
645. C. Brownii, *B. and Br.*
646. C. umbonatus, *P.*
647. *C. radicosus*, B. and Br.
648. C. tubæformis, *Fr.*
649. C. infundibuliformis, *Fr.*
 β. cinereus, *Fr.*

** Pleurotus.

650. C. muscigenus, *Fr.*

** Resupinati.

651. C. retirugus, *Fr.*
652. C. lobatus, *Fr.*

Genus XII. NYCTALIS, *Fr.*

653. N. asterophora, *Fr.*
654. N. parasitica, *Fr.*

Genus XIII. MARASMIUS, *Fr.*

1. *Collybiæ.*

* Scortei.

655. M. urens, *Bull.*
656. M. peronatus, *Fr.*
657. M. porreus, *Fr.*
658. M. oreades, *Bolt.*

** Tergini.

659. M. fusco-purpureus, *Fr.*
660. M. Wynnei, *B. and Br.*
661. *M. terginus*, Fr.
662. M. erythropus, *Fr.*
663. M. archyropus, *Fr.*

*** Calopodes.

664. M. scorodonius, *Fr.*
665. M. Vaillantii, *Fr.*
666. *M. angulatus*, Pers.
667. *M. languidus*, Fr.
668. M. fœtidus, *Fr.*
669. *M. nigricans*, Berk.
670. M. amadelphus, *Fr.*
671. M. ramealis, *Fr.*
672. M. candidus, *Fr.*

2. *Mycenæ.*

* Chordales.

673. M. alliaceus, *Fr.*
674. *M. caulicinalis*, Fr.

** Rotulæ.

675. M. rotula, *Fr.*
676. M. graminum, *B. and Br.*
677. M. androsaceus, *Fr.*
678. M. perforans, *Fr.*
679. M. insititius, *Fr.*
680. M. Hudsoni, *Fr.*
681. M. epiphyllus, *Fr.*
682. M. saccharinus, *Fr.*
683. M. spodoleucus, *B. and Br.*

Genus XIV. LENTINUS, *Fr.*

* Squamosi.

684. L. tigrinus, *Fr.*
685. L. Dunalii, *Fr.*
686. L. lepideus, *Fr.*
687. L. adhærens, *Fr.*

** Cochleati.

688. L. cochleatus, *Fr.*

*** Subsessiles.

689. L. vulpinus, *Fr.*
690. *L. fimbriatus*, Curr.
691. L. flabelliformis, *Bolt.*

Genus XV. PANUS, *Fr.*

692. P. torulosus, *Fr.*
693. P. conchatus, *Fr.*
694. P. stipticus, *Fr.*

Genus XVI. XEROTUS, *Fr.*

695. X. degener, *Fr.*

Genus XVII. TROGIA, *Fr.*

696. T. crispa, *Fr.*

Genus XVIII. SCHIZOPHYLLUM.

697. S. commune, *Fr.*

Genus XIX. LENZITES, *Fr.*

698. L. betulina, *Fr.*
699. L. flaccida, *Fr.*
700. L. sepiaria, *Fr.*
701. L. abietina, *Fr.*

WOOLHOPE NATURALISTS' FIELD CLUB.

STATEMENT OF ACCOUNTS for the YEAR ENDING DECEMBER 31st, 1869.

Dr.	£	s.	d
To Subscriptions received for 1869	43	0	0
,, Entrances received from 15 new members	7	10	0
,, Arrears of Subscriptions received for 1868	4	0	0
,, Ditto do. do. 1867	1	10	0
,, Cash received for spare copies of Transactions ...	9	9	0
,, Ditto for Illustrations	6	11	1
,, Balance due to Treasurer	27	9	6
	£99	9	7

Cr.	£	s.	d
By Balance due to Treasurer	3	4	4
,, E. Palmer and Son—Illustrations	9	11	0
,, W. Thomas for ditto	3	7	6
,, Reports and copies of Annual Meeting, &c. ("Hereford Times")	13	19	0
,, Binding 230 volumes of Transactions and carriage ...	12	4	0
,, Circulars, mounts, stationery, stamps, &c.	21	14	5
,, Ladmore and Son—Photographs	12	12	10
,, Reports of Field Meetings, 1869 ("Hereford Times")	16	6	0
,, Assistant Secretary for 1868	5	0	0
,, Casella Rain-gauges	1	10	6
	£99	9	7

Deposit in the Hereford Savings Bank, with Interest, £36 1s. 2d.

Examined and found correct.

ARTHUR THOMPSON, Treasurer.

JAMES RANKIN, President.
HENRY G. BULL, M.D.
JOHN LLOYD.

Hereford, February 19th, 1870.

OFFICERS FOR THE YEAR

1870.

President:

The Rev. Henry Cooper Key, M.A., F.R.A.S., Stretton Rectory, Hereford.

Vice-Presidents:

The Rev. W. C. Fowle, M.A., Brinsop Rectory, Hereford.
The Rev. Arthur Gray, M.A., Orcop, Ross.
James Rankin, Esq., M.A., Bryngwyn, Hereford.
Elmes Y. Steele, Esq., Abergavenny.

Honorary Secretary:

The Rev. Sir Geo. H. Cornewall, Bart,, Moccas, Hereford.

Central Committee:

Dr. Bull, Hereford.
T. Curley, Esq., F.G.S., Hereford.
John Lloyd, Esq., Huntington Court, Hereford.

Assistant Secretary and Treasurer:

Mr. Arthur Thompson, St. Nicholas Street, Hereford.

FIELD MEETINGS APPOINTED

1870.

1—TUESDAY, MAY 24TH ....The Forest of Deerfold.

2—TUESDAY, JUNE 21ST (Ladies' Day)...Ross and down the Wye.

3—FRIDAY, JULY 22ND..................................Llangorse Lake.

4—FRIDAY, AUGUST 19TH.....................The Longmynd Hills.

5—THURSDAY, OCTOBER 6TH......Hereford, for "A Foray amongst the Funguses."

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