
WOOLHOPE NATURALISTS' FIELD CLUB
1851

£5.50

Symonds
of Kelrigh
Hereford

Birmingham Water Works p. 150

~~29 Aug 1899~~

15th May 1903.

15/5/03.

£5.50

Birmingham Water Works p. 150

Whyalla 15/3/03.

Yours truly
H. Cecil Moore.
Hon. Sec. Woolhope Naturalists' Field Club.
d. 1908

TRANSACTIONS

OF THE

WOOLHOPE

Page 8.—The [illegible]

Page 111, line 12—The photograph of the Eastwood Oak was taken by Mr. Alfred Watkins.

HEREFORD

PRINTED BY JAKEMAN AND CARVER, [illegible]

ISSUED DECEMBER [illegible]

Yours truly
H. Cecil Moore.
Hon. Sec. Woolhope Naturalists' Field Club.
1908

TRANSACTIONS

OF THE

WOOLHOPE

ERRATA.

Page 6.—The 4th verse should read thus:

Blanche dit : "Ma langue court
Le pays des songes.
Au feu je veux à mon tour
Jeter mes mensonges.
Et les mensonges hideux, &c., &c.

Page 111, line 12—The photograph of the Eastwood Oak was taken by Mr. Alfred Watkins.

HEREFORD:

PRINTED BY JAKEMAN AND CARVER, 4 & 5, HIGH TOWN.

ISSUED DECEMBER, 1900.

Yours truly
H. Cecil Moore.
Hon. Sec. Woolhope Naturalists' Field Club.
L. 1908

TRANSACTIONS

OF THE

WOOLHOPE

NATURALISTS' FIELD CLUB.

[ESTABLISHED 1851.]

1898, 1899.

"HOPE ON" "HOPE EVER"

HEREFORD:

PRINTED BY JAKEMAN AND CARVER, 4 & 5, HIGH TOWN.

ISSUED DECEMBER, 1900.

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WOOLHOPE NATURALISTS' FIELD CLUB.

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FROM ITS ESTABLISHMENT IN 1851.

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1862 Hoskyns, Mr. Chandos Wren.
1863 Hoskyns, Mr. Chandos Wren.
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1896 Moore, Mr. H. Cecil.
1897 Moore, Mr. H. Cecil.
1898 Marshall, Rev. H. B. D.
1899 Beddoe, Mr. H. C.

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1899.

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Pulley, Sir Joseph, Bart., Lower Eaton, Hereford, and Green Park Chambers, 90, Piccadilly, W.
Pulley, Colonel Charles, commanding 2nd Goorkas.
Pumphrey, Mr. Henry, High Street, Bromyard.
Purchas, Mr. Alfred J., Chasedale, Ross.
Purchas, Mr. H. Maurice, Broad Street, Ross.
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Rootes, Mr. Charles, St. Owen Street, Hereford.
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Stanhope, The Ven. The Hon. B. L. S., M.A., Byford, Archdeacon of Hereford.
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Steward, Mr. Walter H., Pontrilas, R.S.O., Herefordshire.
Stooke, Mr. Edwin, Aylstone Hill, Hereford.
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Sturt, Col. Napier G., Llanvihangel Court, Abergavenny.
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Symonds, Mr. J. F., Broomy Hill, Hereford.
Symonds, Mr. J. Reginald, 15, Bridge Street, Hereford.
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Thorpe, Mr. William, Ross.
Trafford, Mr. Guy R., Michaelchurch Court, Hereford.
Turner, Mr. Thomas, F.R.C.S., St. Owen Street, Hereford.
Vaughan, Rev. F. S. Stooke, M.A., Wellington Heath, Ledbury.
Vevers, Mr. Henry, Highmore House, Hereford.
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Wallis, Mr. E. L., Hampton Park, Hereford.
Warner, Rev. Preb. C., West View, Bodenham Road, Hereford.
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Watkins, Rev. Morgan G. M.A., Kentchurch, Hereford.
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Williamson, Rev. H. Trevor, Bredwardine, Hereford.
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Wood, Rev. R., Colley Batch, Tenbury.
Woodward, Mr. Ernest T., Daffaluke, Ross.

Members Elected.

1898.

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Hinckes, Mr. R. T., Foxley, Hereford.
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Littledale, Mr. H. Clevedon House, Barbourne Terrace, Worcester
Livingstone, Rev. Canon R. T., Pencombe Rectory, Worcester
Purser, Col. T. H., Birdseye, Bromyard.
Relton, Rev. A., Brinsop Vicarage, Hereford.
Warner, Rev. Preb. Charles, West View, Bodenham Road, Hereford.

1899.

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Bannister, Rev. A., Ewyas Harold.
Brown, Mr. Wm., Whitchurch, Ross.
Denny, Mr. A. R., Yarsop, Hereford.
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Getting, Mr. H. F., Oakleigh, Ross.
Gowring, Mr. E. A., Tre-Evan, Llangarren, Ross.
Hatton, Mr. E. J., Aylestone Hill, Hereford.
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Machen, Mr. Charles, Bicknor Court, Coleford.
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Moody, Mr. C. E., Springfield, Breinton, Hereford.
Morgan, Capt. T. L., Oakfield, Hay.
Morris, Mr. Edgar T., Nugent House, St. Owen Street, Hereford.
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Wade, Mr. Fredk. W., Ledbury.
Winterbourn, Mr. T. H., Broad Street, Leominster.

OBITUARY.

1898.

Feb. 2.—Childe, Rev. Preb. Baldwyn.
Nov. 22.—Andrews, Mr. Henry.

1899.

Hebb, Mr. W.

HONORARY MEMBERS.

Feb. 21, 1899.—Rev. Canon du Port.
Feb. 24, 1899.—Rev. J. D. La Touche.

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 and Archæology 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 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 Five Members, resident in the city or in its immediate vicinity, with the President, Vice-Presidents, Treasurer, Auditor, 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 and Archæology 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 the papers read to the Club during the year, be forwarded, at the discretion of the Central Committee, to the *Hereford Times* newspaper for publication as ordinary news, in preparation for 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 for 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 balloted 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 Annual Subscription is twelve months in arrear, shall not be entitled to any of the rights and privileges of Membership; and that any Member whose Annual Subscriptions are two years in arrear may be removed from the Club by the Central Committee.

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 subscriptions, and draw their particular attention to Rule XII.

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

The Woolhope Club.

The Account of HENRY CHILD BEDDOE, Honorary Treasurer, for the Year ended December, 1898.

1898.	£	s.	d.
To Balance in Hand brought from last Account	80	8	2
,, Entrance Fees	3	10	0
,, Subscriptions for 1898	92	0	0
,, Arrears of Subscriptions...	3	0	0
,, 100 Copies of Survey of Herefordshire sold ..	5	0	0
	£183	18	2

1898.			£	s.	d.
April 2nd.—By paid	Miss Alice May Edmunds—Donations for her brother, Henry Edmunds		2	2	0
Aug. 15th.—	,,	Edw. Stanford, for Archæological Survey Map of Herefordshire	4	15	0
Nov. 7th.—	,,	Joseph Jones, for Printing and Stationery	1	9	0
,,	,,	Jakeman & Carver, for Printing Circulars, &c.	25	6	6
Dec. 24th.—	,,	Mr. J. B. Pilley, Assistant Secretary, 1 year's Salary...	10	0	0
,,	,,	Ditto, for Postages and Incidental Expenses	7	2	0
,,	,,	H. C. Moore, Esq., Hon. Sec. for Editorial Expenses, &c	6	9	0
,,	,,	Jakeman & Carver, for Printing Papers, &c.	12	10	3
			£69	13	9
		Balance in hands of Treasurer	£114	4	5
			£183	18	2

Examined and found correct, this 12th day of April, 1899.

JAMES DAVIES, Honorary Auditor.

The Woolhope Club.

The Account of HENRY CHILD BEDDOE, Hon. Treasurer, for the Year ended 31st December, 1899.

1900.	£	s.	d.
To Balance in Hand brought from last Account...	114	4	5
,, Entrance Fees	9	10	0
,, Subscriptions for 1899	103	0	0
,, Arrears of Subscriptions	7	0	0
,, Volumes of *Transactions* sold	5	0	0
,, Subscriptions over paid (2 at 6d.)	0	1	0
,, Balance of Rhayader Account	12	8	6
	£251	3	11

1899.		£	s.	d.
March.	By paid Messrs. Jakeman & Carver for Printing *Transactions*	123	13	0
July.	,, Ralph Nevill, Esq., two years' Subscription to Congress of Archæological Societies	2	0	0
	,, ,, For 310 Copies of Index of Papers	1	18	9
Dec.	,, H. C. Moore, Esq., Hon. Secretary and Editor, Preliminary Arrangements for Field Meetings	0	15	0
	,, Editorial Expenses	1	0	0
	,, Postages, Telegrams, Subscriptions to Societies, &c.	5	18	10
	,, Joseph Jones, for Stationery... ...	1	11	4
	,, Jakeman & Carver, for Printing, &c.	8	0	3
	,, Mr. J. B. Pilley, Assistant Secretary, one year's Salary	10	0	0
	,, Postages and Sundry Expenses at Field Meetings	6	3	0
		161	0	2
	,, Balance in Hands of Treasurer ...	90	3	9
		£251	3	11

Examined and found correct this 25th day of April, 1900.

JAMES DAVIES, Honorary Auditor.

ILLUSTRATIONS.

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Woolhope Naturalists' Field Club.

CONTRIBUTIONS TOWARDS A FAUNA OF HEREFORDSHIRE.

MOLLUSCA.*

By Arthur E. Boycott and Ernest W. W. Bowell.

In laying this Paper before the members of the Woolhope Club we must commence with an apology for its very incomplete state. But as one of us has now left the county for some years, and the time which the other can devote to the subject is yearly growing less and less, and will probably soon become nil, we feel that we are in great measure justified in publishing now what material we have collected. We trust that in the future most of the numerous gaps will be filled up: and this will be a task to future members of the Club who may be students of this small, but extremely interesting, group of animals. A "Flora," whose equal among similar county publications it would be hard to find, was published some years ago; and we take it that one of the objects for which the Club exists (and, indeed, it so appears from its Rules), is the compilation of an equally complete Fauna. Towards the attainment of this end we offer this contribution. We have tried to make it something more—and we trust better—than a mere list of species and localities, by the addition of notes upon various points connected with the subject. The slugs have been practically omitted—a defect which it must be left to the dim possibilities of the future to rectify in some measure. And, as will be readily seen, the treatment of the various species is very uneven throughout. We may appropriately commence with an account of the work which had previously been done on Herefordshire Mollusca, of which we have been able to avail ourselves. It is as follows:—

(1) "Census of the Authenticated Distribution of British Land and Fresh-water Mollusca," by J. W. Taylor and W. Denison Roebuck. An edition of this constitutes Chapter V. (pp. 94—112) in "Land and Fresh-water Shells" (Young Collector Series, 1889), by J. W. Williams. Included in it are 38 species,

*A short Paper, under this title, was read to the Club at a meeting at Droitwich on August 28th, 1896 (published in *Hereford Times* of September 12th, 1896), and another part, dealing with colour-variation in *Tachea*, at Bewdley on August 27th, 1897 (published in *Hereford Times* and *Hereford Journal* of September 4th, and in *Science Gossip* n.s., Vol. iv pp. 132-135, October, 1897).

the most important of which are eight slugs and *Helicella cantiana* Mont., which we have not found; other interesting records are *Hygromia fusca* Mont., *Pupa anglica* Fér, *Clausilia laminata* Mont, and *Caecilioides acicula* Müll. Another version of this Census is printed in "The Collectors' Manual of British Land and Fresh-water Shells," by L. E. Adams, ed. 2 (Leeds, 1896), pp. 194—197. This contains the same species with the addition of *Vitrea radiatula* Alder. The Census thus contains 39 species, which, considering that it only contains species of which specimens have been seen and verified by the Conchological Society's referees, is perhaps fairly good. The list bears a remarkable resemblance to a list of the shells we have found in the Doward district; this is owing to the fact that the Rev. R. W. J. Smart (*vide infra*) sent some specimens to Mr. J. W. Taylor. "Herefordshire" is defined by Taylor and Roebuck as including parts of Monmouthshire and Worcestershire, while portions of Herefordshire are included in Breconshire, Radnorshire, Shropshire, and Worcestershire (some of these outlying parts are probably now legally included in the counties in which they actually lie); it corresponds with the Botanical district 36 of H. C. Watson. The species recorded in the Census are marked thus (*) below.

(2) A collection made by the Rev. R. W. J. Smart, Vicar of Bishopswood 1884—1889. This gentleman (now Rector of Parkham, near Bideford, N. Devon) kindly sent for our inspection the shells he had collected while at Bishopswood. They comprised 26 species, among which the more remarkable forms were *Pyramidula rotundata* var. *alba* and *Clausilia laminata* var. *alba*. The *Hyalinia* had been examined and verified by the Rev. A. H. Cooke, of King's College, Cambridge.

(3) A collection in Ludlow Museum, labelled "Locality: Hereford. Donor: A. de Boinville." There are here 20 species, the most important being *Paludina contecta* Millet, *P. vivipara* Linné, *Limnaea glabra* Müll., *Planorbis corneus* Linné, *Dreissena polymorpha* auctt., and *Sphaerium rivicola* Leach. Mr. Charles Fortey had suggested to us that too much reliance should not be placed on the localities, and on enquiring of Mr. A. C. de Boinville, who is now resident at Plymouth, we learnt that none of the species could he guarantee to be Herefordshire in origin, except the Unionidæ (*Anodonta cygnea* and *Unio pictorum*), while he was certain that the more interesting species mentioned above are not from this county. We believe it is from this source that the list given in the *Woolhope Transactions* (Vol. for 1886—1889, p. 331) is derived.

(4) Information supplied by Mr. A. C. de Boinville, together with some specimens. Mr. de Boinville has (1897) sent us the following list of species "believed to have been found in Herefordshire"; but without further evidence from specimens, or even contemporary notes, which is not forthcoming, the species, of which we have no other evidence (*Acanthinula lamellata*), cannot be finally admitted to our list:—

"*Helix aspersa.*
—— *hortensis.*
—— *hybrida.*
—— *nemoralis.*
Pupa umbilicata.
Balaea perversa.
Clausilia bidens.
—— —— *biplicata.*

"*Helix arbustorum.*
—— *cantiana.*
—— *aculeata.*
—— *lamstellata.*
—— *granulata.*
—— *hispida.*
—— *depilata.*
—— *virgata.*
—— *cricetorum.*
Zonites rotundatus.
—— *umbilicatus.*
—— *alliarius.*
—— *cellarius.*
—— *purus.*
—— *crystallinus.*
Succinea putris.
—— —— *pfeifferi.*
Bulimus obscurus.
Zua lubrica.
Azeca tridens.
Clausilia dubia.
—— —— *nigricans.*
Carychium minimum.
Limnoeus auricularius.
—— —— *pereger.*
—— —— *stagnalis*
—— —— *palustris.*
—— —— *truncatulus*
Ancylus fluviatilis.
Physa fontinalis.
Planorbis carinatus.
—— —— *marginatus.*
—— —— *vortex.*
—— —— *spirorbis.*
Cyclostoma elegans.
Cyclas rivicola.
Anodon cygnaeus.
Alasmodon margaritiferus.
Unio pictorum.
—— *ovalis.*"

To avoid difficulties of identification, we have quoted the list *verbatim*, the nomenclature used being, we believe, that of J. E. Gray's edition of Turton's "Manual," ed. 1, 1840. Besides this list, Mr. de Boinville sent us a considerable collection of *Tachea* and a few odd shells, noteworthy among which is *Theodoxus fluviatilis* from the river Lugg.

(5) "Contributions towards a list of the Mollusca of Herefordshire" (*Science Gossip*, Vol. xxviii. (April, 1892), pp. 77—79), by A. E. Boycott. This list contains 87 species; while another, known at the time (*Limnaea palustris*) was accidentally omitted. It was drawn up without perhaps due caution, and we now see reason to withdraw some of the records then put forward, having found it very unsatisfactory and uncertain to place much faith in purely second-hand information. It is, however, very possible that some of the records should really stand.

The species thus withdrawn are five in number, as follows:—

Pisidium roseum (= *milium*).
Paludina contecta. (See above under the Ludlow Collection).
Planorbis corneus. (Partly the same).
Limnaea glabra.
Cochlicopa tridens.

(6) There is an isolated record of *Pupa anglica* Fér from Whitney-on-Wye, by C. T. Musson in the *Journal of Conchology*, Vol. v., p. 81, and a specimen of *Caecilioides acicula* Müll. is figured from Bishopswood, collected by R. W. J. Smart, in "A Monograph of the Land and Freshwater Mollusca of the British Isles" by J. W. Taylor in Vol. i. part 1, p. 30, fig. 57 (Leeds, 1894). Both these are presumably really the same records as those in the "Census."

Mr. Charles A. Whatmore (late of Much Marcle) and the Rev. R. Potter

(once of Madley : obit 1896) at one time we believe did a good deal of collecting in the county, but we have been unable to gain any information as to their results. This is a cause for considerable regret in a case like the present where every detail of information is of importance. For it is impossible with so few workers to work to any degree adequately an area of such extent as Herefordshire.

Dr. J. H. Wood, of Tarrington (J. H. W.) has supplied a few interesting records, and we regret that such an able observer has not devoted more of his time to this group.

For the rest we are alone responsible. We would take this opportunity of tendering our best thanks for collecting specimens and other help to several friends, among whom we would especially mention Mr. J. F. Fitzsimons (J. F. F.), to whom several interesting finds are in the first instance due, the Rev. H. W. Ellwood, of Staunton-on-Wye (H. W. E.), Mr. T. A. Boycott, Mr. H. C. Moore, and Mr. J. E. Ballard, of Ledbury. To this last gentleman the credit is due for noting the interesting deposit at Ledbury, and making a careful collection from it, a brief account of a portion of which follows.

SUBFOSSIL DEPOSIT AT LEDBURY.

This deposit was found in the early part of 1896 in making some draining excavations in Ledbury, close to the churchyard. It was quite white and chalky in appearance, and as far as could be seen from the part which was uncovered, of considerable extent. It lies just on the edge of the old Red Sandstone, and nearly at the foot of the hill which rises up behind the Church, and which is Silurian of a limestone character. There seems to be some evidence that a stream once flowed at or near the spot. From the general lie of the place and the character of the deposit, we have no doubt in saying that it is a fresh-water deposit brought down from the high ground behind by some stream. The existence of such species as *Gyrorbis spirorbis* leads to the supposition that the shells must have been partially derived from a large stream or pond. The character of the ground seems to exclude the former; while, on the other hand, a pond still exists a little higher up the hill. It is much to be regretted that a further examination of the deposit was not made while the excavations were still open. It would also be of considerable interest to make a careful search on the ground whence the shells were probably washed, in order to compare the recent with the more ancient molluscan fauna. In the summary of distribution given below, the specimens are reckoned as being Silurian in origin, a point which seems to be well established. The following is a list of the species (22 in number) contained in the shells which Mr. Ballard was good enough to shew me :—

Hyalinia nitidula, cellaria, fulva,
Arianta arbustorum
Tachea nemoralis, hortensis
Pyramidula rotundata,
Hygromia hispida,
Zua lubrica,
Clausilia perversa,

Vertigo substriata, pusilla,
Pupa umbilicata, marginata, ringens,
Carychium minimum,
Ericia elegans,
Limnaea peregra, truncatula,
Gyrorbis spirorbis,
Pisidium fontinale, pusillum.

Two species have not been found elsewhere in the county, viz., *Vertigo substriata* (two specimens) and *V. pusilla* (one specimen). The most abundant species were *P. rotundata* and *Carychium minimum*. The variation was not thoroughly worked out, but the *Zua lubrica* appeared to be conspicuously larger than is usual in the county. The colours in the *Arianta* and *Tachea* were in many cases well-preserved.

Isolated references to the occurrence of several species in Herefordshire and accounts of work done (wholly or partially) with local specimens by the authors may be found in various communications on other subjects. (See "On Shell Coloration in British Extra-marine Mollusca," *Zoologist* (3), Vol. xx., pp. 62—70 (1896); "Erosion in Extra-marine Mollusca," *Science Gossip*, n.s., Vol. III., p. 114 (1896); "Coloration and Variation of British Extra-Marine Mollusca," *Science Gossip*, n.s., Vol. IV., November, 1897, to May, 1898, by A. E. Boycott: *Devonia*, October, 1895, to June, 1896, several references by E. W. W. Bowell and A. E. Boycott, with illustrations of *Anodonta* (p. 36), and *Limnaea stagnalis* and *L. auricularia* (pp. 92, 93): "The Odontophores of Mollusca," *Science Gossip*, n.s., Vol. IV., p. 6 (1897), by E. W. W. Bowell).

DISTRIBUTION.

For the more detailed description of the distribution of the various species in the county, the fourteen sub-divisions used in the "Flora" have been adopted. The exact boundaries of these districts will be found fully set out by the Revs. W. H. Purchas and Augustin Ley in the "Flora of Herefordshire" (Hereford, 1889), pp. I. to XXXVII., and illustrated on the map prefixed to that volume. It seems unnecessary, therefore, to describe them at any length, but the following brief recapitulation may be of use :—

1.—South : including St. Weonards, Kilpeck, Garway, Gannerew, and Llanwarne.
2.—South-east i. : including Ross, Whitchurch, Much Birch, Fownhope, and How Caple.
3.—South-east ii. (to the north-east of 2) : including Woolhope, Dormington, Much Marcle, and Aston Ingham.
4. —East : including Ledbury, Colwall, Cradley, Castle Frome, and Munsley.
5.—North-east : including Bromyard, Bishop's Frome, Bredenbury, and Thornbury.
6.—North-east, central : including Stretton Grandison, Ashperton, Weston Beggard, Felton, Humber, and Grendon Bishop.
7.—Central. We have further sub-divided this rather large and well-worked district into two sub-districts, 7 North and 7 South, the boundary being

the river Wye. The former contains Bridge Sollars, Burghill, Wellington, Preston Wynne, and Lugwardine; the latter Dinedor, Dewsall, Kingstone, and Madley. The city of Hereford lies mostly in 7 N., partly in 7 S.

8.—North-west central: including Weobley, Letton, Byford, Credenhill, Bodenham, Monkland, and part of Leominster.

9.—North i.: including part of Leominster, Hatfield, Little Hereford, Ashford Bowdler, Orleton, and Lucton.

10.—North ii. (west of 9): including Richard's Castle, Leintwardine, Byton, and Aymestrey.

11.—North-west i.: including Kington, Staunton-on-Arrow, Knill, Huntington, and Lynhales.

12.—North-west ii. (south-east of 11): including part of Leominster, Shobdon, Pembridge, Brilley, Winforton, Sarnesfield, and Dilwyn.

13.—South-west Central: including Clifford, Blakemere, St. Devereux, Kenderchurch, and the Golden Valley.

14.—South-west: including Rowlston, Clodock, part of Hay, and Michaelchurch Escley. The Editors of the "Flora" have included in this district a large part of the Black Mountains, which is properly part of Monmouthshire (the Ffwddog is not now part of Herefordshire); but it seems inadvisable to depart so far from the county boundaries as this, so our boundary here follows that of the county proper, running along the top of the most north-westerly ridge of the mountains and into the Monnow near Pandy Station.

Geologically Herefordshire may be described as a sheet of Old Red Sandstone, interrupted only by recent alluvial gravels in the river-valleys, with the exception of the following parts:—

1.—A large tract of Silurian Rocks—largely Aymestrey and other Limestone—in the north-west; this roughly corresponds to districts 10 and 11.

2.—The Silurian outcrop in the Woolhope district (3): this includes a good deal of limestone, which has been extensively quarried in Dormington Wood. Westhide (or Shucknell) Hill in district 6 is an isolated outlier of the Backbury and Stoke Edith Hills.

3.—A small area of Silurian rocks at Ledbury (4). The large quarry in the Coneygree Woods is Wenlock Limestone.

4.—A small tract of Carboniferous Limestone in the south of district (3), comprising the Doward Hills, and a narrow area running north and east from this along the Gloucestershire border. Bishopswood is not included.

In the table following are recorded the occurrences of all the species under fifteen districts, and also under the three geological headings. This is rendered necessary by the fact that the "Flora" districts do not correspond with geological divisions. The record is obviously very incomplete, and we have very little doubt that careful search would result in nearly all the species hitherto found at all in Herefordshire being turned up in each district. Occasionally doubts have arisen as to which district or geological formation a specimen really belongs. These instances are distinguished by a mark of interrogation. The uncertainties

in nearly all cases are connected with dead specimens, which have apparently been removed after death from their real habitat to the place of discovery. This applies to the specimens found in the *débris* of river floods. Thus *Sphaerium rivicola* has occurred in the rejectamenta of the Wye at Rotherwas, on the northern bank, but there is no evidence to show whether it came from district 7 S. or 7 N., or indeed from either. The subfossil shells from Ledbury have been reckoned as occurring on Silurian strata, though they actually occur on the edge of the Old Red Sandstone. The reasons for this are given elsewhere. In two cases (*Pupa anglica* and *Helicella cantiana*), there is an absolute doubt as to which of two districts a record refers. In only one case can aquatic species found in the rivers fairly be said to belong to any certain geological formation. It is obvious that to say that *Anodonta* occurs on the Carboniferous Limestone at the Doward, cannot mean very much when one considers that the specimens in question are taken where the river Wye has flowed perhaps for a mile through the Carboniferous county after a course of many miles through the Old Red, in the middle of which it receives a considerable tributary which is largely derived from Silurian country. In the case of the upper waters of the Lugg, however (as far down as Aymestrey), the snails may be truly associated with a Silurian formation, since from its source the river has flowed through these strata. A similar objection may also be made to the association of any fluviatile species with a particular district. This is especially the case with a river like the Wye, when the large and very sudden floods must be very liable to move such small objects as snails a considerable distance, for one or two high floods often quite alter the configuration of the river-bottom. There is much to be said for the principle of plotting out areas for studying the distribution of Mollusca according to the watersheds of the streams and rivers. Herefordshire is, however, particularly ill-suited for such a sub-division.

TABLE OF DISTRIBUTION IN THE FIFTEEN SUBDIVISIONS OF THE COUNTY, AND ON THE THREE GEOLOGICAL STRATA.

Species.	I	II.	III.	IV.	V.	VI.	VII. N.	VII. S.	VIII.	IX.	X.	X	XII.	XIII.	XIV.	Old Red Sandstone.	Silurian.	Carbon. Limestone.
V. pellucida	...	+	+	...	...	...	+	+	+	..	+	+	..	...	+	+	+	+
Hy. draparnaldi	...	...	...	...	...	...	+	+	...	...	...	...	...	...	...	+	...	...
cellaria	...	+	+	+	...	...	+	...	+	...	+	+	+	...	+	+	+	+
glabra	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	+	...	...
alliaria	...	+	+	...	+	...	...	+	...	+	+	+	...	...	+	+	+	...
nitidula	...	+	+	+	+	+	+	+	+	...	+	+	+	+	+	+	+	+
radiatula	...	...	+	..	...	...	+	...	...	...	...	...	...	...	...	+	...	+
pura	...	...	+	+	+	+	...	+	+	+	...	+	+	...	...	+	+	+
D. crystallinus	...	...	+	+	+	..	...	+	+	+	...	+	+	...	...	+	+	+
C. fulvus	...	...	+	+	+	+	...	+	+	+	..	..	+	...	...	...	+	+
Pol. nitida	...	...	...	...	...	..	...	...	...	..	...	...	...	...	...	...	...	..
excavata	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...
Pyr. rotundata	...	...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
rupestris	...	...	+	...	...	...	...	...	...	...	...	+	...	...	...	+	...	+
Pun. pygmaeum	...	...	...	...	...	...	+	+	...	...	...	...	...	...	...	+	...	...
Ac. lamellata	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
aculeata	...	...	+	+	...	...	+	+	+	...	...	...	...	.	...	+	+	+
Vall. pulchella	..	...	+	+	...	...	+	+	+	...	...	...	...	...	...	+	+	+
Hel. lapicida	...	...	+	+	...	...	+	...	...	...	+	...	...	..	...	+	+	+
Gon. obvoluta	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
H. pomatia	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
C. aspersus	..	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
T. nemoralis	...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
hortensis	...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
A. arbustorum	..	...	+	+	+	+	+	+	...	...	+	...	...	...	...	+	+	+
Hel. cantiana	...	...	...	...	...	...	+?	...	+?	...	...	...	..	...	...	+	...	..
cartusiana	...	...	..	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
Hygr. rufescens	...	...	+	+	...	...	+	+	+	...	...	...	...	...	...	+	+	+
hispida	...	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
granulata	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
revelata	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	..	...
fusca	...	...	+	+	...	..	...	...	...	...	...	...	...	...	...	+	+	+

TABLE OF DISTRIBUTION, &c. (*Continued*).

Species.	I.	II.	III.	IV.	V.	VI.	VII. N.	VII. S.	VIII.	IX.	X.	XI	XII.	XIII	XIV.	Old Red Sandstone.	Silurian.	Carbon Limestone.
E. pisana	..	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...
Hel. ericetorum	..	...	..	...	...	+	+	...	...	...	...	...	.	.	...	+	+	...
caperata	...	+	+	+	...	+	+	+	...	...	...	...	+	+	...	+	+	+
virgata	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	+	...	...
Coch. acuta	...	...	...	...	...	...	...	...	...	...	..	...	..	...	...	...	...	...
Bul. obscurus	...	+	+	+	...	+	+	+	+	+	+	...	...	...	...	+	+	+
montanus	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
P secale	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	...	+	+
ringens	...	...	...	+	...	...	...	..	...	..	...	...	+?	+?	...	+	+	...
umbilicata	...	+	+	...	...	...	+	+	...	...	+	+	...	...	...	+	+	+
marginata	...	+	...	+	...	...	...	...	...	...	...	...	...	..	...	...	+	+
V. antivertigo	.	+	...	...	...	...	...	...	...	...	...	...	...	...	.	...	...	+
moulinsiana	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...
pygmaea	...	...	...	+	...	...	+	...	...	...	...	...	...	...	...	+	+	...
alpestris	...	...	...	...	...	...	..	...	...	...	...	...	...	..	...	...	...	...
substriata	...	...	...	+	...	...	...	...	...	...	...	...	..	...	...	...	+	...
pusilla	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	+	...
angustior	...	...	...	...	...	...	...	...	...	...	...	...	..	..	...	...	...	...
edentula	...	...	+	...	...	...	...	...	...	...	...	...	...	...	...	...	+	...
minutissima	...	...	...	...	..	...	...	...	...	...	..	...	..	...	...	...	...	...
B. perversa	...	...	...	...	...	...	+	...	+	...	...	...	...	...	...	+	...	...
Cl. perversa	.	+	+	+	+	...	+	+	+	..	+	+	...	+	+	+	+	+
rolphii	...	...	...	...	...	...	...	...	...	...	..	..	..	...	...	...	...	...
biplicata	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
laminata	...	+	+	...	...	...	...	...	...	...	...	...	...	...	...	+	+	+
A. tridens	..	...	..	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...
lubrica	...	+	+	+	+	+	+	+	+	+	+	+	...	+	+	+	+	...
C. acicula	...	+	+	...	...	...	+?	...	...	...	...	...	..	...	...	+	+	...
A. putris	..	+	...	...	...	+	+	+	+	...	...	...	+	...	...	+	...	+
elegans	...	+	+	...	...	+	+	...	+	...	+	...	...	...	...	+	+	+
oblonga	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
C. minimum	...	+	+	+	...	...	+	+	+	..	+	...	...	+	+	+	+	+

TABLE OF DISTRIBUTION, &c. *(Continued).*

Species.	I.	II.	III.	IV.	V.	VI.	VII.N.	VII. S.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Old Red Sandstone.	Silurian.	Carbon. Limestone.
Seg. lacustris ...	...	...	...	...	...	..	..	...	...	...	...	...	...	...	...	...	...	...
Hipp. fontana ...	...	...	...	+	+	...	+	+	+	+	...	...	...	...	...	+	+	...
Gyr. nautileus ...	...	...	+	...	...	...	...	...	+	+	...	...	...	...	...	+	...	+?
albus ...	...	..	...	...	...	...	...	+	+	+	...	...	...	...	...	+	+	...
glaber ...	...	...	...	...	...	...	...	...	...	...	...	...	+	...	...	+	...	...
Gyrorb. spirorbis ...	...	...	...	...	+	...	+	+	...	...	...	...	...	+	...	+	+	...
vortex ...	...	...	...	...	+	...	...	+	...	+	...	...	...	...	...	+	...	...
complanatus	...	...	+?	+	+	...	+	+	...	+	...	...	...	...	...	+	+	+?
carinatus ...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	+	...	...
Pl. corneus ...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...
B. contortus ...	...	...	...	...	...	...	...	+	+	+	...	...	+	...	...	+	...	...
A. hypnorum ...	...	..	...	...	...	...	+	+	..	...	...	...	..	..	...	+	...	...
Ph. fontinalis ...	...	...	...	...	...	...	...	+	+	+	...	...	...	...	...	...	...	...
Am. glutinosa ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
L. peregra ...	...	...	+	+	+	...	...	+	+	+	+	+	+	+	+	+	+	+
stagnalis ...	...	...	...	...	+	...	+	+	...	+	...	...	...	...	...	+	...	...
palustris ...	..	...	...	+	...	...	...	+	...	+	...	...	...	...	...	+	+	...
truncatula ...	...	...	+	+	+	...	+	+	+	+	...	+	+	...	...	+	+	+
glabra ...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...	...	...	...
Anc. fluviatilis ...	...	...	+	+	...	...	+	+	+	+	+	+	...	...	+	+	+	+
V. lacustris ...	...	...	...	+	...	...	+	+	+	+	...	...	...	...	...	+	+	...
E. elegans ...	...	...	+	+	+	...	...	...	+	+	...	...	...	...	...	+	+	+
Ac. lineata ...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...
Th. fluviatilis ...	...	...	+	...	...	...	...	+	...	...	...	...	...	...	...	+	...	+
Pal. contecta ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
vivipara ...	...	...	..	...	+	...	+	+	...	...	...	...	...	...	...	+	...	...
Bi. tentaculata ...	...	...	+	..	+	...	...	+	...	...	...	+	...	...	...	+	+	+
leachii ...	...	...	...	...	...	...	...	...	...	+	...	...	...	...	...	...	...	...
Valv. piscinalis ...	...	...	...	...	...	...	...	+	+?	+	...	+	...	+	...	+	+	..
cristata ...	..	...	...	...	...	...	...	+	...	+	...	...	...	...	...	+	...	..
U. tumidus ...	...	...	+	...	...	..	+	+	+	...	...	...	...	...	...	+	...	+?
pictorum ...	...	...	...	...	...	...	...	+	+	...	...	..	...	...	...	+	...	...

TABLE OF DISTRIBUTION, &c. *(Continued)*,

Species.	I.	II.	III.	IV.	V.	VI.	VII.N.	VII. S.	VIII	IX.	X.	XI.	XII	XIII.	XIV.	Old Red Sandstone.	Silurian.	Carbon. Limestone.
M. margaritifera ...	...	+	...	...	...	...	+	+	+	...	...	...	...	+	...	+	...	+
A. cygnea ...	...	+?	...	...	...	...	+	+	+	...	...	...	...	...	...	+	...	+?
Sph. corneum ...	...	+	...	+	...	...	+	+	+	...	...	...	+	...	...	+	...	+
rivicola ...	...	+	...	...	...	+	+	+	...	...	...	...	...	...	...	+	...	+
pallidum ..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
lacustre ...	...	...	...	...	...	...	+	+	+	...	...	...	...	...	...	+	...	...
Pis. amnicum ...	...	+	...	...	...	...	+	+	...	...	+	...	+	...	...	+	+?	...
fontinale ...	...	+	+	...	+	...	+	...	...	+	...	..	+	...	...	+	+	...
pusillum ...	...	+	+	+	+	...	+	+	...	+	+	..	+	...	...	+	+	...
nitidum ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
milium ...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
D. polymorpha ...	...	...	...	...	...	+	+	...	...	...	...	...	...	...	...	+	...	...

In the present imperfect state of this table, it would not be advantageous to enter into any elaborate analysis of it. So far as it can, it may be left to speak for itself. We would however note that little can be made of any distribution by geological formation: any peculiarities in the above table which might be attributed to this cause, may readily, we think, be accounted for by other reasons, *e.g.* absence of suitable water.

The following species, which have not at present been found in Herefordshire, have been recorded in the surrounding counties which are named under each species. The information has been derived from the census of the Conchological Society, from various notes and records in different publications, and from our own observations. The list is by no means exhaustive, and we cannot claim to have made any particular investigations with a view to making it less fragmentary.

Polita nitida: West Gloucester, Monmouth, Worcester, Shropshire.

Helix pomatia: East Gloucester.

Hygr. granulata: West Gloucester.

Bul. montanus: West Gloucester.

Claus rolphii: East Gloucester, Monmouth.

Azeca tridens: West Gloucester, Monmouth, Worcester.

Segmentina lacustris: Worcester.

Planorbis corneus: West Gloucester, Worcester.

Limnaea glabra: Worcester, Shropshire, Brecon.

Bithinia leachii: West Gloucester, Shropshire.

Pisidium nitidum: Worcester, Radnor.

——— *milium:* Shropshire.

We are not aware of any records for the neighbouring counties of the occurrence of the other species which have not been found in Herefordshire.

The county generally is fairly prolific in snails, being hilly and wel wooded. But the monotony of the expanse of Old Red Sandstone is against it being a very happy hunting ground, and especially, we think, against the occurrence of large and frequent variation. The water is not very good. The Wye and many of the smaller streams yield very little; the rapidity of the current and the frequent violent floods are doubtless, in part at least, the cause of this. The Lugg has a much quieter stream and yields a good many species. Small ponds are very numerous, but are too frequently rendered over-foul by cattle or cleaned out by ducks. The recent droughts too have resulted in the abolition of many of the smaller pools. Some parts of the county seem particularly poor in snails: such a district is that surrounding the passage of the Old Red into the Silurian in the neighbourhood of Staunton Bach and Titley in district 11. It is noteworthy that here nearly all the shells found in the neighbourhood occurred in a small fir coppice (elevation about 550 feet) just on Silurian rocks, where the ground was thickly strewn with fir leaves. Among these generally unproductive needles there were found: *Vitrina*, *Hy. cellaria*, *Hy. nitidula*, *Hy. pura*, *D. crystallinus*, *C. fulvus*, *Hygr. hispida*, *Pyr. rotundata*, *Pupa umbilicata*, *Cl. perversa*, and *Z. lubrica*, though none of these occurred at all freely.

METHODS.

As we find that our methods differ in many particulars from those of other collectors, it may be worth while to give some account of our way of doing things, premising, however, that we do not guarantee our practice to be in all respects as good as the theory, the latter being in fact itself a product of evolution.

Our principle has been not so much to make collections and store up duplicates as to amass material which might be useful for future research. Hence we resort largely to "bottling," though this method is not aesthetically delightful: many times during the last few years have we lamented our cleanings out of rare specimens, performed in the days of ignorance. The subject of anatomy is at least as interesting as that of conchology; but let no one suppose that it can be utilized as a *convenient* way of differentiating species. There are very few closely allied species which can thus be infallibly separated: the best instance we know is that of the two *Tacheæ*, which have characteristically different darts. Moquin-Tandon has made a great point of the maxillae as at least confirming classification: but though there are characteristic forms belonging to families and in a less degree to genera, allied species are usually very similar in this respect, the most striking exceptions being perhaps in the genus *Amphibulima* Lam. (*Succinea*, auct). The subject of radulæ has interested us considerably, and we think that many conchologists who do not profess to study the matter very deeply would yet do well to devote some of their attention to these interesting organs. Once more, however, we must warn the hunter for specific differences that this, too, is dangerous ground. There is not one constant formula and number of "teeth" for each species. But to those who revel in microscopic marvels as such we can strongly recommend the radula of *Ericia elegans* Müll.

The anatomy more properly so called, viz., that of the nervous, alimentary, and reproductive systems, is of intense interest; and though much good work has been done (chiefly by professed biologists), it is not too much to say that the subject is still shrouded in a good deal of obscurity. There is so much individual and age-variation that it is by no means safe to assume, as most of our predecessors have tacitly done, that to understand a species one only need cut up half a dozen specimens. The present is only a humble local fauna, so that to quote *in extenso* our notes on this subject would be out of place; but we may indicate that we have found this one of the most interesting branches of our study.

The physiology of the snail and mussel has also great claims on our attention, in fact our own histological work has chiefly been undertaken with a view of elucidating vital functions, but in the present state of our knowledge we have to defer the more exact application of physiological methods. Mr. Boycott has, however, made some experiments with regard to respiration in *Limnaea*—in which matter we have to some extent the advantage of comparing our artificially produced results with those which are observed in the course of field work. The physiological chemistry involved is another great subject in which at present we can only say we have prospected. The special senses afford us yet another field for investigation. In all these matters however we have an additional instrument of research which is not usually so available to the physiologist, namely, the statistics to be obtained in the ordinary course of the naturalists' work. Like Basil Valentine in his "Triumphal Chariot of Antimony," we come round to the old saying—"*ars longa, vita brevis.*"

For field work very little apparatus is required. A satchel upon which one may kneel in wet places is a handy implement, and the usual complement of boxes, wooden and tin (the former *not* to be knelt upon), together with a "landing net" of small mesh—a note-book and a pencil, and a pair of forceps (how many we have lost !), together with a few corked glass tubes for special rarities or small species—this is about the outfit required. When we go *Tachea* hunting we shall require much larger boxes, unless we prefer to use canvas bags, which have many advantages, provided they are not subsequently injudiciously disposed. The transport of the large bivalves is likewise a matter requiring special provision. Another piece of apparatus occasionally required is a large sheet, on which one may sort out small species from armfuls of dead leaves; this plan proved very productive in some of our Backbury expeditions. The malacologist, like the physiologist, calls all other sciences to his assistance, and we might say his kit was not complete without barometer, thermometer, hydrometer, etc., for the due perfecting of his notes, but we must frankly avow that we have not yet reached such a pitch of perfection. The lepidopterist often comes across molluscs, and we have sometimes found it advantageous to go round hedge banks at night with a lantern, as also to use the familar umbrella or "sairey," but these are not regular methods. The great defect in our working lies in the imperfect way in which we are able to explore the recesses of ponds, etc. for aquatic species: it is indeed rather disappointing sometimes when our first knowledge of their riches is gained at the cost of the practical abolition of the locality.

After a good deal of consideration we have come to the conclusion that "cleaning" species of the size of *H. rufescens* Mont and under, is a waste of time. Such specimens if not wanted immediately, are bottled in more or less dilute alcohol: alcohol of 50 per cent. strength is quite good enough for most purposes, and sometimes it may be advantageously used even weaker. If a large number of specimens of one kind are obtained, they may be left to themselves in a wooden box (metal boxes unless very freely ventilated for this purpose must be strenuously avoided) without coming to any harm: aquatic species of course must be bottled. If the bodies are absolutely not required, it is easy to leave them (preferably after some time in spirit) to dry up in their shells, and we then bestow them in boxes in the drawers of an entomological cabinet, or indeed anywhere where they may be conveniently found when wanted for purposes of examination. We always try to take a good many specimens, even of very common things, and do not restrict our attention to adult specimens (the juniors generally must be preserved in alcohol), but the natural rate of production is so great that we feel in no danger of meriting the style of "exterminators."

For special histological work the ordinary spirit specimens will sometimes do amazingly well, but it is better not to trust to such. It is also practically a mistake to try to cut sections of entire animals, even of the smallest species; the greatest care does not produce satisfactory results. It seems laborious perhaps to set about making a hundred preparations of a single species, but it is really the only rational way to work. The macroscopic anatomy must be made a separate subject. With regard to this however we may mention that we have obtained some results, and hope for better, by the following process: to demonstrate the alimentary canal, its disposition and diverticula. The animal is killed with chloroform (the presence of mucus is to be avoided) or else by drowning (so as to leave it in an extended condition). A solution of mercury perchloride is very carefully injected into the alimentary canal (in such a way as may be most convenient). The animal is then suspended in a beaker into which hydrogen sulphide gas is introduced: if this is done successfully the canal will be darkly coloured by the mercuric sulphide thus formed. The animal is next hardened and dehydrated in alcohol: embedded (best in celloidin) and thick sections are cut, from which by the serial method a model may be reconstructed.

We have used in the main the ordinary histological reagents. Some of the more necessary are noted below:—

(α) *Fixing.* Alcohol (sp. rect. B.P.) Very good for most purposes, but should be avoided if any part of the highly muscular *foot* is in question. This latter requires dilute chromic or a chromate solution (the acid seems to have some advantages—it is used in a very attenuated form, so as to allow a partial maceration; otherwise the tissue mentioned is unmanageable).

Flemming's and Perenyi's solutions are good, but perhaps hardly essential: osmic acid is of course of the highest value (unfortunately this statement is true in more senses than one). Acetic acid s often all that is required.

(β) *Decalcifying.* This is an extremely difficult matter to manage with sufficiently delicate results. It is easy enough to get rid of the calcium salts of the shell, but the balance left is rarely in a condition for accurate description. The phloroglucin method sometimes answers, but is on the whole disappointing. The secret of success appears to be very slow decalcification in a large quantity of dilute chromic. The specimen should have been previously hardened in alcohol.

(γ) *Stains.* Various carmines, haematoxylin, and coal-tar colours have been used with success. Diffuse stains are however even more to be avoided in molluscan histology than is necessary elsewhere. We now prefer to use all stains as dilute as possible, and let the process take a longer time. Ehrlich's acid haematoxylin, diluted with 50 per cent. alcohol, and a "picrocarmine" made by adding Orth's lithium-carmine to four times its bulk of saturated solution of picric acid, are our favourites. The latter, it should be added, is merely an empirical formula, but it works very well, having of course the additional advantage of demonstrating elastic fibre of connective tissue. In the haematoxylin alum should also be present in excess. It is necessary to be careful that the tissue to be stained is as free as possible from any other reagent: this does not so much matter with picrocarmine.

Diffuse stains, however, have their use, and they are invaluable in the preparation of radulae—which become invisible in Canada balsam unless stained. For this purpose we use Nicholson's Blue (sodium triphenyl rosanilin sulphate), which may be obtained as a penny dye at any chemist's. It is used in subalcoholic solution. Though not absolutely permanent it is in general sufficiently so, and gives occasionally fine gradations of colouring according to the state of the different parts of the tissue. Fluorescein, eosin, and methyl green are to be avoided for this purpose, except as subsidiary or temporary strains, though the time-honoured combination of haematoxylin and eosin gives useful results.

(δ) *Imbedding*, &c. For fresh tissue when specially thin sections are not required, nothing can be more satisfactory than the ether freezing method, which has the advantage of being a very speedy process. Paraffin is necessary for very thin sections, and celloidin is a very convenient method, though not without minor disadvantages. In any case, and especially if paraffin be used, much greater care than usual is necessary, because the tissues are of unusual delicacy; always excepting the objectionable muscular fibres of the foot, which should be excluded, if possible, from all preparations except such as are meant specially to demonstrate them. We prefer not to stain sections on the slide; better results are generally obtained by staining in bulk before imbedding.

Impregnation with silver nitrate gives good results with some of the beautiful epithelia found in various positions in these organisms, but

more than usual pains are required, because it is so difficult to fix a minute piece of delicate tissue in the necessary way before applying the solution. It is, on the whole, not a method to be recommended for demonstration purposes, though one may sometimes, as if by accident, get the exact result required. The outlines of the cells are often visible (though not very definitely), without any staining or impregnation.

(e) *Mounting media.*—For some time we used only Canada balsam, but of late we have found glycerine a good substitute. When radulæ are in question, it is not at all easy to dehydrate (owing to the texture of the tissue), and glycerine certainly answers very well for such objects. For many other purposes glycerine may well be substituted, and is much less risky a process. Of course one always can use balsam if time permits, and there is then the satisfaction of knowing that the preparation is considerably more permanent. But since we do not usually make preparations with a view to the benefit of posterity, glycerine will generally be found good enough: it should of course be secured ultimately with a ring of balsam or size, but many preparations may only be required for immediate study during a few weeks, after which the best may be selected and the remainder reconverted into raw material. It is better to have a few hundreds of really good preparations than thousands of miscellaneous ones, and yet the miscellaneous ones have their temporary use. [A gum-glycerine-phenol mixture answers better in some respects than glycerine.—A. E. B.]

The radulæ are extracted by boiling the buccal mass in liquor potassae, when nothing is left but radula and maxilla. It is possible to distort these organs by prolonging the boiling. We afterwards rinse in plenty of warm water, leaving them for some time (*e.g.* a day if convenient) in water faintly acidulated with acetic acid; then stain with hæmatoxylin or Nicholson's blue (according to the effect required). The time of staining cannot be stated definitely, but it is better to err on the side of over-staining, as the superfluous colour may be removed by appropriate reagents, sometimes giving very good preparations. Carmine is useless for staining radulæ, as it gives a too diffuse (and to the eye painful) effect. [Picro n.s. carmine, different samples of which differ a good deal in effect, I have occasionally found quite a useful stain for radulæ.—A. E. B.] The maxillae of large species we have mounted dry—they are of course scarcely microscopic objects. The smaller ones may be done best by gently boiling in balsam on the slide; some will be broken or distorted in this process, but practice enables one to hit off the right management of such things. They should of course be dehydrated, though it is possible to manage without this step.

The "darts" are best put up in small cells.

For the preservation of the shells when the other points of interest have been explored, a cabinet would be the most desirable receptacle. A regularly arranged collection of shells is a thing that one can re-examine from time to time with a minimum expenditure of trouble, taking at the same time a sort of pride

in the records of our achievements. But the scientific value of such a collection, unless very extensive and very elaborately labelled, is in proportion smaller than that of a series of good note books in which the facts (many of them incapable of glass case display) are carefully noted and tabulated; always supposing that the specimens referred to in the notes are accessible for reference if necessary. Consequently, we personally pay less attention to the shell collection than we did formerly, while recognising that if circumstances permitted it would be very desirable to preserve every shell in such a way that it might remain a permanent record for the edification of our friends and successors. Any system, however, of keeping shells, that is for the purposes of a private collection, which involves sticking them on to cards, etc., cannot be too strongly condemned. A shell once stuck down is practically removed, till it is un-stuck again, from playing a very useful part in the study of biology; it is scarcely more than a subject on which to exercise the visual æsthetic sense.

Our own experience leads us to offer certain details of advice to our fellow collectors with respect to the manner of collecting. Much more system is needed, we are sure, in the collecting arrangements of the average collector. We have so often found what a nuisance it is not to be able to lay our hands on material or notes when required that the very best advice we can offer to anyone beginning the study is "Make full and regular notes and bestow all specimens where they can be found at once for reference if needed." Everybody will have his own methods of "book-keeping" perhaps, but a very small percentage seem to keep them fully enough or accurately enough. All collectors understand the initial difficulty of finding out names so that species may be accurately designated in their notes. Some have suggested that naming with the aid of text books has considerable educational value. We are inclined to think this view mistaken, because it presupposes a much more perfect system of zoological literature than actually exists. Under present circumstances we should say it was better to get specimens named by some competent (or sub-competent) authority in the first place and then to discover any alterations that may be needed at a subsequent stage. This is of course mainly on account of the note-book difficulty. It is also very desirable to map out as far as possible some regular scheme for collecting for each year: opportunities often do not recur, though many may be anticipated and as it were arranged for. Should any members of the club be willing to co-operate with us in the further investigation of the Herefordshire fauna we shall be very glad to hear from them. There is no single species yet whose habits and anatomy can be said to have been at all completely worked out, and fresh methods and directions of research will occur to every fresh worker.

MEASUREMENTS.

It will be seen that we have devoted a good deal of space to the discussion of measurements and sizes of our local specimens. This is done with a view towards making a collection of materials for an extensive study of variations in size and the conditions which govern them. If all local lists would contain such determinations, much valuable material for this study would be afforded. It is obviously of considerable importance that the methods

of measurement should in each instance be known as accurately as possible. We, therefore, append the following account of the methods of measuring which we have used, which is taken almost entirely from the account given in *Science Gossip*, n.s., Vol. iv. (1897), pp. 161—163.

The rough method of direct application of a rule to the shell is altogether too crude, except for large *Anodonta* and such shells. The method of callipers is much better, but in many cases is not susceptible of sufficiently fine work. It is always difficult to manipulate it with any certainty and rapidity. The best instruments for the purpose are no doubt the micrometer screw guages made by the various physical instrument makers, though too often at somewhat exorbitant prices. These measure to 0·01 mm. as a rule, which is an accuracy rather beyond what is generally required. On the other hand, the direct scale can really only measure to whole millimetres, and that inaccurately, which is going too far to the less preferable extreme. Accurate measurement in whole millimetres is not fine enough for many of the smaller English species. An instrument which we have used with all success, and which has given us every satisfaction, is a small clockmaker's gauge (measuring up to 10 cm.), made by Boley, of Esslingen.* It is a slide-guage, and reads with a vernier to 0·1 mm., which is sufficiently accurate for ordinary purposes. It is always well to err on the side of excessive minuteness, as anyone who has tried extensively knows that the personal equation and the equation of the moment may mean a more or less considerable percentage variation in the results on the same shell measured by different persons or at different times. A guage such as this, as ordinarily used, may probably be regarded as accurate to 0·2 mm. Quite small species, such as *Vertigo*, *Carychium*, should perhaps be measured to 0·01 mm. It is practically impossible to do this with a sliding instrument, indeed it is dangerous with any sort of guage in which the shell must be held fast between two hard points. The simplest way seems to be to measure them under the microscope with a power of 50 diameters or less. The practical difficulties of successfully applying the slide-guage to such shells as *Vitrina*, *Balea*, &c., are also not inconsiderable. It is easier to measure these on a microscope with a travelling stage fitted with scales and verniers. It need hardly be mentioned that a qualification which any practical measurer for these purposes must possess is ease and rapidity of working.

The question next arises, in what direction exactly the measurements are to be made. Most books simply say: altitude so many millimetres or lines, &c., diameter, so much; unless they assure us that the species is about as big as a hazel-nut or some other object of unvarying and immutable magnitude. Is the altitude measured parallel with the axis (columella) of the shell? Is it the length from the apex to the most produced part of the mouth, or from the apex to the umbilicus along the axis? Is the diameter taken parallel with the slant of the whorls, or at right angles to the altitude?

*It may be procured from Messrs. Grimshaw and Baxter, 33 and 35, Goswell Road, Clerkenwell, London, E.C., price 5s. It has the disadvantage of not being long enough for large bivalves, nor hardly broad enough for such species as *H. pomatia*; it takes *Cryptomphalus* easily enough.

C. A. Westerlund (*Fundamenta Malacologica* 1892, p. 71) distinguishes two measurements of height (altitudo *e.g.*, in "*Helix*," *Hyalinia*), or length (longtitudo, *e.g.*, in *Buliminus*, *Clausilia*): (1) altitudo major, from the apex to the lowest part of the mouth: he appears to say that this distance is measured parallel with the axis: (2) altitudo minor, from the apex to the middle point of the underside of the shell *i.e.*, the umbilicus.

The plan which we have provisionally adopted is as follows:—

All helicoid shells have their altitude measured parallel with the columella, or assumed columella, and from the apex to the extreme point of the mouth or point on the last whorl which is most distant from the apex: it may be either in the same species *e.g.*, *Tachea*. That is to say, the altitude lies along a line drawn from this point parallel with the axis to a point where it meets a line drawn laterally from the apex at right angles to the axis. The diameter is the greatest distance from the peristome to the exposed part of the last whorl. It is not perpendicular to the altitude line, nor parallel with the slant of the whorls, but is intermediate in position in *Cryptomphalus* or *Tachea*. In the flatter snails it is almost or quite perpendicular to the altitude line. The chief point to be careful about in measuring such shells as *Tachea* and the other *Helix* genera, is to have the columella parallel with the long limb of the gauge. It is of necessity a point in which one cannot altogether exclude variation dependent on the time or individual.

In passing it may be mentioned that there is another method of measuring *C. aspersus*, which gives rather interesting results. The altitude is measured diagonally from the apex to the furthest point on the peristome, and the diameter is the distance from the peristome to the exposed part of the last whorl, when the shell is resting naturally with its aperture downwards. The measurements are more adapted for use with callipers (altitude), and direct reference to the scale (diameter). If now the fraction $\frac{\text{diameter}}{\text{altitude}}$ is taken, those shells in which it is less than one may be called conoid, those in which it is more than one, globose. This however, is at best only a rough method.

In shells like *Paludina*, *Cyclostoma*, *Buliminus*, *Clausilia*, etc., the altitude is again parallel with and almost along, the columella; and the diameter is the greatest width perpendicular to this. All other univalve British forms fall naturally under one of these two heads. It is important to remember that the altitude of *Planorbis* must be measured in the centre along the columella: this is done with the curved limbs of the Boley guage, and represents the altitudo minor: the total thickness should also be measured. The altitudo major is not easy to determine readily. The same is true of such forms as *L. peregra involuta*.

These two methods of diameter measurement are not particularly disadvantageous, as the object is not so much to make comparisons between the sizes of different species as between individuals of the same species, and to have a method which gives accurate and regular results, while it is easy and rapid of execution.

Westerlund distinguishes latitudo major, which is the whole breadth of the shell measured to the outer edge of the peristome, from latitudo minor, which is

measured at right angles to this. Both seem to be taken parallel with the suture. The divergence between the results obtained by the two methods of measurement of diameter is illustrated under *Paludina vivipara* below.

In measuring bivalves there is: (1) the length, measured from the extreme anterior to the extreme posterior points; the results are often slightly inaccurate owing to the presence, absence, or varying flexibility of the fringe: (2) the breadth; the position of this line is rather difficult to define, but not hard to determine in practice. It may, perhaps, best be said to be the greatest distance perpendicular to the lowest part of the lines of growth (*i.e.* the part furthest from the umbones); it may be, but not necessarily, perpendicular to the length line, and one end may or may not coincide with the umbones, more often, perhaps, meeting the ligament at the hinge: (3) the thickness is measured with the valves closed tightly together.

Westerlund (op. cit., pp. 72, 3) gives very elaborate instructions (after R. J. Bourguignat) relative to the measurements of bivalves. The process is, however, needlessly complicated, entailing eleven separate measurements. It is only useful as a very imperfect substitute for figures, which are really almost more necessary in *Anodonta*. *Unio*, etc., than anywhere else, where the convexity of the lower margin, and especially the form of the posterior end of the shell—two striking and important characteristics—cannot unfortunately be satisfactorily exhibited in measurements.

Besides knowing the absolute length and breadth of a shell, which indicates the size it is also useful to know the relation of the measurements to one another, which partly indicates the shape. This is effected by calculating the fractions $\frac{\text{diameter}}{\text{altitude}}$ or $\frac{\text{altitude}}{\text{diameter}}$, the former being perhaps the more convenient for the flatter, the latter for the more produced species. By this means it is possible to express two of the great deviations of the shape in Gastropoda, conoidity and globosity, in terms of numerals. Further, the varieties *conoidea*, *globosa*, etc., may be thus more closely defined, if it is deemed more convenient to call them by names than by numbers. In the case of a shell such as *Tachea nemoralis*, for example, it is found that in a series of such fractions, worked out from measurements of altitude and diameter, there are a good many near one another. This is the normal degree of globosity or conoidity for the particular series. In others the fraction $\frac{\text{diameter}}{\text{altitude}}$ gradually rises to a maximum; these are the flatter ones; while at the other end there is a corresponding fall which represents the conoid specimens.

All the measurements given refer to full-grown specimens as far as possible. It is easy to determine whether any specimen is full-grown in those species which when adult acquire as distinctive peristome or internal rib, and among the land species few difficulties arise. In the aquatic forms, however, the point is beset with uncertainties: in the majority there is no distinctive point about the shell, and it is no test if one carefully determines that the sexual apparatus is to all appearances adult. There is no doult that this physiological maturity no more marks morphological maturity in mollusca than it does in other animals. Thus the presence of young in a specimen of *Sphaerium corneum* is no proof that that individual may fairly be claimed to be, for the purpose of measurements, an adult.

For comparison with the average measurements of Herefordshire specimens given, the values given by several standard works are also recorded for purposes of comparison. These works are referred to by initials as follows:—

M.T.: "Hist. Nat. des Mollusques terrest. et fluviat. de France par A. Moquin-Tandon"; Paris, 1855.

L.E.A.: "The Collector's Manual of British Land and Freshwater Shells," by Lionel E. Adams, second edition, Leeds, 1896.

J.G.J.: "British Conchology," by John Gwyn Jeffreys, Vol. I., London, 1862.

J.W.W.: "The Shell-Collector's Handbook for the Field," by J. W. Williams, London, 1888.

In all cases the figures given by the first two of these authors are quoted; the others are sometimes omitted where they agree closely with Adams' measurements. Measurements are not given for all the species in Williams.

In all these works, except Moquin-Tandon, the majority of the measurements are given in inches, &c. These have, in all cases, been reduced to approximate millimetres.

It will be noticed that in very many cases the average Herefordshire size seems below that which is said to be normal. It is doubtful whether this is to be taken as indicating that this county really produces forms slightly under the normal size, though it is highly conceivable that such a state of things should persist in an old Red Sandstone county with little lime and away from the sea-coast. The probable explanation is that the measurements given in books are derived from examining picked and especially fine species—not, that is, really *maior* forms, but such specimens as would be picked out for, *e.g.*, a museum series. In J. W. Williams this is especially noticeable; but till more and more accurate work has been done in the matter lengthened comment would be undesirable. How far the dimensions given by some of the authors quoted are from original measurements is unknown. In certain instances (*e.g.*, J. W. Williams gives "length, 2½; diameter, 2½ mill.," for *Vertigo pygmaea*, op. cit., p. 130) we venture to doubt whether the dimensions have been determined with due care and accuracy by the authors we quote. Our figures are, on the whole, more in accordance with those given by Moquin-Tandon than the measurements in the English works quoted.

NOMENCLATURE.

The nomenclature used follows no single author in either genera or species. The well-known Jeffreysian names were largely altered for English readers in 1892 by the second edition of the Conchological Society's List, and these newer names have since come into very general use. But a careful examination of the older literature and original descriptions will, we venture to think, lead to the conclusion that this list by no means settles the question of what are the "correct" names. It seems especially difficult in the matter of the Mollusca to satisfactorily determine and settle what the older authorities meant by their names and descriptions. Indeed, the more the matter is inquired into, the further one is driven from one's ideal of strict correctness and priority to the view that the best name is the one to which people are most accustomed, and about

the significance of which there is not much doubt. At the same time, the quest for a correct list can lead to little else but good, entailing, as it does, a very close examination both of specimens and of ancient works on snails, which we might otherwise pass by unread and unnoticed. Oblivion the labours of the earlier workers seldom deserve: some, it is true, seem poor in the extreme, but such a book as O. F. Müller's "Vermium Historia" (1774) is bright and instructive, and far beyond what was usual at that time. We have added a few notes on synonymy to explain in some measure the nomenclature we have used. These, be it noted, lay not the least claim to be in any way exhaustive. In point of fact the names of the "Systema Naturæ," ed. x., 1758, are usually as little doubtful as many given by later authors, though the words of Linnæus are often far from forming intelligible descriptions by themselves. If one were to exclude all the species which are really insufficiently characterized in the "Systema" (any edition you please), our *Unio* (*Margaritana*) *margaritifer* would be about the only one remaining as a Linnean species. We have made a careful examination of the relics of the Linnean Collection preserved at Burlington House, and the remarks of Hanley and others upon the types which concern us. The fact of the existence of these "type-specimens" (of course, it would be an anachronism to press this word too far) makes it impossible to doubt that most of the species which we designate by Linnean names are properly so designated, but it is extremely dangerous to place too much reliance upon information derived from the collection alone in its present condition, as cousiderable alterations (involuntary, no doubt) appear to have been made in the labelling. Thus, though there is practically scarcely any reasonable doubt, taking the "Systema" and the collection together, that *grisea*, L.=*aspersa*, Müll, and *itala*, L.=*ericetorum*, Müll, yet we have not ventured to re-introduce these names, because the evidence is just too weak to turn the scale of formal definition.

We have preferred to class *Vitrina* with the Limacidae as an aberrant genus: similarly the Endodontidae (*Punctum* and *Pyramidula*) and the Zonitidae (*Hyalinia*, etc.) go with the Helicidae. Anatomical comparison seems to show that both Zonitidae and Helicidae are derived from the prototypes of our Endodontidae, and thus the simplest way seems to be to unite them as one family: more especially as the aberrancies of Endodontids and Zonitids cross over into the normal Helicid path. (Pilsbry has, indeed, stated that the *spicula* of Zonitids are not homologous with those of the Helicidae: but from a careful examination of the species in question,* we find it hard to agree with him). The Endodontid radula and maxilla, though modified in many cases by habitat, yet suggest very plausible hypotheses for the understanding of the further complication of those organs. The Succineidae are, perhaps, hardly separate enough to merit separation from the Helicidae when we have given so wide a meaning to the latter term: yet the peculiarities found in their anatomy and general facies may, we think, be due to a pre-endododontid origin, and not merely to the special habits of the group. The Pupidae must eventually be separated into smaller congregations;

* We are indebted to Mr. W. Moss, of Ashton-under-Lyne, for some valuable material for this research.

but in view of the difficulty of obtaining satisfactory dissections of such small species, and the extreme poorness of the anatomical literature on this group, we have refrained from adding any smaller divisions. At first sight the *Clausilia* seem to demand a "family" to themselves, but from what we do know of their anatomy, we can hardly venture to separate them.

Before proceeding to the detailed specific part of the paper, we may state, that though the paper appears under our joint names, certain sections are almost entirely the work of one of us. Thus to Mr. Bowell are due the sections on "Methods" and on *Limnaea limosa*, while the treatment of *Tachea* and nearly all the measurements are by Mr. Boycott. Any commuuications relative to the subject may be sent to A. E. Boycott, The Grange, Hereford.

GASTROPODA PULMONATA STYLOMMATOPHORA.

TESTACELLIDAE.

TESTACELLA. *Drap., 1801.*

Testacella haliotidea, *Drap., 1801.*

A few specimens in a garden at Broomy Hill, Hereford (7 N). The "cocoon" which it makes when it burrows in the earth for hibernation or aestivation is interesting. We have been informed that a "snail-slug," probably this species, has occurred in a garden at Burghill (7 N). In both places plants from nurseries and greenhouses are fairly numerous.

LIMACIDAE.

LIMAX. *L., 1758.*

***Limax maximus,** *L., 1758.*

Fairly common: we have taken it as "sugar" in Hereford (7 N).

***Limax arborum,** *Bouch.-Chant., 1838.*

The Doward Hill (2), also at sugar there: in the wood on Backbury Hill (3).

AGRIOLIMAX. *Malm., 1851.*

***Agriolimax agrestis,** *L., 1758.*

AMALIA. *Moq., 1855.*

***Amalia gagates,** *Drap., 1801.*

L. E. Adams (Manual Br. L. F. W. Mollusca, ed. 2 (1896), p. 31), remarks that Herefordshire is one of the few recorded inland localities for this local slug.

***Amalia sowerbyi,** *Fér., 1821.*

= *L. marginatus.* Jeffreys, 1862.

VITRINA. *Draparnaud, 1801.*

***Vitrina pellucida,** *Müll., 1774.*

Müller's description brings us no further than the genus. Moquin-Tandon calls what is apparently our species *V. maior*, Fér., 1807 = *V. pellucida*, Drap., 1801: his *V. pellucida*, Müll. is another species.

Fairly common among dead leaves, under stones, among logs, etc., in moist places, but never very abundant. The statement about the hardiness of this species we can fully confirm: it is found crawling about on exposed surfaces even in the coldest weather, and forms an interesting exception to the general rule in moving about in the open in the middle of the day in dry weather.

It appears to be much more abundant in the spring than at any other period of the year; indeed, it is often hard to find a live specimen except early in the year. We have of course observed exceptions to this rule, which, however, seems to be a general one in England (see J. F. Whiteaves List of Moll. of Oxfordshire, Ashmolean Soc. (1857), p. 6; W. E. Collinge in *Zoologist* (3), xiv., p. 467; S. S. Pearce, ibid. (3), v., p. 364; B.C., i., p. 156). It is probably due to the fact that such an essentially boreal species aestivates very deeply and firmly.

Both the greenish and yellowish forms occur, apparently indiscriminately.

ARIONIDAE.

ARION. *Fér., 1819.*

***Arion ater,** *L., 1758.*

As usual, quite common. The red variety (=*rufa*, *L.*) and intermediate forms are not infrequent. We once saw a fine red specimen, spotted with bright brown (cf. *reticulata*, Roebuck) frozen up in a block of ice at Hereford. Cream-coloured specimens used to be common near Holmer on the canal-side.

***Arion hortensis,** *Fér, 1819.*

***Arion bourguignati,** *Mabille, 1868.*

HELICIDAE.

HYALINIA. *Agassiz, 1837.*

=*Zonites* partim B.C., etc. *Vitrea*, Fitzinger, 1833, has also been used a good deal recently.

Hyalinia draparnaldi, *Beck, 1837.*

Moquin-Tandon (1855) and L. E. Adams (1896) say this=*lucida*, Drap. 1801: as M. T. points out, it is certainly not the *lucida* of Drap., 1805, which is small and rather conical, and more like *nitida*, auctt. It may be well here to insist on the extraordinary difficulty in diagnosing the earlier—and, indeed, often the more recent—descriptions of this genus. Most of the species seem to have been called *nitida* or *nitens* at some time or other.

Brainton (7 N), Clehonger (7 S), but nowhere plentifully.

***Hyalinia cellaria,** *Müll., 1774.*

Müller's epithet, "limax totus albus," seems hardly appropriate.

Fairly common, especially in dry places like Dormington (3) and Doward (2) lime quarries. It seems, perhaps, to occur most freely among rubbish in the immediate neighbourhood of houses, for instance, in gardens in Hereford, where it has also been found in a hot-house. White forms (*albina*, Moq.) have occasionally occurred at Dormington Quarries (3): these are usually smaller than the typical forms.

This species has been seen in Hereford (7 N) devouring a small worm.

The very flat form with the periumbilical white well-developed does not seem very common. The more general form is smaller, more conoid, with a wider umbilicus and less white underneath, tending, in short, to show some of the characters of the shell of *Hy. nitidula*. Indeed, from the shell alone, some specimens would be hard to differentiate; though when alive their general appearance is quite different, *nitidula* being much more blackish-brown and lacking much of the yellow of *cellaria*. The latter by no means always has a darkish grey body: it is very frequently quite yellowish. The radulae of both forms of *cellaria* seem identical, and are, of course, quite different from that of *nitidula*.

Hyalinia glabra, *Studer, 1822.*

The synonymy of this species, as throughout the genus, is difficult. It is said that our species is *Hy. glabra*, Jeffreys, 1870, but not of Studer, 1822: while it should really be called *Hy. helvetica*, Blum, 1881.

Widely distributed in woods, among dead leaves, but not common: generally found in a young condition. It is very difficult to fix on the right time for finding *Hyalinia* in a perfect condition, yet it is comparatively easy, if crowding is avoided, to breed up half-grown specimens. If many are put together, their taste for animal food reveals itself.*

***Hyalinia alliaria**, *Miller, 1822.*

Not very common, and often only single specimens: Ross (2), Llanwarne (1), Staunton-on-Arrow (11), Bishopswood (2), Ledbury (4), Hereford (7 N), Berrington (9), Aymestrey (10), Michaelchurch Escley (14).

As has been often pointed out, the garlic smell is not an absolutely specific character, but is shared by other members of the genus: we have occasionally noticed it in *Hy. nitidula*, but generally speaking it is a good confirmatory test.

This smell may very likely be protective or sexual: in either case it is noticeable that its emission is only occasional and often, as far as can be ascertained, entirely absent. It sometimes appears to be exhaled by a snail which is sitting quite quietly. It has been recorded (B. Hudson in *Science Gossip*, Vol. xx. (1888), p. 91) that *Hy. cellaria* and *nitidula* are eaten by ants, while *alliaria* remains immune. If this observation were well-established generally, it would be an important point in favour of the protective nature of the smell.

The general appearance of a live specimen is very different from that of the rest of the genus, and, combined with the smell, renders the identification not very difficult. Certain differences in the radula between *alliaria* and *cellaria* have been pointed out (*Science Gossip*, n.s., Vol. iv. (1897), p. 6: E. W. W. Bowell), but the Herefordshire specimens, which in other respects conform with *alliaria*, do not altogether confirm these observations, their radulae appearing to be hardly different from those of *cellaria*.

[I have no doubt that the radula figured and described by me *l. c.* belonged to a form different from *alliaria* as we have understood it in Herefordshire, and

* I have only examined one radula of Herefordshire *glabra*; it belonged to the genuine *glabra* type, with short central mesocone. A large proportion of the *glabra* records appear to belong to another (closely allied but) separate species.—E. W. W. B.

as it is generally understood. The form may in fact be different from any yet described as British: the only specimens I have met with are from North Devon, and the difference in radula is consistent and striking. At the same time I cannot agree that the radulae of *alliaria* and *cellaria* are identical. E. W. W. B.]

***Hyalinia nitidula**, *Drap. 1805.*

Draparnaud's figure represents a very small species.

As, perhaps, generally, this is the commonest *Hyalinia* found in Herefordshire. It occurs under stones, etc., in most places. The proportion of living and dead specimens found seems to be largely in favour of the latter, more so, indeed, than in other species. The contention of J. W. Williams (*Science Gossip*, Vol. xxvi. (1890), pp. 180 and 275: criticised by S. S. Pace, ibid., p. 233, and C. C. Fryer, ibid., p. 242), that *Hyalinia* are generally to a large extent immune and free from enemies, seems hardly borne out by facts.

In December, 1892, during a severe frost, many specimens occurred buried several inches deep in the earth under stones near Hereford (7 N).

It is not infrequently infested with a parasite, which seems identical with *Philodromus limacum*, Jenyns, which is so common on slugs. It has been stated (W. A. Gain, in *Young Naturalist*, June, 1896, p. 79) that these only occur on slugs in England, on slugs and snails on the Continent; but, as a fact, they occur on many shell-bearing mollusca in England. We have frequently noticed them within the pulmonary sac in *Hyalinia* and *Tachea hortensis*.

Near Longtown (14) a specimen has been seen feeding on a dead *Oniscus*.

The var. *nitens*, Mich., occur not uncommonly: the habitat differs from that of typical *nitidula*, the variety being more addicted to dead leaves, etc., and generally wetter places (cf. B. C., i., p. 163, where a wetter habit is ascribed to the type).

***Hyalinia pura**, *Alder, 1830.*

There is no doubt that Alder described the white form (= var. *margaritacea*, Jeff.) as the type (see *e.g. Journ. Conch.*, vii., p. 151), and was so understood by Forbes and Hanley (*British Mollusca* 1853, iv., p. 37), and Gray, 1857. The brown form Alder called Cat. Moll. Northumb. and Durham, 1848), var. *nitidosa*, Fér., 1822. Moquin-Tandon (1855) gives *nitidosa*, Fér. as synonymous with *pura* Alder and describes the typical shell as "blanchâtre, ambrée ou roussâtre." Jeffreys (1862) and other recent authors generally describe it as "horn-coloured." Putting aside any question of colourative dimorphism, it seems more reasonable to regard the brown form as the natural type: should then the species be called *Hy. nitidosa?*

This species is fairly widely distributed in the county, but is not very abundant anywhere. It occurs rather freely in the Woolhope district (3) among damp, dead leaves.

The type of Alder (= var. *margaritacea*, Jeffreys) is as a rule less abundant than the brown form (*nitidosa*): in the Woolhope district, however, on the Silurian limestone, the white form appears to be almost the commoner. Outside district 3 indeed *margaritacea* has only occurred at Burghill (7 N.) and Rotherwas (7 S).

***Hyalinia radiatula,** *Alder, 1830.*

Sparingly under bark on willow-trees at Whitchurch (2) and Longworth (6).

DISCUS. *Fitzsinger, 1833.*

***Discus crystallinus,** *Müller, 1774.*

This species again has been found in many places, but it seldom occurs freely. It is rather common on Backbury Hill (3) among dead leaves, and generally occurs in the rejectamenta of the Wye at Hereford.

The readiest method of collecting this and many other of the smaller species is to search among some damp accumulation of dead leaves. Quantities may readily be taken away, and, after drying, looked over more thoroughly at home. The brilliant white colour of the present species and *Carychium minimum* render these conspicuous objects, but such a species as *Acanthinula aculeata* requires some looking for. In a small cleft of the rock at Adam's Rocks on Backbury Hill (3), filled with dead oak-leaves, the following species have been found, which will give an idea of the productiveness of such localities (some of the species, it is true, are obviously better found by other means):—*Vitrina pellucida, Hyalinia cellaria, nitidula, pura, Discus crystallinus, Conulus fulvus, Hyg. hispida, Acanth. aculeata, Pyr. rotundata, Vallonia pulchella, Hel. caperata, Crypt. aspersus, Tachea hortensis, nemoralis, Caec. acicula, Bul. obscurus, Zua lubrica, Pupa umbilicata, Vertigo pygmaea, Clausilia rugosa, laminata, Cyclostoma elegans.* And it has been said that snails are averse to living amongst oak leaves.

The average measurement of the diameter is 3.04, max. 3.4 (Aymestry, '10), min. 2.7 (Wye rejectamenta, Hereford, 7 N). M. T.=2 to 3; J. G. J.=3.2; J. W. W.=4.

CONULUS. *Fitzinger, 1833.*

***Conulus fulvus,** *Müll., 1774.*

= *H. trochiformis*, Montagu, 1803, *T. terrestris*, da Costa, 1778.

Widely distributed but not very common: among dead leaves, rubbish, etc., under stones, generally more frequent in and about woods, but also sometimes on the roadside.

An average specimen measures 3.0 × 2.4. M. T. = 3 × 2.5; L. E. A. = 2.5 × 2.5; J. G. J. = 2.5 × 2.5. There seems here to be an important division of opinion as to the whole shape of the shell. We cannot support the statement of Jeffreys (B. C., i., p. 171) that it is larger when found in dry situations than from wet moss.

PUNCTUM. *Morse.*

Punctum pygmaeum, *Drap., 1801.*

The original spelling seems to nave been *pygmea*.

Rare at Burghill (7 N.) on an old wall, and in Rotherwas wood (7 S.) among dead leaves. Careful search in suitable places would probably shew that this species is commoner in the county than it at present appears to be.

PYRAMIDULA. *Fitz.*

Pyramidula rupestris, *Drap. 1801.*

= *H. umbilicata*. Montagu, 1803, Gray, 1840 and 1857, Forbes and Hanley, 1853.

Very abundant in the chinks among the rocks, under stones, etc., in the large limestone quarry on the Great Doward Hill (2: about 400 feet above sea-level). The apical periostracum is frequently considerably eroded. This is often seen in this species, and is doubtless, at least partially, correlated with the exposed life it lives: the Doward locality is especially open. A single specimen has also occurred on the railway-bank near Staunton-on-Arrow (11).

***Pyramidula rotundata,** *Müll., 1774.*

= *H. radiata* da Costa, 1778, Turton, 1831; Mont., 1803.

Very common, and generally distributed. With the possible exception of *Fr. hispida*, this species is probably the most generally common snail in the county, occurring in all sorts of situations throughout Herefordshire. Stones, logs, and dead leaves will almost invariably produce some specimens, and it is one of the most constant constituents of flood débris on the Wye. It is, however, strangely uncommon in the southern part of district 13, though near Bacton, and in the neighbouring district 14, it occurs with its usual frequency. It is also quite common in the north of D. 13. It has occurred abundantly in a hot-house in Hereford (7 N). A live immature specimen (mai. diam. 4.4 m.m.) has been taken on Backbury Hill (3) with about 1½ apical whorls completely broken away: such lesions in small species are not very often noticeable. Specimens from under stones near Bacton (13), from an elevated situation, showed a good deal of deperiostracization about the apex (October, 1896). The variety *alba*, Moq, has occurred at Bishopswood (2: R. W. J. Smart).

Locality.	Diameter.			Height.			Coeff. $\frac{\text{diam.}}{\text{height.}}$		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
Hothouse at Hereford (7 N)	7.4	6.0	6.42	3.4	2.5	2.98	2.52	1.84	2.15
Backbury (3), 1893	6.3	5.5	5.94	3.2	2.5	2.86	2.40	1.90	2.07
——— ——— 1891	6.1	5.7	5.92	3.1	2.7	2.88	2.15	1.965	2.06
——— ——— 1896	6.5	6.1	6.26	3.4	2.6	3.0	2.38	1.84	2.05
Dormington, Q. (3), 1893	6.9	6.1	6.475	3.5	3.1	3.21	2.10	1.91	2.02
——— ——— ——— 1896	6.7	6.3	6.52	3.5	3.0	3.2	2.14	1.91	2.04
Clifford (13)	6.2	5.7	5.9	3.2	2.6	2.9	2.23	1.78	2.03

The general mean of all specimens from the county (including, of course, the above) is 6.15 × 2.99: coeff. = 2.057. M. T. = 5 to 8 × 2 to 4; L. E. A. = 6.5 × 2.5; J. G. J. = 6.985 × 2.54; J. W. W. = 8 × 3. The maximum diameter is 7.4 × 3.4 (hothouse at Hereford, 7 N); the maximum altitude is 6.0 × 4.1 (Coneygree Woods, Ledbury (Silurian) 4). The same specimen gives the lowest $\frac{\text{diam.}}{\text{height}}$ coeff. = 1.463, *i.e.*, is the most conoid specimen; the highest coefficient (=the flattest specimen) is 6.3 × 2.5 = 2.52 (hothouse at Hereford). The normal

coefficient seems to lie a trifle over two (2.057); it might be convenient to reckon those specimens which worked out at 2.5 or more as flat (*turtoni*, Fleming), and those at 1.5 or less as conoid (*pyramidalis*, Jeff.). At the same time, it should be remembered that a high coefficient may be produced or accentuated by other aberrations than the shell being depressed above: the depression may be either above or below, or both. [The description of *Helix turtoni* by Fleming, in *Hist. Brit. Animals* (*1828*), p. 260, says "shell flat on both sides": this is followed by Gwyn Jeffreys (B. C., i., 1862, p. 219). But J. W. Williams (Handbook, 1888, p. 121) under var. *turtonii*, says "shell almost flat above." A little consideration shews that the two descriptions have by no means the same meaning, and the difference between them involve important points in form variation, which are, however, difficult to exactly describe, and still more difficult to measure.]

As will be noticed, the variation in the coefficient (*i.e.* variation in conoidity) is very considerable. For example in shells with a diameter of 6.3 m.m. the altitude may vary (in fairly normal cases) from 2.5 to 3.4, and with a diameter of 6.2 from 2.6 to 3.2. We say in normal cases, because the variation is so frequent that moderately extreme cases cannot be regarded as aberrant mutations. It is interesting to enquire how far variation in the coefficient may be associated with variations in size. Thus it might be suspected that specimens with a large diameter would have a kind of compensatory deficiency in altitude *i.e.* would have a larger coefficient. Applied to our specimens of the present species, the following results are obtained:—those with a diameter greater than 6.15 m.m. have a mean coefficient of 2.06 (variation from 2.52 to 1.84), while those less in diameter than 6.15 m.m. give a mean of 2.03 (2.42 to 1.46). Though the difference here lies in the direction indicated, the difference is not sufficiently great to exclude errors arising from the departure from absolute accuracy which is the unfortunate concomitant of all experimental observations. Further notes on this point will be found under several species below.

HELICELLA. *Fér., 1822.*

Helicella virgata, *da Costa, 1778.*

=*H. variabilis*, Drap., 1801; Moq. Tand., 1855: *variabilis* and *virgata*, however, seem to be distinct, and M. T. is certainly wrong in attributing da Costa's *virgata* to Müller's *pisana*.

Four immature empty shells have been found in a rough field on the high ground near Moreton (7 N), where *ericetorum* and *caperata* also occur. Three are quite small and banded: the fourth is larger (9.9 × 7.6) and white.

The *ericetorum* in this locality are small (*vide infra*), and *virgata* (their usual companion) has apparently quite recently become extinct. The unsuitability of the habitat is probably the cause of this. It is not hard to see how the spread of cultivated ground and the consequent destruction of the wild, rough herbage in which this species delights, may be leading first to its confinement within small areas, and then to its extinction in many parts of England. The soil, too, of Herefordshire is unsuitable.

Helicella ericetorum, *Müll., 1774.*

Following the Conch. Soc., 1892, it has recently become customary to use the name *itala*, L., 1758, for this species, but the change is hardly justified by the evidence.

Common all over the high ground between Burghill and Moreton (7 N), in ordinary, rather rough pasture fields, and especially in and about several gravel quarries. Also occurs abundantly on an ordinary road-side hedge-bank near Stretton Sugwas (7 N), and on Westhide Hill and on the high ground near Moreton Jeffreys (6: J. H. Wood).

The specimens are always small, and the bands, as a rule, of a paler brown than usual. The measurements of the Burghill specimens are:—diam. max. 16.2 × 9.0, min. 14.0 × 7.4, mean 15.3; alt. max. 9.2 × 15.5, min. 7.4 × 14.0, mean 8.41; coefficient max. 15.9 × 7.7 = 2.065, min. 15.5 × 9.2 = 1.685, mean 1.83. For comparison we may quote measurements of some specimens from Folkestone:—diam. max. 18.4 ×10.4, min. 16.7 × 7.3, mean 17.78; alt. max. 10.4. × 18.4, min. 7.3 × 16.7, mean 9.04; coefficient max. 16.7 × 7.3=2.29, min. 18.4 × 10.4=1.77, mean 1.99. This clearly shews that the Burghill specimens are more conoid than those from Folkestone, but whether this is a variation correlated with difference in size such as we have suggested elsewhere, or an independent variation, we are not at present prepared to say: it is probably the latter. It always seems to be larger on the sea-coast (see Ed. Forbes in Brit. Assoc. Reports for 1839, p. 129). M. T. = 10 to 25 × 6 to 12; L. E. A. = 18 × 7; J. G. J. = 17.1 × 6.35; J. W. W. = 17 × 8.

*Helicella caperata, *Mont., 1803.*

Probably = *fasciolata* and *intersecta*, Poiret, 1801; and = *H. striata*, Drap., 1801 (preoccupied). Moquin-Tandon and Gray, 1857 have *fasciolata*, a name for which much may be said.

Fairly common and widely distributed all over the county. It is exceedingly abundant at Dormington Quarries (3), lying about in great profusion on rough stony ground with sometimes hardly a trace of vegetation present: consequently the shells are often weathered and the markings become faded before the death of the snail. The dark form (var. *fulva*, Moq.) occurs here, and also at the Doward (2). We have noticed the form *ornata* Picard in the Woolhope district in places where there are no sheep (see S. S. Pearce in *Journ. of Conch.*, vi., pp. 123 ff.). Of a batch of specimens from Dormington Quarries (Sept., 1896), 5.45 p.c. were *ornata* and 9.1 p.c. *fulva*: of specimens from the large (Wenlock) limestone quarry in Coneygree Woods, near Ledbury (4), 3.1 p.c. were *fulva*. In the latter locality the species lies about over the dry ground in countless myriads, in even greater profusion than at Dormington. The general character of the specimens from here seems to be well-marked: the bands are broken into spots and both ground-colour and spots are bright and clear and the difference between them is thus accentuated. The var. *fulva* seems generally to be confined to the limestone. It has not occurred in the southern part of district 13 (Tram Inn, St. Devereux, etc.) where the species is abundant on the roadside banks. These specimens are never quite so sharply and brightly marked as those from more

secluded localities, where the herbage is much shorter and more scanty, such as the quarries mentioned above. The var. *ornata* occurs but only to the extent of some 2 p.c. and those a dull form: the general colours are more dull and dusky, and there is no doubt a good deal of protective (?) resemblance to withered, light-coloured leaves, etc. We have ourselves been deceived into mistaking the dead, withered heads of *Centaurea nigra* and the ends of bits of broken stick, etc., for *caperata*. A dull whitish form (*albescens*) has occurred in this district (4.2 p.c.)

In the autumn of 1896 specimens with a distinctly pink rib, and in some cases (Ledbury, 4) of a reddish hue all over, were not uncommon (cf. sub *Hyg. hispida* infra).

We can quite confirm the statements relative to the hardiness of this species: it has been seen crawling about over moss in Dormington Quarry (3) when snow lay thick on the ground. Like *Hel. ericetorum*, but not to quite such a marked degree, it is a very shy species.

The following table shows some of the variation in size for four different localities (Dormington and Ledbury are Silurian, Tram Inn and Abbeydore Old Red Sandstone):—

Locality.	Diameter.			Altitude.			Coefficient.		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
Dormington Q. (3)	9.3	6.7	8.20	6.5	3.8	5.34	1.76	1.26	1.54
Ledbury (4)	9.1	7.1	7.99	6.2	4.4	5.16	1.67	1.45	1.55
Tram Inn (13)	10.4	7.0	8.44	7.5	4.8	5.58	1.65	1.37	1.51
Abbeydore (13)	8.9	6.9	7.90	6.1	4.7	5.275	1.58	1.39	1.50

The figures for all Herefordshire specimens examined are:—diam. max. 10.4 × 6.6 (Tram Inn), min. 6.7 × 3.8 (Dormington), mean 8.31; alt. max. 7.5 × 10.3 (Tram Inn), min. 3.8 × 6.7, mean 5.47; coefficient max. 6.7 × 3.8 = 1.76, min. 8.2 × 6.5 = 1.26 (Dormington), mean 1.52. A specimen over 10 m.m. mai. diam. (10.1 × 7.1) comes from Stretton Sugwas (7 N). M. T. = 7 to 10 × 6 to 8; L. E. A. = 10 × 5.5; J. G. J. = 9.5. × 5.7; J. W. W., 11 × 7. Gwyn Jeffreys (B. C., i., p. 214) makes a considerable difference in the size of the *ornata* form, giving 7.6 × 3.8, a point which we cannot in any way uphold. The largest Herefordshire specimens, it is true, are not *ornata*, but this form is, as a rule, well up to the average size.

*Helicella cantiana, *Mont., 1803.*

= *H. carthusiana*, Drap., 1801; Turton, 1831.

Only recorded in Taylor and Roebuck's census. Mr. J. W. Taylor kindly informs us that their record is "Dinmore, October 4th, 1893: H. T. Soppitt," but further information as to the exact locality is not forthcoming. In 1891 79 specimens from Oxfordshire were turned out near Hereford, but they all disappeared in a few months and nothing has been seen of them since. The

experiment probably failed owing to an unsuitable spot having been chosen, though the place certainly appeared similar to those in which it occurs freely in Oxfordshire. Like *e.g. Melanargia galatea* it is a species remarkably capricious in its distribution, being abundant in particular circumscribed localities, but not appearing to stray much. Mr. E. W. Swanton informs us that he attempted to naturalise this species at Bratton St. Maur, Somerset, but without success. Other experiments have however been more successful (see J. C. Blackshaw in *Naturalists' Journal*, Vol. v. (1896), p. 25; L. E. Adams, op. cit, p. 75; Baillie in H. W. Kew Dispersal of Shells (1893), p. 192: it has been introduced into North America). This characteristic of inhabiting extremely restricted areas might easily cause one to pass it by, and renders somewhat unconvincing the interesting suggestions which have recently been put forward (see *e.g.*, L. E. Adams, op. cit., p. 75) concerning its introduction into and progress in Great Britain.

HYGROMIA. *Risso, 1826.*

* Hygromia fusca, *Mont., 1803.*

In September, 1890, six specimens occurred in the large quarry on the Great Doward Hill (2) on a bush of *Clematis vitalba*, and in October, 1893, four specimens among dead leaves in Stoke Woods (3). In neither locality has it been since found, despite repeated searches. The specimens were somewhat paler in colour than usual, but none were actually albescent. Dr. J. H. Wood has taken a single immature specimen from a bush of *Corylus* in Stoke Woods. The Rev. R. W. J. Smart tells us that it used to be quite common at Bishopswood (2), where it always occurred on the trunks of *Fagus*: these specimens were quite normal.

* Hygromia hispida, *L. 1758.*

Includes *H. concinna*, Jeff., 1833. According to Conch. Soc. List, 1892, *hispida*, L. = *concinna*, Jeff. (which is supported by the Linnean types), and *hispida*, Jeff. = var. *hispidosa*, Mousson. It is not Moquin-Tandon's *hispida*, as this has but one spiculum (his *plebeia* has two like our *hispida*).

Very widely distributed and common. It frequently occurs freely in heaps of unbroken stone by the roadside, a situation in which other snails are not often found. The white form (*albida*, Jeff.) occurs at Dormington Quarries (3) and Wyeside (7 N), and the hairless form at Aymestry (10). The var. *subrufa*, Moq. (not a very distinct form) seems to be not uncommon in dry situations such as Dormington Quarries (3). The thickness of the shell here, at any rate, seems distinctly correlated with the aridity of the habitat. A pale peripheral band is not uncommon. A pink tinge in the rib was rather common in the autumn of 1896 (Bromyard, 5, etc.), and has occurred occasionally at other times: the colour is to some degree rapidly evanescent. This species varies considerably in its general appearance when alive: from a deep brown, or almost black, with short stiff hairs, sometimes few in number, to a pale yellowish-drab, with a thick coat of downy whitish hairs almost like *granulata*. The differences are probably in great

part due to the nature of the immediate surroundings and to the state of the weather.

The mean measurements are:—Diam. max. 9.2 × 5.5 (Dormington Quarries (3), 1896), min. 7.2 × 4.2 (Little Tarrington, 1896), mean 7.83; alt. max. 6.1 × 8.0 (Wyeside, 1892), or × 7.9 (Dormington Q., 1893), min. 4.0 × 7.2 (Dormington Q., 1893), mean 4.96; coefficient max. (= flattest) 7.2 × 4.0 = 1.80 (Dormington Q., 1893) and 7.4 × 4.1 = 1.80 (Aymestrey (10), 1896), min. (= most conoid) 7.9 × 6.1 = 1.295 (Dormington Q., 1893), mean 1.58. The variation in the coefficient is exceptionally large in this species. M. T. = 6 to 10 × 4 to 6 (*hispida*) and 7 to 9 × 6 to 8 (*concinna*), L. E. A. = 10 × 5, J. W. W. = 10 × 5.5, J. G. J. 10 × 5 (*concinna*) and 7.6 × 4.7 (*hispida*). The last figures are surprisingly near the average as determined by us.

Hygromia rufescens, *Pennant, 1777.*

Not very common; it is abundant on Broomy Hill at Hereford (7 N) and at Ross (2). It has also occurred fairly freely on the Doward (2), and rarely at Rotherwas (7 S), Wareham (7 N), Staunton-on-Wye (8), Badnage (8), and Dormington Quarries (3: a single specimen only). White and albid forms have occurred freely at Hereford and Ross (on horse-radish), also at the Doward (2: on an elder hedge), and at Rotherwas (7 S). In a garden on Broomy Hill, which has been carefully watched from year to year, the light forms have largely decreased of late years, despite (?) the extraordinary dryness and warmth of the last few seasons. In 1890 they were quite as abundant as the type, but in December, 1894, only 19 p.c. occurred, and in August, 1896, 11 p.c. At Ross the white form occurred, practically alone, in a waste field, and, in company with light forms of *Tachea hortensis* and *Succinea putris*, was very abundant on horse-radish. There may have been some connection between the food-plant and the albinism, but we are not inclined to attach much weight to the instance (see *Science Gossip*, xxviii. (1892), pp. 78, 9; J. W. Taylor, *Monograph*, i. (1895), p. 91).

The var. *rubens*, Moq., has occurred occasionally near Hereford (7 N). The form with a white band round the periphery is of by no means infrequent occurrence: indeed, at least some slight development of this band may be detected in the majority of specimens. Specimens with an opaque white spiral band below the periphery (really a pathological malformation due to some lesion of the mantle edge) have been found on Broomy Hill (7 N). In the same place a live specimen has also occurred in which the apex of the shell was quite broken away, leaving a free passage right through the umbilicus.

The hispidity of the immature shell seems to be an inconstant character: it is sometimes present, and sometimes absent.

It is a shy and timid species, withdrawing into its shell quickly on the approach of the hand, apparently perceiving the object by sight rather than by shadow or vibration of its surroundings: it would thus seem to have rather better sight than most Pulmonata are said to possess (up to 2—4 inches or more).

The general average size is 12.2 × 7.32, coeff. 1.66: max. diam. 13.4 × 7.5 (Ross), alt. 8.6 × 12.4 (Hereford), coeff. 1.94 (10.5 × 5.4: Hereford); min. diam. and alt. 10.5 × 5.4 (Hereford), coeff. 1.44 (12.4 × 8.6: Hereford). M. T. = 9 to 10 × 6 to 8 (it would seem that there must be some mistake here, *Histoire*. ii., p. 207), L. E. A. = 12.5 × 7.5, J. G. J. = 7.6 × 12.7, J. W. W. = 14 × 6. The mean of the Ross specimens is 12.24 × 7.3 = 1.68; from Broomy Hill, off a rockery, 12.35 × 7.52 = 1.64; off an ivy-covered roof, 11.75 × 6.975 = 1.68; off nettles, 12.7 × 8.075 = 1.575. It might be expected that specimens from among ivy would be rather reduced in size. There does not seem to be any very constant difference in size or shape between the dark and pale specimens from the same locality: thus, of a number taken from the same spot (amongst ivy) and at the same time, the pale ones give 11.35 × 6.83 = 1.66, the dark ones 11.75 × 6.975 = 1.68. Of all specimens, those above 12.15 in diam. give average alt. 7.7 and coeff. 1.52, those below 12.15 give 6.90 and 1.695. The variation in the coefficient is of considerable magnitude—about 25 p.c. of the figures given.

ACANTHINULA. *Beck, 1846.*

Acanthinula aculeata, *Müll., 1774.*

= *H. spinulosa*, Lightfoot, 1786, Turton, 1831, Montagu, 1803.

Rather widely distributed, chiefly among dead leaves, etc., and fairly common in some places, *e.g.*, Dormington Quarries (3) and near Moreton (7 N). Fine specimens occurred in Credenhill Wood (8) in 1891. It seems especially fond of sitting on stones which lie amongst accumulations of damp dead leaves. We have taken a few specimens from an old stone wall at Burghill (7 N) which had not the usual adventitious protection of an accumulation of dirt between the spines. As a rule, however, it is very dirty, and is very apt to be mistaken for a bit of dirt and *vice versa*.

VALLONIA. *Risso, 1826.*

* Vallonia pulchella, *Müll., 1774.*

= *H. costata*, Müller, 1774: *H. paludosa*, da Costa, 1778; V Sterki (Proc. Acad. Sci. Philadelphia, 1894, p. 234) argues strongly for the old view, that *pulchella* and *costata* are distinct species; perhaps it is only a case of dimorphism associated sometimes (but certainly not always) with differences of habitat.

Occurs, but not abundantly, at Dinedor (7 S), Doward (2), Backbury (3), and Dormington (3), and on Credenhill (7 N). The form *costata*, Müll., has been found at Backbury.

The statement of Forbes and Hanley (Brit. Moll., iv., p. 79), repeated by Jeffreys (B. C., i., p. 224) and others, that the body is "milk-white," is hardly correct. Many, if not the majority, of the specimens which have come under our notice, not only in Herefordshire but elsewhere as well, might much better be described as having "jet-black" bodies. In many this is actually the case, and in no instance have we seen the epithet "milk-white" justified.

HELICIGONA. *Fer., 1822.*

• **Helicigona lapicida**, *L., 1758.*

=*H. acuta*, da Costa, 1778.

Not very common, and freely only on the limestone. A single specimen has occurred at Burghill (7 N), a few at Aymestrey (10), and it is fairly common in the Woolhope (3) and Doward (2) districts. Burghill is the only locality off the Silurian limestone where it has been found. It seems to have become commoner at Backbury during the last few years. The form with a blunt periphery (*subangulata*, Pascal) has occurred once at Dormington Quarries (3). This specimen also shews a tendency to subscalariformity in the last two whorls.

The Backbury specimens average 16.59 × 7.86 = 2.11: max. diam. 17.7 × 8.0, alt. 17.4 × 9.2, coeff. 2.32 (16.0 × 6.9); min. diam. 14.6 × 6.9, alt. 6.9 × 16.0, coeff. 1.89 (17.4 × 9.2). The specimens from Dormington Quarries average 16.72 × 7.86 = 2.13, max. diam. 17.8 × 7.9, alt. 9.0 × 16.7, coeff. 2.37 (16.1 × 6.8); min. diam. 15.4 × 7.2 and × 7.6, alt. 6.8 × 16.1, coeff. 1.86 (16.7 × 9.0). From Aymestry the coeff. 1.83 (15.0 × 8.2) comes, the average there being 15.6 × 7.8 = 2.00. The Burghill specimen is 15.0 × 7.3 = 2.05. A $\frac{\text{diam.}}{\text{alt.}}$ coeff. of less than 2 is quite uncommon, and indicates a distinctly subconoidal specimen.

Variation in every respect is small compared to what is found in many other species. The maxima and minima for all Herefordshire specimens are all mentioned above. The general mean is 16.6 × 7.85 = 2.11. Other results are M. T. = 12 to 20 × 7 to 9, L. E. A. = 16.5 × 6.5, J. G. J. = 16.5 × 5.1, J. W. W. = 17 × 6.5. The noticeable point is the small relative altitudes (and consequently high coefficients) given by all except Moquin-Tandon. This arises, no doubt, from different methods of measuring the altitude; these authors may refer to the altitudo minor, *i.e.*, the distance from apex to umbilicus, not the total altitude (alt. maior) which is always given in this paper (parallel to axis) unless otherwise specially mentioned. The specimens with a diameter of more than 16.65 give a mean coefficient of 2.122; those less than 16.65 give 2.017.

It may be well here to illustrate the necessity of using specimens of normal shape for determining these $\frac{\text{diam.}}{\text{alt.}}$ coefficients. By normal we mean free from obvious pathological malformation and misgrowths. The common malformation in the present species is a lack of development in the peristome and immediately surrounding parts. This leads to a reduction in the (maior) diameter as measured by us, and consequently the coefficient is lowered, and implies that the specimen is more conoid than is actually the case. This would be compensated for if, as, however, is seldom the case, the malformation of the peristome also involved a loss in altitude of some serious magnitude. These malformed specimens thus nearly always shew a coefficient below two. We trust it is needless to mention that such specimens are never, either here or in other species, included in the data for averages, nor mentioned without special note as to their peculiar circumstances. The specimen, mentioned above, with a blunt keel and some scalariformity is also slightly otherwise deformed, and gives 15.9 × 8.9 = 1.79.

The specimens from the Woolhope district (3) are darker and have less prominent and bright markings than those from the Doward (2).

ARIANTA. *Leach, 1831.*

***Arianta arbustorum**, *L., 1758.*

Not uncommon, but it can in no sense be called abundant. It has occurred at various places in the county in small quantity: it is perhaps commoner on the Doward (2) than anywhere. Near Mordiford (7 S), near Ledbury (4), and at Hampton Bishop (7 N) it has been found in osier beds, to which it seems somewhat partial.

The bandless form (*fuscescens* = *marmorata*) occurs at the Doward (2).

This is probably a commoner species than may at first appear. It is much more nocturnal in its habits than *e.g. Tachea*, and even when moving about freely keeps deep among the herbage. In consequence, careful search, often with a lantern, is necessary to reveal its real abundance. It is, of course, not infrequently seen about in the daytime, and in the autumn (September) may be found crawling on the hedge-banks up to nearly mid-day, just as, at that time of year, *Tachea* may be found out similarly late.

The average size is 20.15 × 16.86 = 1.195; max. diam. 21.1 × 17.6 and × 18.7 (Downton, 10), alt. 18.7 × 21.1 (Downton), coeff. 1.41 (20.2 × 14.4, Doward 2); min. diam. and alt. 17.8 × 14.2 (near Holmer, 7 N), coeff. 1.06 (17.9 × 16.9, near Hereford 7 S). M.T. =14 to 25 × 10 to 20, L. E. A. = 20 × 12, J. G. J.= 20.3 × 12.7, J. W. W. = 24 × 16. The average weight is about 0.58 grammes, max. 0.70, min. 0.39.

CRYPTOMPHALUS. *Agassiz, 1837.*

Sensu restricto as Moquin-Tandon, 1855.

***Cryptomphalus aspersus**, *Müll., 1774.*

= *H. hortensis*, Pennant, 1777; Turton, 1819: *C. vulgaris*, da Costa, 1778. The *H. grisea* of Linnaeus, 1758 is very likely this species. [" H. grisea, 606. H. testa imperforata subovata obtusa grisea: fasciis duobus pallidis apertura oblonguiscula. Gualt. test. t.i.f. B. Habitat in Europa australi: terrestris." The *grisea* of the Linnean collection is *aspersa*, but little reliance can be placed on this fact.]

This large species occurs in most places, but it cannot be said to be abundant everywhere. In certain parts of district 9, for example, it is apparently not common at all. It seems to occur more freely in the neighbourhood of buildings and human habitations. The var. *albofasciata*, Jeff. has been found at Hereford (7 N.), Dormington (3) and Fownhope (3) and is not uncommon. A well-marked form of the variety *flammea* Picard occurs in a stone wall at Tupsley (7 N.) This form in its various minor modifications is one of the commonest types of colour arrangement met with in the county. In the present unsatisfactory state of descriptive nomenclature for the colour mutations of this species, no detailed description of its infinite variation in that direction can very easily be given. The specimens from under ivy on a wall in Hereford are conspicuously dark, while those from a precisely similar situation a few yards away, where clematis is substituted for the ivy, are of quite normal colour. It hibernates in gardens in

large quantities at the base of various close-growing plants. The severe winter of 1894-5 killed large numbers in these situations about Hereford. The number of dead shells of all ages always found is exceptionally large.

Two immature specimens were once found in one of the small holes which are so abundant in the limestone rocks of the Doward Hill. We do not however think that these holes have necessarily been excavated by the snails, attributing their presence rather to the action of water percolating through the cliffs, or of rain. At the same time the holes seem to correspond with those described by Buckland and others as being bored out by various mollusca (see *Zoologist*, 1864, pp. 8932, 9012, 9154, 9146; *Irish Naturalist*, Jan., 1897, p. 8; *Cambridge Nat. Hist.*, iii., p. 49: the question does not seem to have received the attention it might deserve from recent workers).

At present we are not prepared to discuss the variations in band-formula presented by this species. We may however mention that the commonest—in fact normal—type seems to be 1 (23) 45.

The measurements are as follows for all Herefordshire specimens examined:—Alt. max. 35.9 × 37.2 (St. Devereux, 13), min. 25.3 × 25.9 (Hereford, 7 S), mean 29.939; diam. max. 37.4 × 34.7 (Hereford, 7 N), min. 25.9 × 25.3, mean 32.299; $\frac{\text{diameter}}{\text{altitude}}$ coefficient max. 30.6 × 35.3 = 1.154 (Hereford, 7 N), min. 31.1 × 30.5 = 0.981 (Hereford, 7 N), mean 1.079; weight max. 1.993 gms. (37.0 × 34.6, Hereford, 7 N), min. 0.575 (31.6 × 28.7, Hereford, 7 N), mean 1.281. A series from old walls in a garden in Hereford (7 N) give the following figures:—Alt. max. 34.7 × 37.4, min. 27.2 × 30.8, mean 29.772; diam. max. 37.4 × 34.7, min. 28.1 ×27.7, mean 32.239; coefficient max. 35.3 × 30.6 = 1.154, min. 28.3 × 28.4 = 1.003, mean 1.083; weight max. 1.993, min. 0.575, mean 1.269.

M. T. = 25 to 40 × 24 to 45; L. E. A. × 35 × 35]; J. G. J. = 35.56 × 35.56; J. W. W. = 41 × 32. J. W. Taylor (*Monograph*, Vol i., pp. 77-8) gives the normal weight as 2.075 grammes, variation extending from 0.259 to more than 6.5. An old note records a shell from Hereford of 2.233 gms., but the specimen has been since broken up: it is not reckoned in the above averages. The specific gravity of the body-whorl shell varies from 2.868 to 2.955. Mr. de Boinville has sent us a stray specimen with a coefficient of 1.198 (25.3 × 30.3); this has not been included in the calculations above.

The following table of one batch of 24 specimens from a garden in Hereford (7 N) shews the lack of correspondence (*i.e.*, the variations) between diameter, altitude, and weight which is always seen. The same fact may be more forcibly demonstrated by constructing a composite curve from the figures given. In considering the figures in the last column, it must be remembered that they are influenced by variations in shape (relation between diameter and altitude) as well as by absolute differences in size. It should be borne in mind that this is an average series of average specimens.

Diameter.		Altitude.		Weight.		Diam. × Alt.	
1	37.4	1	34.7	2	1.977	1	1298
2	37.0	2	34.6	1	1.993	2	1280
3	35.3	7	30.6	5	1.748	4	1080
4	34.7	3	33.3	8	1.533	3	1155.5
5	34.4	9	30.5	3	1.869	5	1049
6	33.7	6	30.7	15	1.185	7	1035
7	33.6	4	31.1	4	1.772	6	1045
8	33.6	5	30.8	12	1.277	7	1035
9	33.4	11	30.1	18	1.118	10	1005
10	33.2	13	29.4	6	1.695	12	976
11	33.0	7	30.6	7	1.657	9	1010
11	33.0	10	30.2	11	1.336	11	997
13	32.2	12	29.7	19	1.108	13	956
14	32.1	15	29.2	13	1.234	14	937
15	32.0	17	28.8	9	1.467	15	922
15	32.0	20	27.8	10	1.429	18	890
17	30.8	16	29.1	16	1.177	17	896
17	30.8	24	27.2	23	0.941	20	838
19	30.7	14	29.3	17	1.160	16	899.5
20	30.3	21	27.7	20	1.098	19	839
21	29.9	23	27.4	14	1.219	22	819
22	29.6	22	27.5	22	0.994	23	814
23	29.2	19	28.1	21	1.019	21	820.5
24	28.4	18	28.3	24	0.853	24	794

The colour variations seen in young specimens are often very well-marked, not only in pattern of markings but also in the ground tint which may be almost anything from greenish to reddish. This persists to a large extent in the apical region of the adult shell, but in their later growth most of the shells get more or less near the same type, entirely losing the very marked differences they may have exhibited when quite young. Occasionally the immature markings are repeated throughout the growth of the shell, giving rise to striking variations.

TACHEA. (*Leach in Turton, 1831.*)

Statements have been made that it is unknown (J. G. Jeffreys, B. C., Vol. i., p. 188), or at any rate unusual (J. W. Horsley, *Journal of Malacology*, Vol. vi., p. 20, 1897), to find *Tachea nemoralis* and *hortensis* living together. As far as Herefordshire is concerned we have never come across the slightest indication that such is here the case. In no area of any size can one find one and not the other. Further on no single hedge bank where the one is seen at all freely is the other absent: and frequently they may be seen crawling together up the same dried stem of some Umbelliferous plant. The relative abundance of the two species however differs in different localities: and in certain large or small areas one or the other may be relatively very few in number. The following table shews these differences for a few localities where the necessary data have been collected. It may be as well to insist here that throughout our account of *Tachea*

the tables are constructed on collections made on the basis that *every adult specimen seen is taken.* Any sort of selection by the collector vitiates the results, generally we suppose in the direction of making the rarer forms appear less uncommon than they really are.

Locality.	Woolhope District (Silurian) 3	de Boinville Collection (7 N.) circa 1843.	Moreton, July, 1896.	Railway Bank, Hunderton (7 S.) April, 1895.	Broomy Hill (7 N.) April, 1895.	Average.*
No. of Specimens ...	146	737	540	216	308	1947
T. nemoralis	88.4 p.c.	74.5	83.3	44.4	27.6	67.23
T. hortensis ...	11.6	25.5	16.7	55.6	72.4	32.77

The figures here, as elsewhere in similar tables, are percentages.

We shall have to refer several times to these batches of *Tachea*, so we may here say something about the localities. In the Woolhope series, nearly all are from the large limestone quarry in Dormington wood. The other four lots are all from the Old Red Sandstone and from hedge-banks or similar situations. The Broomy Hill locality is 3 miles south of that at Moreton, and half-a-mile across the river Wye to the north of that at Hunderton. The de Boinville shells consist of a long series collected by Mr. A. C. de Boinville near Hereford (chiefly round Hampton Bishop), about the year 1843. These he has kindly placed at our disposal. It cannot, unfortunately, be said that they were collected strictly on our principle, but, from what Mr. de Boinville has told us about them, we do not think that the figures we give for them have been rendered entirely worthless by an excessive exercise of the collector's æsthetic sense. At any rate, though the figures may not be quite as accurate as those drawn from our own more recent collection, their interesting antiquity will be a reasonable excuse for introducing them.

* In the paper read before the Club in 1897, and published in *Science Gossip* for October, 1897, some of these figures were in error given wrong; an accident for which I must offer my apologies. A. E. B.

TABLE SHEWING THE DISTRIBUTION OF THE VARIOUS COLOUR-FORMS OF TACHEA NEMORALIS AND HORTENSIS IN THE FIFTEEN DISTRICTS AND ON THE THREE GEOLOGICAL SYSTEMS.

Species.	I.	II.	III.	IV.	V.	VI.	VII. N.	VII. S.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	Old Red Sandstone.	Silurian.	Carboniferous Limestone.
T. nemoralis	:	+	+	:	:	+	+	+	+	+	+	:	+	+	:	+	+	+
castanea	:	+	+	:	:	+	+	+	+	+	+	+	+	+	:	+	+	+
libellula	:	+	:	:	:	:	+	+	:	:	:	:	:	:	:	+	:	:
mista ...	:	+	+	:	+	+	+	+	:	+	:	:	:	:	:	+	+	+
rubella	:	+	+	+	+	+	+	+	+	+	+	:	+	+	+	+	+	+
T. hortensis	:	+	+	:	:	+	+	+	+	:	+	+	:	+	:	+	+	+
alba unic.	:	+	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
lutea unic.	:	+	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
fusca ...	:	+	+	+	+	+	+	+	+	+	+	:	+	+	+	+	+	+
arenicola	:	+	:	:	:	:	+	+	:	:	:	:	:	:	:	+	:	:
fasciata	:	+	:	:	:	:	+	+	:	:	:	:	:	:	:	+	:	:

***Tachea nemoralis,** *L. 1758.*

Generally common enough, though conspicuously more abundant in some places than others. It is occasionally absent in the most unaccountable way from a length of hedge-bank which to all appearances is most suitable. It moves about most freely in warm evenings after rain; but it may readily be collected (except in very hot weather) early in the morning. In September we have seen it out abundantly in dry, bright weather up till near midday: and in April it stops out sometimes quite late in warm days. In Herefordshire it does not generally seem to have a period of æstivation about July or August as it does elsewhere (*e.g.* in Kent): during a very dry period however (as in the late summer of 1898) this phenomenon may take place to a certain degree.

A very positive statement has recently been made (L. E. Adams, Collector's Manual Br. L. F. W. Shells, ed. 2, 1896, p. 65) that in shells of this species eaten by mice the apex is always entire, and always broken in those devoured by thrushes. After considerable observation of the destruction of *Tachea* by birds in Herefordshire we can only say that we have altogether failed to find any evidence whatever to support Mr. Adams' "rule."

VARIATION IN COLOUR.

All Herefordshire *nemoralis* may be classified by their colours under three main heads, which are as follows:—

(α) var. *castanea*, Moq., of a brown of varying depth. The best marked specimens are of a very fine rich dark brown with a noticeable yellow border external to the peristome.

The specimens in the de Boinville collection are on the whole conspicuously pale, there is indeed but one really richly coloured specimen. This may be in part due to the length of time (about 55 years) which has elapsed since they were collected. But the majority of specimens from elsewhere than the Woolhope Silurian are pale, though the most deeply and richly coloured specimens (as well as some of the palest) which we have collected here are from Breinton on the Old Red Sandstone. In the de Boinville *castanea* the more heavily banded shells have the paler ground colour, as is seen in *rubella* and *mista* (see below).

(β) var. *libellula*, Risso, of a yellow colour. There is a great deal to be said for the suggestion that this form should be called *lutea*, and that similar alterations should be made for all the corresponding mutations of *nemoralis* and *hortensis*.

(γ) var. *rubella*, Moq., of a red colour of various shades. By the side of the band, in specimens of the B.F.;00300, a whitish band is usually seen. In specimens of B. F. 00345 the area between 3 and 4 and 4 and 5 is generally very much paler than that from the future to 3. This paling is only seen well in specimens with very dark, almost black, bands: those with paler bands, appearing to be dark red, do not shew it. Hence, the more dark bands present, the paler the ground-colour. This phenomenon leads to a separatiou of *rubella* into two sub-forms, viz., *rubella* proper, and what has

been called (*Science Gossip*, iv., p. 132, 1897) *mista*. The latter is typically heavily banded with dark bands, and the ground-colour is so reduced in intensity from its original bright red, that it becomes either of different colours (reddish, yellowish, whitish) in different places, or of a colour which it is difficult to properly classify. If the explanation given above of the origin of this form is correct, it will be readily understood that, as a rule, *rubella* has few bands and *mista* many: if *rubella* has many they are pale, and if *mista* has few they are wide and dark. Exceptions to this, of course, occasionally occur, but as a rule this is the case. In the same way *libellula*, B. F. 12345, often has a lighter ground than B. F. 00300: but such differences in an already pale yellow are more difficult to see.

Prof. T. D. A. Cockerell has suggested to us (without however seeing specimens) that this *mista* is identical with the *petiveria* of Moquin-Tandon (ii., p. 167). However *mista* is hardly "fauve" in colour. It however often agrees with what Moquin-Tandon says about the change in colour of *petiveria* on deperiostracisation, namely that it then has a much more distinct and definite red colour. Owing to the reduction in intensity of ground colour, the periostracum here undoubtedly has more influence than usual on the ground colour. Indeed the difference between *petiveria* and *mista* may lie to some extent in a difference in degree in the periostracum. We have not however seen unicolorus *mista*: and Moquin-Tandon applies the name to unicolorus shells only (as he also does in the case of *rubella* and *castanea*).

? (δ) var. *hyalozonata*, Taylor. There are some reasons for suspecting that this form has occurred in the county: see sub *Tachea hortensis* var. *arenicola* below. A single broken specimen has occurred at Dormington Quarries (3) of a very pale yellow with a single (B. F. 00300) transparent, colourless band.

The following table shews the relative abundance of the various colour forms in the various lots of shells. The totals in the last column include also various other material obtained in small lots.

Locality.	Woolhope D.	de Boinville.	Moreton	Hunderton.	Broomy Hill.	Total.
castanea	26.36	11.3	5.1	6.2	7.1	9.47
libellula	14.73	36.1	30.9	14.6	15.3	28.28
rubella	29.46	38.2	7.5	32.3	25.9	25.34
mista	29.46	14.4	56.5	46.9	51.7	36.91
rubella and *mista*	58.91	52.6	64.0	79.2	77.6	62.25

One of the most noticeable things here is the preponderance of *castanea* on the Woolhope Silurian. It is undoubtedly the most local and uncommon form in the county. It has been found as follows:—fairly freely in the Woolhope district (3), in the de Boinville shells (7 N), in a garden in the centre of Hereford (7 N), near Shelwick (7 N), Wigmore (10), Broomy Hill, Hereford (7 N), Bodenham (8), Hunderton (7 S), Moreton (7 N), Breinton (7 N), near Whitecross, Hereford (7 N),

at Kimbolton (9), near Kinsham (10), at Aymestrey (10), and at Weobley (8); many of these are but single specimens.

The presence or absence of band too has such an influence on the general colouration of a specimen that we here give the following table of percentage of unicolorous specimens in the various localities.

Woolhope	... ...	29.46 per cent.
De Boinville	... ...	8.74 ,,
Moreton	... ...	5.33 ,,
Hunderton	... ...	11.46 ,,
Broomy Hill	... ...	10.56 ,,
Other localities	... ...	10.63 ,,
General percentage	... ...	10.045

The higher percentage in the Woolhope District is very largely due to the preponderance of *castanea* there, which are as a rule without bands.

The next table shews the percentage of unicolorous (*i.e.* unbanded) specimens in the various colour forms :—

Locality.	Wool-hope D.	de Boin-ville.	Moreton	Hunder-ton.	Broomy Hill.	Other localities.	Total.
castanea	93.75	17.7	100	66.7	100	88.23	61.49
libellula	26.67	7.8	0	0	0	6.78	4.98
rubella	5.55	10.9	2.9	22.6	13.6	13.11	11.11
mista	0	0	0	0	0	0	0
rubella and *mista*...	2.70	8.0	0.35	9.2	4.5	4.49	4.62

It is often the case with *nemoralis* that we find that in certain small areas one form very markedly predominates. (This is also seen very well in *hortensis*, e.g. in Kent : still better in *H. virgata* in some places). Thus on some short piece of hedge-bank we find *libellula* in large excess of other forms : a little way off another length of the same bank, to all appearances not markedly differing from the first in any respect, *rubella* may be the ruling form. It would be interesting to map out some small district on the basis of collections made from very small areas from year to year. There is for example a short piece (some 100 yards long) of hedge-bank at Breinton (7 N) from which all *Tachea* were collected on one favourable day, the search being very thorough. The specimens obtained were : *hortensis lutea unicolor* 1, *fasciata* 3, *nemoralis* 29 : all the *nemoralis* were very similar in general appearance and were all pale reddish *mista*. And not only do we find in some small area a great uniformity of colour : we may also see that the band-formulae (explained below) present a marked and general character : thus these 29 *mista* referred to were:—1 2 3 4 5 (ten); $\frac{2}{3}$ 2 3 4 5 (six); $\frac{1}{2}$ 2 3 4 5 (four); $\frac{1}{2}\frac{1}{2}$ 3 4 5 (two); $\frac{2}{3}\frac{2}{3}$ 3 4 5; $\frac{1}{2}$ 2 3 (4 5); $\frac{2}{3}$ (2 3) 4 5; $\frac{1}{2}$ 2 3 4 $\frac{2}{3}$; 0 2 3 4 5; 0 2 3 4 $\frac{2}{3}$; $\frac{1}{2}$ 2 3 × 4 5. As another example we may adduce the band-formulæ of 65 *Tachea*, the result of a thorough collection of a short piece of rough ground by the roadside at Stoke Lacy (6). This area was rather isolated in character, being bounded by ordinary hedges and fields. The shells comprise *hortensis fasciata* four giving 1 2 3 (4 5);

$\frac{1}{2}$ 2 3 (4 5); 1 0 $\frac{2}{3}$ (4 5); $\frac{2}{3}$ 0 3 4 5 : *nemoralis mista* 22 giving $\frac{1}{2}$ 2 3 (4 5) (four); $\frac{2}{3}$ 2 3 (4 5); ($\frac{2}{3}$ 2) 3 (4 5) (two); ($\frac{2}{3}$ 2 3) (4 5) (two); $\frac{1}{2}$ 2 3 4 5 (three); $\frac{1}{2}$ $\frac{2}{3}$ 3 (4 5) (two); $\frac{1}{2}$ $\frac{2}{3}$ (3 4 5); $\frac{2}{3}$ $\frac{2}{3}$ 3 (4 5); $\frac{2}{3}$ $\frac{1}{2}$ 3 4 5; 0 $\frac{2}{3}$ 3 4 $\frac{2}{3}$ (two); 0 $\frac{1}{2}$ $\frac{1}{2}$ 4 5; 0 $\frac{2}{3}$ 3 4 5; (1 2) 3 (4 5): *nemoralis libellula* 39 giving 1 2 3 4 5; $\frac{2}{3}$ 2 3 4 5 (seven); $\frac{2}{3}$ 2 3 (4 5) (two); $\frac{1}{2}$ 2 3 4 5 (five); $\frac{1}{2}$ 2 3 (4 5) (three); $\frac{2}{3}$ (2 3 4 5); $\frac{2}{3}$ 2 (3 4 5); $\frac{1}{2}$ $\frac{2}{3}$ 3 4 5 (four); $\frac{2}{3}$ $\frac{2}{3}$ 3 4 5 (two); ($\frac{2}{3}$ $\frac{2}{3}$) 3 (4 5); $\frac{1}{2}$ $\frac{1}{2}$ 3 4 5 (two); $\frac{2}{3}$ $\frac{1}{2}$ 3 4 5; 0 $\frac{2}{3}$ 3 4 5 (two); 0 $\frac{2}{3}$ 3 (4 5); 0 $\frac{1}{2}$ 3 4 $\frac{2}{3}$; 0 (2 3) (4 5); 0 2 3 4 5; 0 0 3 4 5; (1 2) 3 (4 5) (two). The predominant note here is the reduction or absence of the earlier bands : this is present in 60 of the specimens or more than 90 per cent. The fusion of 4 and 5 is also more frequent than usual, occurring in 40 per cent.

We have next to consider (1) the relative frequency of occurrence of 1-banded, 2-banded, etc., specimens; for this purpose such a form as 123 (45) is reckoned as 5-banded, not 4-banded : (2) the frequency of occurrence of each individual band : (3) the strength of each band. It is difficult to exactly measure the width of a band owing to the curvature of the shell. And since the curvature is not the same at all points of the last whorl of the same shell or at the relatively same points on two different shells, exact comparative as well as absolute values are also hard to obtain. It is, however, important to consider the cases where a band is obviously not well-developed. The method here adopted is this : each band has three grades of strength, full strength or more is represented by, say, 3 ; half strength by $\frac{2}{3}$; quarter strength by $\frac{1}{2}$. No exact numerical values of width decide in which grade a band is placed : a band may be of full width but so very faint and obscure and interrupted that it is called quarter strength. The method is obviously a very rough one, but is, we think, useful. The introduction of fractions is less liable to lead to mistakes in writing or printing than the usual method of writing the figure smaller or through or below the line. One great disadvantage of the method is that it takes no account of bands wider than usual, though it might easily be extended to do so. These fractional band-formulæ enable one to express gradual gradations of strength of a band from full strength to absence, as in the common formulæ 1 2 3 4 5; 1 $\frac{2}{3}$ 3 4 5; 1 $\frac{1}{2}$ 3 4 5; 1 0 3 4 5. We may also ascertain the average strength of one band : thus in all the *nemoralis*, in a batch from Moreton, band 1 occurs in 342 specimens and is full strength in 200, half strength in 67, quarter strength in 75, giving a total strength of 252.25, and an average strengh for band 1 of 0.738.

The variations in space between the bands should also be considered. It is not altogether dependant, as might be supposed, on the width of the bands present. It makes a good deal of difference in the general appearance of shells of *e.g.* B.F. 0 0 $\frac{2}{3}$ 0 0, whether it is the upper, middle, or lower part of the band which is present.

(4) The band-formulae : these are given in the well-known plan of G. von Martens (1832), with the fractional modifications explained in the last paragraph. For the purposes of the tables all specimens examined have been included, and not only those in the large batches, where every specimen seen was taken. This would tend to make the rarer forms seem less uncommon than they really are. We, however, suspect that this influence has been here very small, as we have seldom,

if ever, taken only selected *nemoralis* from any place, however small the take may have been. The numbers following each formula are the number of specimens of that formula observed. The figures in square brackets [ ] give the number of each of the main types of formula according to the usual plan: these are summarized in the final table. If the formula is also enclosed in the brackets, it signifies that the main type itself has not been noted, only some of its sub-forms (*i.e.* forms involving fractions). We should like to mention here that it seems to us at least as important to reckon the cases of reduced bands as those where band-fusion has occurred: that is, that the general classification of formulae might just as properly be made on the basis of the reduction of each band as in the presence or absence of particular fusions. Thus instead of reckoning together all specimens of (1 2 3) 4 5 in one class, and all of 1 2 3 (4 5) in another, the types of the classes would be 1 ½ 3 4 5; 1 2 ½ 4 5, etc. The difficulty of deciding whether a band is reduced is no greater than the uncertainty which often attends a band-fusion. There is a great tendency for fusion to take place close to the peristome alone: these are, of course, not bracketed as proper fusions. At the same time one half the last whorl may have fused, the other half separate bands, without any strong line of demarcation. The relative length of the fused and separate pieces here decides the question. Reference back along the shell often shews further details of the fusion, and then such formulae as (½ 2) 3 (¼ ¼) become possible.

ADDITIONAL BANDS.

These are not indicated as fractions: in Herefordshire specimens they are seldom more than quarter-strength. We do not regard them as of very much import when only existing in this rudimentary form. It seems impossible to regard them as genuine fresh extra bands, *i.e.*, a real addition to the mystic five.

In the following tables the figures are absolute numbers unless percentages are expressly indicated.

a. var. castanea.

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Broomy Hill.	Other localities.	Total.
No. of specimens.	34	62	23	6	6	17	148
No bands ...	32	11	23	4	6	15	91
1 ,, ...	...	21	...	1	...	1	23
2 ,, ...	...	4	...	...	...	...	4
3 ,, ...	...	13	...	...	...	...	13
4 ,, ...	...	7	...	1	...	1	9
5 ,, ...	2	6	...	...	...	...	8
More than 5 ...	...	...	...	...	...	...	0

Table shewing the number of specimens in which each band occurs :—

Locality.	de Boinville.	Other localities.	Total.
No. of banded specimens.	51	6	57
Band 1...	6	3	9
,, 2...	14	3	17
,, 3...	43	6	49
,, 4...	34	4	38
,, 5...	29	4	33
Percentage of total normal bands*	49 p.c.	67	51

Table shewing the average band-strength of each band :—

Locality.	de Boinville.	Other Localities.	Total.
Band 1 ...	0.54	... 0.33 ...	0.47
,, 2 ...	0.46	.. 0.75 ...	0.51
,, 3 ...	0.64	... 0.79 ...	0.66
,, 4 ...	0.49	... 0.81 ...	0.53
,, 5 ...	0.50	... 0.81 ...	0.54

Note.—Specimens often occur with faint darker or paler shade in the position of bands; these are not reckoned as bands in this account.

BAND FORMULAE.—Five bands: 1 2 3 4 5 (2: de Boinville), ½ 2 3 4 5 (de B.), ½ 2 3 4 5 (de B. and Dormington Quarries), ½ ½ 3 4 5 (de B.), ½ ½ ½ ½ ½ (de B.)

Four bands: ½ 0 ½ 4 5 (Wigmore D. 10), 0 ½ 3 4 ½ (de B.), 0 ½ ½ (½ ½) (Hunderton), 0 ½ ½ ½ ½ (4: de B.), 0 ½ ½ ½ ½ (de B.), 0 ½ ½ ½ ½ (de B.)

Three bands: 0 0 ½ 4 5, 0 0 ½ ½ ½ (4), 0 0 ½ ½ ½ (6), 0 ½ ½ ½ 0, 0 0 ½ ½ ½ (all de B.)

Two bands: 0 0 0 ½ ½ (4: all de B).

One band: 0 0 3 0 0 (11: de B., near Holmer, and at Hunderton), 0 0 ½ 0 0 (4), 0 0 ½ 0 0 (2), 0 0 0 ½ 0, 0 0 0 ½ 0 (3).

b. var. libellula.

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No. of specimens	19	198	139	14	72	442
No bands ...	4	14	0	0	4	22=4.9 p.c.
1 ,, ...	9	27	13	3	19	71=16.1
2 ,, ...	...	12	...	...	1	13=2.9
3 ,, ...	...	36	6	1	1	44=9.9
4 ,, ...	...	22	13	...	3	38=8.6
5 ,, ...	5	84	103	10	43	245=55.4
More than 5 ...	1	3	4	...	1	9=2.0

*These figures are arrived at as follows: each shell is reckoned as "normally" having five bands. Then, in *e.g.* the de Boinville *castanea*, the total possible normal bands is 255 (unicolorous specimens are treated as being something *sui generis*), and only 126 are present, that is 49 per cent. For this purpose, half or quarter bands count equally as one each with whole bands.

Table shewing the number of specimens in which each band occurs —

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities	Total.
No. of banded specimens ...	15	184	139	14	68	420
Band 1 ...	6	92	113	10	44	265=63.1 p.c.
,, 2 ...	6	101	113	10	45	275=65.5
,, 3 ...	15	170	139	14	66	404=96.2
,, 4 ...	6	154	126	11	49	346=82.4
,, 5 ...	6	152	126	11	49	344=81.9
Extra bands...	1	10	6	0	1	18=4.3
Percentage of normal bands present ...	53	73	89	79	77	78 p.c.

Table shewing average band-strength of each band :—

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
Band 1 ...	0.83	0.90	0.77	0.65	0.84	0.82
,, 2 ...	1.00	0.78	0.89	0.90	0.94	0.86
,, 3 ...	1.00	0.90	1.00	1.00	0.98	0.96
,, 4 ...	1.00	0.94	0.996	0.95	0.98	0.97
,, 5 ...	1.00	0.95	0.992	0.95	0.96	0.97

BAND-FORMULAE.

Five bands : 1 2 3 4 5 : 92 [183].
2/1 2 3 4 5 : 27.
4/1 2 3 4 5 : 14.
1 3/2 3 4 5 : 8.
1 4/2 3 4 5 : 5.
4/1 4/2 3 4 5 : 5.
3/1 4/2 3 4 5 : 7.
3/1 3/2 3 4 5 : 8.
4/1 3/2 3 4 5 : 9.
4/1 2 3 4 3/5 : 2.
4/1 4/2 3 4 3/5 : 2.
4/1 3/2 3 4 3/5.
1 2 3/3 4 5.
2/1 2/2 3/3 4 5.
2/1 2/2 3/3 2/4 3/5.
1 (2 3) (4 5).
1 2 (3 4 5) : [2].
2/1 2 (3 4 5).
(1 2 3) 4 5 : 3.
1 (2 3 4) 5.
(1 2 3) (4 5) : 9.
(1 2) 3 4 5 : 9 [10].
(2/1 2/2) 3 4 5.
(1 2) 3 (4 5) : 1 4 [19].
(2/1 2) 3 (4 5) : 2.
(4/1 2) 3 (4 5).
(2/1 2/2) 3 (4 5).
(1 2) 3/3 (4 5).
(1 2 3 4 5) : 15 [15].
1 2 3 (4 5) : 8 [15].
2/1 3/3 3 (4 5).
4/1 2 3 (4 5) : 4.
2/1 2 3 (4 5).
1 2 4/3 (4 5).
1 (2 3) 45 : 7 [10].
2/1 (2 3) 4 5.
4/1 (2 3) 4 5 : 2.
1 (2 3 4 5) : 2 [4].
4/1 (2 3 4 5).
3/1 (2 3 4 5).
(1 2) (3 4 5) 2 : [3].
(4/1) (3 4 5).

Four bands : 1 0 3 4 5 : 8 [11].
2/1 0 3 4 5 : 2.
4/1 0 3 4 5.
0 2 3 (4 5) : [4].
0 3/2 3 (4 5) : 2.
0 4/2 3 (4 5).
0 (2 3) (4 5).
[0 2 (3 4) 5].
0 3/3 (3 4) 5.
[1 2 0 4 5 : 3]
2/1 4/2 0 4 5.
1 4/2 0 4 5.
2/1 2 0 4 5.
0 2 3 4 5 : 2 [19].
0 3/2 3 4 5 : 6.
0 4/2 4/3 4 5.
0 4/2 3 4 5.
0 4/2 3 3/4 5.
0 4/2 3 3/4 3/5 : 3.
0 3/2 3 4 2/5 : 2.
0 4/2 3 4 2/5 : 2.

Note here that four bands are produced by absence of 1 in 25, of 2 in 11, and of 3 in 3 instances.

Three bands : 0 0 3 4 5 : 14 [30].
0 0 4/2 4 5 : 7.
0 0 4/3 3/4 5 : 2.
0 0 3/3 4 5 : 2.
0 0 3 4/4 4/5.
0 0 3 3/4 3/5 : 2.
0 0 3 3/4 5 : 2.
[1 0 3 0 5].
4/1 0 3 0 3/5.
0 0 (3 4 5) : 4.
0 0 3 (4 5) : 5 [6].
0 0 3/3 (4 5).
0 0 (3 4) 5.
1 2 3 0 0.
[0 2 0 4 5].
0 4/2 0 4 5.

The three cases of 1 2 3 0 0, 1 0 3 0 5, and 0 2 0 4 5 are from the de Boinville collection.

Two bands : 0 0 0 4 5 : 9 [10].
0 0 0 3/4 3/5
[0 0 3 4 0 : 3].
0 0 3 4/4 0 : 2.
0 0 3/3 3/4 0.

With the exception of one 0 0 0 4 5 from Wigmore, all these are from the de Boinville collection.

One band : 0 0 3 0 0 : 65 [71].
0 0 4/3 0 0 : 2
0 0 3/3 0 0 : 4

After B. F. 1 2 3 4 5, B. F. 0 0 3 0 0 is the commonest formula in *libellula;* the various localities give:—Woolhope 47.4, de Boinville 10.6, Moreton 9.3, Hunderton 21.4, other localities 26.4, and total 14.7 per cent of all *libellula*. B. F. 1 2 3 4 5 gives :—Woolhope 47.4 p.c., de Boinville 10.6, Moreton 24.5, Hunderton 21.4, other localities 36.1, general mean 20.8 p.c. Of course, if such forms as 0 0 3/3 00 and 3/1 2 3 4 5 were included in these results, the figures would be higher, especially for those of B. F. 1 2 3 4 5. It is worth noting that Moquin-Tandon (*Histoire*, 1855, Vol. ii., p. 165) regard *libellula*, B.F. 1 2 3 4 5, as the type of *nemoralis* (under the name of *quinquefasciata*). Draparnaud (*Histoire*, 1805, p. 94) also expresses much the same view.

ADDITIONAL BANDS.—The following is a list of such specimens (20 in number):—

From the de Boinville Collection: 0 2 3 × 4 5, 0 $\frac{4}{5}$ 3 × 0 0 (a rather remarkable specimen), 0 $\frac{3}{5}$ 3 × $\frac{4}{5}$ $\frac{4}{5}$, 0 $\frac{3}{5}$ 3 (4 4 4) $\frac{3}{5}$, $\frac{4}{1}$ 0 $\frac{3}{5}$ 4 × 5, 1 2 3 × (4 5) two, 0 0 × 3 4 5, 0 0 0 4 × 5, 0 0 × $\frac{3}{5}$ 4 5, 0 0 (3 × 4 5), 0 0 (× 3 4 5).

From Moreton: $\frac{4}{1}$ 2 3 3 4 5, 1 2 3 × 45, 0 2 3 × (4 5), 1 2 3 × (4 5), (1 2 3) × (4 5), 0 0 3 × (4 5).

From the Woolhope District: $\frac{3}{1}$ 2 3 × 4 5.

From near Holmer (7 N): $\frac{3}{1}$ 2 3 × 4 5.

c. var. rubella.

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No. of specimens ...	38	210	34	31	89	402
No bands ...	2	23	1	7	12	45=11.2 p.c.
1 ,, ...	34	54	30	19	40	177=44.0
2 ,, ...	...	17	...	...	1	18=4.5
3 ,, ...	2	58	2	...	13	75=18.7
4 ,, ...	...	19	...	3	8	30=7.5
5 ,, ...	...	38	1	2	15	56=13.9
More than 5...	...	1	...	...	...	1=0.25

Table shewing the number of specimens in which each band occurs:—

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No of banded specimens...	36	187	33	24	77	357
Band 1 ...	...	40	1	2	16	59=16.5 p.c.
,, 2 ...	...	54	1	4	24	83=23.2
,, 3 ...	36	178	33	24	76	347=97.2
,, 4 ...	2	130	3	5	37	177=49.6
,, 5 ...	2	125	3	5	35	170=47.6
Extra bands...	...	1	...	1	...	2=0.56
Percentage of normal bands present ...	22	56	25	34	49	47

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
Band 1 ...	...	0.46	0.25	0.25	0.50	0.46
,, 2 ...	...	0.63	0.50	0.69	0.57	0.61
,, 3 ...	1.00	0.79	1.00	1.00	0.85	0.86
,, 4 ...	1.00	0.86	0.83	0.90	0.84	0.85
,, 5 ...	1.00	0.85	0.83	0.90	0.82	0.85

BAND FORMULAE.

Five bands:	1 2 3 4 5 : 8 [50].	(1 2 3) (4 5).
	$\frac{4}{1}$ 2 3 4 5 : 10.	(1 2) 3 (4 5) : 1 [3].
	$\frac{3}{1}$ 2 3 4 5 : 4.	($\frac{4}{1}$ 2) 3 (4 5).
	1 $\frac{3}{4}$ 3 4 5.	($\frac{3}{1}$ $\frac{3}{4}$) $\frac{3}{5}$ ($\frac{3}{4}$ $\frac{3}{5}$).
	1 $\frac{3}{5}$ 3 4 5.	[1 (2 3) 4 5].
	$\frac{3}{1}$ $\frac{3}{5}$ 3 4 5 : 3.	$\frac{4}{1}$ (2 3) 4 5.
	$\frac{4}{1}$ $\frac{4}{5}$ 3 4 5 : 7.	[(1 2) 3 4 5].
	$\frac{4}{1}$ $\frac{3}{5}$ 3 4 5 : 4.	(1 2) $\frac{3}{5}$ 4 5.
	$\frac{3}{1}$ $\frac{4}{5}$ 3 4 5 : 1.	
	$\frac{4}{1}$ $\frac{4}{5}$ 3 $\frac{3}{4}$ $\frac{3}{5}$: 2.	
	$\frac{4}{1}$ 2 3 4 $\frac{3}{5}$.	
	$\frac{4}{1}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{3}{5}$: 3.	
	$\frac{4}{1}$ $\frac{4}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	
	$\frac{3}{1}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	
	$\frac{4}{1}$ $\frac{4}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	
	$\frac{4}{1}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	
	$\frac{3}{1}$ $\frac{3}{5}$ $\frac{3}{4}$ 5.	
Four bands:	0 2 3 4 5 : 5 [18].	0 2 3 (4 5) : [5].
	0 $\frac{3}{5}$ $\frac{3}{5}$ 4 $\frac{3}{5}$.	0 $\frac{4}{5}$ 3 (4 5).
	0 $\frac{3}{5}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	0 $\frac{4}{5}$ $\frac{4}{5}$ (4 5).
	0 $\frac{4}{5}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	0 $\frac{4}{5}$ $\frac{3}{5}$ ($\frac{3}{4}$ $\frac{3}{5}$) : 2.
	0 $\frac{4}{5}$ $\frac{4}{5}$ $\frac{4}{4}$ $\frac{4}{5}$: 2.	1 0 3 4 5 : [3].
	0 $\frac{4}{5}$ $\frac{3}{5}$ $\frac{3}{4}$ $\frac{3}{5}$: 2.	$\frac{4}{1}$ 0 3 4 5.
	0 $\frac{4}{5}$ $\frac{3}{5}$ 4 5.	$\frac{4}{1}$ 0 $\frac{3}{5}$ 4 5.
	0 $\frac{4}{5}$ 3 4 5 : 2.	[0 2 (3 4 5)].
	0 $\frac{4}{5}$ 3 4 $\frac{3}{5}$.	0 $\frac{4}{5}$ (3 4 5).
	0 $\frac{3}{5}$ 3 4 $\frac{3}{5}$.	[1 2 0 4 5].
	0 $\frac{4}{5}$ $\frac{4}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	$\frac{4}{1}$ $\frac{4}{5}$ 0 4 $\frac{4}{5}$.

The single specimen of 1 2 0 4 5 is from Little Tarrington (6). We have here absence of 1 in 24 specimens, of 2 in 3, and of 3 in 1.

Three bands:	0 0 3 4 5 : 19 [51].	0 0 3 (4 5) : 8 [9].
	0 0 $\frac{3}{5}$ $\frac{3}{4}$ $\frac{3}{5}$: 3.	0 0 $\frac{3}{5}$ (4 5).
	0 0 $\frac{3}{5}$ $\frac{3}{4}$ $\frac{4}{5}$: 2.	0 0 (3 4 5) : 7.
	0 0 $\frac{4}{5}$ $\frac{4}{4}$ $\frac{4}{5}$: 4.	0 0 (3 4) 5.
	0 0 $\frac{4}{5}$ $\frac{3}{4}$ $\frac{3}{5}$.	[0 2 3 0 5 : 2].
	0 0 $\frac{3}{5}$ 4 5 : 8.	0 2 3 0 $\frac{3}{5}$.
	0 0 $\frac{4}{5}$ 4 5 : 7.	0 $\frac{4}{5}$ 3 0 $\frac{4}{5}$.
	0 0 3 4 $\frac{4}{5}$.	[0 2 3 4 0].
	0 0 3 $\frac{4}{4}$ $\frac{4}{5}$.	0 $\frac{4}{5}$ $\frac{4}{5}$ $\frac{3}{4}$ 0.
	0 0 3 $\frac{3}{4}$ $\frac{3}{5}$: 2.	
	0 0 3 4 $\frac{3}{5}$: 2.	
	0 0 3 $\frac{3}{4}$ 5.	

The two 0 2 3 0 5 are from de Boinville, and the 0 2 3 4 0 from Hereford (7 N).

Two bands : 0 0 0 4 5 : [8]. [0 0 3 4 0 : 9].
[0 0 3 0 5]. 0 0 3 $\frac{4}{5}$ 0 : 3.
0 0 3 0 $\frac{4}{5}$. 0 0 $\frac{4}{5}$ $\frac{4}{5}$ 0 : 6.

With the exception of one B. F. 0 0 $\frac{4}{5}$ $\frac{4}{5}$ 0 from the Doward (2), all these are from the de Boinville collection.

One band : 0 0 3 0 0 : 157 [177]. 0 0 $\frac{3}{5}$ 0 0 : 12.
0 0 $\frac{4}{5}$ 0 0 : 8.

B. F. 0 0 3 0 0 is the commonest one in *rubella*, forming 44.0 per cent. of the total banded specimens, the various localities give :—Woolhope 94, de Boinville 29, Moreton 91, Hunderton 79, and other localities 52 per cent.

ADDITIONAL BANDS.—But two of these have been seen : they are 0 0 3 × $\frac{2}{5}$ 5 (Hunderton), and (1 2) 3 × 4 5 (de Boinville).

d. var. mista.

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No. of specimens... ...	38	79	254	45	170	586
No bands ...	...	...	...	...	...	...
1 ,, ...	...	...	...	...	...	...
2 ,, ...	...	...	1	...	...	1=0.2
3 ,, ...	...	3	7	1	...	11=1.9
4 ,, ...	2	13	23	7	6	51=8.7
5 ,, ...	36	62	220	36	160	514=87.7
More than 5 ...	...	1	3	1	4	9=1.5

Table shewing the number of specimens in which each band occurs :—

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other-localities.	Total.
No. of banded specimens ...	38	79	254	45	170	586
Band 1 ...	36	72	228	39	167	542=92.5
,, 2 ...	38	71	242	44	167	562=95.9
,, 3 ...	38	72	254	43	170	577=98.5
,, 4 ...	38	79	254	45	170	586=100
,, 5 ...	38	79	253	45	170	585=99.8
Additional bands ...	...	2	3	1	4	10=1.7
Percentage of normal bands present ..	99	94	97	96	99	97

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
Band 1 ...	0.83	0.94	0.725	0.82	0.86	0.81
,, 2 ...	0.91	0.95	0.92	0.96	0.98	0.946
,, 3 ...	1.00	0.965	0.998	1.00	1.00	0.99
,, 4 ...	1.00	0.99	0.996	1.00	1.00	0.997
,, 5 ...	1.00	0.99	0.98	0.988	0.99	0.986

BAND FORMULAE.

Five bands : 1 2 3 4 5 : 176 [307]. (1 2) 3 (4 5) : 50 [55].
$\frac{2}{5}$ 2 3 4 5 : 47. ($\frac{2}{5}$ 2) 3 (4 5) : 3.
$\frac{4}{5}$ 2 3 4 5 : 40. ($\frac{4}{5}$ 2) 3 (4 5).
1 $\frac{4}{5}$ 3 4 5 : 3. ($\frac{4}{5}$ $\frac{4}{5}$) 3 (4 5).
1 $\frac{2}{5}$ 3 4 5 : 5. (1 2 3 4 5) : 24 [24].
$\frac{4}{5}$ $\frac{4}{5}$ 3 4 5 : 6. (1 2 3) (4 5) : 24 [26].
$\frac{2}{5}$ $\frac{2}{5}$ 3 4 5 : 15. ($\frac{2}{5}$ 2 3) (4 5) : 2.
$\frac{4}{5}$ $\frac{2}{5}$ 3 4 5 : 9. 1 2 3 (4 5) : 30 [58].
$\frac{2}{5}$ $\frac{4}{5}$ 3 4 5 : 3. $\frac{2}{5}$ $\frac{2}{5}$ 3 (4 5)
$\frac{4}{5}$ $\frac{2}{5}$ 3 4 $\frac{2}{5}$: 2. $\frac{4}{5}$ $\frac{2}{5}$ 3 (4 5).
$\frac{4}{5}$ 2 3 4 $\frac{2}{5}$. $\frac{4}{5}$ $\frac{4}{5}$ 3 (4 5) : 2.
1 (2 3) 4 5 : 23 [28]. $\frac{2}{5}$ $\frac{2}{5}$ 3 (4 5).
$\frac{2}{5}$ (2 3) 4 5 : 3. $\frac{4}{5}$ 2 3 (4 5) : 16.
$\frac{4}{5}$ (2 3) 4 5 : 2. $\frac{2}{5}$ 2 3 (4 5) : 7.
(1 2 3) 4 5 : 3 [3]. (1 2) 3 4 5 : 6 [7].
1 (2 3) (4 5) : 5 [7]. ($\frac{4}{5}$ 2) 3 4 5.
$\frac{2}{5}$ (2 3) (4 5) : 2. 1 (2 3 4) 5 : 5 [5].
1 2 (3 4 5) : [4]. 1 (2 3 4 5) : 3 [6].
$\frac{2}{5}$ 2 (3 4 5). $\frac{4}{5}$ (2 3 4 5) : 2.
$\frac{4}{5}$ $\frac{2}{5}$ (3 4 5). $\frac{2}{5}$ (2 3 4 5).
$\frac{4}{5}$ 2 (3 4 5).

The B. F. 1 2 3 4 5 is much the commonest in *mista*, forming 30 per cent. of the total specimens : the different localities give :—Woolhope 18, de Boinville 30, Moreton 25, Hunderton 38, and other localities 42 per cent.

Four bands : 0 2 3 4 5 : 9 [26]. 0 (2 3) (4 5) : 2 [2].
0 $\frac{2}{5}$ 3 4 5 : 6. 0 2 3 (4 5) : 6 [9].
0 $\frac{4}{5}$ 3 4 5. 0 $\frac{2}{5}$ 3 (4 5).
0 $\frac{4}{5}$ 3 4 $\frac{2}{5}$: 4. 0 $\frac{4}{5}$ 3 (4 5).
0 2 3 4 $\frac{2}{5}$: 4. 0 $\frac{4}{5}$ 3 (4 $\frac{2}{5}$).
0 $\frac{2}{5}$ 3 4 $\frac{2}{5}$. 1 0 3 4 5 : 6 [13].
0 $\frac{4}{5}$ $\frac{4}{5}$ 4 5. $\frac{2}{5}$ 0 3 4 5 : 5.
1 2 0 4 5 : 2. $\frac{4}{5}$ 0 3 4 5 : 2.
(1 2) 0 4 5.

Band 1 is thus absent in 37 cases, 2 in 13, and 3 in 3 (de Boinville).

Three bands: 0 0 3 4 5 : 5 [10]. 0 2 0 4 5.
0 0 $\frac{3}{4}$ 4 5 : 3.
0 0 3 $\frac{2}{3}$ $\frac{2}{3}$.
0 0 3 $\frac{2}{4}$ 5.

The 0 2 0 4 5 is from Hunderton (7 N).

Two bands : 0 0 3 4 0 (Moreton 7 N).

ADDITIONAL BANDS: 1 2 3 × 4 5 : 3 [5]. [(1 2) × 3 4 5].
$\frac{3}{4}$ 2 3 × 4 5. (1 2) × $\frac{4}{5}$ 4 5.
$\frac{4}{5}$ 2 3 × 4 5. [1 2 3 3 4 5].
[1 (2 3) × 4 5]. 1 2 $\frac{4}{5}$ $\frac{4}{5}$ 4 5.
$\frac{2}{3}$ (2 3) × 4 5. (1 2 3) × (4 5).
(1 2) × 0 4 5. (1 2) 3 × 4 5.

e. var. rubella + var. mista = total rubella.

As explained above, our *mista* is to be reckoned under *rubella*, if it is desired to put it under any of the primary colour forms. We accordingly append a further set of tables concerning both forms reckoned together.

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No. of specimens	76	289	288	76	259	988
No bands ...	2	23	1	7	12	45=4.5p.c.
1 ,, ...	34	54	30	19	40	177=17.9
2 ,, ...	...	17	1	...	1	19=1.9
3 ,, ...	2	61	9	1	13	86=8.7
4 ,, ...	2	32	23	10	14	81=8.2
5 ,, ...	36	100	221	38	175	570=57.7
More than 5 ...	...	2	3	1	4	10=1.0

Table shewing the number of specimens in which each band occurs:—

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No. of banded specimens.	74	266	287	69	247	943
Band 1 ...	36	112	229	41	183	601=63.7p.c
,, 2 ...	38	125	243	48	191	645=68.4
,, 3 ...	74	250	287	67	246	924=98.0
,, 4 ...	40	209	257	50	207	763=80.9
,, 5 ...	40	204	256	50	205	755=80.1
Extra bands ...	—	3	3	2	4	12=1.3
Percentage of normal bands present ...	62 p.c.	68	89	74	83	78

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
Band 1	0.83	0.77	0.72	0.78	0.83	0.78
,, 2	0.91	0.81	0.92	0.94	0.93	0.90
,, 3	1.00	0.84	0.998	1.00	0.95	0.94
,, 4	1.00	0.909	0.994	0.99	0.97	0.96
,, 5	1.00	0.906	0.98	0.98	0.96	0.957

BAND FORMULAE.—We give these in the simpler forms without fractions.

Five bands: 1 2 3 4 5 : 357. (1 2) 3 4 5 : 8.
(1 2) 3 (4 5) : 58. 1 (2 3) (4 5) : 7.
(1 2 3 4 5) : 24. 1 2 (3 4 5) : 4.
1 (2 3 4) 5 : 5. 1 2 3 (4 5) : 58.
(1 2 3) (4 5) : 27. 1 (2 3) 4 5 : 29.
(1 2 3) 4 5 : 3. 1 (2 3 4 5) : 6.

Four bands: 0 2 3 4 5 : 44. 0 2 (3 4 5).
0 2 3 (4 5) : 14. 0 (2 3) (4 5) : 2.
1 0 3 4 5 : 16. 1 2 0 4 5 : 3.
(1 2) 0 4 5.

Here four bands are produced by suppression of band 1 in 75 per cent., of 2 in 20, and of 3 in 5 p.c.

Three bands: 0 0 3 4 5 : 61. 0 0 (3 4 5) : 7.
0 0 3 (4 5) : 9. 0 0 (3 4) 5.
0 2 3 0 5 : 2. 0 2 3 4 0.
0 2 0 4 5.

Two bands: 0 0 0 4 5 : 8. 0 0 3 4 0 : 10.
0 0 3 0 5.

One band: 0 0 3 0 0 : 177.

f. All T. nemoralis.

N.B.—The figures in the two following tables are percentages.

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No. of specimens ..	129	549	450	96	354	1578
No bands ...	29 p.c.	9	5	11	10	10
1 ,, ...	33	18.5	9.5	24	17	17
2 ,, ...	—	6	0.2	—	0.6	2
3 ,, ...	1.5	20	3	2	4	9
4 ,, ...	1.5	11	8	11	5	8
5 ,, ...	33	35	72	50	61.5	52
More than 5 ...	0.8	0.9	1.5	1	1.4	1 p.c.

Table shewing the number of specimens in which each band occurs :—

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Other localities.	Total.
No. of banded specimens ..	91	501	426	85	317	1420
Band 1 ...	48 p.c.	42	80	60	72	62
,, 2 ..	50.5	48	83.5	69	74	66
,, 3 ...	100	92	100	98	99	97
,, 4 ...	53	79	90	73	81	81
,, 5 ...	53	77	90	73	80	80
Extra bands ...	1	2.5	2	2	1.6	2
Percentage of total normal bands present ...	61	68	89	74.5	81	77 p.c.

The following tables shew the number of each main type of band-formula found in each colour form. Corresponding figures for the more detailed formulae may readily be computed from the tables already given.

Band-formulae.	*castanea.*	*libellula.*	*rubella.*	*mista.*	Total.
Five bands :					
1 2 3 4 5...	7	183	50	307	547
(1 2 3 4 5)	...	15	...	24	39
(1 2) 3 (4 5)	...	19	3	55	77
(1 2) 3 4 5	...	10	1	7	18
1 (2 3 4 5)	.	4	...	6	10
1 (2 3) 4 5	...	10	1	28	39
1 2 3 (4 5)	...	15	...	58	73
1 (2 3) (4 5)	...	1	...	7	8
1 2 (3 4 5)	...	2	...	4	6
(1 2 3) 4 5	...	3	...	3	6
1 (2 3 4) 5	...	1	...	5	6
(1 2) (3 4 5)	...	3	...	...	3
(1 2 3) (4 5)	...	9	1	26	36
Four bands :					
0 2 3 4 5	7	19	18	26	70
0 2 3 (4 5)	1	4	5	9	19
0 2 (3 4) 5	...	1	...	...	1
0 (2 3) (4 5)	...	1	...	2	3
0 2 (3 4 5)	...	...	1	...	1
1 0 3 4 5	1	11	3	13	28
1 2 0 4 5	...	3	1	2	6
(1 2) 0 4 5	...	...	...	1	1
Three bands :					
0 0 3 4 5	12	30	51	10	103
0 0 3 (4 5)	...	6	9	...	15
0 0 (3 4) 5	..	1	1	....	2
0 0 (3 4 5)	...	4	7	...	11
0 2 3 4 0	1	...	1	...	2
0 2 0 4 5	...	1		1	2
1 2 3 0 0	...	1	...	..	1
1 0 3 0 5	...	1	...	....	1
0 2 3 0 5	...	...	2	...	2

Band-formulae.	*castanea.*	*libellula.*	*rubella.*	*mista.*	Total.
Two bands :					
0 0 0 4 5	4	10	8	...	22
0 0 3 4 0	...	3	9	1	13
0 0 3 0 5	...	...	1	...	1
One band :					
0 0 3 0 0	19	71	177	...	267
0 0 0 4 0	4	...	...	...	4

In all *nemoralis* B. F. 1 2 3 4 5 is the commonest, reaching 33 per cent. : 0 0 3 0 0 is next with 10 per cent. Fusion of two or more bands occurs in 26 per cent. Of four-banded specimens, 1 is absent in 70 per cent., 2 in 24 per cent., and 3 in 6 per cent.

The rule of Des Moulins given by Moquin-Tandon (*Histoire*, ii., p. 164) certainly does not hold good for Herefordshire specimens as these tables show. It is that "the rarity of varieties seems to increase in direct ratio to the number of the bands when this is even, and in inverse ratio when the number of bands is odd: thus the form with two bands is the most common of those with an even number, the form with five bands in those with an odd number of bands." In Herefordshire four bands is commoner than two bands, and one band than three bands.

As an example of the differences in the colour-variation found in different localities we give the following notes on 1468 specimens from the neighbourhood of Toulouse, compiled from the data given by Moquin-Tandon (op. cit., p. 167). A trifle over 50 per cent. are unicolorous : *libellula* = 89 p.c., *rubella* 6 p.c., and *petiveria* (banded and unbanded) 5 p.c. : nearly 41 p.c. of the total number are *libellula* 0 0 0 0 0, 24 p.c. are *libellula* 1 2 3 4 5, and 10 p.c. are *libellula* 0 0 3 4 5 : all the *rubella* are 0 0 0 0 0, while but 3 per cent. of all the shells have the formula 0 0 3 0 0.

Additional Bands : 0 2 3 × 4 5 (*l.* 3). 0 2 3 × (4 5) (*l.*).
0 2 3 × 0 0 (*l.*). (1 2 3) × (4 5) (*l. m.*).
0 2 3 (4 4 4) 5 (*l.*). 0 0 3 × (4 5) (*l.*).
1 0 3 4 × 5 (*l.*). 0 0 3 × 4 5 (*r.*).
1 2 3 × (4 5) (*l.* 3). (1 2) 3 × 4 5 (*r. m.*).
0 0 × 3 4 5 (*l.* 2) 1 2 3 × 4 5 (*l.* 2, *m.* 5).
0 0 0 4 × 5 (*l.*). (1 2) × 3 4 5 (*m.*).
0 0 (3 × 4 5) (*l.*). 1 (2 3) × 4 5 (*m.*).
1 2 3 3 4 5 (*l. m.*). (1 2) × 0 4 5 (*m.*).

By far the commonest position for an extra band thus seems to be between bands 3 and 4 (more than 75 per cent.). In two specimens only is the extra band not next to 3 on one side or the other : in these it lies between 4 and 5.

WIDTH OF THE BANDS.—As has been before mentioned, this is a difficult thing to measure exactly. We append a few examples for what they may be worth. The general tendency is to show that band 4 is, on the whole, the widest.

Form.	Band 1.	2.	3.	4.	5.
mista, pale, de Boinville	0.7	1.0	1.4	2.8	2.3
mista, dark ,,	0.9	1.3	2.8	3.9	2.6
libellula, light ,,	0.7	0.6	1.3	2.6	2.35
libellula, dark ,,	0.5	0.9	2.2	3.9	2.9
libellula, B. F. 1 0 3 4 5 de Boinville	0.55	...	1.0	1.1	2.55
libellula ,, ,,	0.6	...	0.8	1.5	2.3
rubella ,,	0.7	0.8	1.4	2.6	2.1
mista, Moreton ...	0.7	0.8	1.3	2.4	2.4
mista, B.F. $\frac{4}{1}$ 2 3 4 5 Moreton	0.15	0.5	1.6	1.9	1.1

From measurements of band 3 in specimens with B. F. 0 0 3 0 0 the following values have been obtained:—*castanea* max. 2.2 (Holmer), min. 0.9 (de Boinville), mean 1.64; *libellula* max. 3.5 (de Boinville), min. 0.5 (de B.), mean 1.50; *rubella* max. 3.3 (de B.), min. 0.6 (de B.), mean 1.54. The widest specimens of 3 are, we think, as a rule, found in those shells with B.F. 0 0 3 0 0.

J. Sauveur (Ann. Soc. Malac. Belgique, 1866-7) proposes that bands more than 1.5 m.m. wide shall be classed as "broad," less than 0.5 m.m. as "narrow." The fact is that different limits are required for the different bands. The lower limit for all might be 0.5 m.m. and the upper limit 1.0 for bands 1 and 2, 2.5 for 3, 3.0 for 4, and about 2.75 for 5. But it is difficult to lay down hard and fast limits.

COLOUR OF THE BANDS.—This varies, as is generally the case, from rather deep brown to almost black. In some cases in *rubella* the bands are distinctly reddish, *i.e.* comparatively pale: this occurs in shells with four or five bands in which the ground colour is rich red. In *libellula* the bands are usually dark, but a single specimen has occurred at Shobdon (11) with quite pale brown bands.

NOTE ON THE WHITE LINE.—The white or whitish line which is so frequently seen along the borders of a dark band in this species, as mentioned above, is of some interest. It does not seem to have been adequately noted in most of the descriptions. It occurs most noticeably in *rubella*, but is often equally well-developed, though naturally not so conspicuous, in *libellula*: it occurs in *castanea* but is not so well marked. It is most noticeable in specimens with a single median band (B.F. 0 0 3 0 0): traces of it may also be seen very often when more bands are present, but frequently in heavily banded specimens it seems to be absent. It occurs both above and below the band, but is best developed (as a rule, though by no means always) below band 3. It is remarkable for another characteristic beside its colour. The ordinary dark bands are, with very rare exceptions, compared to the rest of the shell, transparent: at least this is so

except perhaps occasionally with exceedingly thin specimens. Even in these the bands are of a much more homogeneous transparency than the rest. The white band on the other hand is much more opaque than the ground-coloured area of the shell. It will be of great interest to discover the arrangement of the prismatic layer (or whatever it may be) which is the cause of these variations in transparency. Now the pale band is usually best seen in specimens in which the dark band is darkest and widest. There are reasons for thinking that at least part of the pigmentation of an ordinary band is produced by concentration of the ground-colour pigment. May then the white line be regarded as an area from which the ground-colour has been removed in the pigmentation of the dark band? The opacity has also to be accounted for. It is to be noted that even when the white band is not obvious, a certain amount of opacity can be seen bordering the dark bands. Generally we may say that though the pigmentation and whiteness seem in some way intimately associated with transparency and opacity respectively, the association in either case may be broken (as *e.g.* in *hyalozonata* forms).

COLOUR OF PERISTOME AND RIB.—We have said nothing above about the colour of the peristome and rib in Herefordshire *nemoralis*. It is a difficult subject and beset with great uncertainties. For instance a pinkish colour on the lip may apparently be due to (1) a real mutation; or (2) the fact that the peristome is only just completed; or (3) that the season of growth has been a cold one; or (4) that for some reason the individual in question has not been sexually active; or (5) that the shell is old and weatherworn (or occasionally young and weatherworn); or (6) that it has been collected and cleaned for many years. So much for the colour. Much might be said also about the relation of the colour of the rib to that of the peristome. Here again the influence of age seems very marked. The peristome is anything almost from black to pink (we speak only of local specimens), and so is the rib. The colour of the rib is more evanescent and prone to fade than is that of the peristome. Some few specimens we have seen in which the inner side of the peristome is very much lighter than the outer side: but genuine *bimarginata* or *albolabiata* or *roseolabiata* we do not record from Herefordshire. Very old specimens and very young ones may sometimes delude us into a fiction of an important form: but a little inspection and consideration will generally soon shew that they are not the genuine mutations.

MEASUREMENTS.—The following table summarises the dimensions which have been observed.

		Woolhope	de Boinville.	Moreton.	Hunderton.	Total.
castanea ...	diam. max.	22.5×17.5	23.5×17.9	23.5×18.7	21.8×16.0	23.5
	min.	20.3×15.3	18.9×14.7	18.7×14.8	20.2×16.6	18.7
	mean.	21.40	20.90	20.75	20.78	20.94
	alt. max.	18.4×22.3	18.5×21.9	18.7×23.5	16.7×20.6	18.7
	min.	15.3×20 3	14.3×19.1	14.3×20.7	14.8×20.6	14.3
	mean.	16.74	16.48	16.21	16.07	16.45
	$\frac{D.}{A.}$ coeff. max.	15.8×21.8 = 1.380	21.6×15.3 = 1.412	20.7×14.3 = 1.447	20.6×14.8 = 1.392	1.447

MEASUREMENTS—*(Continued)*.

			Woolhope	de Boinville.	Moreton.	Hunderton.	Total.
		min.	18.4×22.3 = 1.212	19.2×16.3 = 1.178	19.5×17.1 = 1.140	20.2×16.6 = 1.217	1.140
		mean	1.278	1.268	1.280	1.231	1.273
libellula	... diam.	max.	23.4×17.9	25.1×18.9	22.7×18.3	22.6×17.8	25.1
		min.	20.8×17.1	17.9×14.4	18.2×14.9	19.4×15.7	17.9
		mean	21.87	21.23	20.75	21.24	21.05
	alt.	max.	17.9×23.4	19.0×23.4	18.3×22.7	18.1×22.1	19.0
		min.	16.8×21.4	14.4×17.9	14.7×19.3	15.4×21.2	14.4
		mean	17.27	16.43	16.38	16.65	16.43
	D./A. coeff.	max.	23.4×17.9 = 1.307	20.6×14.5 = 1.421	22.3×16.1 = 1.385	21.7×15.8 = 1.380	1.421
		min.	20.8×17.1 = 1.216	21.9×18.9 = 1.154	20.7×18.1 = 1.144	21.6×17.8 = 1.213	1.144
		mean	1.266	1.298	1.267	1.275	1.281
rubella...	... diam.	max.	23.4×18.9	24.7×21.1	22.6×17.5	23.8×18.9	24.7
		min.	20.1×16.4	18.0×14.6	19.1×14.9	19.5×16.5	18.0
		mean	21.81	21.28	20.67	21.06	21.21
	alt.	max.	19.1×22.8	21.1×24.7	18.0×21.5	18.9×23.8	21.1
		min.	15.3×21.2	14.2×20.2	14.7×19.8	15.3×21.4	14.2
		mean	16.95	16.495	16.20	16.63	16.50
	D./A. coeff.	max.	22.0×15.8 = 1.392	21.1×14.6 = 1.445	19.8×14.7 = 1.347	21.4×15.3 = 1.399	1.445
		min.	22.8×19.1 = 1.194	24.7×21.1 = 1.171	20.2×17.0 = 1.188	19.5×16.5 = 1.182	1.171
		mean	1.287	1.289	1.276	1.266	1.285
mista ...	... diam.	max.	24.0×18.9	24.2×18.5	23.2×16.8	23.3×18.2	24.2
		min.	20.5×14.5	18.1×15.0	19.1×14.9	19.7×16.3	18.1
		mean	22.07	20.95	20.84	21.14	20.96
	alt.	max.	18.9×24.0	19.8×23.2	18.5×22.2	18.6×22.7	19.8
		min.	14.5×20.5	13.9×19.3	14.7×20.0	14.7×20.0	13.9
		mean	17.245	16.88	16.35	16.35	16.50
	D./A. coeff.	max.	20.5×14.5 = 1.414	21.8×15.4 = 1.416	21.4×15.0 = 1.427	21.6×15.5 = 1.393	1.427
		min.	20.8×17.9 = 1.162	20.5×18.5 = 1.108	21.4×18.4 = 1.163	19.7×16.3 = 1.208	1.108
		mean	1.279	1.241	1.274	1.293	1.270
mista + *rubella*: diam.		mean	21.96	21.19	20.82	21.10	21.06
	alt.	mean	17.12	16.60	16.33	16.47	16.50
	D./A. coeff.	mean	1.283	1.276	1.275	1.281	1.277
All *nemoralis*...	diam.	max.	24.0×18.9	25.1×18.9	23.5×18.7	23.8×18.9	25.1
		min.	20.1×16.4	17.9×14.4	18.2×14.9	19.4×15.7	17.9
		mean	21.78	21.17	20.80	21.10	21.05
	alt.	max.	19.1×22.8	21.1×24.7	18.7×23.5	18.9×23.8	21.1
		min.	14.5×20.5	13.9×19.3	14.3×20.7	14.7×20.0	13.9
		mean	17.00	16.53	16.34	16.47	16.46
	D./A. coeff.	max.	20.5×14.5 1.414	21.1×14.6 = 1.445	20.7×14.3 = 1.447	21.4×15.3 = 1.399	1.447
		min.	20.8×17.9 = 1.162	20.5×18.5 = 1.108	19.5×17.1 = 1.140	19.5×16.5 = 1.182	1.108
		mean	1.281	1.281	1.273	1.281	1.279

The above table is calculated only on the figures given by certain large "takes": in this way fairer averages are obtained. Certain "records" however are to be found among odd specimens, viz.:—*rubella* 25.0 × 19.1 (Downton); *mista* 24.4 × 18.9 (Hereford, 7 N).

The general Herefordshire mean is thus 21.05 × 16.46: M.T. = 18 to 30 × 12 to 25; L. E. A. = 22.5 × 16.5, with variation in diam. from 16 to 28; J. G. J. = 22.86 × 16.5; J. W. W. = 25 × 15. If these measurements may rightly be compared with our own, the Herefordshire shells are more conoid than usual. J. W. Horsley (*Journal of Malacology*, Vol. vi., 1897, p. 20) gives 22.5 × 16.5 (? from Adams), and mentions variation up to diam. 32.

The following are the figures arrived at in enquiring whether variation in diameter is associated with variation in coefficient: *mista* (Moreton), those with diam. more than mean = 1.2867 mean coeff., those less = 1.2641; *libellula* (Moreton), those more = 1.2789, those less = 1.2559. Thus the general tendency is to confirm the suspicion that shells of a greater diameter have a relatively less altitude.

The next table is given as an example of the usual distribution of diameters and altitudes (and indirectly of coefficients) in a group of *nemoralis*. The measurements are taken to the nearest half-millimetre, and are those of a batch of 447 specimens from Moreton.

	18	18.5	19	19.5	20	20.5	21	21.5	22	22.5	23	23.5	Total.	m.m. diam.
Alt. m.m. 14	...	...	...	...	...	...	...	...	...	...	...	...	—	
14.5	...	...	...	2	2	2	...	...	...	...	...	...	6	
15	1	1	3	4	4	2	2	2	...	...	...	...	19	
15.5	...	1	1	24	23	23	9	3	...	...	...	...	84	
16	...	...	3	5	23	38	13	14	1	3	...	...	100	
16.5	...	...	...	5	10	36	28	27	4	...	...	...	110	
17	..	...	...	1	5	11	22	20	7	1	1	...	68	
17.5	...	...	...	...	...	1	11	12	6	7	...	...	37	
18	...	...	...	...	...	3	2	6	3	4	...	...	18	
18.5	...	...	...	...	...	...	1	...	2	1	...	1	5	
Total ...	1	2	7	41	67	116	88	84	23	16	1	1	447	

WEIGHT.—The following table summarises the weights observed. Considerable care was in all cases taken that the shells should be as clean as possible both outside and inside: in many cases the shell was afterwards broken to verify its freedom from remains of the animal. To secure uniformity all shells should be kept dry at least some months after cleaning out the animal. Very many shells

such as old worn specimens) which may be measured are not available for weighing. The weights are expressed in milligrammes.

		Woolhope.	de Boinville.	Moreton.	Total.
castanea	max.	850	1009	1053	
	min.	524	333	360	
	mean	658	604	777	671
libellula	max.	...	1454	1107	
	min.	...	200	240	
	mean	...	659	649	654
rubella	max.	...	1495	1013	
	min.	...	190	267	
	mean	...	742	683	722
mista	max.	...	1472	1115	
	min.	...	220	315	
	mean	...	692	673	679
rubella + *mista* ...	mean	...	719	675	695
All *nemoralis* ...	max.	...	1495	1115	1495
	min.	..	190	240	190
	mean	...	681	675	677

The above table contains all the maxima and minima with the exception of an odd specimen of *libellula* from Breinton (7 N.) which weighs only 188 mgms. J. W. Taylor (*Monograph*, i., p. 78) gives the normal weight as 0.713 grammes, with a variation up to 5.119 grammes.

The weight by no means always varies with the size: the thickness of the shell must also be taken into consideration. This may be measured on the intact shell on the last whorl near to, but not in contact with, the peristone. It then varies from about 0.1 to 0.35 mm.: it also varies directly with the weight as a rule, when variation due to difference in size is eliminated. The correspondence is however never quite exact: this is due to the fact that the thickness on the last whorl is not a thoroughly sound measure of the thickness of the shell everywhere, and probably also to variations in composition and specific gravity of the shell.

* Tachea hortensis. *Müller, 1774.*

Not the *H. hortensis* of Pennant, 1777, or Turton, 1819, which is *aspersa*; =*H. fasciata* partim da Costa, 1778.

Widely distributed and common. In many places (*e.g.* round Hereford 7 N) it is much commoner than *nemoralis*, while at other situations (*e.g.* Dormington Quarries, 3) it is in a very considerable minority. For the relative abundance of the two species, see the table under *Tachea* above (p. 40). It has the same habits as *nemoralis*, except that it seems to often come out in suitable weather before *nemoralis* is moving: it also appears to be more addicted to climbing up the dry stems of tall plants in the hedgerows. A single specimen of *fasciata* was found

near Breinton (7 N) on December 26th, 1896, crawling about on the hedge-bank, whither it had emerged with the apparent intention of astonishing any conchologist who might pass by. Even when the winter is quite mild, *Tachea* generally hibernates continuously from October to March.

Colour-forms.—The variation found here is even less than in *nemoralis*, and all *hortensis* which have occurred in Herefordshire fall under five heads:—

(α) var. *alba unicolor*: one must be careful to avoid reckoning pale *lutea* under this head, though the distinction is not one of any very great importance, a series of gradations perfectly connecting the two forms. It is well to clean out the shell before deciding that it is *alba*: when alive pale *lutea* sometimes look quite white.

(β) var. *lutea unicolor*: this includes all yellow forms without bands; the variation in intensity of ground colour is considerable. A slight alteration of the shell at the periphery, appearing as a faint band (sometimes opaque, sometimes transparent), is not uncommon. The yellow colour ssems never to attain the depth and brilliancy which it often shews in specimens from more southern localities. This is more particularly noticeable in the yellow *fasciata* forms.

(γ) var. *fasciata*: this is not quite the same thing as Menke's *fasciata*, in that it only includes banded specimens with a white or yellow ground colour, which are not *arenicola*. We have quite failed to satisfactorily distinguish between *alba fasciata* and *lutea fasciata*. Extreme forms occur (more commonly in *alba*) fairly frequently, and are easy enough to deal with; but the great majority are in a border class of their own, and to make a fresh group for these would only double the difficulty by having two boundary lines instead of one. The doubtful specimens arise in two ways: either the whole ground-colour is indefinitely whitish, or one part is yellow while another part is quite white. As in *T. nemoralis rubella*, an excess of banding is often associated with a paling of the ground-colour: a heavily banded, bright yellow *fasciata* is rare, while in *alba fasciata* the bands are often wide, numerous, and of a deeper colour than in *lutea*. Some *alba fasciata* have few, or thin, or pale bands: these specimens are more truly *alba* and the whiteness has a different origin. The var. *coalita*, Moq., is naturally considered under the head of *fasciata*: it is a form which least deserves a separate name. The constant presence in *coalita* of the periumbilical and perisutural ground-colour tends to show that the view that such forms as *lilacina* arise by fusion of the bands is erroneous. The change of ground-colour round the umbilicus, to the occurrence of which throughout *Tachea* attention has been called of old, is often very well seen in *fasciata*.

(δ) var. *arenicola*, Macgill. This includes all forms with non-pigmented bands. The error of description contained in the name has often been pointed out. The variety is usually described as having "transparent" bands. What is meant is, no doubt, that the bands are colourless, for all bands (*i.e.* all normal bands) in *Tachea* are transparent, and it is this transparency which,

to a large extent, separate off the bands from the rest of the surface of the shell. Sometimes the transparent part is wider—regularly or irregularly—than the pigmented part, *i.e.* the pigment does not necessarily spread over the whole of the altered area marked off by its transparency as a band. The transparency is doubtless due to some rearrangement in the structure of the shell, and it is natural to suppose that this difference lies in the prismatic layer. In many thin *hortensis* the bands are not very much more transparent than the rest of the shell; but a sharp differentiation (as is seen in *H. virgata*) is seen in fairly thick *arenicola* or in *T. nemoralis rubella* B.F. 0 0 3 0 0, where the contrast between the transparency of the dark band and the opacity of the white band on either side of it (when this occurs) is very well-marked. Two fairly distinct forms of *arenicola* have occurred in Herefordshire:—(1) which is much the commoner, has an opaque or relatively opaque ground, and the ground colour is pale, generally nearly white: (2) this is comparatively rare; the ground is translucent and may be bright yellow, while the bands are, only partly in consequence, not very well-defined; it is either (α) a true *arenicola* form of thin and translucent *lutea* or *alba*, or (β) a form without true, normal bands at all: specimens occasionally turn up both in *hortensis* and *nemoralis* (*e.g.* in *libellula* and *castanea* 0 0 0 0 0) where there is an ill-defined pale peripheral band comparable to the pale band in *H. rufescens:* whether these bands are strictly homologous with the regular bands of *fasciata* is very doubtful. Traces of this band may generally be detected in most *lutea unicolor;* it is only well-marked examples which are here referred to.

One occasionally notes curious specimens in which the transparency due to bands 4 and 5 seems to extend right up to the umbilicus without the intervention of another opaque area, the opacity of the non-banded area between the suture and bands 1, 2, 3 and 4 being very well marked. The corresponding condition on the upper side (*i.e.* towards the suture) we have not noted.

Under *T. nemoralis* above reference was made to the possible occurrence of the form *hyalozonata* in the county. This supposition rests on three specimens of apparent *arenicola* which have occurred, two from near Moreton, and a broken specimen from near Tupsley. Three points make it quite likely that these should really be referred to *nemoralis:* (α) ordinary and indubitable *arenicola* did not occur with them, though *hortensis* and *nemoralis* both occurred freely; (β) the ground colour is bright yellow, which is, to say the least, very uncommon in true *arenicola;* (γ) the specimens are of a very large size for Herefordshire *hortensis*, the two Moreton ones being 21.4 × 16.9 (weight 717 mgms.) and 23.3 × 17.3 (weight 887 mgms.); the last specimen is very decidedly larger than any other local *hortensis* we have seen. It is a matter of considerable regret that the spiculum was not examined in these cases. These specimens will not be taken into account in the tables below.

(ϵ) var. *fusca*, Poiret. Four specimens of this form have occurred, three in the

de Boinville collection and one at Breinton (7 N). The last locality has been repeatedly searched since the single specimen was found, but without success. It will be convenient to here give details of these specimens, as they will not afterwards be considered: from the de Boinville collection, 18.1×14.8 (weight, 449 mgms); 17.8 × 13.3; 17.6 × 13.2: from Breinton, 18.1 × 13.5 (weight, 358 mgms).

The following table shews the relative abundance of these forms in various localities. The figures are percentages.

Locality.	Woolhope	de Boinville.	Moreton.	Hunderton.	Broomy Hill.	Total.
alba unicolor...	...	1.6	1.14	...	1.4	1.1
lutea unicolor	17.65	15.4	87.5	43.3	33.6	37.1
fasciata ...	82.35	50.5	11.4	54.2	61.9	50.6
arenicola ...	...	30.85	?	2.5	3.1	10.7
fusca	...	1.6	...	...	...	0.4
Total unicolor	17.65	18.6	88.6	43.3	35.0	38.7
Total banded	82.35	81.4	11.4	56.7	65.0	61.3

In the summer of 1896 a very marked tendency towards albinism in unicolorous *hortensis* was noticeable round Hereford (7 N). This was probably correlated with the excessive dryness of the year, the total rainfall for the first eight months being only a little over 8 inches in Herefordshire. This was backed up by the remarkable paucity of rain for several years previous to 1896. Many conchologists hold that deficiency of pigment is the result of cold and wet. Such deficiency might well arise when either heat or cold and wet become exaggerated into excess towards the minima and maxima at which the species may comfortably thrive.

A. var. fasciata.

The numbers in the following table are absolute unless percentages are indicated.

	Woolhope	de Boinville.	Moreton.	Hunderton.	Broomy Hill.	Total.
1 Band ...	...	...	...	...	...	...
2 ,, ...	...	...	...	...	...	...
3 ,, ...	...	2	2	...	...	1.5 p.c.
4 ,, ...	...	7	...	...	2	3.4 p.c.
5 ,, ...	14	84	8	60	78	94.3 p.c.
More than 5	...	2	...	...	...	0.8 p.c.
No. of specimens	14	95	10	60	80	259
Band 1 ...	14	91	10	60	80	98.4 p.c.
,, 2 ...	14	89	8	60	78	96.1 p.c.
,, 3 ...	14	94	10	60	80	99.6 p.c.
,, 4 ...	14	95	8	60	80	99.2 p.c.
,, 5 ...	14	95	10	60	80	100 p.c.
Extra bands	...	2	...	...	...	0.8 p.c.

The above table contains those catches only where every adult shell found was taken. Unfortunately much of our *hortensis* material was not collected on

this basis. Chief among the forms thus excluded is a single one-banded specimen B.F. 0 0 0 4 0 from near Hereford (7 N). In this the ground-colour is bright yellow, and the band is very peculiar. Contrary to all rule, it is not transparent, and is a peculiar bright brown colour, having that appearance of being painted on the shell which is so frequent in birds eggs. Some few other specimens with faint indications of a similar band have occurred near the same place.

Table of average band-strength :

Locality.	de Boinville.	Hunderton.	Broomy Hill.	Total.
Band 1	0.88	0.98	0.88	0.908
,, 2	0.85	0.91	0.85	0.867
,, 3	0.91	0.99	1.00	0.964
,, 4	0.96	1.00	1.00	0.982
,, 5	0.94	1.00	1.00	0.978

Band-Formulae.—The following list include all specimens examined: so that in all probability the rarer forms seem to be rather commoner than they really are.

Five bands : 1 2 3 4 5 : 253 [354].
(1 2 3 4 5) : 16.
(1 2 3) 4 5 : 7.
(1 2) 3 4 5 : 16 [17].
1 (2 3) 4 5 : 29 [30].
(1 2 3) (4 5) : 40.
1 2 3 (4 5) : 16 [18].
1 (2 3) (4 5) : 5 [7].
1 (2 3 4) 5 : 3 [4].
(1 2) 3 (4 5) : 11 [12].
1 (2 3 4 5) : 2.
1 2 (3 4) 5.
$\frac{2}{1}$ $\frac{2}{3}$ $\frac{2}{3}$ 4 5 : 2.
$\frac{4}{1}$ $\frac{4}{3}$ $\frac{4}{3}$ 4 $\frac{2}{3}$: 2.
$\frac{4}{1}$ 2 3 4 $\frac{2}{3}$.
$\frac{4}{1}$ $\frac{4}{3}$ $\frac{4}{3}$ $\frac{2}{3}$.
1 2 $\frac{2}{3}$ 4 5 : 2.
(1 2) $\frac{4}{3}$ (4 5).
$\frac{4}{1}$ 2 3 (4 5).
$\frac{2}{1}$ 2 3 4 5 : 13.
$\frac{4}{1}$ 2 3 4 5 : 5.
1 $\frac{2}{3}$ 3 4 5 : 21.
1 $\frac{4}{3}$ 3 4 5 : 21.
$\frac{2}{1}$ $\frac{2}{3}$ 3 4 5 : 19.
$\frac{4}{1}$ $\frac{4}{3}$ 3 4 5 : 3.
$\frac{4}{1}$ $\frac{2}{3}$ 3 4 5.
$\frac{2}{1}$ $\frac{4}{3}$ 3 4 5 : 2.
$\frac{2}{1}$ (2 3 4) 5.
$\frac{2}{1}$ (2 3) 4 5 : 2.
$\frac{2}{1}$ (2 3) (4 5).
1 $\frac{2}{3}$ 3 (4 5).
$\frac{2}{1}$ $\frac{2}{3}$ $\frac{2}{3}$ $\frac{2}{3}$ $\frac{2}{3}$: 3.
$\frac{4}{1}$ $\frac{2}{3}$ $\frac{2}{3}$ 4 5 : 2.
$\frac{4}{1}$ $\frac{4}{3}$ $\frac{2}{3}$ $\frac{2}{3}$ $\frac{4}{3}$.
$\frac{4}{1}$ $\frac{4}{3}$ $\frac{4}{3}$ $\frac{4}{3}$ $\frac{2}{3}$.
(1 2) $\frac{2}{3}$ 4 5.
1 2 $\frac{4}{3}$ 4 5.

Four bands : 1 0 3 4 5 : 10 [12].
[0 2 3 4 5 : 4].
0 $\frac{4}{3}$ $\frac{4}{3}$ $\frac{2}{3}$ $\frac{2}{3}$.
$\frac{2}{1}$ 0 3 4 5 : 2.
0 $\frac{2}{3}$ $\frac{2}{3}$ 4 $\frac{2}{3}$: 2.
0 $\frac{2}{3}$ $\frac{2}{3}$ $\frac{2}{3}$ $\frac{2}{3}$.
[1 0 3 (4 5)].
1 0 $\frac{4}{3}$ (4 5).

Three bands : 1 0 0 4 5 (de B.)
1 0 3 0 5 : 2 (Moreton).
0 0 3 4 5 (de B.)

One band : 0 0 0 4 0 (Breinton).

Moquin-Tandon (*Histoire*, ii., p. 170) regards yellow *fasciata*, B.F. 1 2 3 4 5, as the type of *hortensis* under the name of *quinquevittata*.

B. var. arenicola.

Band-Formulae.

Five bands : 1 2 3 4 5 : 32 [45].
(1 2) 3 (4 5) : 5.
(1 2 3) (4 5) : 7.
1 (2 3) 4 5 : 5 [6].
(1 2) 3 4 5.
(1 2 3 4) 5.
(1 2 3 4 5) : 6.
1 (2 3) (4 5) : 5.
1 2 3 (4 5) : 2.
(1 2 3) 4 5 : 2.
1 $\frac{4}{3}$ 3 4 5 : 3.
1 $\frac{2}{3}$ 3 4 5 : 5.
$\frac{2}{1}$ 2 3 4 5 : 2.
$\frac{2}{1}$ (2 3) 4 5.
$\frac{2}{1}$ $\frac{2}{3}$ 3 4 5.
$\frac{2}{1}$ 2 3 4 $\frac{2}{3}$.
1 2 3 4 $\frac{2}{3}$.

Four bands : 1 0 3 4 5.

Three bands : 1 2 3 0 0 : (de B.)

Two bands : 1 0 3 0 0 : (de B.)
0 0 3 0 5 : (de B.)

A form of *arenicola* was mentioned above with a thin, transparent shell, and somewhat ill-marked bands. We are doubtful how far these specimens should rightly be reckoned as *arenicola*, or the bands as normal bands. They have hence been excluded from the above tables. It is worth while, however, to mention that in this form the B. F. 0 0 3 4 0 has occurred at Hunderton, and 0 0 3 0 0 at White Cross, Hereford.

Width of Bands.—As a general rule 3, 4, and 5 are about equal in width; equally generally 4 is slightly, often markedly, the widest of the three: 3 is very seldom in excess of 4 and 5. In some places (*e.g.* parts of Kent) where the B.F. 0 0 3 0 0 occurs, 3 is often very prominent, just as it is in *nemoralis*, where 0 0 3 0 0 is common. The influence which difference in the width of the bands exerts on the general appearance of the shell is very marked in *fasciata*—more so than in *T. nemoralis*. It is desirable that some simple plan should be devised to express the ratio between the banded and unbanded areas on a shell.

Colour of Bands, etc.—The peristome and rib are practicably invariably white in the local specimens which we have seen. Some faint traces of a pinkish or brownish tinge, chiefly on the rib, form the only exceptions to this. The colour of the bands varies more than in *T. nemoralis:* this is no doubt correlated with the greater abundance of the forms with absolutely non-pigmented bands. The colour may vary from black (usually in specimens with a white ground-colour) to the palest yellowish-brown, though almost any shade of brown.

MEASUREMENTS.—The following table gives a summary of the dimension which we have obtained for this species :—

		de Boinville.	Moreton.	Hunderton.	Total.
arenicola ...	diam. max.	20.0 × 14.8	...	...	20.0
	min.	16.8 × 12.8	...	...	16.8
	mean.	18.29	...	...	18.29
	alt. max.	15.0 × 19.4	...	...	15.0
	min.	12.6 × 17.2	...	...	12.6
	mean.	13.70	...	...	13.70
	$\frac{D.}{A.}$ coeff. max.	20.0 × 13.9 = 1.439	...	...	1.439
	min.	17.0 × 13.8 = 1.232	...	...	1.232
	mean.	1.335	...	...	1.335
fasciata ...	diam. max.	20.5 × 15.9	19.3 × 15.2	20.0 × 15.8	20.5
	min.	17.0 × 13.3	17.4 × 14.1	17.1 × 12.9	17.0
	mean.	18.75	18.56	18.30	18.57
	alt. max.	16.9 × 19.7	15.2 × 19.3	15.8 × 19.5	16.9
	min.	12.7 × 17.4	13.2 × 18.6	12.9 × 17.1	12.7
	mean.	14.37	14.23	14.295	14.33
	$\frac{D.}{A.}$ coeff. max.	20.5 × 14.4 = 1.423	18.6 × 13.2 = 1.409	19.2 × 14.1 = 1.362	1.423
	min.	19.0 × 16.5 = 1.151	17.4 × 14.1 = 1.234	18.2 × 15.0 = 1.213	1.151
	mean.	1.305	1.304	1.280	1.296
lutea unicolor ...	diam. max.	20.3 × 15.9	20.2 × 15.8	20.5 × 16.0	20.5
	min.	16.8 × 13.6	17.0 × 13.6	15.6 × 12.1	17.0
	mean.	18.59	18.48	18.40	18.48
	alt. max.	15.9 × 20.3	16.9 × 20.1	16.0 × 20.5	16.9
	min.	12.3 × 17.2	13.2 × 18.5	12.1 × 15.6	12.1
	mean.	14.28	14.37	14.15	14.29
	$\frac{D.}{A.}$ coeff. max.	18.9 × 13.5 = 1.474	18.5 × 13.2 = 1.401	19.8 × 14.1 = 1.404	1.474
	min.	17.9 × 15.2 = 1.178	18.7 × 15.5 = 1.142	16.4 × 13.5 = 1.215	1.142
	mean.	1.302	1.286	1.300	1.293
Total ...	diam. max.	20.5 × 15.9	20.2 × 15.8	20.5 × 16.0	20.5
	min.	16.8 × 12.8	17.0 × 13.6	15.6 × 12.1	15.6
	mean.	18.57	18.49	18.34	18.49
	alt. max.	16.9 × 19.7	16.9 × 20.1	16.0 × 20.5	16.9
	min.	12.3 × 17.2	13.2 × 18.5	12.1 × 15.6	12.1
	mean.	14.14	14.35	14.24	14.22
	$\frac{D.}{A.}$ coeff. max.	18.9 × 13.5 = 1.474	18.6 × 13.2 = 1.409	19.8 × 14.1 = 1.404	1.474
	min.	19.0 × 16.5 = 1.151	18.7 × 15.5 = 1.142	18.2 × 15.0 = 1.213	1.142
	mean.	1.313	1.289	1.288	1.300

The above table does not include all the extreme specimens which we have come across : from Whitecross, Hereford (7 N), we have a *lutea unicolor*, 14.7 × 8.2 (= 1.783), and an *alba unicolor*, 18.1 × 11.6 (= 1.560), both remarkably flat specimens; from Broomy Hill (7 N), a *fasciata*, 17.2 × 12.0 (= 1.433), and an *arenicola*, 20.2 × 15.3; from Bullingham, a *fasciata*, 20.0 × 17.0; from Little Tarrington (6), a *fasciata*, 17.2 × 12.5. It may be as well to state that none of these are malformed, pathological specimens. Such specimens are quite common,

and the malformations may produce extraordinary measurements, *e.g.* a *lutea unicolor* from Moreton has alt. 14.3, diam. 12.4 (= 0.867).

The Herefordshire mean being about 18.5 × 14.2, M. T. = 15 to 20 × 12 to 20 : L. E. A. = 18 × 16. J. W. Horsley (loc. cit.) gives 18 × 16 with a deviation in diam. down to 11 m.m.

In all the *hortensis* from Moreton, those with a diameter greater than the mean have a mean coefficient of 1.289, those less 1.286; the de Boinville shells give 1.311 and 1.316 respectively. There is here little indication of any difference.

TABLE OF WEIGHTS (in milligrammes) :—

		de Boinville.	Moreton.	Other Localities.	Total.
fasciata	max.	765	650	561	765
	min.	167	205	145	145
	mean	439	440	350	390.5
lutea unicolor	max.	750	851	523	851
	min.	215	245	165	165
	mean	422	532	299.	407
arenicola	max.	631	...	...	..
	min.	219	...	...	...
	mean	352.5	...	...	.
Total	mean	410	496	333	383

SUCCINEIDAE.

AMPHIBULIMA. *Lamarck, 1805.*

Müller (1774) has a *H. succinea*, which renders the usual name of *Succinea*, Drap., 1801, not available.

Amphibulima putris. *L., 1758.*

The difficulties which have been made about this species as described in the Systema seem rather unnecessary : Linné refers to Lister's figure (1678), which is certainly a *Succinea*. No doubt Linné's name is more generic than specific.

Fairly common and widely distributed. It occurs with the next species at Tupsley (7 N), Longworth (6), Doward (2), and elsewhere. We have beaten it off nettles at Longworth.

The idea that this species and the next hibernates in the mud of ponds (see L. E. Adams, op. cit., p. 114; 1896) is probably no the whole truth : we have found them both hibernating in large numbers under stones and among rubbish near Hereford (7 N) some distance from water in December in a severe winter.

A form paler and more fragile than usual occurred very freely at Ross (2) on *Armoracia* (see sub. *Hyg. rufescens* supra), and is occasionally found elsewhere Doward, near Hereford, etc.).

The largest specimen we have noted measures 16.5 × 9.2.

Amphibulima elegans. *Risso, 1826.*

= *S. pfeifferi*, Rossmässler, 1835.

Has much the same distribution and occurrence as *putris*, and is, on the whole, rather commoner. It used to be exceedingly abundant in the Hereford and Gloucester Canal (now unfortunately drained) near Hereford (7 N). A dwarfed form of the type known as *pfeifferi* (though *pfeifferi* Rossm. seems to be really a synonym of *elegans*, Risso) occurs, but rarely, on the margins of a small pool in Stoke Woods (3).* A form with a very pale, thin shell has been noted at the Doward (2).

The differences in external appearance between this species and *putris* are, especially when alive, generally pretty obvious: *elegans* has a much darker body, often with a strong purplish or deep violet tinge (as in *Vitrina pellucida*), and the shell is redder; if, on the other hand, *putris* has a dark body (it is usually comparatively light in colour), it is of a greyish or brownish tinge, and the shell seems to be very seldom distinctly reddish. The most ready, and at the same time certain, method of distinguishing the two lies in the maxilla, which in *putris* is strongly ribbed, while in *elegans* it has only a single median projection. This difference is very useful in the case of small forms or immature specimens, and, while easily investigated, gives very definite results. The habitat of the two species are to a large extent different, though not infrequently they are found actually together: *elegans* affects much wetter places than *putris*, and may be seen crawling about, actually submerged, or floating on the surface like a *Limnaea*.

PUPIDAE.

BULIMINUS. *Ehrenberg, 1837.*

*** Buliminus obscurus.** *Müll., 1774.*

It occurs sparingly in a good many localities, and is widely distributed over the county: it is, however, fairly abundant only in the Woolhope district (3), the Doward (2), and on the Silurian near Ledbury (4). The white form (*albina*, Moq.) has occurred at Burghill (7 N), Backbury (3), and Dormington Quarries (3).

We have not infrequently seen young—and sometimes old—shells coated with particles of dirt, but not conspicuously more so than other shells (*e.g. Clausilia*) which occurred with them. We believe that the "adventitious protection" thus afforded to this species is to a large extent imaginary, though on tree-trunks (in which situation we have not met with it in the county) the muddy coating may be of some use.

*It is right to add that these dwarf forms are not like any specimens labelled *pfeifferi* in the British Museum. They are much less ventricose. One specimen was dissected and proved to be adult (a fact which might have been inferred from the developement of the shell). It is probable that they represent a third form in the group of *S. arenaria*, Bouch (*oblonga* of British authors) and *S. oblonga*, Drap., and in all probability should be treated as separate from *S. elegans*, Risso: though the unfortunate lack of material prevents our dogmatising on this point.

The following table gives the measurements for three stations, all on Silurian limestone:—

Locality.	Altitude.			Diameter.			Coefficient.		
	Max.	Min.	Mean	Max.	Min.	Mean	Max.	Min.	Mean
Backbury (3)	9.2	7.7	8.28	3.6	3.3	3.475	2.71	2.22	2.38
Dormington Q. (3) ...	9.4	8.1	8.77	3.7	3.5	3.59	2.69	2.19	2.44
Ledbury (4)	8.6	7.6	8.00	3.7	3.4	3.50	2.46	2.16	2.29

The coefficient here is of course $\frac{\text{altitude}}{\text{diameter}}$: the diameter is measured perpendicular to the altitude and (almost) to the axis. For all Herefordshire specimens the figures are:—alt. max. 9.4 × 3.5 (Dormington), min. 7.6 × 3.4 (Ledbury), mean 8.31; diam. max. 3.7 × 8.1, 3.7 × 9.0, 3.7 × 8.9 (Dormington), 3.7 × 8.0 (Ledbury), min. 3.3 × 7.9, 3.3 × 7.7 (Backbury), 3.3 × 8.6 (Doward), mean 3.50; coefficient max. 9.2 × 3.4 = 2.71 (Backbury), min. 8.0 × 3.7 = 2.16 (Ledbury), mean 2.37. M. T. = 9 to 11 × 4 to 5; L. E. A. = 9 × 3.5; J. G. J. = 8.9 × 3.8; J. W. W. = 10 × 4.5.

ZUA. *Turton, 1831.*

= *Cochlicopa*, Risso, 1826 (Fér. 1822): *Azeca*, Leach, in Turton, 1831, has also been used a good deal.

*** Zua lubrica.** *Müll., 1774.*

Perhaps = *H. subcylindrica*, L. 1767, as some authors hold.

Common and widely distributed, but not abundant anywhere as a rule. Often occurs in gardens, and single specimens may be found practically everywhere.

The average size is about 5.4 × 2.3: M. T. = 5.5 × 2.5; L.E.A. = 6 × 2.25; J. G. J. = 6.35 × 2.2; J. W. W. = 6 × 2.5.

CAECILIOIDES. *Blainville, 1817.*

= *Achatina*, auctt. *Caecilianella*, Bourg., 1856.

*** Caecilioides acicula.** *Müll. 1774.*

= *B. terrestre*, Mont. 1803.

Three specimens have at different times been found among dead leaves and other *débris* on Backbury Hill (3), one of which measured 4 m.m. long. One from Bishopswood (2) is figured by J. W. Taylor (*Monograph*, Vol. i. (1894), p. 30, fig. 57: about 3.4. m.m. long), and the Rev. R. W. J. Smart sent us a small one from the same place. The mean sizes usually given are from 4.4 to 5 m.m. long.

This subterranean species is very frequently found in the *débris* of rivers. Repeated search in the rejectamenta of the Wye near Hereford (7 N?) has at last revealed two small specimens (Jan. 1899).

CLAUSILIA. *Draparnaud, 1805.*

* Clausilia perversa. *Pulteney, 1799.*

= *Cl. rugosa*, Drap., 1801, B. C., etc. : *Cl. nigricans*, Maton and Rackett, 1807; Gray, 1840 and 1857; Forbes and Hanley, 1853; *T. bidens*, Mont., 1803. It has been recently insisted that the *bidentata* of Ström (1759) is this species : if this is true, this name must of course take precedence, as Jeffreys suggested (B. C., V. 1869 Supplement, p. 161).

Widely distributed; single specimens may be found in most parts of the county, but it only seems to be abundant in such limestone districts as the Doward (2) and the Woolhope area (3).

It usually occurs among stones, etc., especially in quarries, but it has been taken under the bark of willow trees (Broomy Hill, Hereford, 7 N) and elm stumps (Holmer, 7 N). *Balea perversa* is usually found under bark on trees, but the distinction of habitat is not conclusive; and the two species may occur together (in stone walls or under bark on willow trees).

A specimen (long. 11.8 m.m.) from the Doward (2) has the last whorl separate and scalariform: a precisely similar case is figured by J. W. Taylor (*Monograph*, i., p. 121, fig. 271: see also *Conchologist*, i., p. 37).

Contrary to R. Rimmer's rule (*Land and Freshwater Shells*, 1880, p. 172; J. G. Jeffreys, B. C., i., p. 280, 1862; see also J. W. Taylor, *Monograph*, i., 1895, p. 73) the specimens from some stones, walls, etc. (*e.g.* Clifford Castle, 13) are hardly worn at all, while, on the other hand, many specimens from among moss and dead leaves (*e.g.* some parts of Dormington Quarries, 3) are very considerably abraded. When walking the species does not always trail its shell on the surface behind it, though it is true that it very often does.

All the dimensions given below for this species were estimated with the microscope and the travelling stage.

The following table exhibits the variations in length from various localities :—

Locality.	Max.	Min.	Mean.
Clifford Castle (13)	10.8 ...	9.9 ...	10.42
Aymestrey (10), 1895	12.2 ...	10.2 ...	11.18
,, 1896	12.2 ...	10.3 ...	11.23
Backbury Hill (3)	11.9 ...	10.4 ...	11.15
Doward (2)	13.3 ...	9.6 ...	11.21
Badnage (8)	11.7 ...	10.3 ...	11.23
Birley Hill (8)	12.5 ...	10.2 ...	12.31
Dormington Quarries (3), 1893 ...	13.0 ...	10.5 ...	11.55
,, 1891 ...	11.8 ...	10.4 ...	11.09

The mean length of all Herefordshire specimens (including those above) is 11.27, max. 13.3, min. 9.6. M. T. = 11 to 16, L. E. A. = 12, J. G. J. = 12.7. J. W. W. 13.

With regard to the width of the shell (measured at right angles to its long axis) and the length of the mouth (parallel to the long axis, from edges of peristome) the following details may be given :—

Locality.	Mean length.	Breadth. Max.	Breadth. Min.	Breadth. Mean	Length of Mouth. Max.	Length of Mouth. Min.	Length of Mouth. Mean
Aymestrey (10), 1895 ...	11.18	2.8	2.3	2.56	2.7	2.2	2.50
Doward (2)	11.21	2.8	2.5	2.64	2.6	2.2	2.34
Badnage (8)	11.23	...	...	...	2.4	2.3	2.34

This shews, *e.g.*, that the Doward specimens are both absolutely and relatively ($\frac{\text{length}}{\text{breadth}}$ = Doward 4.21. Aymestrey 4.37) wider than Aymestrey specimens, though, at the same time, they have very much shorter mouths. Two extreme specimens from the Doward give 13.3 × 2.7, mouth 2.6, and 9.6 × 2.5, mouth 2.2. Specimens with a width of 3 m.m. are distinctly uncommon as a rule (*e.g.* 12.3 × 2.9 from Wigmore 10), though a short, wide form (hardly pronounced enough to class under any of the varietal names for such forms) occurs at Dormington Quarries (3), a characteristic specimen giving 10.8 × 3.2, mouth 2.3 long.

As generally, though, speaking roughly, the rule holds that the longer the specimen the wider it is, within small limits the correspondence is by no means exact. Thus :—

Length.	Breadth.	$\frac{\text{Length.}}{\text{Breadth.}}$
13.3 (1).	2.7 (4).	4.93 (1).
12.3 (2).	2.9 (2).	4.24 (4).
11.6 (3).	2.6 (7).	4.46 (3).
11.3 (4).	2.7 (4).	4.185 (5).
11.0 (5).	2.3 (9).	4.78 (2).
10.8 (6).	3.2 (1).	3.375 (9).
10.6 (7).	2.7 (4).	3.93 (6).
10.5 (8).	2.8 (3).	3.75 (8).
9.6 (9).	2.5 (8).	3.84 (7).

This is only a sample of a few specimens taken at random, but a further series gives us the same essential results. From such figures we may learn that the longer specimens are often, perhaps generally proportionately narrower than the shorter ones. This conclusion is really only what we might expect from general considerations: any deficiency in length is made up to the total growth-standard of the individual by an increase in width. But aberrant forms, such as the last specimen, also occur: these indicate an actual variation in the type of shape, and shew a shape-variety, as it might be called.

The width given by other authors is 2.0 to 2.5 (M. T.), 3 (L. E. A.), 2.54 (J. G. J.), nearly 3 (J. W. W.). The length of the mouth is given as 2.7 by J. W. W., a figure which is in excess of the Herefordshire average, but corresponds with the greater length (12—14) also given by this author. The length of the mouth seems to be very constant in our specimens: 2.7 to 2.2 are the limits among specimens varying from 13.3 to 9.6 in length. The length 2.3, for example, is associated with specimens from 10.3 to 11.6 long, and 2.2 with 9.6 to 11.5.

*** Clausilia laminata.** *Mont., 1803.*

= *C. bidens*, Drap., 1805, Gray, 1857, and perhaps Müller, 1774.

It has occurred at the Doward (2) and Dormington Quarries (3), and more commonly at Adam's Rocks, Backbury Hill (3), but we have not found it abundant anywhere. The Rev. R. J. W. Smart sent us many specimens from Bishopswood (2), including two of the white form (*albina*, Moq.): it seems to be very common about there.

A few specimens only give Dormington long. 18.2; Backbury, 16.15 × 4.2. M. T. = 11 to 18 × 3.45; L. E. A.= 16.5 × 4; J. G. J. = 17.8 × 3.8; J. W. W. 17 × 4. The very wide differences in normal shape implied by the measurements given by L. E. Adams and Jeffreys are curious.

BALEA. *Gray, 1824.*

Balea perversa. *L. 1758.*

= *P. fragilis*, Drap., 1801: Turton, 1831: Forbes and Hanley, 1853.

Abundant under the bark on apple-trees in an orchard at Tillington Common (8), also in a similar position at Rotherwas (7 S), and two specimens from a willow tree at Burghill (7 N). It should probably be described as common in such situations, but, as may be readily imagined, it is not always easy to find, nor probably are such places examined as frequently as they should be. After a shower the snails come out and disport themselves on and about the parts of the tree-trunk which have been wetted by the drainage from the central fork of the tree: the direction of this drainage and the character of the bark are the only two factors which seem to determine the part of the tree inhabited. *Onisci* appear to feed on young specimens.

We have not noted any remarkable differences between specimens of *B. perversa* from Herefordshire and those from other English localities: local specimens are perhaps uniformly darker than is seen in many localities. It frequently occurs in company with *Clausilia bidentata*, Strom, but we have not found such association occuring in Herefordshire.

PUPA. *Draparnaud, 1805.*

Linnaeus described a *Helix pupa* in 1758, hence this generic name should not rightly stand.

Pupa secale. *Drap., 1801.*

= *T. juniperi*, Montagu. 1803: Gray, 1840.

Abundant in the large quarry on the Great Doward Hill (2). Dr. J. H. Wood has found a single specimen in Stoke Plantation (3). The Doward specimens are quite clean as a rule, though they often lie about very openly among the stones and *débris* (cf. R. Rimmer, op. cit., p. 152). The Doward form is rather a short one, the measurement of length (altitude) being:—max. 7.7, min. 6.1, mean 6.87. M. T. = 7 to 9; L. E. A. = 8; J. G. J. = 7.6; J W. W. = 8.

*** Pupa ringens,** *Jeff., 1833.*

Probably = *P. anglica*, Fér., 1822, as in Conch. Soc. List., Forbes and Hanley 1853, Gray 1857, etc. Jeffrey's name is probably invalidated since Michaud called another species *ringens* in 1831. It is doubtful whether the present species is rightly assigned to this genus.

"Whitney-on-Wye," C. T. Musson in *Journal of Conchology*, Vol. v. p. 81. From the description of the locality this record would seem to probably belong to district 12. A single subfossil specimen from Ledbury (4).

Pupa umbilicata, *Drap., 1801.*

= *P. cylindracea*, da Costa, 1778, according to the Conch. Soc. List. and Gray 1857. There seems nothing in da Costa's description, except the epithets "transparent, smooth, glossy," to identify it with the present species: his figure is quite indeterminate, and he makes no mention of the denticle. Montagu (1803), under *T. muscorum*, apparently combines both species: he says it sometimes has a "white marginated aperture" (ii., p. 335). Müller (1774) under *H. muscorum*, seems to do the same: he says *e.g.*, "apertura edentula," but also "exemplar in apertura tuberculum seu denticulum exhibet" (*Verm. Hist.*, ii., pp. 105, 6). Linné's (1758) *T. muscorum* is "pellucida" (which the next species is not), and yet has an "apertura edentula." From his collection, it seems that he meant *marginata* of Drap., but this evidence is of no great value. Draparnaud's *muscorum* of 1805 is neither species. It is worth noting that da Costa really calls it "*cylindraceous*."

Occurs in several localities (Burghill 7 N, Bullingham 7 S, Aymestrey 10, Staunton-on-Arrow 11) and is abundant at the Doward (2), Backbury (3), Kilpeck (1), and exceedingly common under ivy in the walls of a garden in Hereford (7 N).

A fair number of a long series taken at Hereford in October, 1893, proved to contain young of about two whorls (mai. diam. about 0.9 m.m.); not more than one or two occurred in each adult specimen. This does not agree very well with the statement (Moquin-Tandon, *Moll. Terr. Fluv. de France*, Vol. ii., p. 391) that the young are excluded in July and August. On the other hand young specimens of 3 or 4 whorls (together with nearly full-grown ones) abounded in the same locality in October, 1896, and very likely all the young ones are not excluded simultaneously. Young of about 1½ whorls also occur inside specimens taken in July, 1897. It should however be borne in mind that the French season may differ (as it does in other species) from that prevalent in England, and further, that it is impossible to definitely fix the reproductive season of almost any snail within one or two months.

About half of a batch taken in October, 1893, were found to be alive in October, 1896: such a long survival without food and in a dry-pill box is unusual in so small a species.

Our own observations do not confirm the statement (von Martens: see B.C. i., p. 248) that this species hibernates conspicuously early.

Pupa marginata, *Drap., 1801.*

= *muscorum*, L. 1758, according to Conch. Soc. List, but see under the last species. Forbes and Hanley 1853, and Gray 1857, also have *muscorum*.

Occurs very rarely on the Doward (2): also in the sub-fossil deposit at Ledbury (4).

VERTIGO. *Müller, 1774.*

Vertigo substriata, *Jeff., 1833.*

In the Ledbury sub-fossil deposit (4).

Vertigo pygmaea, *Drap., 1801.*

A few specimens have been found on Backbury Hill (3), at Dormington Quarries (3), and near Huntingdon (7 N).

Measurements (Dormington) = 1.9 × 1.15: M. T. 1.5 to 1.75 × 0.5 to 0.75; L. E. A. = 2 × 1; J. G. J. = 1.65 × 1.02; J. W. W. = 2.5 × 2.5.

Vertigo pusilla, *Müll., 1774.*

Müller's description fits but fairly well.

In the subfossil deposit at Ledbury (4).

Vertigo antivertigo, *Drap., 1801.*

A few specimens have occurred under stones near the quarries in Stoke Woods (3).

SPHYRADIUM. *Agassiz, 1837.*

Sphyradium edentulum, *Drap., 1805.*

Has occurred at Backbury (3), but sparingly.

GASTROPODA PULMONATA BASOMMATOPHORA.

AURICULIDAE.

CARYCHIUM, *Müll. 1774.*

* **Carychium minimum,** *Müll., 1774.*

= *T. carychium*, Gmelin, 1788, Mont., 1803.

Common among dead leaves, moss, etc., in many places especially in the Woolhope district (3). At Clifford (13) we once noticed quite a congregation inside the remains of a moss-grown skull. Despite its small size, its bright white colour renders it very conspicuous among dead leaves, from which it is easily collected.

In one batch of Herefordshire specimens (mostly from Backbury 3) nearly 20 per cent. had one denticle suppressed: but other lots from the same localities fail to shew this peculiarity at all.

The size seems fairly constant, though to the naked eye the variation looks considerable. The average is about 1.95 × 0.85 to 0.9 m.m. M. T. = 1.5 to 2 × 1.0; L. E. A. = 1.75 × 0.875; J. G. J. = 1.78 × 0.89. This is one of the few instances in which our local specimens appear to be larger than those usually recorded. It should however be remembered that measuring such a small shell is not easy by the ordinary methods: it is necessary to do it with the microscope under a low power with some care to obtain accurate results.

LIMNAEIDAE.

HIPPEUTIS. *Agassiz, 1837.*

Hippeutis fontana, *Lightfoot, 1786.*

= *Pl. nitidus* partim, Müller, 1774, B.C., Gray, 1840, and generally of English authors: *Pl. fontanus*, Gray, 1857; Turton, 1831; Montagu, 1803. Müller's *Pl. nitidus* undoubtedly included both this species and *Segmentina*. He mentions the septa ("forte ex restauratione fractae testae"), while his collection contains a mixture of the two species labelled *Pl. nitidus* in his own handwriting (see J. G. Jeffreys, B.C., Vol. v., 1869, Supplement, p. 152), though later rearrangement of his specimens does not appear to have been absolutely excluded. The Conch. Soc. are hence apparently in error in giving *Segmentina nitida*, Müller = *Pl. lineatus*, Walker, 1784: a thoroughly clear description of *Segmentina* is given by Lightfoot (1786) as *N. lacustris*, a name which might be used.

Of fairly frequent occurrence, but nowhere abundant, though it is common in a small pond in Garnons Park (8) on reeds, and fairly large: on water-lily leaves in Devereux Pools (3) and at Longworth (6); on caddis-cases from Tupsley and the Canal near Hereford (7 N). It also occurs in a pool in Stoke woods (3), near Wareham (7 N), at Grafton (7 S), and in the Canal near Munsley (4).

The average size is quite small and but few of the specimens seem to be full-grown. From Garnons, where they are larger than usual, the diameter averages 5.1, max. 5.8, min. 4.3. M. T. = 2 to 4.5; L. E. A. = 5.5; J. G. J. = 5.7; J. W. W. = 5.3.

GYRORBIS. *Agassiz, 1837.*

Gyrorbis complanatus. *L., 1758.*

= *Pl. complanatus*, B. C., and in all probability of Linnaeus. The Conch. Soc. have *P. umbilicatus*, Müller, 1774 : = *P. marginatus*, Drap., 1805.

Not uncommon, as a rule, where it occurs. It has been found in the Canal (7 N and 4), at Tupsley (7 N), near Wareham (7 N), Longworth (6), Pentelow Brook (3), Staunton-on-Wye (8), Doward (2), and Yazor Brook, near Huntingdon (7 N). Only a single specimen has occurred in Pentelow (1889), and the water appears to be far too calcareous for their liking. An attempt to found a colony from Wareham in September 1890 in the small pond in Stoke Woods, whence one branch of the Pentelow has its origin, has failed, probably from the same reason. We have on two occasions found dead specimens in the quarry on the Great Doward (2 : about 500 feet), once with a comparatively fresh body within the shell. It has not been found in the river or elsewhere in that neighbourhood, and it may have been brought by some bird from some considerable distance.

Several specimens with very blunt keels (some quite ecarinate) have occurred near Wareham. Many of those from Yazor Brook shew signs of being slightly deformed : this is perhaps due to the fact that the level of the water in the stream there is constantly and suddenly changing owing to mills, etc.

The average diameter of Tupsley specimens is 15.1, max. 16.7, min. 14.5 ; of Wareham specimens 14.3, max. 17.5, min. 12.5. A large proportion of the specimens generally seem to be quite young. One Tupsley specimen gives mai. diam. 16.7, greatest thickness (which is not strictly the altitudo maior) 3.6, height in centre (alt. minor, *i.e.*, from apex to umbilicus) 0.7. M. T. = 12 to 15 × 3 to 3.5 ; L. E. A. = 15 × 3.5 ; J. G. J. = 15.24 × 3.2 ; J. W. W. = 19.05.

Gyrorbis carinatus, *Müll., 1774.*

Probably = *H. planorbis*, L., 1758.

This form can only be positively recorded from the Canal (7 N), where the distinct form var. *disciformis*, Jeff. occurs.

There is either no inconsiderable difficulty in distinguishing between this species and the last, or, judging from the collections, real *carinatus* is much rarer than one is led to believe from the published accounts. Indeed it may still be said to be an open question whether the two should not be united. On the other hand however, valid differences appear to be found in the maxilla, which, with extended investigation, may be found to afford the crucial test as it does in *Succinea*.

Gyrobis vortex, *L., 1758.*

Contrary to the general rule (*e.g.* B.C. i., p. 89) in Herefordshire this species is much more abundant than *Pl. spirorbis*, though it has much the same distribution. It is found in the Canal near Hereford (7 N) and at Munsley (4), at Tupsley (7 N), Huntingdon (7 N), and it is very abundant in the "lakes" on the common at Staunton-on-Wye (8), where many of the specimens are twisted and otherwise

distorted, though we failed to find any absolute scalariformity here. The vegetation in these ditches was then (April, 1893) extremely thick and close (see *Journal of Conchology*, Vol. v., p. 302). In August, 1897, it occurred fairly freely in a small ditch at Broomy Hill, Hereford. This ditch is very small, and has been very thoroughly and systematically worked for some years past, and the species can hardly have escaped notice if it had been present. It is almost certainly to be regarded as a recent innovation into this locality, possibly from Staunton Common, the ditches of which are in connection with the Wye, and both Staunton Common and the ditch at Hereford are flooded when the Wye rises to any height. A single specimen has since been found in the rejectamenta of the Wye above the neighbourhood of the ditch. The distance by river is about 15 or 16 miles, and of course it may have come from somewhere nearer, or by some other means than floods.

The average diameter of the Staunton specimens is 7.0 with but little variation : M. T. = 7.5 ; L. E. A. = 7.5 ; J. G. J. = 7.6 : J. W. W. = 9.5.

Gyrorbis spirorbis. *L., 1758.*

The Conch. Soc. ascribe the name to Müller, 1774 : if Linné's species were not the present one, Müller's name would have been preoccupied for an allied species, and hence not available.

Not very common : in a stream in Moccas Park (13 : H. W. E.) with many slightly contorted specimens, Longworth (6), Tupsley (7 N), the Canal (7 N). In the last two localities it has been found chiefly on caddis-cases. Also in the sub-fossil deposit at Ledbury (4). In no locality can it be said to be abundant.

GYRAULUS. *Agassiz, 1837.*

Gyraulus nautileus, *L., 1767.*

If such a form as *crista* may stand as a type, the name should be *crista*, L. 1758 : = *P. imbricatus*, Müller, 1774, Turton, 1831.

Probably commoner than it appears to be, as it requires very careful looking for. It is abundant in a shallow pond near Grafton (7 S), also in a small pond in Garnons Park (8) on reeds, where the form *crista* L. also occurs. This variety is also found at Grafton, but is not very well-marked there. It has also occurred in a pond at Whitchurch (2) on *Nymphaea*. The pond at Grafton is surrounded by oak-trees, and is generally fairly full of decaying leaves, on which *nautileus* is chiefly found, together with *Pl. fontanus*, *Pisidium pusillum* and *Sphaerium lacustre*. It is curious to note that the same four species occur in a very similar pond near Oxford : (cf. L. E. Adams, op. cit., p. 9, on the usual absence of mollusca from such ponds).

Gyraulus albus, *L., 1758.*

Not very common : often occurs on caddis-cases. It has been found at Tupsley, in the Canal near Hereford (7 N), at Longworth (6), Garnons (8), Aymestrey (10), in the rejectamenta of the Lugg near Lugwardine (7 N : J. F. F.)

and alive in the Lugg at Hampton Bishop (7 N), but nowhere abundantly. It will be noticed that all the localities except Garnons are in connection with the Lugg Valley.

The average diameter is about 5.5 : M. T. = 4 to 7 ; L. E. A. = 7 ; J. G. J. = 7.0 ; J. W. W. = 6.35.

Gyraulus glaber, *Jeff.*, *1883.*

The synonymy of this species is very difficult : perhaps = *P. parvus*, Say (as Conch. Soc., 1892) : = *P. laevis*, Alder (?). The date is often given as 1830 ; the date on the title-page of *Trans. Linn. Soc.*, Vol. xvi., is certainly 1833.

Abundant in the mud in the upper pond at Burton Court, near Eardisland (12) ; it also occurs in Rotherwas Park (7 S).

BATHYOMYPHALUS. *Agassiz, 1837.*

Bathyomphalus contortus, *L.*, *1758.*

Not very common. It has occurred at Tupsley (7 N), near Wareham (7 N), in the Canal (7 N), Ruckwall brook near Eaton Bishop (7 S), Staunton-on-Wye (8), and at Pembridge (12). It is generally found freely where it occurs at all. In a small pond near Wareham, which communicates with the Wye in flood-time, about 1892 it used to be very uncommon : in June, 1895 it was "common," and in April, 1898 it had reached the stage of being abundant.

Many young specimens are found. The average size of those which appear to be full-grown from Wareham is about 5.7 × 1.8. M. T. = 4 to 6 × 1.5 to 2 ; L. E. A. = 5 × 2 ; J. G. J. = 4.4 × 1.9 ; J. W. W. = 5.1 × 2.54.

PLANORBIS. *Guettard, 1756.*

Guettard is pre-Linnean : besides, there is *Helix planorbis* in S. N. X. Some such name as *Euplanorbis* would not be without parallels. *Coretus*, Adanson, 1757, is also pre-Linnean, and has other objections to it.

Planorbis corneus, L. 1758.

The two specimens in the Ludlow Museum labelled "Hereford" are from the Cam near Cambridge : A. C. de Boinville. Specimens from Berkshire have recently been introduced into a pond at Broomy Hill, Hereford, where they have done fairly well and whence the species may become further disseminated.

PHYSA. *Draparnaud, 1801.*

Physa fontinalis, *L.*, *1758.*

Fairly common : Yazor Brook near Huntington (7 N), near Shelwick (7 N), Bullingham (7 S), near Wareham (7 N), Canal (7 N), Tupsley (7 N), and Staunton-on-Wye (8). A form towards var. *inflata*, Moq. has occurred at Bullingham.

APLEXA. *Fleming, 1828.*

The Conch. Soc. have *Bullinus*, Adanson. Moquin-Tandon is in error here in his account of these generic titles, and their authors. Fleming's account (*British Animals*, p. 276) is quite clear.

Aplexa hypnorum, *L.*, *1758.*

Linne's habitat "in muscis humentibus" makes one almost doubt the correctness of the identification.

Very local : it used to be abundant in a small pond at Broomy Hill, Hereford (7 N), which is close to the river, and is frequently flooded, and almost as frequently dried up. Each winter, when the pond refilled, the species re-appeared till recently, when, most of the pond having been filled up, we have failed to find any specimens, and it seems highly probable that the locality is now permanently destroyed. The pond is often put into free communication with the river, which might easily lead to further dissemination of the species, but at present it has not been found in any communicating water. This species appears to actually prefer ponds which are often dry (see W. Jeffery in *Journ. of Conch.*, Vol. iii., p. 310 : A. H. Cooke, in *Camb. Nat. Hist.*, Vol. iii. (1895), pp. 27, 46 : B. C., i., p. 97).

It also occurs freely in a running ditch near Little Tarrington (6).

Measurements of Broomy Hill specimens are :—max. 13.5 × 5.0, min. 8.5 × 3.3, mean 11.1 × 4.4. M.T. = 8 to 10 × 3 to 4 ; L. E. A. = 12 × 4.5 ; J. G. J. = 12.7 × 5.1 ; J. W. W. = 12.7 to 19.05.

LYMNEA. *Brug., 1791.*

Limnaea, Poli, 1791 = *Anodonta*. If Bruguière intended his name to be derived from λιμναῖος he certainly adopted a very strange method of transliteration, but anyhow he has produced a sufficiently distinct title for the genus. The usual rules of synonymy allow the emendation of a mis-spelt name : if the derivation is correct, the spelling *Limnaea* should therefore be restored.

***Lymnea limosa**, *L. 1758.*

"H. limosa 615. H. testa imperforata oblongiuscula pellucida, apertura ovata. Fn. Suec. 1314. Habitat in Europae paludibus." Brief though the description is, there is not much doubt that it refers to our polymorphic species. Müller's (1774) name *peregra* was accompanied by a better description, and many others have made two species, out of which the better characterised has survived when it appeared necessary to suppress one. But if we start from Ed. X. of the Systema, there is no excuse for not using the name *limosa* for the whole species or group (as some would call it, and as it may eventually become). As used here, it includes *L. involuta*, Thompson, 1840, and *L. auricularia*, L., 1758. Moquin-Tandon (1855) applies *auricularia* as usual to the inflated forms ; *peregra* to forms which are considerably elongated ; and *limosa* (= *ovata*, Drap., 1805) to what may fairly be called ordinary average specimens. Draparnaud's (1805) figures take the same view. It seems customary now to regard as the type of *peregra* the *limosa* form of Moquin-Tandon. In such a variable species it is convenient to have some form which we may call typical : we should say that such a one is well figured by R. Rimmer (*Land and F. W. Shells of Br. Isles, 1880*, Plate V.). Linné's account of *auricularia* is not altogether satisfactory : he refers to Lister's figure (Angl. t. 2, fig. 23), which does not agree with our idea of "spira acuta brevissima," nor with the current notion of *auricularia*.

L. limosa occurs in every district of the county, but it does not here present us with quite so large a range of variation as in some other British localities. At Huntsham (N. Devon), for instance, there is a large marshy field within which

eleven very fairly distinct forms may be found, each having its own colonies and peculiar habitats (*i.e.*, running or still water: stony or muddy places: amongst *Ranunculus* of various species or other water plants, etc.). There is a locality in Herefordshire (Staunton-on-Wye: 8) which we may contrast with this. Here we find, on the contrary, a very great uniformity—ditches and ponds all give us very much the same forms if examined at the same periods, the variations which occur being generally more or less pathological. At different periods or in different seasons we find, as might be expected, some considerable difference: so that to understand this species in any locality it is necessary to make periodical observations over as long a period as possible. Owing to various causes we have not been able to give this periodic variation sufficient study, but the general result of our researches is to show that in a series of favourable seasons the size of average specimens gradually increases till a maximum is attained: and then, as a rule, these large-sized specimens produce a very numerous progeny of small specimens, which in their turn present us with offspring larger than themselves, and so on. In a pond under observation at Sissinghurst, in Kent, a biennial change has occurred with some regularity during the last few years, a *labiosa* form producing large *limosa*, and these in turn reverting to *labiosa*, in successive seasons. This particular form of succession does not seem to occur in Herefordshire—at least we have not met with it: but large, loosely-built forms appear at intervals in a similar way. High spired specimens, having rather the facies of *L. truncatula*, are developed sporadically from the ordinary form, and these are especially prevalent in the Staunton-on-Wye locality, and a very marked palustroid specimen has been taken at Holmer (7 N).

Our rivers are not very prolific in *Lymnea* of this species: this is no doubt due to the generally unimpeded majesty of their currents. Such fluviatile forms as do occur in the Wye shallows are not high spired, but, on the contrary, small, thin and globose. In quieter places in both Wye and Lugg, more ordinary specimens occur, but not in any abundance.

We have been unable to trace the Linnean type of *auricularia*: but if it was anything like the figure given by Locard (p. 23 *op. cit.*) we very much doubt whether it is represented in England at all. The figure however seems to be much exaggerated. Specimens answering to the description given by the French conchologist, and not violently disagreeing with his figure are to be found in the British Museum—loc. Kashmir. (I have seen a good many French specimens, but not one so extreme as the figure in question). These specimens are undoubtedly extreme forms of the variety *labiosa*, and very different from the *auricularia* of English books. Our *auricularia*, which used to occur in great profusion and in every phase of development in the Canal, was similar to the forms *monnardi*, Hartm., *trenquelleoni*, Gassies, and *ampulla*, Kuster. More exact definition is not easy, as these forms run into one another, and we have no doubt our continental friends would give it a distinct name if we submitted it to them, though there is really nothing very remarkable about it except its extreme mutability. The form was generally a small one, rarely exceeding 19 mm. in height, and the last whorl was usually rather flattened, so that the

tendency was not in the direction of *L. ampla*, Hartm. (of which, by the way, a very large example may be seen in the Vize collection). At the same time there is no chance of confusing these forms with labiose varieties of the ordinary *peregra*.

A more or less similar form occurs in canals all over England, and the majority of English collectors' specimens probably belong to this type. We obtained a large number of examples after the dessication of the canal, together with many *peregra*, especially of the large compressed forms, and any quantity of intermediate specimens between these apparently very distinct types. Either two species were in the habit of hybridising to an abnormal extent and with an equally abnormal success, or we had a selection of forms of one polymorphic species; our own view is the latter.

Another *auricularia* form occurs at Belmont, where specimens were obtained in July, 1896 (see under *Anodonta cygnea*). These, while bearing some resemblance to the canal forms, are of much thinner substance, the prismatic layer having been apparently neglected in some. This may well have been a case of inadequate supply, for there was a regular carpet of *Anodonta*, which must have absorbed a very large quantity of the necessary salts. These *Lymnea* are the *ampla* of Hartmann, and larger than the canal forms, from which they may have been derived.

It is well in an essay of this present kind to note what does not occur as well as what does. In Herefordshire we do not find those thin, smooth, transparent and yet strong-shelled forms which are so noticeable in *e.g.* Kent and Somerset. These forms do not belong to any special variety, but transmute *L. vulgaris*, Pfeiffer into *L. succinea*, Nilsson, and our "ordinary *peregra*" into *L. microcephala*, Kuster, etc. They seem to depend for their distinctive characters merely upon the shell-making capabilities of the soil: it is just possible that they may bear some analogy to the transparent varieties of *Tachea*, and these latter may be facilitated in production, if not caused, by similar means. A single half-grown specimen occurred in the rejectamenta of the Wye at Rotherwas (January, 1893): this resembles the canal form.

Again, we have not regularly met with any forms in which the peristome is abnormally thickened all round. A solitary specimen alone thus marginate has been found near Wareham (7 N). There are specimens in the Pentelow Brook (3) which seem to have abnormally thick shells, but further examination shews that the thickness is due to external accumulations of calcareous matter, which forms a more or less perfect crust, assisted no doubt by the presence of certain algae. This additional coating, measured on the empty. dry shells, amounted to 18 per cent. of the total weight. A specimen from a small pond at Hereford had 5 per cent. of "confervoid growth" on its shell, and was not more than usually dirty. The Burton Court specimens mentioned below are similarly protected, and on the removal of the external coat the shell is found inside with an unusually perfect surface. There seems to be little tendency in this case for the coating to become confused with the shell-layers themselves, but in some large ampullaceous forms this has happened, and we have dark markings produced by the inclusion of this

surface decoration in the substance of the shell itself. The occlusion has taken place not only under the periostracum, but in some cases between the prismatic and nacreous layers. As we have before mentioned, labiose forms of the *peregra* section do not occur in the county as a distinct race. There are occasional specimens with flattened and dilated last whorls, but these are very different from the regular thing known to collectors as *labiosa*. The nearest we have to this last-named form is *L. canalis*, Villa, which used to occur in a mill-pond at Longworth. It seems to have been a transitional form of *peregra*, but has not been found since 1890 in that locality.

Quite the most remarkable form of *limosa* met with in Herefordshire is one which occurs apparently as a permanent form in a pond at Burton Court, near Eardisland (12). It appears to be *L. auricularia* v. *acuta* of British authors: but here at all events it is well isolated from the *auricularia* type, and no transitional forms occur. Mr. Bowell is inclined to compare it with the *L. ovata*, Drap.: not however implying that it is that species, but, rather, that judging from the description and plate, it seems to tend in the same direction. A more important point about it is that though one cannot well tabulate such things as difference of texture, "build," etc., the anatomy is strikingly different in these respects from that of other *limosa* (*auricularia* and *peregra*). These little differences are a matter of degree of course, but the total of them gives the impression that we are dealing with a different kind of thing: viz., a much more definitely fixed form. The nervous system is coloured a sort of orange, as in *L. stagnalis*. We have taken some hundreds of specimens, and the same distinct facies characterises nearly every one. Here is a form fairly well advanced in the way of specific differentiation: yet we should not be altogether surprised if some later visit should reveal them all degenerated into "ordinary *peregra*." The above-mentioned is the only locality where we have found them. *L. japonica* (Japan) in the British Museum, seems to be similar, judging, of course, from the shell only.

The form usually called *limosa*, *L.* (*i.e.*, that which is generally, though we believe without any very definite reason, referred to Linne's type) was very plentiful in 1890 in a pond in Stoke Edith Park, and a smaller variety, in other respects very similar, is the typical pond *Lymnea* of Herefordshire. This latter, is not, however, exactly the same as Locard's *limosina* since it generally has a longer instead of a shorter spire. It seems to pass without difficulty into forms resembling *intermedia*, Mich., *ataxiaca*, Loc., etc., but generally smaller than these (Locard gives H. 17—22, D. 9—12 min. for *intermedia*, and H. 15, D. 10 for *ataxiaca*: ours are 14—15 and 8—10 speaking roughly). The typical *vulgaris C. Pfr.* we have not met with in the county, but specimens rather more like *vulgaris* than *intermedia* occur in a stream at Hereford and elsewhere. Mr. Boycott has bred specimens covering pretty well all the ground from *limosa* to *vulgaris* from a single large and very typical specimen of the former from Wyeside.

Amongst the Staunton-on-Wye specimens, to which we have before alluded, there is, despite the alteration in type from time to time, a pretty constant ratio between the height and diameter. The portion that does vary is that between

the total height and the height of the peristome—*i.e.*, the height of the spire is the variable quantity. Of 9 specimens taken in December, 1892, the averages are H. 14.82, D. 9.1, H.P. 9.61., while of 8 taken in April, 1895, the figures stand H. 16.01, D. 9.84, H. P. 11.775, the ratio $\frac{H}{D.}$ being thus practically constant (1.62), whilst the height of peristome has undergone a relative increase. When we apply the same method to our material from other sources we obtain similar results, but as we have not collected long enough with this object in view, we have scarcely sufficient data for tabulation.

There is much to be said against the "specific distinction" of *peregra* and *auricularia*. At the same time the radula of typical *auricularia* differs from that of typical *peregra* in that the former has the marginal teeth internally, the latter externally, serrate, and in *auricularia* the central is relatively smaller. Intermediate forms have intermediate radulae. These facts are not however quite universally true, though very nearly so. They would tend to support the idea of two species with free hybridisation. Since the only bar to hybridisation of allied species appears to be usually a mechanical one, we may suppose that in the case of *peregra* and *auricularia* this bar does not exist. One would be prepared to find that such instances are not as rare in the animal kingdom as they have been supposed to be by the earlier writers on the subject.

Nearly at the top of Dinmore Hill (elevation 500 feet) is a roadside drinking trough about 6 feet long, a foot wide and generally with some 6 inches depth of water. It is fed by a small pipe, the water being derived from some slightly marshy ground in the wood. In 1890 and 1891 a rather thin and fragile, but otherwise fairly typical form of *L. peregra* was abundant in this trough, but in August, 1894, there were certainly none there. In September, 1897, however they were very plentiful again, as was also the case in October, 1898. This raises the question as to how they have been, at least twice, introduced into this very isolated bit of water. It is quite certain that they have not come down the pipe, and the only other water anywhere near is the river Lugg (in which *peregra* occurs), which is distant at its nearest point $\frac{3}{8}$th of a mile, and about 320 feet lower. On mollusca in such situations, see H. W. Kew, *Dispersal of Shells* (1893), p. 20.

In 1893 a single specimen was placed in a small artificial pond at Hereford. By 1895 the species occurred here in immense profusion. In 1895 *Limnaea stagnalis* was also introduced, and flourished exceedingly. Now in 1898 *peregra* has almost disappeared. This might be in some part due to a violent epidemic of infection with the parasitic worm *Chaetogaster* which broke out in the pond during 1896 (see *Science Gossip*, *n.s.*, Vol. iii., 1896, p. 115), though the possible influence of the *stagnalis* is not to be overlooked.

Lymnea stagnalis, *L., 1758.*

= including *L. fragilis*, L., 1758.

Not very common: abundant at Tupsley (7 N), and in the Canal (7 N and 4), also a single specimen on the common at Staunton-on-Wye (8), one in the Lugg near Lugwardine (7 N), and in "ditches and pools in the Fromey valley"

(6 : J. H. W.). In September, 1890, two specimens of the monstr. *scalariforme* were found in the dry bed of the Canal near Shelwick (7 N). The Tupsley form and one of the scalariform specimens are figured in *Devonia* for June, 1896, p. 92.

The type, as understood by Locard, agrees in shape with our Tupsley specimens, and the size is also conformable to them (H. 40 to 50, D. 23 to 25 m.m.). They also bear a strong likeness to Rossmässler's figure (*Iconograph.* 1884, p. 56 t. xxi., fig. 168) of *fucinensis*, Paulucci, though less to his description which does not fit the figure very well. The form which used to be found in the Canal is similar to *arenaria*, Colbeau (1865), but was larger than that form as a rule (Locard says, H. 25 ; D. 12 m.m.).

The chief locality for this species is the Tupsley one : here it flourishes to a wonderful extent. K. Semper (see *Animal Life*, 1890, pp. 160—5) and H. de Varigny (*Journ. de l'Anat. et Physiol.*, Vol. xxx., 1894, pp. 147—188) have shewn by experiment how the size of this species is modified by the volume of water in which it grows up : so that we should expect to find smaller forms in smaller or shallower ponds. Comparing the Canal and the Tupsley pond forms we do not find that Semper's theory agrees with our experience, the Canal forms being very distinctly the smaller. But at Tupsley there is a series of ponds of varying sizes, and to a certain extent it is true that the larger forms are found in the larger ponds. But at the same time, the largest pond of all produces very few *stagnalis* indeed, and we generally find a few large specimens in the smallest ponds also. It is to be noted that the largest pond is very considerably larger than any of the others and it has rather different molluscan fauna : *e.g.* in it *Physa fontinalis* abounds and is not often found in the others. The pond which produces the largest specimens is very much deeper than most of the others, and in September, 1896, and other dry seasons was one of two which were not dried up. In flood time the ponds are all connected together and with the river Lugg. This is probably the origin of the single specimen found in the river near by. It might also have come originally from the Canal, but was much more of the Tupsley type. It should be noticed with regard to the occurrence of this species in the valley of the Frome, that there is a communicating overflow from the Canal into the Frome at the aqueduct near Canon Frome.

When the specimens have opportunity for quick growth the shell produced is globose (sometimes approaching *turgida*, Menke, and *helophila*, Brgt.) : when, on the contrary, the process is continued over a long stretch of time, the shell will be thicker and more elongated. This is especially noticeable in cold seasons. The species has been transplanted from Tupsley to a very small artificial pond near Hereford, where it has flourished exceedingly, subgibbous and sublabiate forms being the rule. It grows here (as, indeed, always) very quickly, and specimens twelve months old average more than 30 m.m. long. The Canal specimens are considerably thicker in shell-substance than those from Tupsley : two of the former (unselected specimens) average a thickness, the measurements being made in various parts, of 0.31 m.m., while two of the latter only average 0.142 m.m. The Canal specimens are also often strongly lacunar or malleate, and

markedly gibbous specimens sometimes occur at Tupsley. This gibbosity has been taken to be the expression of very favourable conditions which have lasted only for a time, while the lacunar structure is explained as the result of drought and unfavourable surroundings (see J. W. Taylor, *Monograph*, i., pp. 64, 71). It seems very probable that the Hereford Canal was not a very good place for *stagnalis* : their small size, and thick, narrow shells do not point to a luxuriant life. But why the Canal was unfavourable it is difficult to say ; some mollusca used to flourish there exceedingly.

This species produces a pigment somewhat similar in colour and properties to punicin. It is also to be obtained from *Pl. complanatus*, but it is quite distinct from the haemoglobin which occurs in *Pl. corneus* as a coelomic fluid, and in the buccal muscles of all the *Limnaea* which have been examined. This pigment resembles eosin in appearance. It is chiefly found in specimens functionally male, and appears to be derived from some part of the sexual apparatus ; which, we have not been able to determine with accuracy. When hot water is poured over a male adult specimen the fluid is ejected from the genital orifice. It quickly turns light purple on exposure to the air, and finally fades. Traces of it may often be seen in the columella of specimens in collections (cf. W. Nelson in *Quart. Jour. Conch.*, 1877, p. 216). Similar pigments seem to be secreted by *L. palustris*, and, in a much less degree, by *L. peregra* : to these in part are probably due the vars. *tincta*, Jeff., *roseolabiata*, Jeff., and possibly *corvus*, Gmelin, as well as *roseolabiata*, Wolf, of *L. stagnalis* (see W. E. Collinge in *Zoologist* (3), Vol. xi., p. 309). Indeed, specimens with a purplish tint are quite common in *L. palustris*, and by no means rare in *L. stagnalis*, as is mentioned in most of the descriptions of these species.

Specimens slightly eroded, and especially with a spiral band erosion, have occasionally been taken.

Some measurements are as follows, the second dimension given being the altitude of the aperture :—Tupsley : Alt. diam. and alt. of aperture max.; 46.4 × 27.4 × 25.6 ; alt. diam., and alt. of aperture min., 35.0 × 18.3 × 18.2; mean, 40.5 × 22.9 × 21.7. Canal : Alt. and diam. max., 38.9 × 20.4 × 17.7, alt. of aperture max., 38.8 × 21.4 × 17.4 ; alt., diam., and alt. of aperture min., 26.3 × 15.2 × 13.0 ; mean, 33.4 × 18.3 × 15.6. It will thus be seen that the Canal specimens are proportionately much narrower than those from Tupsley in the proportion of about 2.14 to 1.87 for the $\frac{\text{altitude}}{\text{diameter}}$ fraction. The diameter is always less than the length of the mouth in normal specimens : one of the scalariform specimens measures 34.3 × 15.0 × 15.5. M. T. = 40 to 65 × 20 to 30 ; L. E. A. = 50 × 25 ; J. G. J. = 50.8 × 25.4 ; J. W. W. = 38.1 to 50.8 × 25.4. The point suggested by this last author, viz., that the length may vary by 13 m.m. while the diameter remains constant, would be very interesting, if it were true.

* Lymnea truncatula, *Müll., 1774.*

= *L. fossarius*, Turton, 1831 ; Montagu, 1803.

Common in many places in muddy ditches and on the mud on the water's edge in the rivers. It is commonly freely coated with dirt. A single empty shell

has been obtained from the large quarry on the Great Doward Hill (2: about 500 feet): it occurs in the Wye at the foot of the hill. The two specimens in Ludlow Museum, labelled "*L. glabra*: Hereford," are very fine *truncatula*, but are not really from this county.

As is well known, this species is practically amphibious: indeed, as a rule, it is found close to, rather than actually in the water. In confinement it habitually climbs out of the water, and will bear dessication for a fortnight on a dusty shelf without dying. We have found it in the merest trickle of moisture on the top of the Black Mountains over Llanthony at an elevation of about 1,700 feet. Sheep are here plentiful. It is uncertain whether this locality is in Herefordshire or Monmouthshire.

Measurements of specimens from the Frome at Longworth (6) are:—Alt. max., 9.6 × 4.4, min., 7.9 × 3.9, mean, 8.56; diam. max., 4.5 × 8.8., min., 3.8 × 8.1, mean, 4.2. From a small ditch near Grafton (7 S):—Mean, 8.6 × 4.35. The average length of ordinary specimens from the banks of the Wye and Lugg is 6.7 m.m. A specimen from the Wye at Whitchurch (2) is as wide as 4.7 × 7.4. M. T. = 6 to 10 × 3 to 5; L. E. A. = 10 × 5; J. G. J. = 10.2 × 5.1; J. W. W = 12.7 long.

Lymnea palustris, *Müll. 1774.*

Widely distributed in all sorts of ponds and ditches of all sizes, but not common. A very small ditch near Hereford (7 N) is the only locality where it has appeared abundantly. Here it was at one time very common, and the specimens were a good deal larger than is usual in the county. It was formerly rather common in the Canal (7 N), but the specimens were small. Most of the other localities depend on single specimens.

Measurements of Hereford specimens are:—Alt. max., 24.0 × 9.7, min., 19.6 × 9.3, mean, 21.3; diam. max., 22.7 × 10.5, min. 20.2 × 8.7, mean, 9.5. M. T. = 10 to 25 × 6 to 12; L. E. A. = 25 × 10; J. G. J. = 25.4 × 10.2: J. W. W. = 19.05 long.

[Lymnea glabra, *Müll., 1774.*

The two specimens in Ludlow Museum, labelled "*L. glabra*: Hereford," are (α) not from Herefordshire, and (β) not *glabra*, but *truncatula*. This species occurs freely in ponds near Hay, just over the Herefordshire border in Breconshire. (J. H. W. and T. A. Chapman).]

ANCYLUS. *Geoffroy, 1767.*

*Ancylus fluviatilis, *Müll. 1774.*

It seems possible that Müller had much of the modern *A. fluviatilis* under his *A. lacustris*: of the latter he says "in rivis et lacubus passim" and "foliis Nymphaeae adhaeret," also "apertura oblonga"; while his *fluviatilis* is "apertura ovali" and "limax ignotus neminique huc usque visus est": further, "a praecedente splendide diversus est." We seem here to have a general distinction between the two species correctly drawn; but *lacustris*, as a rule, does not occur in "rivis," and, on the whole, is not so common as

fluviatilis. At any rate, *fluviatilis* is hardly as rare as Müller's words imply. Linné's description of *H. lacustris* would fit either species; he, however, talks of "adhaerens plantis": on the other hand, he refers to Lister's figure (*Hist. Anim. Angl.*, 1678, t. 2, fig. 32), which, if it is more like one than the other, favours *fluviatilis*: Lister, too, talks of "saxis adhaerenti," and (p. 151) of its occurring in the stony shallows of the Ouse. At the same time, it must be mentioned that Linné's descriptions do not always fit Lister's figures to which he refers. Linné's *lacustris* probably included both species, perhaps in itself rather favouring the modern *lacustris*. Lightfoot (1786) well describes and figures *Patella oblonga* as "perfectly distinct from the *P. lacustris* of Linnaeus" (*Phil. Trans. Roy. Soc.*, lxxvi., p. 168, t. iii. B), and his name might well be used. From the Linnean Collection it appears that his *P. lacustris* is *A. fluviatilis*: but circumstances have rendered this test quite inconclusive. da Costa (1778) under *P. fluviatilis* does not distinguish between the two species: his figure is of *A. fluviatilis*, Auctt. The *P. lacustris* of Turton (*Conch. Dict., 1819*) is our *fluviatilis*. It is difficult to say how far conclusions may fairly be drawn from descriptions of habitat: *e.g.* T. Brown (*Conchologists' Text-Book* (1836), p. 51) says that fresh-water *Patella* are "generally found attached to aquatic plants," while the usual experience is that *fluviatilis* is the commoner species and lives on stones.

In many streams and running waters throughout the county and often common. It is widely distributed in the Wye; it is noticeable here that a locality where it is very abundant one year will entirely fail to produce it the next. These sudden and complete appearances and disappearances are probably due to the heavy floods. It has been found sparingly in the large pool in Devereux Park (3), but it has not been discovered in the small stream which supplies that pond. The specimens were of normal size: others have recorded finding dwarfed (J. G. Jeffreys, B. C., i., p. 120) or hypertrophic (W. Thompson, A. N. H. (1), Vol. vi., p. 121) forms in still ponds. It would be a matter of some interest to determine whether any constant mutation is associated with the change in habitat. Two or three specimens occurred in a small brook near Hereford (7 N.) a few years ago when it was nothing more than an open sewer. The var. *albida*, Jeff. has once been found in the Wye at Symond's Yat (2).

Specimens from the Wye measure:—length and width max. 7.8 × 6.1, min. 5.9 × 4.3, mean. 6.88 × 5.08. M. T. = 4 to 10 × 2 to 8; L. E. A. = 7.5 × 5.5; J. G. J. = 7.6 × 5.9.

VELLETIA. *Gray, 1840.*

= *Ancylus* partim auctt.

Velletia lacustris, *L., 1758.*

= *P. oblonga*, Turton, 1831; Forbes and Hanley, 1853. On the name see under *Ancylus fluviatilis*.

Widely distributed on water-lily leaves, rushes, etc., but not common, and only abundant in a small pool in Garnons Park (8) on rushes.

The Garnons specimens average 5.15 × 2.975 with a maximum of 5.8 × 3.3. M. T. = 6.5 × 2.75; L.E.A. = 6.5 × 2.5; J. G. J. = 6.35 × 2.5; J. W. W. = 6.35 × 2.1.

ERICIA. *Moquin-Tandon, 1848.*

= *Cyclostoma*, Drap., 1801, et auctt. *Pomatias*, Studer, 1789, is prior to this, but both indicate large groups, and perhaps *Ericia* is preferable.

* Ericia elegans, *Müll., 1774.*

Local, but usually abundant where it occurs: Doward (2), Dinmore (8), generally in the Woolhope district (3), near Mord iford (7S), and in the subfossil deposit at Ledbury (4). Though this species is not actually confined to the limestone here, it must be borne in mind that the soil of Dinmore Hill is very rich in lime, as is evidenced by the exist ence of the "petrifying springs" there. The other localities may all be said to be on limestone.

Young specimens are often rather brightly marked with spots and blotches of a violet shade. Old shells, however, seem to always loose their mar kings and a good deal of their striation, especially in a stony locality (*e.g.* Ada m's Rocks, Backbury Hill, 3). It generally hides rather deeply among the stones, rubbish, etc., among which it lives, and on the Doward we have observed it buried to the depth of several inches in the soil under stones in the summer.

As the authorities point out, this is a very timid snail. But, from observations, their sensitiveness seems to us to be due rather to their fine perception of movement than their supposed longsightedness (see A. H. Cooke in *Cambridge Nat. Hist.*, iii., p. 184). The young are much bolder and more active than the adults, as is the case with most land mollusca; this is especially noticeable in *Ch. lapicida*. The statements that *elegans* uses its snout in progression are, it seems, erroneous; though it occasionally applies its snout to the surface on which it is walking, it does not appear to draw itself along at all by its means.

Measurements are as follows:—From Backbury Hill, alt. max. 15.5 × 11.1, min. 12.6 × 9.0 and × 9.2, mean 13.90; diam. max. 11.1 × 15.5 and × 15.3, min. 9.0 × 12.6, mean 10.035; coeff. max. 14.2 × 9.8 = 1.449, min. 14.2 × 11.0 = 1.291, mean 1.385. From the Doward Hill:—alt. max. 15.8 × 10.6, min. 13.1 × 9.1, mean 14.49; diam. max. 10.6. × 15.8 and × 14.6, min. 9.1 × 13.1, mean 9.98; coeff. max. 14.4 × 9.4 = 1.532, min. 14.6 × 10.6 = 1.377, mean 1.450. The maxima and minima for the whole county occur in these figures: the means are 14.04 × 10.04=1.399. M. T. = 10 to 15 × 8 to 12; L. E. A. = 15 × 10; J. G. J. = 15.24 × 10.16; J. W. W. = 13 to 14 × 8.5 to 9. This is one of the few instances where J. W. Williams' figures are a trifle smaller than our own: they are generally largely in excess.

The statement is made (see J. W. Taylor, *Monograph*, Vol. i. (1894), p. 26, fig. 36) that in this species the body-whorl "is more tumid and voluminous in female than in male individuals." Nine specimens taken at random from a number from Backbury Hill were carefully dissected, and the shells measured, with the object of testing this statement. Two of these proved to be males and seven females. The former had $\frac{\text{altitude}}{\text{diameter}}$ coefficients of 1.365 and 1.400, while the females gave from 1.291 to 1.441 with a mean of 1.3745. Making the assumption —and it seems justifiable to do so—that our method of measurement is a fair one for the purpose, this shews that the rule is not universal in all

specimens. It is probable that, granting the described difference to really exist, variations in tumidity due to other causes tend to mask the sexual difference. An attempt was also made in another way. Taking all the shells, a curve was constructed in which the ordinates were the numbers of specimens, while the abscissae represented the coefficients. If the alleged sexual dimorphism is prominent and constant, the curve thus obtained should shew two maxima. One prominent maximum occurs about the coefficient 1.37, while there are indications of another in the neighbourhood of 1.43, which may represent the female and male forms of shell respectively. The curve, however, is not sufficiently definite. A very complete and extended investigation of this point would yield interesting results.

BITHINIA. *Gray, 1821.*

This seems to be the original spelling, not *Bythinia*, as usually given.

Bithinia tentaculata, *L., 1758.*

= *N. iaculator*, Müller, 1774: *Cycl. impurum*, Drap., 1801, Turton, 1831.

Fairly common and well distributed: the Wye at Whitchurch (2) and near Rotherwas (7), the Lugg near Hereford (7N) and at Aymestry (10), the Frome at Longworth (6), the Canal near Hereford (7N) and at Munsley (4), also at Tupsley (7N), Huntingdon (7N), Staunton-on-Wye (8), and Hereford (7N). Somewhat eroded specimens have occurred at Whitchurch, Huntington, and Hereford; in the last locality also the pathological spiral white bands have been seen.

Tupsley specimens average 10.69 × 6.57, max. 11.4 × 6.9, min. 9.6 × 6.2 M. T. = 8 to 15 × 5 to 7.5; L. E. A. = 12.5 × 6.25; J. G. J. = 12.7 × 6.35; J. W. W. = 12.7 × 7.62.

VALVATA. *Müller, 1774.*

Müller only included *cristata* in his *Valvata*: *piscinalis* was a *Nerita*.

Valvata piscinalis, *Müll., 1774.*

= *V. obtusa*, Turton, 1831; *T. fontinalis*, Montagu, 1803.

Not uncommon, and generally abundant where it occurs: Canal (7N), Huntington (7N), Staunton-on-Wye (8), Tupsley (7N), Lugg at Aymestrey (10) and at Hampton Bishop (7 N), rejectamenta of Wye near Hereford (7), and Eardisland (12). It was at one time abundant in the Yazor Brook near Huntington, but since the bed of the stream was dug out in 1892 it has become comparatively scarce there, though some of the other species (e.g. *Physa fontinalis*) are as plentiful now as before the cleaning.

Immature specimens have been observed to spin downward threads in captivity: this species is not included in the usual lists of thread spinners, but it has been recorded before (see *Science Gossip*, n.s., Vol. ii., 1895, p. 82: *ibid.*, 1874, p. 51, G. S. Tye: *Trans. Yorks. Nat. Union*, part 5, 1880, p. 31).

We are indebted to Mr. H. C. Moore for collecting for us the conchological contents of the stomachs of various trout taken in the Aymestrey waters of the Lugg (10). Particulars of the two larger lots are given:—May, 1896 (12 trout),

Valvata piscinalis, 33; *Ancylus fluviatilis*, 4; *Planorbis albus*, 1. April, 1898 (6 trout), *Limnaea peregra*, 15; *Valvata piscinalis*, 87; *Bithinia tentaculata*, 5; *Planorbis albus*, 2. It should be noted that on both occasions the May-fly was out abundantly, and that the trout were feeding on them freely as well as on the snails: some of the bodies of the snails were quite fresh.

Valvata cristata. *Müll.*, 1774.

Occurs plentifully on rushes in a small pond in Garnons Park (8), and also on "caddis-cases" from Tupsley (7N), though it has not been noticed alive in the latter locality.

Particulars of the shells on three cases from Tupsley may be of interest:—

	I.	II.	III.
Sphaerium corneum (valves)	1	6	—
Bithinia tentaculata	15	9	—
Valvata cristata	21	—	4
Planorbis vortex	—	3	1
——— *spirorbis*	—	—	3
——— *albus*	—	1	—
——— *contortus*	10	—	6
——— *complanatus*	—	—	2
Physa fontinalis	—	1	—
Limnaea peregra	—	2	2
Total...	47	22	18

The partiality of the "larvae Phryganearum" for this species was noticed as long ago as 1774 by O. F. Müller (*Vermium Historia*, Vol. ii., p. 198).

The following details of 20 caddis-cases from the Canal near Holmer may be of interest:—

Species.	No. of cases on which it occurred.	No. of specimens on all the cases.	Greatest number on one case.
Hipp. fontana	7	8	2
G. albus	4	11	8
G. complanatus	7	11	5
G. spirorbis	1	1	1
G. vortex	2	4	3
L. peregra	2	11	10
L. stagnalis	3	3	1
Vell. lacustris	3	6	4
Bi. tentaculata	15	64	11
V. piscinalis	4	5	2
Sph. corneum	13	25	3
Pis. pusillum	11	40	20
Succ. elegans	1	1	1

Also many fragments, especially of *Sphaerium*. *L. stagnalis* goes up to 15 m.m. long, *Pl. complanatus* to 10 m.m. diam., and *Sph. corneum* to 10 m.m. diam.

PALUDINA. *Lamarck, 1812.*

The Conch. Soc. has *Viviparus*, Montfort, 1810, and recently *Vivipara*, Lamarck, 1809, has been used. To reproduce a specific name of 1758 as a generic title in 1809 "naturae repugnat," as well as ordinary rules.

[Paludina contecta, *Millet, 1813.*

= *N. vivipara*, Müll., 1774: Drap. 1805 (who, however, refers Linne's *H. vivipara* to this species); Turton, 1831; Gray, 1840; *Pal. listeri*, Forbes and Hanley, 1853. Montagu, 1803, under the name *vivipara*, does not seem to distinguish the two species.

The two specimens in Ludlow Museum labelled "Hereford" are from near Cambridge (A. C. de Boinville).]

Paludina vivipara, *L., 1758.*

= *N. fasciata*, Müll., 1774; *P. achatina*, Drap. 1801; Turton, 1831; Gray, 1840. Linne's *H. vivipara* is much more this species than the last, though it no doubt comprised both.

Formerly abundant in the Hereford and Gloucester Canal near Hereford (7N). It is still found in the undrained part near Canon Frome (6), also near Munsley (4). The specimens in the Ludlow Museum labelled "Hereford" are from near Cambridge (A. C. de Boinville).

Specimens from the Canal were on one occasion frozen into a solid block of ice for several days in a basin: they recovered, however, and produced young. It may be well to put on record that specimens of both this species and *Pal. contecta* from Berkshire have recently been introduced into a small artificial pond at Broomy Hill, Hereford; it may in the future become disseminated further from this locality, though at present they do not seem to be flourishing very well.

The young of this species floats on the surface of the water freely up to at least a fortnight after extrusion.

Measurements of specimens from the Canal near Shelwick (7N) are as follows:—alt. max. 39.8, min. 33.0, mean 34.94; diam. parallel to suture max. 29.1, min. 25.8, mean 27.28; diam. perpendicular to length max. 27.8, min. 22.7, mean 24.38 M. T. = 25 to 35 × 17 to 25; L. E. A. = 38 × 30; J. G. J. = 38.1 × 30.5.

A comparison between the measurements of the diameter taken (1) parallel with the suture, and (2) perpendicular to the axis is interesting. The two measurements are by no means always proportionate to one another or to the length. This indicate differences of shape of a somewhat obscure kind, which it is difficult to explain exactly and in detail. We may be permitted to give in the following table the measurements of 18 specimens in detail to illustrate the matter:—

Altitude.		Diam. perpendicular to length.		Diam. parallel to Suture.	
1	39.8	1	27.8	1	29.1
2	37.6	6	25.2	2	28.4
3	36.6	4	25.4	4	28.2
4	35.9	4	25.4	4	28.2
5	35.5	3	25.6	8	27.6
6	35.2	2	25.7	2	28.4
7	35.2	6	25.2	8	27.6
8	35.0	8	24.7	6	27.8
9	34.9	17	22.8	18	25.8
10	34.5	12	23.4	6	27.8
11	34.2	8	24.7	13	26.6
12	33.6	18	22.7	17	26.0
13	33.5	10	23.9	10	27.1
14	33.5	10	23.9	11	26.7
15	33.5	12	23.4	15	26.3
16	33.3	15	23.0	14	26.5
17	33.2	16	22.9	16	26.1
18	33.0	14	23.1	11	26.7

The details of this table are much more readily seen when they are graphically represented on a composite curve. They will not here be treated of at greater length: the main points can readily be ascertained by inspection of the table. As instances, however, we may notice number 9, which is a narrow shell in both diameters, while number 10 is narrow in one diameter, broad in the other.

THEODOXUS. *Montfort, 1810.*

= *Neritina* Lamarck, 1822, et auctt.

Theodoxus fluviatilis, *L. 1758.*

In August, 1890, discovered in some abundance on the large stones of a breakwater in the Wye about half a mile below Symond's Yat Station (2). These specimens were clean, and of a rather bright yellow colour with rich brown markings. In April, 1891, they were uncommon, but they occurred again abundantly in September, 1891, and in August, 1894. In July, 1895, we failed to find any, but their disappearance was perhaps due to the season of the year

only and the state of the river, though it seems very improbable that this is the whole explanation. It has since been found in its usual abundance. The later specimens—in some cases with a slight incrustation and erosion—are much duller in ground-colour and the markings are dirty black and heavier. The stream is fairly rapid in the place where they are found, and they do not seem to wander much from the breakwater. We have failed to find them close to up or down stream, though one dead specimen has been found among the *débris* on the island some hundreds of yards higher up stream, so that they presumably occur somewhere higher up.

Two specimens have occurred in the rejectamenta of the Lugg near Hereford (7N : J. F. F.). Mr. A. C. de Boinville tells us that it used to be very abundant in the Lugg at Hampton Bishop (7 N) about 1843. Several searches here revealed nothing, but at length (September 1898) a few specimens have been found in the gravelly shallows of the river there. These specimens were rather dirty, and as they sit among the fine gravel resemble small black pebbles to such a degree that experiment is necessary to discriminate between the stones and the shells. C. C. Fryer (*Conchologist*, Vol. i., 1891, p. 25) considers that the "chequered shell and spotted hind part of the foot may aid it in concealment among the fine pebbly sand of swift streams." It is very much to be doubted whether this chequered appearance is ever very prominent as the snail sits in its natural habitat: even in an aquarium (where its life is generally very short) the spots are by no means a striking characteristic in the specimens we have seen.

PELECYPODA.

ANODONTA. *Lamarck, 1799.*

Anodonta cygnea, *L., 1758.*

Including *A. anatina*, L. 1758.

Abundant in the Canal near Hereford (7N) and at Belmont (7S). It has also occurred in the Yazor Brook near Huntington (7N : dead shells, probably washed down from the pools at Huntington, near which they were found), at Allensmore (7S), at Hampton Court (8), and Mr. C. E. J. Machen tells us that "mussels" are common in the ponds about Whitchurch (2). The large pool at Allensmore was in 1896 almost completely dried up, and thus could be thoroughly searched. Very few shells, however, were found, which is noticeable as the species is generally fairly abundant where it occurs at all. In June, 1896, the big reservoir at the Hereford Waterworks was drained, and all the Unionidae found were collected. They were—

Anodonta cygnea	213	=	60 per cent.
Unio pictorum	136	=	39 ,,
Unio tumidus	4	=	1 ,,

All these shells were very bright and clean; this was due, no doubt, to the fact that the water in the tank is always fresh and clear, though the mud (6 or

8 inches deep), on the bottom was somewhat foul, though not nearly so much so as in many ponds. Many of the shells shew slight bilateral symmetrical injuries and shell-distortions, which may have been caused by fish, with which the tank abounded. How, however, the fish could reach the lower border, where the shells are buried in the mud, is not at all clear. It is not necessary to produce such a bilateral result that both sides should be actually injured. A sort of sympathetic malformation is often seen on the free valve of an attached bivalve *e.g.*, *Sphaerium corneum* on caddis-cases), and similar phenomena, which are at present difficult of exact interpretation, not infrequently occur (cf. *Science Gossip*, n.s., Vol. iii., p. 114; *Cambr. Nat. Hist.*, iii., p. 257—the explanation here given will apparently not hold good for all cases, viz., that the malformation arises from injury to the growing edge of the shell, and that the edges of both valves are in contact with the subjacent object). This species has been found very sparingly in the Wye near Hereford, from which source the water is pumped into the reservoir. Furthermore the type found in the Wye is totally different (see below). The Waterworks specimens are somewhat similar to those which used to be found in the Canal. The fish have all been derived from the river, as far as is known. Hence it is interesting to consider how the species has been introduced into the reservoir, which occupies the highest point of ground for some distance round.

In 1896 the water in the lower pool at Belmont was nearly all run off. Here shells of this species paved the bank, frequently several layers deep, in a band from one to eight or ten yards wide, all round the pond. The width of this band varied with the angle of slope of the side of the pool, and their distribution in depth was very sharply and accurately defined. This was where the water, in ordinary levels of the pool, was from 1½ to 2½ or 3 feet deep: none occurred above and none below these points. We have observed a similar phenomenon in *Anodonta* and *Unio* in ponds in Kent, and (though here it is less well-marked) in *M. margaritifera* in the Wye. In the Hereford Waterworks the species had to live in some 6 to 8 feet of water, the banks being too steep and too bare. In connection with the Belmont locality, it is interesting to consider the amount of calcium carbonate, which had been built up into the shells, there present. From calculations—which must of necessity be rough—the amount would appear to be not less than 340,000 kilogrammes. The water and surroundings are by no means very calcareous to all appearances.

This species makes tracks very similar to those of *M. margaritifera*, but usually goes deeper into the mud than either that species or *Unio pictorum*. Young specimens are often almost completely buried. A medium-sized specimen will half bury itself (*i.e.*, as much as is usual) in hard, marly soil in 15 to 20 minutes.

The form which occurs in the Wye is very different from that found elsewhere in the county. It occurs abundantly near Whitchurch and the Doward Hills (2), and single fragments have been found at Canonbridge (7) and at Eign, Hereford. It closely resembles the type specimen of *A. anatina* in the Linnean Collection, and would seem to be, if anything, the genuine *anatina* of Linné and many Continental authors. The so-called *A. anatina*, *L.* of recent English authors.

(*e.g.*, J. W. Taylor, *Monograph*, Vol. i., 1896, fig. 330, p. 164: and L. E. Adams, *Manual*, 1896, p. 152, plate viii., fig. 2) seems to be only *A. cygnea*: in many cases immature, alate specimens of the latter are called *anatina*. At best, too, *anatina*, whether the genuine Linnean form or the usual one of English collections, cannot be called more than a form of *cygnea*. There appears, however, to be a fairly constant difference in colour between *cygnea* and the Wye *anatina*: the latter is a dark but vivid green (something like the tone of viridian), whereas *cygnea* is any colour from brown to bright yellow—any colour, that is, except this particular cold green: it is sometimes a vivid green, but is always yellower than *anatina*.

Measurements.—It is difficult in this species to define to any degree of accuracy the point at which any specimen becomes, for the purpose of measurement, adult. The series from the Waterworks, for example, comprises a perfect series of gradations from 20 millimetres and less to more than 100 millimetres. The strict average length of all these does not give fairly the average size of adult specimens for the locality. The majority are of middle size (50 or 60 m.m. long), but there are reasons for regarding these as immature, and, further, there are no adequate grounds for holding that the largest specimens are in any sense hypertrophic. The fact is, that in this and allied forms growth goes on for a number of years—certainly sometimes for several years after the individual has attained sexual maturity. In some cases (*e.g.*, at Belmont) we find that there are relatively very few palpably immature forms, the overwhelming majority being, to all appearances, full-grown and all very much of the same size. The practice we have adopted is to select for measurement the larger group of each batch: not, that is, the very largest only, but those which seem fairly full-grown. This, of course, is an uncertain process, but it seems almost the only practicable one under the circumstances. It renders minimal and average values of less worth than in other cases. That in one locality we find very few, and in another a majority of, plainly young specimens at the same time of year may indicate that in the latter case many die off before reaching their full dimensional maturity. The figures are as follows:—Canal, length max. 140 × 68, mean 109.5; breadth max. 69 × 126 and × 112, mean 58.5. Wye at Whitchurch, length and breadth max. 82 × 48.5, mean 73 × 41.5. Belmont, length max. 146 × 81, mean 137; breadth max. 81 × 146 and × 131, mean 76; thickness max. 54 × 81 × 146, mean 48.5. Allensmore, max. 142 × 76 × 49, mean 137 × 74 × 47. Waterworks at Hereford, max. length and breadth 115 × 67, max. thickness 36 × 64 × 113, mean 111.5 × 64.5 × 33. M. T. = 175 × 95 × 65 for *cygnea*, and for *anatina* 130 × 40 × 20; L. E. A. = 70 × 137.5 and 50 × 87; J. G. J. = 136 × 70 and 89 × 53.

The thickness of the shell-substance of one valve is measured in various places about the centre of the curvature of the shell. This may be taken into account in connection with the average weight. The following results are thus obtained:—

Locality.	Mean length.	Shell thickness.			Weight.		Grammes per 1 mm. of length.
		Max.	Min.	Mean.	Max.	Mean.	
Belmont ...	137	3.18	1.85	2.49	144.0	105.8	0.772
Allensmore ...	137	1.24	1.03	1.13	65.7	58.8	0.429
Waterworks ...	111.5	0.52	0.38	0.45	19.0	16.9	0.152

[NOTE.—In such a large species as the present it is unnecessary to carry the measurements beyond the nearest half-millimetre and the weights beyond the nearest decigramme].

This shews that Belmont specimens are thick and heavy, while those from the Waterworks are thin and light: specimens from Allensmore occupy a medium and, we think, a fairly average position. As far as can now be judged, the weight and thickness, as well as the shape, of those from the Canal would be much the same as in those from Allensmore, but the specimens from the Canal were collected so long after death, that as far as weights and finer measurements are concerned they are practically useless. In the table, besides the length and shell-thickness, the breadth and thickness should of course also be taken into account: this (see above for the figures) would somewhat reduce the differences, but would leave the main point untouched. J. W. Taylor (*Monograph*, Vol. i., p. 79) gives the average weight as 20.9 gms. with a variation up to 144.3 in the form *incrassata*.

The variation in shape in this species is here, as always, considerable. Without figures it is impossible to adequately describe them. Measurements here do not tell us anything very much about the detailed shape, and one finds that differences, which to the eye look large, become insignificant when one attempts to reduce them to numbers. A very slight difference, for instance, in the inclination of the lower border towards the posterior end may very materially alter the appearance of a shell, but it is a difference which it is exceedingly difficult to describe either in words or by numbers. There is, too, a good deal of confusion about the varietal names. Suffice to say that in Herefordshire the three main mutations occur:—(α) the *anatina* form, (β) the thick, rather swollen, more or less rostrate form, usually rather alate (Belmont), (γ) the thinner form, the upper and lower borders more parallel, shell usually paler in colour (*e.g.* Waterworks); besides these there is the *anatina* form from the Wye.

MARGARITANA. *Schumacher, 1817.*

Margaritana margaritifera, *L., 1758.*

Very abundant in the Wye round Hereford (7) and elsewhere, at Whitchurch (2), etc. Empty valves may be found on almost every gravel beach, and the live shell is easy to obtain. It is nearly always badly eroded, and always small. Specimens from Breinton (7) are in some cases eroded right through the shell; sand, etc., then enters the hole, but this is soon skinned over by the

mollusc, and consequently a hard mass—frequently of considerable size—of agglutinated sand and mucous material is to be found blocking up the hole. Various stages in the process may be seen: from the case where the sand has merely a skin between it and the snail, to examples whose shells shew on their interior hard lumps in which the sand is thoroughly impregnated and bound together with secretion. It is in the last degree unlikely that these examples of perforated shells are due to fracture rather than erosion.

It lives in the rapid parts of the Wye, where there is a more or less sandy bottom, in from 1½ to 4 or 5 feet of water: it seems to prefer a depth of about 3 feet. Deep holes and muddy localities with but a sluggish stream of water it does not seem to affect much. It is often found in especial abundance in the shoal water at the head of rapids, where the bottom consists of fairly large stones, the interstices being filled with sand and fine gravel. For instance, we have taken it in great plenty just above the Castle Green ferry at Hereford, on the Bullinghope side, and again just above a rapid near Breinton. It is easiest taken in the early part of the year (March, April), when it moves into quite shallow water near the bank. At such times they may be seen crowding the beds of the little sandy bays which often occur at the foot of a beach. Here they move about freely, and their long, curving tracks are very conspicuous on the bottom. It often walks in a very nearly regular circle, and we should judge, from various data, that from 12—15 feet in a day would be an average journey. When not moving, it resumes its almost vertical posture, or at any rate sinks deeper into the sand: the marks of these stoppages may be seen on their tracks. We have noticed precisely similar phenomena in *Anodonta* and *Unio pictorum*. It does not bury so much of its shell in the soil as *e.g. A. cygnea*: this is very possibly correlated with the usually harder bottom in which *M. margaritifera* occurs.

Averages of a number from Breinton (1893):—max. 92.5 × 46.9 × 27.0 and wt. 32.705, 86.6 × 42.5 × 28.5 and wt. 40.083; min. 74.1 × 40.2 × 22.9 and wt. 16.700, 78.5 × 40.6 × 22.6 and wt. 21.344; mean. 82.99 × 42.75 × 25.86 and wt. 29.790. From Eign (Hereford):—mean. is 87.2 × 44.4. M. T. = 80 to 110 × 40 to 50 × 20 to 30: L. E. A. = 125 × 50: J. G. J. (B. C. i. 38) = 127 × 61: J. W. W. = 140 × 63.5 × 25.5. From these measurements it would seem that the Hereford specimens are a good deal shorter, and proportionately broader and thicker than the ordinary English specimens. The mean length of another lot from Breinton is 83.2, max. 93.5, min. 75.0.

A few determinations of the specific gravity of the Breinton shells give the average value of 2.734 for the marginal, and 2.719 for the umbonal region.

Though our specimens are undoubtedly small, some of the older English measurements make the size a good deal too large in comparison with other species: thus John Berkenhout (*Syn. Nat. Hist. Gt. Brit. I. rel.* ed. 2, 1789, pp. 193 and 201) gives *Mya margaritifera* as 5½ × 2½ in. and "*Mytilus cygnaeus*" as 5 × 2½.

UNIO. *Philippson, 1788.*

Unio tumidus, *Philippson, 1788.*

Empty shells are fairly common in the Wye round Hereford and Breinton (7 N) on the gravel beaches, but no live specimens have been found in the river: as a rule the specimens are small and much eroded. A fragment has occurred in the Wye at Symond's Yat (2). A few were found in the Canal near Withington (?6 or 7 N) when it was drained: two large specimens here occurred in a muddy place near a lock, while those from gravelly places were more ordinary in size. It occurs occasionally in the Frome (6 and 7 S): there is an overflow into this stream from the Canal near Canon's Frome, but they are probably native and not escapes from the Canal. A few occurred in the large tank at the Hereford Waterworks (7 N) in 1896: these are very bright, clean specimens, with conspicuous green and yellow rays, and a purple-lilac coloured nacre, and are hardly at all eroded. They probably took origin from the immediately adjacent river, being pumped up into the tank when small, possibly attached to fish, many of which thus come up.

A remarkably fine and heavy specimen from the Canal has the following dimensions:—long 104.5, wide 52.3, thick 37.0, wt. 87.5, and another large one is 100.3 × 42.1 and wt. 41.258: the smallest from the Canal is 60.8 × 32.9 × 23.7 and wt. 12.227: the mean is 88.8 × 39.6 and wt. 39.35. From the Waterworks:—max. 72.3 × 35.6 and wt. 17.72, min. 49.9 × 25.5 × 16.6 and wt. 5.09, mean. 63.7 × 31.9 and wt. 12.4. From the Frome the mean is 52.6 × 28.2 and the specimens vary very little.

Difference in shape is illustrated by two specimens from the Canal:—60.8 × 32.9 and 80.2 × 32.9, the former being a wide, and the latter an elongated specimen. The general mean dimensions are 73.1 × 34.7: M. T. = 60 to 110 × 30 to 50 × 20 to 25, and L. E. A. 75 × 37.5. G. S. Tye (in *Science Gossip*, April, 1885) records one 125 × 56.25.

Unio pictorum, *L. 1758.*

Common on the gravel beaches in most places along the Wye, round Hereford, but few live specimens have yet been taken: the empty shells are usually very much eroded and worn. Near Rotherwas, in the north bank of the river, the water was a few years ago (Jan., 1893) cutting away some of its own old deposit: the section thus revealed shewed numerous specimens of *U. pictorum*, the periostracum of which was remarkably fresh and perfectly well-preserved. Abundant in the large reservoir at the Hereford Waterworks (7 N) in June, 1896: these specimens are as a rule small, but all are very clean and brightly coloured. They fall into two well-marked groups—those which are pink inside and bright yellow outside (of these there were—excluding very young ones—61 per cent.) and those with white inside and duller greenish—yellow outside (=39 per cent.) Mr. J. T. Nance of Balliol College, Oxford, has kindly examined for us specimens of both these forms and is of opinion that the pink colour is due to a trace of manganese, which certainly occurs in those with pink nacre but not in those with white nacre. The general analysis of one of the white shells may be worth quoting:—

Water	1.34
Organic matter	4.00
Ca Co_3	93.01
Al_2 O_3	1.58
Iron	trace
	99.93

The analyses were made some twelve months after cleaning out the shells.

The specimens in Ludlow Museum are from "ponds resulting from the overflow of the Lugg near Hampton Bishop" (A. C. de Boinville).

From the Waterworks:—max. 77.6 × 36.4 × 24.5 and wt. 25.17, while an average specimen gave 52.7 × 22.3 × 15.8 and wt. 6.20 (in a case like the present where specimens range down to very young ones, it is impossible to give a proper average drawn from all the specimens owing to the uncertainty in determining the maturity); the mean of the larger specimens is 67.4 × 29.8 × 20.3 and wt. 15.152, but these values are probably too high. The mean of Wye specimens is 74.0 × 31.7 × 22.3 with a max. of 77.5 × 35.4 × 25.2. M. T. = 60 to 120 × 25 to 45 × 20 to 35, and L. E. A. 75 × 33.4: G. S. Tye (*loc. cit.*) records one 121.5 × 54.5.

PISIDIUM. *C. Pfeiffer 1821.*

Pisidium amnicum. *Müller 1774.*

Not uncommon: generally to be found in the débris of floods in the Wye and Lugg, and live specimens have occurred in the Wye at Hunderton (7) and in the Lugg at Hampton Bishop (7 N). It is found freely in the Yazor brook near Huntingdon (7 N), and in the ditches round the Lugg near Aymestrey (10), but not apparently in the river itself there: it has also occurred in the Worm Brook near Dewsall (1) and near Eardisland (12).

From rejectamenta of Wye at Hereford averages are:—5.8 × 4.35 × 3.0, max. 6.4 × 4.7 × 3.4, min. 5.4 × 4.2 × 2.6: from Yazor Brook, max. 8.0 × 6.4, min. 6.7 × 5.2, mean 7.45 × 5.8: from Aymestrey, max. 8.5 × 6.7, min. 5.4 × 4.3 × 2.7, mean 7.2 × 5.65 × 3.5.

Differences in shape are also shewn: the coefficient $\frac{\text{length}}{\text{breadth}}$ is from the Wye 1.335, from Yazor Brook 1.28, and from Aymestrey 1.27, the first locality thus affording relatively narrower shells. The highest fraction is 1.36 from the Wye, the lowest 1.25 from Huntingdon.

The general Herefordshire mean is 6.8 × 5.3 × 3.25 and coeff. 1.295. M. T. = 7 to 12 × 6 to 8 × 4 to 6 and mean coeff. 1.357; L. E. A. 9.5 × 7.5 and coeff. 1.267.

Pisidium fontinale, *Drap., 1801.*

Abundant in a ditch near Monkland (12), and in a small pond at Broomy Hill, Hereford (7 N): also at Tupsley (7 N), in the canal near Munsley (4), near Hoarwithy (2), near Dewsall (1), and near Brimfield (9). It also occurs in the subfossil deposit at Ledbury (4). Frequently found with *Pis. pusillum*.

Monkland specimens average 3.25 × 2.65; those from Wyeside 3.05 × 2.45 with a maximum of 4.0 × 3.0. M. T. = 3.5 × 2.5; L. E. A. = 4.5 × 3.75.

***Pisidium pusillum**, *Gmelin, 1778.*

Not uncommon: it occurs in many pools and streams, and generally only requires careful looking for.

SPHAERIUM. *Scopoli, 1777.*

= *Cyclas*, Bruguière, 1791, and many of the earlier authors (Gray, 1840, Forbes and Hanley, 1853, etc.)

Sphaerium corneum, *L. 1758.*

Occurs commonly in many ponds and slow streams, and is almost always found in the flood refuse of the Wye and Lugg. It has been taken alive in the Wye at Whitchurch (2), in the Frome at Longworth (7 N), and the Lugg at Hampton Bishop (7 N). The var. *pisidioides*, Gray, and var. *vittata* have also been occasionally taken. The var. *nucleus*, Studer, occurs at Staunton-on-Wye (8), but not in any very exaggerated form.

The average size is about 10 × 8.1 × 6.4, with a maximum of 12.8 × 10.4 × 8.7, and a minimum of 8.3 × 7.1. M. T. = 12 × 9 × 7; L. E. A. = 11.25 × 8.5; J. G. J. = 11.4 × 8.9.

Sphaerium rivicola, *(Leach) Lamarck, 1818.*

Rare and not numerous: the Wye at Symond's Yat (2) and near Rotherwas (7 N: in rejectamenta), the Lugg at Mordiford (7 N), and the Frome at Longworth (6) are the only localities, in each of which but one or two specimens have been found.

Sphaerium lacustre, *Müller, 1774.*

Not common: abundant in the Canal near Shelwick (7 N), a few in a pond near Holmer (7 N), one at Tupsley (7 N), one in rejectamenta of the Wye near Rotherwas (7 N), in the lakes on the common at Staunton-on-Wye, and in a small pond at Grafton (7 S). This last locality is now practically non-existant, the pond being dry for most of the year. The specimen in rejectamenta at Rotherwas could not have come down the Lugg from the water-meadows at Tupsley, since the locality is more than a mile above the junction of the Lugg and Wye: it might have been derived from Staunton via Letton Lake.

A large canal specimen measures 11.5 × 9.5: L. E. A. = 10 × 7.5 which is perhaps fairly in accordance with our local specimens. M. T. = 10 to 14 × 8 to 10.

DREISSENA. *Van Beneden, 1835.*

Dreissena polymorpha, *auctt.*

Moquin-Tandon (ii., p. 599) points out that Pallas (whose date in any case was 1754) in his *Mytilus polymorphus* included two varieties, as he said, but which appear to be really distinct species. As Pallas' var. *marinus* comes first in his book, the name *polymorpha* should properly belong to that, and not to his var. *fluviatilis* as it has done. By strict rules also a name of 1754 is admissible, and then apparently *volgae*, Chemnitz, 1795, would be the name. The name *fluviatilis* has been adopted by some authors.

Formerly abundant in the Hereford and Gloucester canal near Hereford (7 N) and elsewhere (Munsley 4 etc.) It still lives in a stretch of the canal at Canon Frome which has escaped drainage (J. H. Wood). One or two fragments have from time to time been picked up in the rejectamenta of the Lugg near Hereford (7 N). In September, 1898, a single valve was obtained from a gravelly shallow at Hampton Bishop, with some comparatively fresh periostracum still adhering to the shell. The older specimens from the Lugg had been put down as dead shells washed out of the Canal, there being an overflow into the Lugg at the Shelwick aqueduct. But the comparative freshness of this last specimen seems to preclude such an origin, since the Canal near Hereford has been dry since 1890. The conclusion is that *Dreissena* has lived somewhere in the Lugg since the draining of the Canal: and, if this is so, it is probably living there still. At present we have been unable to find any living specimens in the river.

The specimens in the Ludlow Museum are from near Northampton (A. C. de Boinville).

Average length of Hereford shells is 33.2: M. T. = 30 to 50, L. E. A. = 35.

ERRATA, ETC.

Page 3, line 4.—For *lamstellata* read *lambellata.*

Page 7, line 15.—For county read country.

Page 16, line 12 from bottom.—Dele n.s. and read picrocarmine.

Page 30.—*Helicella virgata.*—Mr. William Blake has found this species in fair abundance in some gardens in Ross (D. 2). It has not been noted in the surrounding country; and may hence possibly have been introduced into its present situation. The locality has only been built on in comparatively recent years. Both the banded and unbanded *(lutescens* and *albicans)* occur.

Page 32.—*Helicella cantiana.* Mr. H. T. Soppitt has been good enough to supply us with further details. He writes: "I do not seem to have made any notes of the species collected," (*i.e.* at the Woolhope Fungus Foray at Dinmore in October 1893) "but if *Helix cantiana* was among my finds from Dinmore, it was obtained in the wood, within ten minutes walk of the Station." This places the record in District 8. The parts in question have been examined not infrequently by us, but we have not yet succeeded in again finding *cantiana.*

Page 35, line 14.—For 1.52 read 1.62.

Page 35, line 8 from bottom.—For 7 N read 8, and add "Rejectamenta of Wye at Hereford (7 N?): Hope-under-Dinmore (8)."

Page 36, line 7.—Dele Silurian.

Page 38.—Mr. William Blake records a scalariform specimen of *C. aspersus* from Ross (2).

Page 41.—Add *T. hortensis arenicola* for District 2 (Ross: W. Blake).

Page 44, *et seqq.*—It may not be sufficiently clear that, where no number or figure follows a band-formula, it is to be understood that only a single specimen has been recorded.

Pages 78, 80.—*Gyr. complanatus* and *Bath. contortus* have recently been found abundantly near Stretton Grandison (D. 6).

Page 81.—*A. hypnorum.* The occurrence of this species in ditches, etc., which frequently dry up is noted also by H. Laver in *Trans. Epping Forest and Essex County Nat. Field Club,* Vol. II., Part 6, July 1882. We have also noticed it in Kent.

Page 81.—*L. peregra.* Since the large tank at the Hereford Waterworks was cleared out in 1896 an *auricularia* form has made its appearance there in some abundance. It is similar to that found at Belmont, which is distant about a mile and a half (August 1899).

As an example of the strange places in which *peregra* will live, we may mention that we have recently noted the "typical" form of large size and in abundance in a very foul pond in a stable-yard at Staunton-on-Wye (D. 8).

Woolhope Naturalists' Field Club.

ANNUAL MEETING, TUESDAY, FEBRUARY 22nd, 1898.

THE Annual Meeting of the Woolhope Naturalists' Field Club was held in the Woolhope Room, Free Library, Hereford, on Tuesday afternoon, 22nd February. The following were present:—Mr. H. Cecil Moore, President. Rev. Preb. Elliot, Rev. M. G. Watkins, Dr. J. B. Fitzsimons. Messrs. H. C. Beddoe, Spencer H. Bickham, R. Clarke, Jas. Davies, Thos. Hutchinson, Alfred Watkins, and Jas. Pilley (Assistant Secretary).

PUBLICATION OF *THE TRANSACTIONS.*

With reference to the proposition (see page 304 of *Transactions* 1897) of Mr. Alfred Watkins, namely, that the *Transactions* be published annually, the Resolution of the Central and Editorial Committee was read as follows:—"Much as they regret it, the Committee do not see their way to adopt Mr. Alfred Watkins' proposition."

FINANCIAL REPORT.

Mr. Beddoe, Hon. Treasurer, presented the annual financial statement for the year ending December 31st, 1897. The principal receipts were: Subscriptions received for 1897, £99; 96 copies of Survey of Herefordshire sold, £12; volumes of *Transactions* sold, £4 11s. 6d.; entrance fees, £5 10s.; whilst the expenditure, which comprised the cost of printing and incidental expenses, amounted to £61 2s. 7d. With a balance of £80 8s. 2d. in the hands of the Treasurer, the total was brought up to £141 10s. 9d.

REPORT OF ASSISTANT SECRETARY.

Mr. James Pilley, Assistant Secretary, read the following:—"The report for the year is not of the usual satisfactory character. There appears to have been a falling off all round; the number of members was less, and the resignations have exceeded the addition of new members. The income has also slightly decreased, and the attendance at the field meetings has been considerably less than in recent years. The Jubilee, which monopolised a great deal of public attention, probably affected the fortunes of the Club during the year 1897. The number of members on the books during the year was

219, against 231 in 1896, an addition of only seven made to the list, a decrease of ten compared with the previous year. Ten members have retired during the year, and three have been removed by death, including the late Mr. G. H. Piper, who had been a member for twenty-three years, having been elected in 1873. He filled the Presidential chair in the years 1883 and 1886, and has enriched the transactions by papers not only on geological subjects, as the Passage beds at Ledbury, the Woolhope Valley, the Coal measures of the Clee Hills, &c., also other papers on Bronsil Castle, Arthur's Stone at Dorstone, Mordiford Church, and the Legend of the Dragon, &c. His geological treasures, although unfortunately lost to the county, have found a resting place in the national collection. The income for the past year was £109, a decrease of £1 10s. on that of the previous year. The attendance at the four Field Meetings was very much under the average, numbering only 164. On the Ladies' Day there were only 36 present, the smallest number for several years. Counter attractions at Stretton Sugwas on the same day doubtless accounted for the diminished numbers. The arrear list shows no substantial decrease, it is rather less than usual, and appears the only favourable item in this report."

ELECTION OF PRESIDENT FOR 1898.

The Chairman said those present would doubtless remember the circumstances attending the election of Dr. Wood as President of the Society. It was not ascertained absolutely whether he would be able to act in that capacity, and now he had stated his inability to continue in office. He had, therefore, much pleasure in proposing the election of Rev. H. B. D. Marshall, of Norton Canon, in his place, he being a very old member (applause).

The Mayor seconded, and the Rev. H. B. D. Marshall was elected President.

FIXTURES OF FIELD MEETINGS FOR 1898.

The next business was to determine upon the forthcoming summer's field days. The following outings had been suggested: Aymestrey to Presteign, or Presteign to Aymestrey; the Ragged Stone and Chase End Hills; Tewkesbury Abbey; Llanthony Abbey and the Bwlch to Talgarth or Glasbury; Stoke Edith to the Landslip, through Devereux Park; Pershore and Evesham.

Mr. Hutchinson said he had discussed the matter with Mr. Moore, who had suggested the first four named, with Tewkesbury as the Ladies' Day. With regard to the Llanthony outing, he added that it would be similar to the walk up the Olchon Valley and over the Black Mountains last year, which every one appreciated very much.

Preb. Elliot said he should propose in place of Llanthony the Stoke Edith route.

The Rev. Morgan Watkins observed that they were there six or seven years ago.

Mr. Hutchinson said they were so pleased with the Olchon Valley outing last year that it was hoped Llanthony would be one of the outings at any rate.

The Chairman also suggested Bishop's Castle and Bromyard.

It was decided to vote on each place individually, and the following, with the accompanying dates, were eventually agreed upon:—

May 27th, Aymestrey to Presteign, or Presteign to Aymestrey.

June 30th, Llanthony, thence through the Bwlch to Talgarth, or Glasbury, or Hay.

July 28th (Ladies' Day), Tewkesbury Abbey.

August 30th, The Ragged Stone and Chase End Hills for the Geology of the southerly end of the Malvern range of hills.

ELECTION OF DELEGATES.

The Rev. J. O. Bevan was elected delegate to the British Association Meeting, and the Rev. J. O. Bevan and Mr. Thomas Blashill were elected delegates to the Archæological Congress.

GENERAL SUBJECTS.

GEOLOGY.—Mr. Moore announced that a model of a group of Old Red Sandstone fossils had been presented by the executors of the late Mr. Piper, of Ledbury, and was now in the museum. This fossil of the fishes, "Cephalaspis" and "Auchenaspis" was found in the railway cutting near Ledbury Station. Mr. Piper obtained possession of it, and it was considered so valuable that he presented it to the authorities of the Natural History Museum, South Kensington, who gave him two or three excellent models, of which the model in the Hereford Museum is one. A selection of the best of Mr. Piper's fossils are now in the Museum, Natural History Department, South Kensington, having been bought by Dr. Henry Woodward, head of the Geological Department, for £200.

They are described and figured in Catalogue Fossil Fishes, British Museum, part II., pp. 189, 197 pl., fig. 1, 5.

I. Cephalaspis Murchisoni, Egerton.

II. Auchenaspis Egertoni, Lankester.

Locality.—Old Red Sandstone Passage Beds, Ledbury, Herefordshire. Presented by George H. Piper, Esq., F.G.S., 1889. (P. 6023).

ORNITHOLOGY.—Mr. Walter Pilley has recently presented to the Museum a Whooper (Whistling Swan) which had been shot on the river Wye near Whitney many years ago.

RECORDS OF FACTS IN LOCAL NATURAL HISTORY.—Mr. Moore exhibited a collection of Records of Facts in Natural History and earnestly invited the assistance and co-operation of members by the formation of Committees as proposed in his address on 23rd April, 1897, with the view of such Records of Facts being published in a regular systematic order in the *Transactions*.

PUBLICATION OF THE DIOCESAN RECORDS.—A letter was read from Rev. Augustin Ley proposing the investigation and publication of the Diocesan Records which went back to a very early period. He offered a guinea towards this object.

THANKS TO THE RETIRING PRESIDENT.

Mr. J. Davies then proposed a hearty vote of thanks to the retiring President. He remarked that Mr. Moore had now filled the office of President for two years, and of Hon. Secretary for he did not know how many years—(hear, hear). It was only those gentlemen who had filled the office of President who knew the amount of work to be done. He did not know what they should have done if their friend had not taken upon himself the office as successor to Dr. Bull—(applause)—and he was sure they would all join with him in expressing their best thanks to him for the way he had filled the office of President, and in expressing the hope that he would continue for many years as their Hon. Secretary—(applause).

The Rev. Morgan Watkins seconded, remarking that he knew something of the untiring work the late President had performed, and he congratulated Mr. Moore on the amount of interesting information he had collated It was a great pleasure to him as to them all to think they would continue to have his services as Secretary—(applause). They wished him health and strength, and were glad to have been under his mild sway and government for the past two years—(applause).

Mr. Moore suitably responded, and suggested that Committees should be formed to take up different scientific subjects at the Field Meetings, so as to secure a division of the labour of collecting and preparing the details, with a view to their being published more fully.

Mr. Spencer Bickham (Ledbury) was thanked for his kind offer to extend hospitality to the Club on the proposed occasion of their visit to Tewkesbury Abbey.

ORNITHOLOGY.

Colonel Reid has presented to the Museum a Shag (Green Cormorant) shot at Eardisley on 22nd February, 1898.

THE BURNING OF THE BUSH.

BY E. LASHFORD CAVE.

SIR,

In my youthful days I was dragged out of bed early one New Year's Day to see the ceremony of the "Burning of the Bush," and I have a vivid remembrance of seeing in the lurid light a number of farm labourers encircling a bonfire and every now and then bending down in unison and shouting "Old Cider." When the fire had nearly ended, the "Bush," which had been hanging in the kitchen all the year was lit, and when well lighted was carried across a number of "ridges" of newly planted wheat, the number which could be traversed while the bush still remained alight being considered an omen or forecast of the number of successful (farming) months in the coming year.

On New Year's Day this year I was in London and chanced to see a copy of "Le Monde Illustré" and was struck by a picture representing a number of peasants standing hand in hand round a fire in the fields, and the resemblance of it to the old bush burning which I had seen upwards of forty years before. On looking at the text which accompanied the picture I found it related to the "Feu de St. Jean," and a thought occurred to me whether there might not be some remote connection between that and our local "bush burning," both being about the same date.

It may be a far fetched idea but as I have never met with any very clear account of the meaning and origin of the bush burning ceremony, I have submitted the idea on the chance that there may be something in it. The verses, of which I enclose a copy and rough translation, do not betray a very high order of poetry, and are essentially French.

LE FEU DE SAINT JEAN.

From "Le Monde Illustré."

Un feu luit dans les guérets !
  Un autre s'allume !
En voici plus loin, plus pres
  Qui percent la brume.
Notre feu monte à son tour
  Leger comme une âme !
On y voit comme en plein jour !
  Activons la flamme !

Refrain No 1.

Dans ce beau feu d'or et d'argent
  Petite fille,
Jette un bois léger qui petille,
  Branche ou brindrille,
Tu feras plaisir à Saint Jean !

St. Jean s'asseoit dans son feu
  Comme au sein de l'ombre
Il compte avec le bon Dieu
  Nos péchés sans nombre
" Approchez ! Vite ! approchez
  " Que Saint Jean vous voie !
" Et jeter tous vos péchés
  " Dans son feu de joie !

Jeanne dit—" Voyons un peu
  " Car Saint Jean nous presse,
" Si je puis dans ce beau feu
  " Jeter ma paresse !
Le simple aveu de ce tort
  Lui fait l'âme nette !
  Et Saint Jean, pour son effort
  Sourit à Jeannette ! . . .

Refrain No. 2.

Dans ce beau feu d'or et d'argent,
  Petite fille,
Jette un noir péché qui petille,
  Faute ou vetille !
Tu feras plaisir à Saint Jean.

Blanche dit : " Ma langue court
  Le pays des songes. . .
Au feu je veux à mon tour
  Jeter mensonges hideux
S'en vont en fumée ! . .
  Et Saint Jean par toutes deux
A l'âme charmée ! . .

Refrain No. 2.

Au feu, gourmandise, au feu
  Dit Berthe qui saute !
La flamme crépite un peu
  Mais n'est pas bien haute !
Et malgré son cri vainqueur
  Saint Jean se demande
Si Berthe veut de bon cœur
  N'etre plus gourmande !

Refrain No. 2.

Et Colette après Suzon
  Vient blanchir son âme
Et les péchés à foison
Pleuvent sur la flamme !
Quand tous sont passés au feu
  Et que tout cœur brille,
Saint Jean dit : " Seigneur, mon Dieu
  " Voici ta famille."

Refrain No. 1.

SAINT JOHN S FIRE.

From "Le Monde Illustré."

A fire shines in the fields,
  Another begins to burn ;
Here another, there another,
They pierce through the mist ;
Our fire ascends in its turn
  As light as a soul !
It is as light as day,
  Let us feed the flame !

Refrain No. 1.

In that beautiful fire of gold and silver,
  Little girl,
Throw a light crackling wood,
  Branches or twigs,
You will give pleasure to Saint John.

Saint John sits in his fire
  As in the shade,
He reckons with the good God
  Our numberless sins ;
Approach quickly, come nearer,
  Let Saint John see you
And throw all your sins
  Into his bonfire.

Janet says : " Let us see,
  " For Saint John is hurrying us,
" If I can into that beautiful fire
  " Throw my idleness ;"
The confessing of that sin
  Clears her soul,
  And Saint John for her effort
  Smiles at Janet ! . . .

Refrain No. 2.

In that beautiful fire of gold and silver,
  Little girl,
Throw a black sin which
  Fault or failing
You will give pleasure to Saint John.

Blanche says : " My tongue runs
  In dreamland,
In my turn I will throw
  My untruths,
And the hideous lies
  Disappear in smoke,
And Saint John by both of them
  Is delighted ! . . .

Refrain No. 2

Into the fire, greediness into the fire,
  Says Bertha, jumping ;
The flame crackles a little
  But is not very high,
And in spite of her victorious cry
  St. John wonders
If Bertha wishes earnestly
  To be no longer greedy !

Refrain No. 2.

And Colette after Susan
  Comes to purify her soul,
And the sins in quantity
  Rain over the flame ;
When all have passed the fire
  And that each heart rejoices,
Saint John says : "Lord, my God,
  Here is thy family."

Refrain No. 1.

REMARKS BY THE REV. M. G. WATKINS.

In his pleasant reminiscence of the "Burning of the Bush," and his citation of the quaint French folk-poem, "Le Feu de Saint Jean," Mr. Cave has touched upon a superstition more or less common throughout the West of Europe. (See *Ellis's Brand's Popular Antiquities* [3 vols., C. Knight and Co., London, 1841], Vol. i. p. 166—186; and *Napier's Folklore of the West of Scotland* [Gardner, Paisley, 1879], p. 161—170, esp. p. 163.)

I find a cutting from a newspaper in 1890, which much resembles Mr. Cave's story.

"BURNING THE BUSH IN NORTH HEREFORDSHIRE.

"Sir,—Can any of your correspondents explain this interesting custom? On the first day in the New Year, about 5 a.m., a long pole was taken from the hop-yard and straw tied on the whole length. Then the pole was carried to the wheatfield just planted. A bundle of wheat-straw was fastened on the top of the pole and the bush put in it. A hole was made with an iron bar, and the pole planted. The straw was then set on fire, and the embers that dropped from the pole were taken up and put on twelve ridges. A little more straw was then put on the twelve fires. A hawthorn bush that branched out to the four cardinal points (the stem about the size of a churchwarden pipe) was cut; the stems were held over the fire to make them pliable, and planted in the form of two O's. Then the men and boys, all standing in a ring, joined hands, and shouted 'Old cider!' six times. Cider was then drunk from a wood bottle, the new bush carried home, and hung by the mistletoe in the farmhouse kitchen till the next year.

"It is nearly forty years since this rite was discontinued. It was to ensure a good crop of wheat. What was the origin of it?"

A farmer (now dead) informed me that he remembered so late as about the year 1872 a ceremony of the same kind being performed at the Great House Farm, near Llangua, which is one-and-a-half miles from Pontrilas. Twelve fires were lit in a long row in the corn-fields on the eve of Twelfth Day, together with one "boulter" (sheaf), which was raised on a high pole and called the "Old Mother." When these fires were lit, it too was burnt, the belief was in order to bring fertility to the land.

In all the above examples a confusion may be noted between heathen and Christian mythologies, and between religion and science. Many other accounts of the "Burning Bush" also display it. The struggle between religion and science reminds us of Plato's words about the old quarrel ever breaking out afresh between philosophy and poetry. The twelve fires and the "Old Mother," said my farmer-friend, represent

the twelve Apostles and the Virgin Mary. In reality they are much older than the Apostles and go back to the astronomical learning of the Phœnicians, testifying to the passage of the sun through the signs of the Zodiac. The "Old Mother" probably represents Mother Earth, Demeter Ceres. St. John the Baptist's Day and Midsummer Eve, also famous in folklore for Bel-fires, Beltane rites, etc., point not obscurely to the two solstices. The early Church in Britain would try to repress these fantastic superstitions, but under a thin varnish of Christianity they would break out again in the case of ignorant men, living far apart, it may be, from centres of light and knowledge. Thus it has been supposed that sacred long-standing buildings were purged, as it were, from their connection with heathenism and accepted as holy places by the Christian priests. So, too, with large, ancient yews; they were sacred trees to the heathen, they were rescued from heathenism and dowered with more holy associations by Christians.

It would be interesting to know whether any remnants of what I may call this fire worship still linger in Herefordshire or the West of England generally.

RAINFALL AND TEMPERATURE.

THE following extracts from a letter dated 19th February, 1898, from Mr. Henry Southall to *The Ross Gazette* are of interest.

The following table will show the fall in each month for the last two years, and also the average for the decade 1880-9 :—

	1880-9	1896	1897
January ...	2·52	0·37	2·42
February ...	2 66	0·24	2·19
March ...	2·09	2·24	3·81
April ...	2·20	0·81	2·13
May ...	2·35	0·18	1·24
June ...	2·51	2.19	3·20
Total 1st six months ...	14·33	6·03	14·99
July	3·25	1·08	1·69
August ...	2·03	1·05	3·92
September ...	2·49	5·93	2·60
October ...	3·27	2·85	1·84
November ...	3·36	0·70	1·87
December ...	2·45	3·47	3·60
Last six months ...	16·85	15·08	15·52
Total for year ...	31·18	21·11	30·51

It will be seen from this that the fall in 1897 was just under the average, the months of June, August, and December being wet, whilst May, October, and November were each dry months. The contrast between the fall of the first eight months in 1896 and that of the corresponding period in 1897 is very striking—8·16 inches in 1896 and 20·60 in 1897, more than two and a half times as much; the average being 19·60 or one inch only less than 1897. The year was fairly dry till the 2nd March, but from this till the 17th April 5·66 inches fell, nearly twice as much as usual in this the driest part of the year. From this time till the 4th August, the weather was mostly very fine, except the last week in May, when a fall of nearly an inch and three quarters was very beneficial after six weeks of very dry weather. Over an inch fell again on the night of the 8th June, and about the same quantity in heavy thunderstorms, June 26th—28th and July 19th—21st.

Between the 4th of August and September 8th, there were only two days without rain in five weeks, and the fall amounted to upwards of five inches This was disappointing to farmers, as the crops were

nearly ripe, and a good deal of damage was done to some of them in consequence. September 9th to 27th being very fine, however, the later harvest proved propitious. The absence of frost in October and November was also remarkable, and in many places geraniums were uninjured till early in December. The extreme warmth of the 38 days ending February 1st slightly exceeds previous records. The average temperature for Ross and Greenwich for 1897 was as under :

	Ross.	Greenwich.	Ross, less than Greenwich.
Minimum or night temp. ...	42·86	43·47	— 0·61
Maximum or day temp. ...	57·22	58·03	— 0·81
Mean maximum and minimum	50·04	50·75	— 0·71

In 1876, the minimum temperature was 42·88, so practically the same as 1897, and this is the highest registered.

The maximum temperature was exceeded in the following years, so that 1897 proved to have been quite a hot year :

1868	60·6	1869	58·5
1893	60·4	1876	58·2
1872	58·6	1854	58·1
	1870 ...	57·9.	

THE DRY WINTER.

In a letter from G. J. Symons, F.R.S., in *The Times* of March 16th, 1898, we learn that since the year 1858 there have only been two winters drier than the winter just closed.

The figures for Camden Square, N.W., for these three winters are for the six months October to February.

1879-80	5·02
1890-91	5·21
1897-98	5·62
Average for 40 years	10·93

by which we see that the total yield of snow and rain scarcely reached half the average.

At Ross, Herefordshire, the average rainfall during these six months is 14·25. In 1897-98 it reached only 8·78 or 62 per cent. of the average.

Our wells and underground water supplies are in general chiefly dependent upon the percolation of winter rains. The serious importance of an extremely dry winter is obvious.

Woolhope Naturalists' Field Club.

FIRST FIELD MEETING, FRIDAY, MAY 27TH, 1898.

PRESTEIGN FOR STAPLETON CASTLE, KINSHAM, AND AYMESTREY.

FOR the First Field Meeting this year the programme of the day included the exploration of the Valley of the River Lugg from Kinsham to Aymestrey. Having trained to Presteign, a walk of twenty minutes brought the members, under the guidance of Mr. W. E. Britten, to the base of the hill upon which are the ruins of Stapleton Castle. At the ruins the Rev. R. W. T. Hunt, Vicar of Byton, and the Rev. C. Leonard Edwards, Vicar of Lingen, met the party. and kindly gave them the benefit of their local knowledge throughout the route. The history of Stapleton Castle is given in Robinson's *Castles of Herefordshire.* In the present day there are no vestiges in the masonry of any date earlier than the seventeenth century. The remains are fairly considerable, and represent a manor house, rebuilt, probably, of the materials of the former more ancient work, supplemented extensively with bricks. The outlying traces of earthwork defences point to a date as early as the stockaded mounds of the Ancient Britons. From the Castle a footpath was followed, skirting a genuine Keltic lane, which conducted to elevated ground commanding an extensive view of Radnor Forest (2,166 feet) and the intermediate heights of Knill Garraway (1,245 feet), Herrock Hill (1,226 feet), Worsel, Hanter (1,361 feet), Whimble (1,965 feet), Whinyard Rocks, five hundred yards north of Whimble Hill (1,629 feet), the Hergest Ridge (1,394 feet), Burva Bank, &c. Mr. Hunt halted the party at the north-western base of Cole's Hill in order to point out a moraine in the oval-shaped valley. The regular shape of this valley is most conspicuous from the camp Wapley, the parapets of which are 1,100 feet above sea level, on The Warren, about one mile south, and prompts the physical geologist to look for glacier action, the evidence of which is here exhibited.

The ascent of Cole's Hill was made from the north-western side. The day was gloriously fine, such a day as often at this time of year succeeds a long spell of rain, and makes all nature busy drinking in the joys of refreshed life ; the atmosphere was clear except towards the north, where the outlines of the distant hills were obscured by the haze ;

the bracken was not yet out in full vigour, and as we ascended the slopes of Cole's Hill, yielding gently to the tread, we sniffed the fresh scent of the moorland, and oft'times rested to pluck some freshly-grown Club-moss, or bright young sprouts of the whimberry plant, until we found ourselves assembled on the summit, 1,097 feet above sea level, close to nine saucer-shaped circular hollows, which some have considered to be "hut circles," whilst others think they are the sites of "beacon fires." The Rev. J. Barker, of Eardisland, has dug into one of them, and did not find any traces of charcoal or burnt soil. Their small size, only about six feet in diameter, their very close proximity to each other, and their situation upon the very summit of the hill, instead of in a sheltered southerly aspect, disposes us to question their use as "hut circles"; their uniformity, and shallow depth of only a foot or foot and a half negatives the idea of excavations for water or for quarrying purposes. We cannot satisfactorily account for them, but are inclined to agree with Mr. Hunt that they are the sites of ancient beacon fires.

On the summit of Cole's Hill an instructive and useful address was given by Mr. H. J. Marshall, of Gayton Hall, Ross, on "Trees and how to grow them."

Mr. Moore followed with an address on the geological features of the district, pointing out how we had left behind us the Old Red Sandstone near Titley Junction, had entered the Upper Silurian, and that the broken fragments which we could kick up on the surface here were the tilestones of the Upper Ludlow series, whilst as we proceeded eastwards down the hill towards Kinsham Court we should travel upon Wenlock Shales, until at Deerfold Bridge we should find a narrow belt of Aymestrey limestone crossing the river from Shirley Farm and extending as far as Lyepool Bridge. The most active of the party who wished to explore the exposure of Aymestrey limestone would find it on the right bank of the river within one hundred yards on this side of Aymestrey Bridge. Looking eastwards, Mr. Moore pointed out the profiles of Croft Ambrey, Gatley Hill, and Bringwood, with the two intervening valleys, each of which is denuded down to the Wenlock shales, and on a longitudinal section he exhibited the two anticlinals connected with these three places, as shown in his paper on the Geology of Aymestrey at the Field Meeting of May, 1896. (See the Geological Section accompanying Mr. Moore's paper on the Geology of Aymestrey in *Transactions*, 1896). He exhibited some good specimens of the characteristic fossils of the locality, such as Pentamerus knightii, atrypa, euomphalus, rhynconella, spirifer, etc.

From the eminence he pointed out the situations of the camps of Croft Ambrey and Wapley, better known locally as The Warren, contiguous to the boundary line of the territories of the Silures and the Ordovices; Old Radnor and Cwm, a small square camp in Radnorshire on the right bank of the Ithon, near Castell Collen, seven miles north of Builth, being, according to ancient maps investigated, upon the Silurian boundary, which extended to the sea in the present Cardigan Bay.

Offa's Dyke is not visible from Cole's Hill, as it is situated on the western slope of Rushock Hill in Herefordshire, thence proceeding northwards into Radnorshire under Burva Bank.

Harleys Mountain, 1,266 feet high, two miles due north, and in Herefordshire, was seen, cultivated as arable land up to its very summit.

On the descent from Cole's Hill, Mr. Edwards pointed out in the north-west Lingen Church, close to a camp which has an Ancient British appearance, and to the site of the Castle. Beyond lay Deerfold Forest, which was once a Royal forest, and within the last fifty years has been cut up into arable farms. The position of the Chapel Farm, where Swynderby for many years preached the Lollard doctrines, was also pointed out. This building is illustrated by Mr. Blashill, facing page 182 of *Transactions*, 1869, and an excellent paper on "The Ancient Forest of Deerfold" is to be found on page 164 of the same volume.

After a walk of about a mile, Kinsham Court, most charmingly situated, the residence of Mr. F. L. Evelyn, was reached. Mr. Evelyn was not at home, but Mrs. Evelyn met the party, and conducted them to a view from the garden, giving a peep of the distant hills on the boundary of Herefordshire and Radnorshire, but the greatest surprise was the sweetness of the scene which suddenly burst into view from the terrace. This was none other than that of Kinsham Dingle, which is justly described as one of the most picturesque spots in Herefordshire. The river Lugg, at the depth of, it may be, a hundred feet below, winds with a little cascade in the valley immediately below the Court, and the scene is without doubt a lovely one. This property formerly belonged to the Harleys, and Lord Byron was a visitor to the Court. There are some noble and handsome trees here, especially a silver fir, apparently about eighty feet high, which had a girth of 12 feet 8 inches at the height of 5 feet from the ground.

The small Church in the grounds was inspected. Externally it has no special architectural pretensions.

Mr. Robert Clarke has kindly furnished the Editor with the following notes upon

KINSHAM CHURCH.

Close to the mansion is the small Early English Church of Kinsham, consisting of a chancel and nave of equal width, and without a chancel arch. On the north side of nave is an Early English doorway. There is a small chamfered square-headed unglazed window (a so-called leper's window), six-and-a-half inches wide by eighteen inches in height, with the old iron bars remaining and an oak shutter inside. On the right hand of this small window is an Early piscina and credence under a cusped head, a rather unusual position to find one. There is also another similar piscina and credence in the south wall of chancel. An Early octagonal font is now placed on a brick base. There are mural monuments to the Harleys, Earls of Oxford and Mortimer, former

owners of Kinsham, with the arms of the Harleys and Mortimers on the shields.

After refreshments, kindly provided by Mrs. Evelyn, had been partaken of, the party left the Court, and took a picturesque path that ultimately led down to the bank of the river, whose course was then followed. The scenery was of a romantic description.

Less than one mile from Kinsham Court, on the left bank of the Lugg, and within 200 yards of Deerfold Bridge, is the site of a building, either a priory or a nunnery. There are no vestiges now, but the irregular surface indicates traces of artificial work, and in a sale map of Lord Oxford's property of Held farm, in the early part of the present century, two buildings are shown. A little more than half a mile up the Limebrook stream are the remains of what is called in the Ordnance map the "Nunnery." It is impossible at the present time to distinguish which was the Nunnery and which was the Priory. The building higher up the Limebrook stream was the larger of the two. A local veteran insisted upon the Ordnance authorities having made an error, and that the site of the Nunnery was lower down the Limebrook stream, and overlooking the river Lugg. Reference will be made further on to all we know of Limebrook Priory.

The party entered the road by Dead-woman's lane close to Deerfold Bridge. The more active members proceeded up the hill by the banks of the Limebrook stream to view the vestiges of the Nunnery or Priory, which consist of two walls about 18 feet high, one 29 feet 6 inches in length, the other 40 feet with a thickness of 3 feet 6 inches, and traces of several other contiguous buildings were evident in the rugged ground surface. In a field opposite the ruins, on the opposite side of the lane, outlines were plainly discernible of the old fish ponds. In an adjacent old cottage carved beams and other woodwork, incorporated in the building, indicate suspicions of having been annexed from the monastic buildings, or possibly portions of outbuildings, judging from the wooden jambs of the perpendicular doorways.

Half a mile beyond the Abbey is the locality of that rare plant *Asarabacca*, a description of which is to be found in *Transactions*, 1881, page 38, growing like ivy on the hedge banks on the left-hand side of the lane which leads to the small circular mound, conspicuous by a clump of fir trees, called The Camp. This camp stands on an elevation of 940 feet in Deerfold Forest opposite Shobdon Hill, 1,039 feet high, on the opposite side of the river Lugg.

From Deerfold Bridge the walk was taken principally along the left bank of the Lugg to Lyepool Bridge: a few of the party walked by Shirley Farm along the right bank of the river. In the meadow below Shirley Farm an apple tree was pointed out which had taken growth from the fallen bough of its parent tree. Mr. Moore exhibited photographs he had taken of this apple tree which yearly bears fruit.

From Lyepool Bridge to Aymestrey Bridge, the two and a half miles walk on the right bank of the Lugg, was tedious and heavy, owing to many a quagmire in Mere Hill Wood, rendered worse from the recent heavy rains. Many a mishap occurred to members of the party, the most serious to the Rev. Preb. C. Warner, who, in endeavouring to cross a boggy ditch by a fallen tree, fell into the Silurlan mud and was extricated. as he very good-humouredly expressed it, by the united force of Britain and Ireland, and true enough his rescuers were Mr. W. E. Britten and Rev W. Ireland.

Rock Hall Quarry in the Common Wood, behind the Crown Inn at Aymestrey, was not reached until 4.30 p m., the hour for lunch at Mortimers Cross Inn; thus unfortunately there was no time to halt for using the geological hammers. Mr. A. T. Southall, however, succeeded in earrying away a trophy of typical fossils.

About 400 specimens of fossils out of the collection of the late Rev. T. T. Lewis have been recently sold for £30 to the British Museum, having been purchased from Mr. Ward, of Yatton Court, by Mr. A. S. Woodward, when he visited Ledbury to pack up the collection purchased for £200 from the collection of the late Mr. George H. Piper. Having been deprived of these collections for exhibition in our County Museum, we have some consolation in the reflection that they have fallen into such good hands in our National Museum.

The sweet-toned church bells of Aymestrey were ringing in honour of our visit It was 5 o'clock when the party, numbering forty, sat down to dinner at Mortimer's Cross Inn. The President, Rev. H. B. D. Marshall, in proposing the health of the Queen, said:—"We are here (on the site of the great Battle of Mortimer's Cross) on 'historic ground' We may say also that we have been to-day (geologically speaking) on ground that is prehistoric. But referring to the history of our own country, years ago I remember being so impressed as a school-boy with some lines of verse quoted as a 'heading' to the concluding chapter—the chapter on the reign of Queen Victoria—in a then popular History of England, that I have not forgotten them to this day. They ran as follows:—

'They decked her courtly halls,
They reined her hundred steeds;
They shouted at her Palace gate—
A noble Queen succeeds.'

Gentlemen, a noble Queen *has* 'succeeded.' One of whom we may well say, in the language of a poet who is *not* anonymous,

'She wrought her people lasting good,
A thousand claims to reverence closed
In her, as Mother, Wife, or Queen.'

It is the high prerogative of the Queen that she is the fountain of honour. In that capacity Her Majesty has been pleased to confer the

"birthday honour" of a Baronetcy on a distinguished member of our Club, and at one time its President. I venture, in the name of the Woolhope Club, to express on the part of its members their congratulations and good wishes to Sir James Rankin on the distinction recently conferred upon him by the Queen."

Sir James Rankin was President of the Woolhope Club in 1869, and it is to him that we owe our Woolhope Club Room under the roof of the Free Library and Museum.

After dinner the members walked to Kingsland Station, distant a little more than two miles. The total length of the walk to-day was computed at over twelve miles

Ordnance Maps 180, 181, New Series, 1/- each, on the scale of 1 inch to a mile, include the whole district. On the large scale of 6 inches to 1 mile, 1/- each, the following six maps are required: Herefordshire, 5 S.E., 6 S.W., 6 S.E., 10 N.E, 11 N.W., and 11 N.E.

The Geological Map, No. 55, N.W., embraces the district east of Deerfold Bridge, and No. 56, N.E., gives the western portion.

A list of the members and visitors who attended is now given :— The President (Rev. H. B. D. Marshall), Mr. E. Ballard, Rev. C. H. Binstead, Mr. G. M. Brierley, Mr. W. E. Britten, Mr. E. W. Caddick, Major J. E. R. Campbell, Rev. W. S. Clarke, Mr. R. Clarke, Dr. A. J. H. Crespi, Dr. J. B. Fitzsimons, Rev. R. Harington, Rev. E. J. Holloway, Mr. T. Hutchinson, Rev. W. Ireland, Rev. Augustin Ley, Mr. J. W. Lloyd, Mr. W. G. Lloyd, Mr. H. J. Marshall, Rev. R. T. A. Money Kyrle, Mr. C. S. Morrison, Dr. W. Elliott Price, Mr. H. A. Wadworth, Rev. Prebendary Charles Warner, Rev. Morgan G. Watkins, Mr. H. Cecil Moore (Hon. Secretary), and Mr. James Pilley (Assistant Secretary). Visitors: Mr. M. N. Asheley, Rev. A. C. Auchmuty, Mr. W. Boycott, Rev. Leonard Edwards, Rev. P. H. Fernandez, Mr. J. F. Fitzsimons, Rev. R. W. T. Hunt. Mr. W. F. Lloyd, Lieutenant H. J. T. Marshall, R N., Rev. Preb. J. S. Sidebotham, Mr. H. M. Sidebotham, Mr. F. Shuttleworth, Mr. A. T. Southall, and Captain E. F. Temple.

LIMEBROOK PRIORY.

We have nothing new to chronicle respecting this building beyond our respect for the proprietor, Mr. Gisborne, for retaining its ruins free from molestation, and we must remain contented with giving all the extracts we can obtain from authorities. To begin, we have the following from *Notitia Monastica*, 1744, by John Tanner.

Herefordshire XIX. Lymbroke, or Lingebrooke.

AUSTIN NUNS.—Here is said to have been an alien priory, cell to Aveney in Normandy,[t] as Mon. Angl. 1. 1036 ex pat. 16 Ric. 2 p. 3 m. 26. but it is more certain that about a quarter of a mile from the left bank of the River Lugg was a priory of nuns[u] of the order of St.

t—No such Monastery occurs in Du Monstrier's Neustria Pia. unless in Mon. Angl. it be falsely printed for Aulney, which had a cell in Lincolnshire called Limbergh.

u—Leland. Itin. Vol. iv. p, 89.

Austin,[v] founded by some of the Mortimers[x] as early as R. 1.[y] which continued till the general suppression when it had six nuns,[z] and was endowed with 22l 17s. 8d. *per. ann.* Dugd. 23l. 17s. 8d. Speed. It was granted, 7 Ed. 6. to John West and Rob Gratwick.

The following references are given in *Diocesan Histories, Hereford*, by the Rev. Chancellor H. W. Phillott. On page 51 we read, "Of twenty religious houses in Herefordshire, seven belonged to the Augustinians, Flanesford (A.D 1346), Wigmore, Wormesley, and two houses for nuns, Aconbury and Lymbroke (1349), in Herefordshire, Chirbury in Shropshire, and Ratlinghope, a small home dependent on Wigmore," &c. Again on page 55, "Of the alien priories there were six or seven in the diocese of Hereford, viz., in Herefordshire—Lymbroke, Lyre Ocle, Monkland, Titley and we may add, perhaps, the church of All Saints', Hereford, subject to the hospital of St. Anthony at Vienna; and in Shropshire—Diddlebury and Wenlock."

Mr. Robert Clarke has furnished us with the following notes from *Dugdale's Monasticon* :—"Some litt e confusion appears in the foundation of this House. Dugdale considers its inhabitants to have been Benedictines, Tanner quotes Bishop Booth's register at Hereford to prove them Austin Nuns, and Speed, a Bodleian manuscript, and Gervase of Canterbury make them White Nuns. That the Mortimers were founders rests upon Leland's authority in his Itinerary, 'Mortimers, Earls of the Marches, were founders of Wygmore, Lymebrook, and Feverlege.' Some genealogical collections, however, of the time of Queen Elizabeth, preserved among the Harleian manuscripts, speak of Robert de Lingan as the founder. 'Here,' says Bishop Tanner, 'is said to have been an alien priory cell to Aveney in Normandy, but it is more certain that about a quarter of a mile from the left bank of the river Lugg was a Priory of Nuns of the Order of St. Austin, founded by some of the Mortimers as early as Richard I, which continued till the general suppression, when it had six nuns.' All that Dugdale himself found of this monastery was confined to an Inquisition 'ad quod damnum' of the 24th of Edward III., by which it appeared that no detriment to the Crown seemed likely to arise, should the King permit Adam Esgar to bestow his manor of Brokkeswodepower on the prioress and convent of Lingebroke, to be held by them to keep the anniversary of the said Adam yearly. In 1291 the temporalities of this monastery

w—Register Car. Booth episc. Hereford mf. f. 167. The Monasticon placeth Benedictines; and Speed, mf Bodl. and Gervase of Cant. make them white nuns.

x—Leland. Itin. Vol. v. p. 11.

y—Because mentioned in Gervase's catalogue.

z—MS. Corp. Christ. Coll. Cant.

Vide in Mon. Angl. tom. 1. p. 474. inquis. 24 Ed. 3. n. 33. Heref. de maner. de Brokkeswode Power.

Leland. Itin. Vol. iv. p. 89. 92. Vol. v. p. 11.

In Nash's Worcestershire Vol. 1 p. 248 of the impropriate rectory and advowson of the vicarage of Clifton.

Pat. 9. Ed. 1. m. 20 vel 21, Pat. 10. Ed. 1. m.

Rot. Pat. 2 Ed. 2 p. 2. m. 2. pardon. priorissæ pro adquis. eccl. de Stoke Bleze sine licentia regis.

Pat. 10 Ed. 3. p. 21. m., Pat. 23 Ed. 3. p. 1. m. 31. licent. perquirendi maner de Brokeswo.ie.

Pat. 29 Ed. 3. p. 1. m. 30. pro. ten. in Draycote pro. anniversatio Will. de Waldsheof.

appear to have amounted to £6 8s. 8d. Their spiritual possessions were then confined to one church. Ecclesia de Cliftone est pauperum monialium de Lyngebrok, £6 13s. 4d. From the references to public records, noted by Bishop Tanner, we may infer a slight increase in their revenues in the reign of Edward II. and Edward III, the most material of which was the manor of Brokkeswood Power. Several leases were made by the prioress and convent, under their seal, of messuages, lands, and tithes in Cowarne Magna, Nun Upton, Perry, Lingen, and other places, in the counties of Hereford and Worcester, between the 12th and 30th years of Henry VIII., the counterparts of which remain in the Augmentation Office, but the Priory seal is not attached to any of them, nor has it been discovered by the editors elsewhere. Julian Barbor, the only prioress whose name has occurred to the editors of the *Monasticon*, surrendered this House to the King (Henry VIII.) December 28th, 1539, when she had a pension granted to her for life of six pounds. Tanner says at the Dissolution here were six nuns, but four only, besides the prioress, appear to have had pensions. The site of Lymebrook Priory was granted in the 7th of Edward VI. to John West and Roger Gratwyk, the one of Slynfold and the other of Syllyngton in the county of Sussex. The clear value as revenue of this priory in the 26th Henry VIII. was £22 17s. 8d. Speed, who gives the value including the reprises, says £23 17s. 8d."

The following also appears in the *Monasticon* with reference to a land transaction:—"Tercio diae Februarii, anno 7, Regis Edwardi VI., pro Ada Lutleye: The scite and capitall messuages of the late priorie of Lymbroke in the countie of Hereford, and all those landes, meadowes, and pastures, called Mylfelde, Crossefelde, Orefelde, the Range Bache, the Hokeland, William Felde, le Hedge Rowe, le Rie Meadowe, Orpyns Close, Pisbis Felde, Covent Grounde, Milfurlonge, Quarrel Felde, Brome Hill, and Hokeland, parcel of the possessions of the late priorie of Lymbroke."

In Bound's *History of Wigmore* there appears the following:—"At Limebrook, near Lingen, was formerly a cell for canons, which belonged to Aveney in Normandy, and at a little distance near the river Lugg was a nunnery, of nuns of the Order of St. Augustine, founded by Robert de Lingham, by the aid of some of the Mortimer family. Some ruins are still to be seen near the banks of the river." The above was written in 1876.

A FEW NOTES ON THE BOTANY OF THE DISTRICT.

By Rev. Augustin Ley.

The route taken by the members of the Woolhope Club, in following the Valley of the Lugg from Presteign to Aymestrey, lay through a district rich in botanical interest. It is therefore disappointing to be able to record very few plants of note or interest which were seen upon the day. Later in the season, when brambles and roses would have been in condition to be studied, the botanists would have been able to give a better account of themselves. One or two plants, however, were seen which may be of sufficient interest to be mentioned. On walls quite close to the town of Presteign, but just within the county of Hereford, a white variety of the Ivy-leafed Toad-Flax, which we think as pretty as it is rare, was noticed. The roadside quarry and rocky banks under Stapleton Castle were covered with a profusion of the Curved Stonecrop, and one or two other members of this family, which are rare, were noticed on walls at Mortimer's Cross, and elsewhere during the course of the walk. A small but elegant plant of the Chickweed tribe, the Upright Mœnchia, which is rare in Herefordshire, was also seen abundantly on the steep grassy bank beneath Stapleton Castle; while in the ruins themselves the curious Henbane was picked. This plant frequents waste places near old ruins or buildings, where it has the habit of reappearing directly the soil is disturbed, after having been apparently lost for a long course of years. Whether it was ever cultivated we do not know; unless for medicinal purposes we fail to see any motive for the cultivation of so fœtid and poisonous a plant. One more interesting find, and one only, so far as we know, was made, in an abundant colony of the Common Club-Moss (very far, however, from common in Herefordshire), through which the route of the party took them on the north-west flank of Cole's Hill. One or two local mosses were also discovered. We should like to add that more than one pair both of the Dipper and the Common Sandpiper were noticed on the Lugg. It is interesting to know that these latter birds breed on the Lugg as well as on the Monnow, and, I believe, the Teme, in Herefordshire.

FURTHER NOTES ON THE ORNITHOLOGY AND BOTANY

By Donald Mathews.

Mr. Donald Mathews has sent the following list of birds and plants seen on the Field Meeting on Friday, May 27th, between Presteign and Aymestrey :—

BIRDS.

Falco tinnunculus, kestrel; *muscicapa grisola*, fly catcher; *cinclus aquaticus*, dipper; *pratincola rubicola*, stonechat; *p. rubetra*, whinchat; *sylvia atricapilla*, blackcap; *phylloscopus sibilatrix*, wood-wren; *regulus cristatus*, goldcrest; *certhia familiaris*, treecreeper; *parus palustris*, marshtit; *motacilla melanope*, gray wagtail; *m. rayi*, yellow wagtail; *anthus pratensis*, meadow pipit; *corvus corone*, carrion crow; *alcedo ispida*, kingfisher; *columba œnas*, stock dove; *turtur communis*, turtle dove; and *ardea cinerea*, heron. The more common birds have not been included.

PLANTS.

Hyoscyamus niger, *Mœnchia erecta*, *Doronicum plantagineum*, *Verbascum thapsus*, *Chelidonium majus*, *Viola lutea*, *Enonymus europœus*, *Sanguisorba officinalis*, *Cotyledon umbilicus*, *Jasione montana*, *Vaccinium myrtillus*, *Polygonum bistorta*, *Triglochin palustre*, and *Ophioglossum vulgatum*. The more common plants are not recorded.

THE BURNING OF THE BUSH.

With reference to previous remarks upon this subject, and the query on page 10, Mr. Wm. Langston, of Marston, Pembridge, writes, under date 27th October, 1899, to say that "The 'Burning of the Bush' is still kept up in this part of Herefordshire."

TREES AND HOW TO GROW THEM.

By H. J. Marshall.

Trees are grown either naturally, free from the control of man; or artificially, man controlling nature.

In the first case the planting is done with seed—wind-borne, sea-borne, or carried by birds, all sorts germinate and start for the struggle of life, suitable or unsuitable for the soil and situation, as the case may be. Those least suitable are easily suppressed and smothered by their more vigorous neighbours, and without much detriment to the survivors. But amongst the latter a war to the knife ensues, in which all suffer severely—some are killed down altogether, and perish to make food for their couquerors, while others, though overtopped and stunted, still hang on by the flanks of the victors, stunting their growth and anticipating their supplies as long as they can get light and air enough to ripen a leaf; until in the course of time man comes along with an axe, or a bush fire sweeps away conqueror and conquered, and a fresh forest of a different sort rises on the ashes of its predecessor.

In the second case, man selects, guided by the example of Nature, his first step being to ascertain what trees thrive upon the soil, and with the exposure of the land, he proposes to plant—obviously a simple proceeding.

Next he studies his market generally, and his nearest market principally, and here he is met by this difficulty, that, as his crop takes some years to mature, there must be considerable difficulty in forecasting market requirements at so distant a date. What seems to me to be the best way of arriving at a conclusion on this most vital point, is to hark back through the past, note what timber has been most in request in his district and for what purposes; eliminate all for which a demand can never be expected to recur (such for instance as crooked oak for shipbuilding), and "cover his market."

His next subject for consideration will be—should his plantations be each of one sort or all mixed; and according to my judgment the evidence available is conclusive in favour of mixed; and for these reasons:—In the first place, let his woodcraft be as good as it may, he may still err in his selection of trees for soil and situation; and by mixing, risk of failure is reduced. Secondly, nearly every tree is liable to disease of some sort; generally due to a parasite peculiar to itself: notably the larch, which is perhaps universally admitted to be at the head of the list of profitable trees suitable to our soil and climate, but is now looked upon with some suspicion owing to the fact that larch canker has been so well established amongst us by means of "whole

larch" plantations. It will therefore probably be admitted generally that by mixing your trees and not allowing larch, for instance, to rub against larch, or oak against oak, the spread of these parasitic attacks will not be promoted. Thirdly, we cannot doubt that the same rule of plant food applies to trees as to farm crops, and that the land gets sick of one sort of crop. As a proof, in all old forest lands not so subject to man's control, ample evidence exists that Nature has arranged alternation of crops—to take one instance only—in New Zealand in places where Kauri gum is quarried no Kauri trees are now to be found, and short of providing a succession of crops, we can at all events so arrange our trees that the fallen leaf of one shall provide a manure for the other, and that their roots intermingled shall seek out the food each requires. Having selected our trees, fenced in and planted our land, filled up all gaps as they occur, after some eight or twelve years the necessity for thinning begins to arise, and I know I shall be at variance with all authority when I say that it is just as necessary to have your trees equi-distant after thinning as it is admittedly after planting.

I have never seen anyone plant at varying distances, nor, so far, have I ever seen anyone thin out to even distances. I leave to "Authority" the explanation of this course of procedure, and the production of the arguments in favour of it, and shall satisfy myself by saying that if you wish your plantation level topped, and your trees of even size, you must leave them equal root room. To accomplish this, you must thin to even distances, and fill up gaps, should any occur, with a rather more rapid growing sort of tree A small matter if filling up has been attended to in the early days The time for thinning can be readily ascertained by measuring a sprinkling of marked trees, year by year, which will show by their decreasing rate of girth-growth when they begin to suffer from overcrowding.

Anyone taking the trouhle to examine the older trees, lying prone in a fall of coppicing. can see how the width between the rings increased after each fall, and decreased again as crowding was felt before the next fall.

Pruning is a subject on which authorities differ a good deal, but most deprecate—I confess that I believe in it thoroughly. In the face of the expressed disapproval of the said authorities I have in my own practice gone hesitatingly for some time, but, the further I go, the less I hesitate. A small belt of larch which I had to prune most severely on account of the presence of much disease, gave me the best average record of girth-growth during the last 12 months of any I had by $\frac{1}{4}$-inch.

So much for tree growth under control in new plantations. As regards the management of existing woods, such as the coppicing you see on the other side of the valley, and how to make it profitable, I can only say that it is of vital importance, but that time does not permit of my dealing with it here and now.

LIST OF BIRDS OBSERVED AT AYLSTONE HILL, HEREFORD.

By T. Hutchinson.

This list was not made for publication, but our Secretary, being at that time short of a paper for this meeting, requested me to let it appear in the *Transactions*. I am afraid ornithologists will not find many species worthy of note, but it may be of interest to some members of the Club to know that fifty-five different species of birds have been observed within so small an area as one garden, and that within a mile of the centre of the city. I have seen several other species on Aylstone Hill, such as the Brambling (*Fringilla montifringilla*), Stone Chat (*Saxicola rubicola*) Sand Martin (*Hirundo reparia*), Lapwing (*Vanellus cristatus*), etc, etc., but the list is confined strictly to birds observed in and from my own garden. To mention some of the more interesting species: I have seen the Heron (*Ardea cinerea*), Kestrel (*Falco tinnunculus*), and Wild Duck (*Anas boscas*) pass over. I have heard the Land-rail (*Crex pratensis*), and the Barn Owl (*Strix flammea*) close to the house. The Wood Pigeon often nests in the garden, and during the breeding season is very tame, feeding on the grass in front of the windows. Many birds are tamer at this time of the year, although at other times shy and wary. The Partridge (*Perdix cinerea*) and Magpie (*Pica caudata*) are instances of this. I have seen both close under the windows. The rarest bird in the list is the Pied Flycatcher (*Muscicapa atricapilla*), a male, which occurred two years ago, and stayed in the garden for half an hour. A Hawfinch (*Coccothraustes vulgaris*) paid me a visit several mornings in March last. The Nuthatch (*Sitta Europœa*) occurs commonly, and four Titmice; the Great and the Blue have taken possession of a disused pump in which they, one or other of them, have for some years made their nest. The most interesting bird to me is the Lesser Spotted Woodpecker (*Picus minor*), which for the last four or five years has during the months of March and April frequented an elm tree which some years ago had the top cut off, causing the bark to separate from the trunk, and so form a suitable sounding board for it to tap on with its beak, producing a loud whir-r-r-r sound which can be heard for a quarter of a mile at least. This is its call note. After the breeding season commences, the tapping ceases. The bird arrived this year toward the end of February. I once saw three of these birds on a tree in a garden in the Cathedral Close. I have also seen a Green Woodpecker (*Picus viridis*) busy at an ant-hill just in front of Aylstone Cottage.

While on the subject of birds, I wish to ask the meeting if the Club could not take some steps to enforce the provisions of the Wild Birds' Protection Act, 1880, 1881, 1884, which have practically remained a dead letter from the day they were passed. I would suggest

that a Committee be appointed to see if something cannot be done in this direction, and I beg to give notice that I will at our next meeting propose that a Committe be appointed for the purpose. Anyone interested in the matter will find a summary of the Acts in Whitaker's Almanack, 1898, p. 649.

There is one other matter to which I should like to refer. I read in last week's *Hereford Times* a letter professing to come from a member of the Club and signed "M.A., F.G.S.," complaining of the length of our excursions, and particularly of the arduousness of the meeting to-day, our meeting next month, and of one of the meetings last year. I think it is to be regretted that this gentleman did not attend the Annual Meeting, when the excursions were fixed, and raise his objection then. Anything he had to say would, I am sure, have been listened to with respect, and it would have been much better than airing his grievances anonymously in the local Press, a practice which is contrary to all the traditions of the Club.

List of birds observed at Aylstone Cottage, Hereford :—Blackbird (*Turdus merula*), Blackcap (*Curruca atricapilla*), Bullfinch (*Fyrrhula vulgaris*), Chaffinch (*Fringilla cælebs*), Chiffchaff (*Sylvia hippolais*), Creeper (*Certhia familiaris*), Crow (*Corvus corone*), Cuckoo (*Cuculus canorus*), Ring Dove (*Columba palumbus*), Turtle Dove (*Columba turtur*), Wild Duck (*Anas boscas*), Spotted Flycatcher (*Muscicapa grisola*), Pied Flycatcher (*Muscicapa atricapilla*), Goldfinch (*Coccothraustes elegans*), Greenfinch (*Coccothraustes chloris*), Hawfinch (*Coccothraustes vulgaris*), Common Heron (*Ardea cinerea*), Jackdaw (*Corvus monedula*), Jay (*Garrulus glandarius*), Kestrel (*Falco tinnunculus*), Kingfisher (*Alcedo ispida*), two killed by flying against window, Lapwing (*Vanellus vulgaris*), Common Linnet (*Linota cannabina*), Magpie (*Pica caudata*), Martin (*Hirundo urbica*), Nuthatch (*Sitta Europœa*), Barn Owl (*Strix flammea*), Partridge (*Perdix cinerea*), Landrail (*Crex pratensis*), heard, Redstart (*Ruticilla phœnicurus*), Fieldfare (*Turdus pilaris*), Redwing (*Turdus iliacus*), Gold-crested Wren (*Regulus cristatus*), Robin (*Erythaca rubecula*), Rook (*Corvus frugilegus*), Hedge Sparrow (*Accentor modularis*), House Sparrow (*Passer domesticus*), Starling (*Sturnus vulgaris*), Swallow (*Hirundo rustica*), Swift (*Cypselus apus*), Common Thrush (*Turdus musicus*), Missel Thrush (*Turdus viscivorus*), Great Titmouse (*Parus major*), Blue Titmouse (*Parus cæruleus*), Cole Titmouse (*Parus ater*), Marsh Titmouse (*Parus palustris*), Long-tailed Titmouse (*Parus caudatus*), Pied Wagtail (*Motacilla alba*), Grey Wagtail (*Motacilla melanope*), Whitethroat (*Curruca cinerea*), Lesser Whitethroat (*Curruca sylviella*), Green Woodpecker (*Picus viridis*), Lesser Spotted Woodpecker (*Picus minor*), Wren (*Troglodytes vulgaris*), Yellowhammer (*Emberiza citronella*).

Woolhope Naturalists' Field Club.

SECOND FIELD MEETING, THURSDAY, JUNE 30TH, 1898.

LLANTHONY ABBEY AND CHURCH, BY FATHER IGNATIUS' MONASTERY AND CAPEL-Y-FFIN, TO LLANIGON AND HAY.

GLORIOUS weather favoured the Club for their Second Field Meeting this year on Thursday, June 30th. Carriages from Abergavenny punctually met the party, more than fifty in number, at Llanvihangel Railway Station, and, after a drive of six miles and a half, halted for half an hour to allow an inspection of Llanthony Parish Church, in the grounds of Llanthony Priory. The Church is in the diocese of Llandaff, and is situated by the river Honddu, in the vale of Ewias, at the western foot in Monmouthshire of the Hatteral range of the Black Mountains.

We were met by the vicar, the Rev. Plaskitt C. Lewis, who conducted us over the building, and gave information respecting its history and recent restoration, under the supervision of Mr. J. James Spencer, architect, of Abergavenny. The restoration was largely due to the generosity of Lord Llangattock, Mr. Walter Savage Landor, and others.

The Church is a small and plain structure, consisting of a nave 52ft. long and 19ft. wide, a chancel 34ft. long and 15ft. wide, and a small north porch. On the western gable of the nave is a modern stone bell-cote. It stands on an elevation of 779ft. above the sea level. It is believed that it stands upon or near the site of a cell, built early in the sixth century by David, afterwards the Patron Saint of Wales, "where he passed a probationary period in solitude before he became Archbishop of Caerleon-upon Usk, and transformed his See to Menevia, the present St. David's." The chancel of this Church is probably the original Church, built by William and Ernisius, when the adjacent Priory of Canons-regular of the order of St. Austin was established in the early part of the 12th century. (See remarks by Mr. Thomas Blashill in *Transactions*, 1876, page 204). The inner arch is rebated for a gate or folding door, with holes for the hinges still existing. This probably formed the western entrance of the original Church, to which the nave was afterwards added as an infirmary for the sick and superannuated canons. The original fire-place, now built up, was at the west end of the nave, and has been modified for heating purposes of the present

day, and towards the east end are doorways in both the north and south walls. "The larger and more important, close to the position now occupied by the pulpit, is blocked, but as it apparently led into adjacent cloisters, and was opposite the Priory Church, it was no doubt a processional door by which the Canons, coming from the former building, passed into the infirmary, on their way to St. David's Church, close to the present chancel arch, its former entrance doorway." There is an aumbry in the north wall of the chancel. On the south side is a smaller recess, but no signs of rebating for an aumbry, nor any sign of a piscina; this probably served as a credence table. In the restoration the walls were not pointed but plastered, consequently some features remain hidden. There are two ancient slits above the chancel arch, whose objects are uncertain.

The doorways of the Church are pointed, whilst the windows are round-headed with broad splays inwards, thus marking the transition from the Norman to the Early English period of architecture. The ancient font is retained at the west end of the Church. The north porch is an addition of a later period, and has been recently rebuilt with the old stones, and it has a massive oak roof.

The Priory Church of Llanthony was dedicated to St. John Baptist. Reference to *Transactions*, 1891, page 203, shows that the Priory Church has a bearing of about five degrees to the south of east, being orientated for St. John Baptist's Day, September 24th. The Parish Church is orientated about twelve degrees south of east, for March 1st, St. David's Day. The Priory Church, 212 feet long, 50 feet wide, and 100 feet in width at the transepts, was erected not long after the chancel of the Parish Church was built.

The word Llanthony is derived from Llan Ddewi nant Honddu, *i.e.*, Church of David on the brook Honddu. The architecture of the buildings has been already treated in *Transactions*, 1876, p. 204, 1891, p. 199. See especially the critical remarks 1891, p. 209, by the Rev. John Davies, of Pandy, on the observations of the Rev. George Roberts, 1846, and of Professor Freeman in the *Archæologia Cambrensis*. At the suppression Llanthony had but £99 yearly, whilst the new Priory of Llanthony established at Gloucester by Milo, nephew of Hugh de Lacy, Earl of Hereford, who founded the original priory, was, on the authority of Speed, valued at £748.

At the dissolution Llanthony was granted to one Richard Arnold. In the last century it belonged to the Earls of Oxford; it then passed to Colonel Wood, by purchase from Lord Oxford, and then to Walter Savage Landor, the eminent author, whose son carefully regards the ruins with the respect they deserve. There are views of the ruins in the *Antiquities of Great Britain*, by T. Hearne and W. Bryne (1807), and, with a plan, in Coxe's *Historical Tour in Monmouthshire* (1801)—those in the latter work being after drawings by Sir R. C. Hoare, Bart.*

*An excellent plan of the remains of Llanthony Priory with a well-illustrated historical description forms the twenty-eighth series of "The Abbeys of Great Britain" on page 16 of *The Builder* for January 7th, 1899.—EDIT.

Resuming seats in the carriages after glancing into the fine specimen of pointed architecture of the Gate House, now converted into a barn, the members proceeded along the narrow road for another four miles to Capel-y-ffin, the Church of the boundary, viz. of Monmouthshire and Breconshire.

Father Ignatius' Monastery is in Breconshire, and in the diocese of St. David's. Its situation is half a mile west of Capel-y-ffin: it is in the same hamlet as Capel-y-ffin, namely, Glynfach, the little glen, or, Glynbwch, the glen of the stag, as it used to be called, and is situated in the parish of Llanigon. The small farmhouse adjoining Capel-y-ffin is in Blaenbwch, a hamlet of Glasbury, which entirely surrounds the little chapel; it is called the Chapel House.

The monastery was visited; but, unfortunately, Father Ignatius, who had kindly promised the visitors every attention in his power if at home, and was engaged from home. Father Ignatius' monastery is described on page 204 of *Transactions*, 1891. So also on the same page is Capel-y-ffin. Of the seven yew trees in the churchyard the largest girths 18 feet at five feet from the ground; the second largest measures 14 feet. There are also two other yew trees close to the churchyard, making a total of nine. Not one of these is planted upon the north side of the chapel.

CAPEL-Y-FFIN—THE CHURCH OF THE BOUNDARY.

Mr. Robert Clarke took photographs of this small chapel, and furnished particulars as follows:—This Church is in the diocese of St. David's. It is a rectangular building measuring externally 28 feet 6 inches by 18 feet. It has no chancel arch. It has a wooden bell turret on the west-end, and a south-porch. The early windows have been replaced by churchwarden windows. The font, however, remains; of the 12th century date, and it has a circular shaft supporting the octagonal bowl. The pulpit is in the late Jacobean style; on the front, under the book-board, is carved the following inscription:—"This pulpit, erected A.D. 1780. W. Bridgwater, D. Walker, churchwardens. R. Varrey, erector." It is unusual to meet with this word, but in some of the Welsh churches the word "undertaker" is sometimes met with. Of the two small bells with bell turret, the smaller is inscribed "Glory to God. September 9, 1716." The larger was recast by Llewellyn and James, 1895.

A bench mark on the western wall of Capel-y-ffin has an elevation of 1047·7 feet. At one o'clock the narrow cart track from the western end of Capel-y-ffin towards Hay was entered, with the river Honddu in the valley upon the right hand, and the gradually narrowing defile between the Black Mountains on the east, on whose summit is the boundary line, reaching in its greatest altitude 2,306 feet, between Herefordshire and Breconshire, and the more westerly spur

named Taren Llwyd, the northern extremity of which terminates in Rhiw Wen at the Twmpa, 2,263 feet. At half-past two the summit of the pass, three miles distant from Capel-y-ffin, was reached. It is on an elevation of 1,800 feet, and is called Bwlch-yr-Efengyl—the Pass of the Gospel—probably from its being the route of Archbishop Baldwin in 1188, on his journey from Talgarth to Llanthony, accompanied on his crusade through Wales by the historian Giraldus de Barri, Archdeacon of Brecon.* We have, half-a-mile west of Father Ignatius's monastery, Taren-yr-Esgob—the Bishop's Knoll—and near Patricio Pont-yr-Esgob—the Bishop's Bridge—over the river Grwynne, under the Fwddog Hill. The sudden opening of the extensive panorama in front on reaching Bwlch-yr-Efengyl is charmingly surprising. On the right is Pen-y-Beacon, 2,219 feet, on the left the edge of the rocks at Rhiw Wen 2,263 feet, in the foreground the cultivated fields of Radnorshire mapped out, and in the background, the hills of Shropshire, Radnorshire beyond Rhayader, the Carmarthenshire Vans, and the Breconshire Beacons.

The Rev. W. E. T. Morgan, vicar of Llanigon, met the members at Bwlch-yr-Efengyl and conducted the party to Llanigon, distant about three miles, skirting the base of Pen-y-Beacon, until near Twyn-y-beddau—the Mound of the Graves—the route led by Dan-y-Capel along the valley of the Cilonw Brook. Other members branched off in different directions. About a dozen ascended Rhiw Wen, which has been familiarly called Lord Hereford's Knob,† and descended to Llanigon by the valley of the Digedi. The parties eventually reunited at Llanigon, where, after inspecting the Church, they were hospitably entertained by the Vicar, ably assisted by his lady parishioners who had decorated the schoolroom with rare and gay wild flowers, and who presided at the various tea tables and waited on their grateful guests, whilst the Vicar gave us the local historical, legendary, and natural history associations which are appended.

This carefully prepared paper was highly commended and appreciated by the members, as expressed by our President in returning thanks to the writer.

The members, refreshed in mind and body, walked to Hay station after a delightful day's outing, including a walk of about ten miles.

Ordnance maps of the district are:—New Series, on the scale of one inch to one mile, Sheet 214 from Llanvihangel to Llanigon; and Sheet 197 from Llanigon to Hay.

*The Rev. W. E. T. Morgan writes to the Editor as follows:—"In a letter which I wrote to the *Brecon and Radnor Express* some time back, I discuss this question of the journey of Archbishop Baldwin from Brecon to Llanthony, through Talgarth, and conclude that he did not go so far north as the Bwlch-yr-Efengyl, but crossed either by Rhiw Wen, past Blaenybwch, or up a path on the left side of a dingle further south, called the Red Dingle, and the path Rhiw Cwnstab. On the left of the path, near the top of the hill, is a large stone, which has the appearance of being the shaft of an old cross, once placed on the brow of the hill, to direct pilgrims to Llanthony, or to commemorate the route of Archbishop Baldwin. Rhiw Wen, (the white path) is the zig-zag bridle path leading from Tregoyd to the top of Blaenbwch dingle. Wen, white, often signifies purity: here it may mean "the holy way," by which pilgrims crossed over to Llanthony.

†Lord Hereford's Knob is another name for the Twmpa, or, more correctly, "Twmpath," a mound.

The following is a list of the party:—The President, Rev H. B. D. Marshall, Revs. E. R. Burroughes, W. S. Clarke, R. Evans, J. E. Grasett, E. J. Holloway, A. G. Jones, Preb. W. H. Lambert, Canon R. J. Livingstone, R. T. Money-Kyrle, W. E. T. Morgan, A. Pope, F. S. Stooke-Vaughan, Preb. C. Warner, H. T. Williamson; Messrs. B. St. John Attwood-Mathews, Ernest Ballard, W. M. Baylis, R. Clarke, Luther Davis, Iltyd Gardner, H Scott Hall, T. Hutchinson, J. Lambe, Charles E. A. Moore, John Riley, C. Rootes, J. P. Sugden, J. R. Symonds, J. Woodward, H. Cecil Moore, Hon. Secretary, and James B. Pilley, Assistant Secretary. Visitors: Messrs. T. Blinkhorn, W. Boycott, W. H. Charles, W. E. de Winton, Rev. T. Emmott, M. W. Froude, F. Gardner, D. E. Holloway, Rev. Plaskitt C. Lewis, Rev. Stuart McArthur, D. R. W. D. Marshall, Rev. C. L. Money-Kyrle, Hugh J. Pitt, Walter Pitt, L. J. C. Riley, C. C. H. Riley, F. Shuttleworth, J. S. Stooke-Vaughan, Colonel William J. Thomas A.D.C., Colonel Henry Thomas, and Mr. C. E. Williamson.

NOTES ON LLANIGON PARISH.

By Rev. W. E. T. Morgan.

I am proud to welcome to-day a visit from so distinguished a body as the Woolhope Club.

You entered the parish some short distance before Capel y-ffin was reached. It is somewhat strange that this little chapel is entirely surrounded by Blaenbwch, a hamlet of Glasbury. Capel-y-ffin means "The Chapel of the Boundary," and near this spot the three counties of Hereford, Brecon, and Monmouth meet, and the three dioceses of Hereford, Llandaff, and St. David's, and also England and Wales. I have very little to say about Capel-y-ffin. The Church was rebuilt about 1820. It is situated in the hamlet of Glynfach, "The Little Glen," or, as it used to be called, "Glynbwch, "The Stag's Glen." There are seven yew trees in the churchyard, two on the left and five on the right of the path leading to the Church, planted in a semi-circle.

It may be of interest to notice that the modern Monastery of Father Ignatius is situated in Glynfach. A little above the Monastery, near a waterfall, may be found the somewhat rare fern, *Asplenium Viride.*

In the year 1708 a case was argued before the Ecclesiastical Court as to whether this chapel belonged to Glasbury or Llanigon, Lewis Thomas, vicar of Llanigon, refusing to serve it. It was decided in favour of Llanigon, and the Vicar ordered to perform the duties. There is a double endowment, one of tithes; the other of land. The services for many years have been performed by the Vicars of Cwmyoy, as curates-in-charge. At the top of the dingle is the celebrated pass Bwlch yr Efengyl, or "The Gospel Pass," or as others derive the name, Bwlch-y-fan-Cul," the pass of the narrow place." This spot is mentioned in a deed from Pope Honorius II. to Urban, Bishop of Llandaff, 1129, defining the boundaries of Llandaff diocese. It is given as Buch dir Mincul.. There is an old tradition in the parish that St. Paul crossed over this pass on his way to pay a visit to Caractacus, whose acquaintance he is supposed to have made in Rome, and who resided at the Celyn. To make the story more authentic, he is said to have lost one of his sandals on the mountain. From this spot there is a most commanding view of the beautiful valley of the Wye, and of the hills beyond.

In 1337, orders were issued by the Crown, "De hominibus arraiandis et ad ductores hominum Suthwalliœ ducendis," to the following, Bartolomeo de Burghershh, vel Ejus locum tenenti, aut ballivis suis in terris de Ewyas and Glynbegh, vel aliquâ parte Earundem. Also to Galfridi de Mortymer, vel et E in terris de Ewyas de Glynbegh, &c. Also to Willielmo le Blount, vel et in terris de Ewyas et Glynbegh, &c.

In 1403, on September 15th, King Henry IV. issued a deed authorising Sir William Beauchamp to grant pardons to certain Welshmen, his vassals, for having borne arms in Glyndwrdu's (Owen Glyndwr) cause against King Henry, and to empower Sir John Oldcastle and others to pardon certain inhabitants of the towns of Brecknock . . . Hay, Glynbough, and Dinas, to receive their weapons, and to oblige them to take an oath of fidelity.

This deed was dated at Devennock where the King then was. Jones, p. 164.

Camden speaks of "A lordship of Glinbock, within a mile of the Hay. It is no market town or castle; but at Llanigo appears a castle or tower."

This doubtless alludes to the mound in Bailey Court, where there probably existed at one time a watch tower to guard the road leading down to the Wye ford. On the opposite side of the brook is Penglomen, the "pigeon's head."

The following entry is taken from Lewis Dunn's Visitation of Wales, "Llan Eigen wrth y Gelli Penygenglwst."

And now we come to Llanigon. Llanigon is derived from Llan, a church, and Eigen, Eigen's church. There is another dedication suggested to Eigion, a son of Caw, and a Saint of the 6th century. We claim the first. Eigen was a daughter of Caradog (Caractacus), who was the son of "Bran ab Llyr." who is said by some to have first introduced Christianity into this country. According to Professor Rees, in his essay on the Welsh Saints, Eigen is claimed to be the first British female saint. She lived at the close of the first century, and was married to Sarllog, lord of Caer Sarllog, the present Old Sarum.

There are two wells in the parish named after her, one at the pine end of Mr. E. Phillips's workshop, the other, in Llwyn-Maddy meadow, the spring at the source of the brook which joins the Digedi near Llanthomas. Eigen is said to have lived at Trefynys, now Llanthomas. There was a later dedication of the Church—according to Ecton—to St. Nicholas.

The present edifice is a plain building with porch, nave, and chancel. The north chancel window is believed to be the original Norman window, redressed at the restoration in 1855. Mr. Nicholson, of Hereford, was I believe, the architect, and the work cost about £400, of which sum £200 was borrowed on the rates from the Public Works Loan Office. This mortgage is dated 11th December, 1854, and the sum paid up with interest in the year 1875. The south chancel window is also the original Early English window. The tracery of the old windows was unfortunately altered in 1855. The nave roof is barrel or waggon shaped, and ceiled. The priests' door in the chancel, and a door opposite the present entrance, and a small window adjoining the priests' door were closed at the restoration. The old east window was removed to the west end, and the present memorial window introduced to the memory of the 15th Viscount

Hereford. The vestry was added. The original chancel arch was much smaller than the present one, with a smaller one on the south side. There is a curious entry in the Parish Records, dated 1732, when permission was given to Mr. Henry Wellington to pierce this arch "for his own conveniency and also the conveniency of some part of the parish."

There were several mural paintings and texts on the old walls; on the north wall, opposite the present door, the text Isaiah lviii., 1; a little to the east the Lion and the Unicorn; a figure on the north of the old arch; and some device, with text, on the south-east wall. Also above the present door, Psalm lxxxiv., 10; and The Lord's Prayer and The Ten Commandments on the east wall. Jones, in his "History of Breconshire," remarks:—"The walls of the nave are bedaubed with caricatures of death and time, a wretched imitation of the King's arms, and 'many a holy text strewed around,' instead of which a litttle white-lime would be more ornamental, and, I fear have an equal effect in promoting the devotion or loyalty of the parishioners." The whole of the interior of the Church is now cased with brick. The nave roof has settled considerably towards the east, while all the walls are most irregular. The font in the porch is the old font, and was discovered about ten years ago buried among the rubbish under the vestry steps. The font outside (if it be a font) was found at Tymawr used as a flower vase. It is said to be very old, and was brought to Tymawr in 1883 from a field called Wern-newlands, where it was used as a drinking trough for cattle. (Mr. Stephen Williams, of Rhayader, considered it to be an old font. If so, may it not be the font of the old Chapel Capel-y-tair-ywen? Mr. Robert Clarke thinks that it is a catillus or quern.) Many people remember the old stocks and whipping-post near the lich gate.

The oldest stone in the churchyard is the one lying opposite the porch. It is probably a 13th century tombstone of a priest. It has a floriated cross of the fleur-de-lys pattern. There are a few Welsh inscriptions near the lich-gate, the oldest date, 1656.

The Church is about 440ft. above sea level.

The oldest Registers date back 1712. There are three bells. diameters 2ft. 10½in., 2ft. 7in. and 2ft. 5in. with the following inscriptions:—

Big Bell, Soli Deo Detor Glorya, William Watkins, George Delahay, C.W.I.P., 1670; (2) William Watkins, George Delahay, gent., C. Wardens, I.P., 1670; (3) William Watkins, George Delahay, C. Wardens, I.P., 1670. The coal shed was erected in 1849, when an old stone staircase to the bell chamber was closed.

The place names in the parish are entirely Welsh, often corrupted, so as to be almost past recognition. The fields, too, have their distinguishing names. No Welsh services have been conducted in the Church for at least a hundred years, and the Welsh language has nearly disappeared, although the parents of many of the

inhabitants spoke it. Llanigon is a vicarage; patron, the Lord Chancellor; commuted value £237 10s. 6d. The great tithes are of the same value, owned by Viscount Hereford. There is an old vicarage house, a cottage, near the Church. The new vicarage, built on land given by E. H. Greenly, Esq., was completed three years ago.

As in most rural parishes the population is decreasing, many of the small farms being now merely "by takes" to the larger ones, and many cottages having fallen into ruin. Large numbers of the inhabitants have migrated to the Works. The following statistics may be interesting. The population of the parish, including Glynfach, was in 1801, 458; 1811, 586; 1821, 596; 1831, 545; 1841, 547; 1851, 518; 1861, 484; 1871, 442; 1881, 410; 1891, 386.

The area of the parish is 8,380 acres—Llanigon 4,687, Glynfach 3693. The parish comprises three Manors, Haia Wallensis, Cilonow (Cil, the back, onen onwydd, of the ash trees), and Glynfach, or Glynbwch. There was formerly another Manor of Llanthomas, but it seems to have been merged into Haia Anglicana.

Haia Wallensis and Glynbwch now belong to Viscount Hereford, Haia Anglicana to Sir Joseph Russell Bailey, and Cilonow to Lord Ashburnham.

Llanigon probably at one time included the Manor of Haia Anglicana, but when Hay Castle was built by Sir Philip Walwyn, one of Bernard Newmarch's Knights, and a town in time sprang up around it, a Church was built, St. Mary's, about 1135, and a new district carved out of the mother parish of Llanigon. You are acquainted, I presume, with that interesting grant by William Revel, of Hay Church and endowments to the Benedictine Priory of St. John's, Brecon. There is frequent mention of our parish in the Cartulary of St. John's Priory, Brecon, commencing about 1150.

There is Henry of Hereford's grant of the churches of Hay and Llanigon, as William the Priest of Hay held them, to the Priory of St. John's, Brecon. It is spelt Egion. Then there is an agreement between Philip of Hay and his brother Richard respecting the tithes of Hay and Llanigon in 1175. Here it is spelt Eggian.

Gerald, Bishop of St. David's, confirms the grants of the churches of Hay and Llanigon in 1199.

William de Braose and Maud, his wife, confirm the grant of the churches of Hay, Llanigon, and Llangorse to Brecon Priory, and make provision for the services of these churches.

Pope Honorius III. takes the Priory under his protection, and confirms the grants made by the Bishop of St. David's of the churches of Hay, St. Egyon, Mara (Llangorse), and Talgarth, 26th January, 1222.

In 1253, Pope Innocent IV. gave the first-fruits and tenths of all eeclesiastical benefices to King Henry III. for three years, which occasioned a taxation in the following year, sometimes called "The Norwich Taxation," and sometimes "Pope Innocent's Valor." Here, again there is mention of St Eguino.

In 1288, Pope Nicholas IV. granted the tenths to King Edward I., for six years, towards defraying the expense of the Crusades, and a taxation was made of the possessions of the Priory of Brecon. This is known as "Pope Nicholas's taxation." Amongst the items appears the name of the Church of St. Eguino. There is also a record of the disposal of the tithe in Queen Elizabeth's reign; and in the Public Record Office an account of a grant from the Crown of the tithes and advowson of Llanigon in the reign of James I.

A note by the vicar, John Lloyd, dated July 1st, 1782, may be found in an old register book—"This Church, a vicarage, endowed with one half of the great tithes, dedicated to St. Nicholas, is in the patronage of the Prince of Wales, and was in early times appropriated to the Priory of Brecon, a religious house of the Benedictine order, founded by Bernard de Newmarch in the reign of Henry I., and was given by the 2nd Charter of Roger Fitzwalter, Earl of Hereford, grandson of our Conqueror Bernard, to the Priory of Brecon. It is there called St. Ægion. (I cannot find the parish mentioned in the 1st five Charters of Roger, but it appears in the 6th and 7th.) In the 26th of Henry VIII. there was a general survey of ecclesiastical benefices made under the authority of an Act of Parliament. In the return made by the Commissioners on this occasion the Vicarage of Llanigon was valued at £7 12s. 8½d., arising from tithes, fruits, &c. Upon the suppression of the Priory of Brecknock, the lands and possessions thereto belonging came into the hands of the Crown. In the first return after the dissolution, viz., the 29th Henry VIII., the Crown Steward or receiver answers for £6 13s. 4d. for the rectory of Llanigon, being for the fruits, tithes, oblations, and emoluments to the said rectory belonging demised by common seal at that rent. In the next reign (Edward VI.) the same rent is accounted for, and much the same description given, except that in this roll, the 6th of the King's reign, the Rectory of Llanigon is described as having been demised by lease of the Court of Augmentations in the 29th Henry VIII. to Edward Gostwike for 21 years. This lease is extant in the Augmentation office. In A.D. 1560 there was another lease made of this rectory at the same rent, viz., £6 13s. 4d. for another term of 21 years to Miles Horre, the particulars of which lease are in the Augmentation office."

In the 7th James I., the tithes of Llanigon were sold by the Crown to Morrice and Phelips.

The Parish Feast used to be held on the 20th September, if that day fell on a Sunday, if not, on the Sunday following. St. Nicholas Day is December 6th. The Iolo MSS., I believe, state that St. Eigen's Feast was observed on the 10th September.

Several of the old inhabitants remember well the keeping of the Feast. On the appointed day all the men and boys congregated together in the field adjoining the White Swan Inn, now the blacksmith's shop. Women used to bring up baskets of cake from Hay, and sell them about the field. Jugs of ale from the adjoining public house were freely

handed round. All the young men and women who were away in service used to return home for these festivities. A good deal of wrestling and fighting went on. Big rings were formed in Maeslan, and in the Penyrwrlodd meadow on the other side of the brook. The church bells were rung, and the porch was often strewed with pots, and cups, and broken glasses. Beer was drunk *ad lib.* There was then a public house—the Sun Inn—in what is now known as the Church House, which was afterwards moved across the road to the present shop. On Monday all the women and children joined the festivities, and all indulged in dancing to the strains of the harp and fiddle. All kinds of the choicest viands were cooked for the Feast. There was also much cock-fighting, and Rhoda Newall, the oldest inhabitant, declares that when she was quite a child she remembers on one occasion seeing a bull baited in Maeslan. A number of dogs were set on the bull, which roared and ran about the field, harried by the dogs, "a barbarous work," as she remarked.

The feast was kept up for a whole week. On Monday and Tuesday the riffraff danced at the two public-houses, and on Wednesday night the farmers' sons and daughters had a great ball. The feast began to die away in the Rev. G. Dowell's time, and was wholly abandoned about 35 years ago, when the Rev. W. J. Thomas was vicar of the parish.

There is only one Charity in the parish, a small farm, Caebwla, about 17 acres, left by Lewis Watkins, "for the maintenance of a charity school within the said parish of Llanigon."

The faculty for building the present schoolroom, which is situated in the churchyard, was granted by John Banks Jenkinson, Bishop of St. David's, dated 5th day of April, 1838.

The Woolhope Club paid a visit to Twyn-y-Beddau, "The mound of the graves," on the 25th May, 1872, an account of which is to be found in the *Transactions* for 1871-2-3. I must here add some notes which were left by the late Rev. T. W. Webb, of Hardwick. "One, if not two, cannon balls have been found near this spot. At the south-west side are three small upright stones, said to mark the burial places of as many chieftains, and to have been originally six feet high; which is, however, improbable. At the north-west, about 35 yards distant, had been three graves, one of which had been effaced; the others were lined with large rough slabs at the side. Flint flakes have been frequently found in the Waen Chapel (the ground west of the tumulus) and towards the Chwarel du, at the foot of the mountain, and on other parts of the plateau, occasionally of considerable size. I have a large core weighing 4lbs. They were formerly used often as gun-flints. Traditions differ much as to the parties in the last fight. The most credible refers it to the time of Edward III. One party is said to have come up the Capel-y-ffin dingle, the other through the New Forest dingle, and to have encamped (or rather bivouacked) the night before in the hollow at the extreme end of the latter, called Pant-y-beddau. The

fight began on the brow that is visible from the tumulus in the direction of the Bwlch, and was continued down to the tumulus, "and there they finished them." Blood stood deep in the battle-plain, and the name of the farm beneath, Maescoch, "the red field," seems to refer to it. Besides this there are confused stories of much fighting around the Birches in the direction of Craswall, and there is said to be a camp with a tumulus on that side. At Maescoch, it is said, were two tumuli, one in a meadow, Twynglas, which hardly looks artificial; the other in Caetwmpyn, now ploughed down. Nothing is said to have been found there but a rude earthen pipkin in the bottom of a hedge at some distance.

There is another tumulus, much less known, at some distance from Twyn-y-beddau, on the left hand of the track leading to Llanthony, and not far from the mouldering ruin of an old public-house called Rhydwernen. The name of this tumulus, which is in the form of a parallelogram, measuring about 30 yards by 12, is Twyn-cae'r-eithin. At no great distance, by the side of the green road leading to Llanthony, where it is crossed by another green trackway, is a large flat stone lying level with the turf. This is said to mark the burial place of the Scotch pedlar, "Cawr mawr," murdered there before the Union, but another, and perhaps preferable account, refers it to the ancient king, "Yr hen frenhin"; and the pedlar is said to be buried near Penlan, where there is a stone cross standing in a ditch. Another such stone, if not the same, is said to stand in Caemagorwydd. Not far from Twyn-cae'r-eithin, are three upright stones standing together on the open hill. These have been said to mark the burial place of three officers; but others call them the boundary stones of the Manors, which meet at this spot—Lord Hereford's and Lord Ashburnham's."

Just above Dan-y-Capel, on the open hill, are the remains of a small chapel, called Capel-y-tair-ywen—"The Chapel of the three yew trees." Some parts of the walls remained within the memory of man, but a quarry which has been opened on the spot has much defaced the site. The yew trees were standing in the last century. The chapel was dedicated to St. Celin, son of Caw ap Geraint ap Erbin, a saint of the 6th century. Jones suggests that the chapel was probably in ruins in 1576.

Some say that it was founded by St. Cyllin, son of "Caractacus." In a map dated 1806 this seems to be called Capel Brengoron; in another map Castell Brengoron. Bren is probably Bryn, and Coron a crown. It has been argued with some degree of ingenuity that there once existed here a college, founded by Eurgain (Eigen), daughter of Caradog. The idea emanates from the supposed discovery of this fact in the name Brengoron. As the proof is not decisive on the point, I prefer leaving the matter to be further investigated in the future.

The old barn of Maestorglwyd is of considerable interest, as an old tradition exists that it was once a Roman Catholic place of worship, and that the adjoining field was used as a burial ground. There is an

ecclesiastical arched doorway on the north side, and the roof is remarkable, with its oak beams and trifoliate decoration. At the west end there was a stable, and above it a room, once undoubtedly used as a dwelling place. There was a fireplace, and adjoining it was an aperture opening a few feet above the ground on the outside. This end was taken down in 1889, and these curious remains were destroyed. The wall at the base was nearly 6ft. thick. As there seems to be no evidence of its ecclesiastical use, there is another probable solution that it was once the old tithe barn, and that here the Steward from the Priory of Brecon, into whose hands the living had fallen, used annually to take up his abode while collecting the tithe corn into the barn, and housed his horse in the stable below.

There is another interesting barn in the parish, Llwynllwyd barn, which now belongs to Llanthomas Farm. A school was held in this barn for some years, under the mastership of the Rev. Vavasor Griffiths, pastor of the old Chapel of Maesyronen, or, more probably, of Maesgwyn. Here William Williams, or, as he is best known, "Williams of Pantycelyn, author of "Pêr Ganiedydd Cymru," received part of his education. He is said to have been converted on his way home from school, when listening to a sermon by Howell Harris in the churchyard of Talgarth in 1738. On the death of Mr. Griffiths in 1741 the school was removed to Haverfordwest. Two houses in the parish demand a passing notice, Llanthomas and Penyrwrlodd. The earliest known owner of Llanthomas was Walter Devereux, Earl Ferrers, Chief Justice of South Wales in 13 Henry VIII. Then it came into the possession of William Thomas, one of the Clerks of the Council, and principal instructor and adviser of King Edward VI., for whom he drew up several discourses and rules for his political conduct, which may be seen in Strype's Memorials. He was executed in 1554, in the reign of Queen Mary, ostensibly for treason in intending the death of the Queen, but really for some advice he had given her brother which it was supposed had been prejudicial to her, and for his adherence to the reformed religion. Penyrwrlodd, a fine old mansion, beautifully situated above the village. was once the residence of the Watkins family. The old part of the house was built in 1650 (the date may be seen over the porch) by William Watkins, an active partisan and an officer in the army of the Parliament against Charles I. He left behind him a splendid collection of Coats of Mail. He was one of the principal agents of the Propagators of the Gospel in Wales. The story is told of Joseph Arndell, a later owner of the property, that he was an infidel, who usually spent his Sunday in planning irrigation works for watering the meadows. After his death his ghost is supposed to have haunted the neighbourhood, and greatly disturbed people's minds. It was accordingly decided to hold a service, "reading him down," or "laying his ghost." Six of the neighbouring clergy assembled for this purpose. Each was provided with a candle, and they joined in reading a service of some sort, which was intended to bring the ghost to the spot.

Presently it appeared in the shape of a great bull, which terrified them all with its terrible bellowing. The courage of five out of the six failed them, their candles went out, and they fainted with fear, leaving the work of exorcism to be proceeded with by the remaining one. Strong in faith, he went on with the service, describing a circle with his candle, into which he entered, and concluded the prayers. "Why are you so fierce, Mr. Arndell?" quoth the parson to the bull. "Fierce I was when I was a man, but ten times fiercer now that I am a devil," replied the raging bull. As the service proceeded the bull was seen to grow smaller in proportions, until in the end it assumed the dimensions of a fly, when it was seized by the parson, and imprisoned in a box, and carried to the Long Wood of Penyrwrlodd, and buried in a well. Ever after the parish had peace.

This is a common legend. The same story is, I believe, told of a Mr. Vaughan, of Hargest, near Kington. The ceremony of "laying" him took place in Kington Church, and he was placed in a snuff-box.

Two Druidical altars are said to exist in the parish, one under an oak tree in the rough ground above Penyrwrlodd; the other in front of the Allt cottage.

The top of the Black Mountains is sandstone with conglomerate; and below, the Old Red Sandstone; while there is a great deal of limestone all over the parish, which once was much used, as traces of limekilns are found on most of the large farms. There are considerable quantities of petrified moss on the brook side.

Some of the waterfalls on the Cilonow brook are extremely picturesque and beautiful. The streams abound with trout, and there are a few eels. I have never seen a snake of any description in Breconshire, and only one in the parish of St. Harmon, during a residence of ten years in Radnorshire, although I hear that the adder has been seen here. Blind worms are common. Badgers have been caught in the parish of late years, and there is an earth at present in the wood opposite the Celyn. The glowworm may be seen in the parish. About two years ago a death's-head moth was caught in my garden. Excellent building and paving stones and tiles are found in the numerous quarries. Some small veins of lead were discovered and worked in the hill many years ago. "Charming" was very commonly practised here in days gone by, and indeed the art is occasionally resorted to in the present day. Everybody seems to have believed in it, and to have some tales to tell of extraordinary cures effected on man and beast. A few of these charms which I collected appeared in *Folk Lore* for June and September, 1895.

The following dates may be still seen in the parish, three at Maescoch, one on the lintel of the back kitchen door, 1638; another on an upright in the barn, 1681; and a third, 1678, above the kitchen door leading to the stairs. At Cwmcoinant, on the parlour mantelpiece, D. L. 1780. P.P.; and on the lintel of the barn door,

H P

1692

At Penlan on a beam across the barndoor, 1671, F. P. At Danycapel, above the door leading to the kitchen, 1640; and a curious stone above the barn door—

"A. BRUTE,
Aged 17,
1781."

Brute is well-known as a family name in the district. Date on wardrobe in vestry, 1686. Besides the date 1650 on the porch at Penyrwrlodd, there is another on the present stable wall.

W.
I. H.,
1708.

On the Church House a stone,

IOHN DELEHAY ANODNI 1692.

There are two entries which I should like to notice from an old parish book, dated Easter, 1838—24 Manchets for the Communion, 2s. Perhaps some of you know the Hospital of St. Cross, near Winchester, where an old bequest has left for every traveller "a horn of beer and a manchet of bread," at the porter's lodge.

In an entry, dated 1836, is a sum of 2s. 6d. for mending the Scullion gate (in a later entry it is spelt Scallion). The Scallion (Lich-gate) is a common word in this neighbourhood. Halliwell gives Scallage (a Lich-gate) as a western word.* In a list of Radnorshire words which I furnished to the English Dialect Society some years ago, I introduced this word, and had a correspondence with Professor Skeat on the subject. I think he suggested as the root of the word Scalu, A.S., a shell, a coffin. The Welsh for a Lich-gate is Porthysgrin.

With regard to the history of Nonconformity in the parish, I have nothing to add to a paper which I prepared for the Club last year, on "Olchon," which has been published in the *Transactions* of 1897, page 264.

In 1629 a special commission, No. 5875, was issued by Charles I. to Sir Richard Hopton: "Whereas Sir Robert Heath did lately exhibite an English bill or information into this Court against Thomas Gwynn, Esq, James Tomkins, James Lloyd, and divers others, showing thereby that Edward, last Duke of Buckingham, was seized in fee of the lordship and manor of Haya Glynbough, in the county of Brecknock, whereof the manor of Llanthomas, Kyllonow, fforren part Weston hamlett, otherwise called Haya Anglicana, the town of Haya, the fforrest of Yarle and Parkbach . . . . have by all the memory of man beene parcell which Duke, about 12th May in the 13th year of Henry VIII., being attainted of high treason, the premisses became forfeited to Henry VIII. After whose decease the premisses descended to Edward VI. . . . . Mary . . . . Elizabeth . . . . James, who by his letters patent bearing date the 7th year of his reign,

*There is a Scallion Gate now at Clodock.—EDIT.

granted certain lands and tenements to Howell Gwynn, deceased, and James Tomkins. . . . And that the said Gwynn and Tomkins, by color of that grant, entered into castle and mannor of Haya Glynbough, Haya Fforrein, Weston Hamlett, the towne of Haye, the Fforest and Park Baugh, not comprised in the letters patents. . . . Forasmuch as it appeared that Mr. T. and Mr. G. claime nothing in the mannor of H. Wallensis, otherwise H. Glynbough, the Courte did allow the said mannor of H. Anglicana to appertain and belong to his Majesty . . . and it was thought fitt that a Commission should be awarded to set out the said mannors one from the other.

Special Commission, Anno 5, Charles I., No. 5,876, addressed to John Hoskins (serviento ad legem), Richard Hopton, soldier, John Shuter, Esq. May it please your lordship—

That whereas a Commission, &c., &c. We have directed our precepts unto . . . to be and personally appear before us, at the Markett House, in the town of Haye, on Thursday, 20th of this instant month of August, by 9 of the clock. . . . And then was produced unto us by Watkin Lewis a copy of our Inquisition, taken in the xxvi. Edward I., upon the death of Humfrey Bohun, late Earl of Hereford and Essex, that he died seized of the castle of the Haye and of 30 tenements in Weston, mentioning the particulars of the lands, in the whole amounting to 315 acres, 2 roods, and the rents thereof at the end of the same summed up to be £7 19s. 10d., and another inquisition taken in x. of Edward III., upon the death of John, Earle of Hereford, that he died seized of the Manor and Castle of Hay, and that is there de redditu Assisar liberorum tenentium tam Anglicorum quam Wallicorum £14 10s. 9d.

And a parchment roll endorsed Hay Computum ibidem of the accompts and proffits of the Manor, Castell, fforest, and boroughe of Hay in the time of King Edward III., and another parchment roll of the profits of the same from Michaelmas in vi. Richard II. to Michaelmas of vii. of the same King, and again to Michaelmas of viii. . . . in all which rolles is expressed and set down what the custom rentes of Weston were and what the fforreine rents were . . . and also an olde written paper booke was produced by the said W. L., which he affirmeth to be a true copy of the custome bookes, and customes and rents, and of the names of the tenants and their rents in Weston and in the fforeign. . . . And there was also produced before us by Evan Thomas a deed dated x. Henry VII. of a garden lying in Weston which afterwards appeared unto us upon a view to be at the west ende of the town of Haye according to his relation withoute the walls near unto the church there, and there was also produced before us by William Watkins, gentleman, a deed dated 46 Edward III. of a tenement and landes in suburbia villæ de Haya in loco qui dicitur Weston between the churchyard of the said church at the west ende of the said towne, and the towne walls from the King's Highway, there to Wye, and deposeth that under his father he himself enjoyeth the

tenements and landes bounden by the said deed, and saieth that he hath heard about 15 years since that there was a place called Weston, but certainly did not know it till about five years agone when he first came to the sight of the said deede, and the said Watkin Lewis . . . . showed a field called Churchfield which he said was parcel of Weston, and said that he could show us the boundaries of Weston . . . and the defendant, Mr. Gwynne, then also produced a book of accountes and recognitions in 10 Henrici 8th Computus præposit Edwardi Ducis Buckingham under the title of Haya Anglicana, wherein the rentes of the fforrein are expressed and a copy of the Letters Pattentes 14 Henrici 8 made by King Henry VIII. to the Lord Stafford intayle by the name of Haye Castle Mannor Boroughe Anglicana Haya fforest cum pertinentiis et redditus fforinsec. And in 33 Henrici 8 a rolle in parchment of recognitions of the tenements of the landes called English Haye, wherein is redditus fforinsec, et terra dominicalis in church field and other fieldes; and 33 Hen. 8 the said booke agreeinge with the saide rolle, and 34 Henrici 8 a parchment rolle computus Thomœ Waters deputatus, Thomœ Whitney, balliff, reddit fforin' in Margin' et de John ap Powell ap Roger de eisdem et clauso vocat, Watgull in church field, terra dominicalis in church field et account pro fforest. And in the seconde yeare of the reigne of Queen Mary a grante of the reversion to the Lord Stafford recit' Castrum de Haya et Castrum de Haya Anglicana prædict', and in the first yeare of King James, at a Court holden by the said Watkin Lewis, recognit' acr' per reddit' per annum 4s. per nomen Llangwathan, and 7 Jac. a grante of reddit' fforinsee? to James Tomkins and Howell Gwynne. And the witnesses produced on behalfe of the said defendant, Mr. Gwynne, doe say as followeth:—1, David Thomas, aged 70; 2, William Jones, 78; 3, William Thomas Williams, 75; 4, John Prichard, 46; 5, Hughe Phillips, 72; 6, William Whitney, 50; 7, John James, 51; 8, Thomas Parry, 68; 9, John Thomas, 60; 10, Lewis Watkins, 70; to the effect that they have never heard of Weston or only of late, and that they cannot mete out the fforein, but that it is part of English Haye. No. 3 'thinketh that the fforein reacheth from the liberties of the town toward Cusoppe, and withoute the towne to Wye and to the Welshe Haye in some places.' No. 4 'taketh it to bee parte of the English Haye for that the Steward at the rising of the Courte of the fforren would bidd them praye for the Lorde of the English Haye and called them that appered sometimes men of the countrey, sometimes men under the fforrest, and sometimes men of the fforein.' No. 6 'taketh the fforein doth belong to the Castle of the English Haye and that the baylif's officers of the Towne cannot arrest within the fforein and that the fforein reacheth Southwardes from the Castle to Henallt, and to Dulas towards Cusop Eastward.' No 8 'Sayeth that those without the Towne came to the Courte of the fforein, and that most of the fforein lieth southward towardes the fforest.' No. 10 'Sayeth that he hath known the towne of the Haye this 50 years, and that for all that tyme the tennantes of the

fforein have done suite to William Boyle and the defendante Mr. Gwynne and his father."

The Decree founded on the above evidence dated "Friday, 27th June, after reciting the above statements, adds that the Manor of Welsh Haye was given by Queen Elizabeth in the 30th year of her reign to Edward Lord Stafford for 60 years, and that the rent rolles of the tenants showed that the lands 'infra Dria de Glynbough do lye in the forreine,' and that the rent for the same were paid by them unto the said Thomas Gwynne, and by him claimed as parcell of the Manor of Haya Anglicana, and further stating 'that the Manor of Haya Wallensis is severed by noted and knowne Tumpes Stones markes and boundes from the Mannor of H. A., and adjoyneth unto the fforreine which lieth on the East and South-Easte part of it, which Mannor of Welch Haye extendeth from the river Wye unto a hill called Hainault, and from thence to a little purle of water or gutter called Ffos-y-ffin adjoynning to the forest on the S.E., which forest lyeth within the fforein and from thence by knowne markes to a Tumpe called Brynybedd, and soe over the Black Mountaine by the Parke Baugh in the tenure of the said T.G., and that a messuage in the tenure of the sd. Watkin Hœll Lewis called Llangathen, there lyinge without the aforesaid boundes of the said mannor of H W. which he holdeth of the mannor of H. W. at the yearly rent of xviii. £ is parte and parcel of the same mannor, &c., &c. It is ordered that . . . . soe much of the saide lande as by the aforesaide certificate of the Commissioners appeareth to be part of H. W., shall be settled, with the King's Majesty, and for that part wh. is left by the sd. Commissioners in an uncertaintie. It is ordered that a newe commission," &c., &c.

I wish to add a few notes supplied to me on the birds of the parish by Miss C. A. Thomas; and on the wild flowers by Miss E. B. Thomas, of Llanthomas.

ORNITHOLOGY OF THE DISTRICT.

By Miss C. A. Thomas.

Eighty-seven kinds of birds have been seen in the parish, among which may be mentioned the following:—Black redstart (seen once years ago), garden warbler (uncommon), yellow wagtail (less common than formerly), lesser spotted woodpecker, kite (very rare), heron, raven (rather rare), kingfisher (rare), turtle dove, nightjar, snow bunting (not quite certain), Richard's pipit (not quite certain), wild goose (specimen not identified), gull (specimen not identified), ring ouzel, lesser grebe (nearly certain), water rail, blackcock, lesser whitethroat (not common), grasshopper warbler.

BOTANY OF THE DISTRICT.

By Miss Edith Thomas.

The parish is rich in wild flowers, among the more rare species are the following:—*Adoxa moschatéllina, aspérula odoráta, campánula pátula, chelidónium majus, chrysosplenium alternifolium, carlina vulgaris, eupatorium cannábinum, geranium lúcidum, geranium praténsé, geranium sylváticum* (one place), *gentiána campestris* (one place), *géum intermedium* (Tregoyd Wood), *geum riválé, hypéricum androsæmum, inula helénium, lactúca murális, linaria cymbalária, listera ováta, menyanthes trifoliata* (Tregoyd Wood), *myrrhis odorata* (one place), *neottia spirális* (one place), *orchis incarnata, páris quadrifolia, pinguicula vulgáris, polygonum bistorta, prunus, padus, ranunculus lingua* (Tregoyd Pool), *sambúcus ébulus, saxifraga granuláta, scutellaria galericulata* (Tregoyd Pool), *solánum dulcamára, spérgula arvensis, tragopógon pratensis, trollius europœus, valeriána officinális, vícia sylvática, víburnum ópulus.*

THE BLACK MOUNTAINS—LLANTHONY AND LLANIGON.

[By a Visitor—Mr. F. SHUTTLEWORTH].

LIKE clouds that float at rest upon the blue horizon, in the distance stand the Black Mountains of Herefordshire and the Welsh borderland Majestic yet not stupendous, beautiful yet hardly sublime, wild and dreary, yet with surroundings which have a fertility peculiar to themselves, these mountains possess an attraction for me and many others that is difficult to define, but the power of which is intensely strong, and the influence mysteriously pleasing and welcome. Ruskin says: "To myself mountains are the beginning and the end of all natural scenery; in them and in forms of inferior landscape that lead to them my affections are wholly bound up. The slightest rise and fall in the road—a mossy bank at the side of a crag of chalk, with brambles at its brow, overhanging it—a ripple over three or four stones in the stream by the hedge—above all, a wild bit of ferny ground under a fir or two, looking as if, possibly, one might see a hill if one got to the other side of the trees, will instantly give me intense delight, because the shadow, or the hope, of the hills is in them." The emotional and even religious influence of mountains on some minds is singularly strong, and those who find pleasure in travelling among the mountains which form the principal subject of this narrative cannot fail to appreciate the force of this sentiment, and the ever varying delights of which Ruskin speaks. The Black Mountains consist of a remarkable triple range of hills, united by an immense bluff or cross range at the northernmost end, and presenting the openings of two narrow valleys—the Vale of Ewyas and the Vale of Grwyne. It matters not whether you tramp the heath on the top of the hills or wander through the pretty vales "lying in pensive quietness between," there is always a subtle charm pervading the neighbourhood. The mountains are bold and rugged, the valleys are charmingly secluded, and the streams that meander through the vales are picturesque in the extreme. And then there are the romantic ruins of Llanthony, the remarkable escarpment at Cwmyoy, several interesting old camps, and the crowning height of Pen-y-cadr-vawr, which peeps above the main ranges like an old Welsh sentinel keeping guard o'er his sleeping confrères. The district, too, teems in historical incident and

> "Many a tale
> Traditionary round the mountains hangs."

The Woolhope Naturalists' Field Club last year went over a portion of the Black Mountains by way of the Olchon Valley, and the excursion proved so enjoyable that it was decided that another of the valleys should be visited this year. This outing, which took place last Thursday, proved exceptionally pleasing, and it is hoped in many

quarters that another part of the range will be visited next year. The train conveying the members and friends left Hereford at a quarter past nine, and upon arrival in due time at Llanfihangel-cru-corney, a number of conveyances were found in readiness to convey them up the sweet Ewyas Valley. The road lay along the bottom of the valley, beside the murmuring Honddu, and the mountains, towering heavenward on every hand, effectually shut out the vale from the outer world. Each turn in the road unfolded to our delighted gaze some new beauty, as each fresh vista of the mountains opened out. At times a mist hung heavily around and partially obscured the landscape; then the sunlight played around the mountain top, and the light and shade played hide and seek on the swelling ground and hollows. Here and there a deep furrow down the mountain side told the tale of the tiny mountain spring and how

> "The bursting clouds
> To fury rouse the gentle brooks."

The lane we were pursuing was very narrow, and overhung by high hedges, but the surface for the most part was fairly good, and our position in the conveyance gave us the advantage of a good look-out. When that entertaining writer, Archdeacon Coxe, came this way about a century ago, his experience was very different to ours. He says:—"After catching a transient view of the Honddy, winding through a deep glen, at the foot of the hills overspread with wood and sprinkled with white cottages, we proceeded along a hollow way, which deepened as we advanced, and was scarcely broad enough to admit the carriage. In this road, which with more propriety might be termed a ditch, we heard the roar of the torrent beneath, but seldom enjoyed a view of the circumjacent scenery. We passed under a bridge, thrown across the chasm, to preserve the communication between the fields on each side; this bridge was framed of the trunks of trees, and secured with side rails, to prevent the tottering passenger from falling into the abyss beneath. Emerging from this gloomy way, we were struck with the romantic village of Cwmyoy, on the opposite bank of the Honddy, hanging on the sides of abrupt cliffs, under a perpendicular rock broken into enormous fissures. We continued for some way between the torrent and the Gaer, and again plunged into a hollow road, where we were inclosed, and saw nothing but the overhanging hedgerows. I would not recommend timid persons to pass this way in a carriage, for, in the whole course of my travels, I seldom met with one more inconvenient and unsafe. Excepting in very few places, there is not room for a single horse to pass by a chaise; and should two carriages meet, neither could proceed until one was drawn backwards to a considerable distance. The soil is boggy in wet, and rough in dry, weather; the ruts worn by the small Welsh cars are extremely deep, and oftentimes we were prevented from being overturned only by the narrowness of the road, and the steepness of the sides, which would not allow the carriage to fall obliquely." Could this have been the self-same road we travelled

on last Thursday, or was it the Celtic lane which the present highway in part embodies, and which in others lies deep down alongside—a veritable "hollow way," a ditch?

As we drew near Cwmyoy, we noticed with interest its remarkable rocks and the picturesque whitewashed cottages on the hillside. Then a few miles further up the valley, we caught sight of the romantic ruins of Llanthony Abbey, and shortly afterwards, after negotiating a sharp bend in the road, we were alighting at the gates. The Club has several times before visited Llanthony, and therefore only a short time now was spent among the ruins. However, we wandered around the noble arches and paced the elastic turf that has taken the place of the pavement, much interested in what we saw. Although the ruins themselves cannot be compared to Tintern Abbey, yet they have many attractive features, and their situation among the lonely mountains lends them an additional charm. "The yellow tints, which age has imparted to the grey stone," wrote Archdeacon Coxe, "produce a pleasing and mellow effect, the breadth and massive remains of the dilapidated tower are relieved, in every point of view, by the mountains in the background, and the general character of the whole is majestic simplicity. These ruins derive also a peculiar beauty from their situation in the deep vale of Ewias, which unites dreariness and fertility, and is well adapted to monastic solitude. The vale itself is fertile in corn and pasture, occasionally tufted with trees, and enlivened by the transparent and murmuring Honddy. It is wholly encircled by an amphitheatre of bleak and lofty mountains, which seem to exclude all intercourse with the rest of the habitable world. Hence it presents different aspects – in a serene sky and glowing sunshine the landscape conveys the idea of a pleasing retirement; under a loaded atmosphere and in cloudy weather, gloom and dreariness predominate." Giraldus, who regarded the spot as specially marked out for heavenly contemplation, "a spot happily chosen, and one that moves the kind affections," says: "Here the monks, sitting in their cloisters, when they choose to refresh their eyes by looking upward from their books, may see rising over the roofs of their dwellings on every side the mountain tops which seem to touch the sky, and often the goats or wild deer feeding on the summit, and appearing as if on the verge of the horizon." The goats and wild deer are no more, and their places are taken by nimble-footed sheep and ponies, but the everlasting mountains remain the same as when first the monks selected this romantic site for the exercise of their devotions. But now

> "No incense rises save some chance wildflower
> Breaths grateful to the air—no hymn is heard,
> No sound—but the bat's melancholy wings,
> And desolation breathes from all around."

Leaving the Abbey—or Priory as I believe it should be correctly designated—we proceeded to inspect, under the guidance of the Vicar (the Rev. Plaskitt C. Lewis), the Parish Church, which stands in the

monastic grounds. As this has been elsewhere described, it is un necessary to linger now on its architectural or historical details.

At the west of the Abbey ruins several members of the Club inspected an ancient barn, in which is a fine arch. which is supposed, says Archdeacon Coxe, to have formed the grand entrance into the Abbey.

The carriages were at length re-entered, and the party proceeded on the four mile ascent to the elevation of 1047·7 feet at Capel-y-ffin, in the parish of Llanigon, Breconshire. When we reached the parting of the ways, we left the conveyances for good. The majority of the members proceeded first to the left to pay a visit to the latter-day monastery of the celebrated Father Ignatius. We wound up along a narrow lane, moist with recent rain, and there appeared a silence about the place that could be almost felt. Past the tiny school, on past the "pilgrim's rest," we went to the porch of the monastic buildings, the door of which bears the inscription: "Blessed is he that cometh in the name of the Lord. Jesus only. Pax." No one, however, answered our repeated rings at the bell, perhaps owing to the fact that a service in the church was not quite over at that time, so after waiting a few minutes the party proceeded to inspect the church. Huge grilled gates shut off the secular from the monastic church, and by peeping through the grill we were enabled to obtain a look at the high altar. In the secular church we saw another altar, at which I believe visiting married clergy officiate at Mass, only celibates being allowed to officiate at the high altar. Here was also the life-size image of "Our Ladye of Llanthony," the story of whose appearance in a meadow near by is well known.

From the monastery we retraced our steps down the lane, and then round to Capel-y-ffin, the Church of the Boundary, over the little bridge where the rippling Honddu "makes sweet music with the stones." At this spot the boundaries of Herefordshire, Breconshire, and Monmouthshire, and the dioceses of Hereford, St. David, and Llandaff unite. Capel-y-ffin itself is an uninteresting little structure—if it is interesting for anything, it is so for its diminutive size and primitive fittings. The chapel could hardly hold twenty persons. There is, however, a fine row of yew trees in the little churchyard.

The walk was soon commenced to Bwlch-yr-Efengyl, the "Pass of the Gospel." The scenery now got wilder. The mountains loomed on either side, and as we rose higher the air began to freshen. Every now and then a little rill of water crossed the trackway, and fell picturesquely to the gully below. The road at length dispensed with hedgerows and took to the open, and to the left loose rocks fallen from the mountain above lay strewn all over the ground. At length the summit of the pass between the mountains was reached, 1,800 feet high, and a magnificent view was spread out before us.

"Ah, that such beauty, varying in the light
Of living Nature, cannot be portrayed
By words, nor by the pencil's silent skill,
But is the property of him alone
Who hath beheld it, noted it with care,
And in his mind recorded it with love."

The country for miles lay spread out before us like a huge map—hills succeeded hills, and valleys valleys, and in the far distance some of the mountains of North Wales were visible. It was indeed a superb sight, and one that will dwell long in the memory of those who saw it. The wind meanwhile was whistling keenly around us, so under the guidance of the Rev. W. E. T. Morgan (vicar of Llanigon) and Colonel Henry Pateshall Thomas we pushed on down the slope to Llanigon. Sometimes along a green trail, and then through the fern we went, until at length a lane was reached, but still rapidly descending we passed on. At length a halt was called at an interesting old farm house, Penyrwrlodd—the head of the meadow, which was duly inspected by the Club. Thence across the fields we went to Llanigon, where the Vicar and Colonel Wm. Thomas, of Llanthomas, showed us over the church, and then Mr. Morgan invited us to tea in the schoolroom. It was a meal we were well ready for, and the thoughtfulness that provided it was duly appreciated by the Club Several ladies presided at the tables, and altogether the tea was a great success.

As the meal was drawing to a close, the Rev. W. E. T. Morgan commenced to read some "Notes on Llanigon" which he had prepared for the occasion. The paper, which had been very carefully prepared, was of a most instructive character, and gave a new meaning to the country we had just passed through, as it dealt, among other things, with every object of interest we had seen.

The President heartily thanked the Vicar for his paper, and alluded to the fact that the tables were decorated with the wild flowers of the parish—(applause).

The members at once had to make a move towards Hay, some awheel and some afoot, for the train left at half-past six. The station was reached in due time, and, as the train steamed away towards Hereford, we caught many a glimpse in the distance of the mountains where we had spent such an enjoyable day, until at length they faded from view like clouds

"By the midnight breezes strewn."

Woolhope Naturalists' Field Club.

THIRD FIELD MEETING, LADIES' DAY, THURSDAY, JULY 28TH, 1898.

GLOUCESTER CATHEDRAL, TEWKESBURY ABBEY, AND MALVERN PRIORY.

THE Ladies' Day has again come and passed, so attractive was the programme that at first it threatened to be overwhelmingly patronised, until it was discovered that numerous other events of local interest to Herefordians were due in the calendar of the same day. Notwithstanding all these counter attractions which appealed especially to parents, to *old* girls (the writer fortunately is anonymous) and to old boys of all the principal schools in Hereford, a muster of seventy members and their friends assembled to visit the beautiful buildings of Gloucester Cathedral, Tewkesbury Abbey, and Malvern Priory.

So many volumes have been written of the history and of the periods of architecture of the component parts of each of these buildings, that in these Victorian days of cheap literature, with the facility and cheapness of reproduction of the most exquisite tracery by photography, the student of architecture has great advantages in making himself familiar with the various styles of progression in this enchanting subject. With all the advantages of the present day, with its schools of science and art, its University Extension lectures (amongst which we in our city have found none more popular than those upon architecture), the nation has acquired a legion of scholars, an enormous increase of draftsmen and architects, and a great advance in the beauty of our buildings during the last half century. Nevertheless the architecture of to-day has not eclipsed that of many centuries ago in either grandeur, elegance, or sublimity of design.

To the student of church architecture it proved most unexpectedly appropriate to visit these three buildings upon the same day; even the much smaller building of Malvern Priory upon which, comparatively, but little wealth had been expended, betrays the same architectural lines in its mixture of Norman and perpendicular work from its earliest foundation to its battlemented tower; nor is this at all surprising when it is considered that the periods of building were the same, and that Tewkesbury and Gloucester in those earlier days were included in the diocese of Worcester.

It is an intellectual treat to hear the salient features of a building explained by a teacher who knows it and loves it. To judge from his writings none can love his Cathedral more fervently than the present Dean of Gloucester, the Very Rev. H. D. M. Spence, D.D. In reply to our appeal to him the Dean wrote from the Continent that he "would have been very pleased to have shown the Woolhope Naturalists' Field Club party over the Cathedral had he been at home." The vergers engaged for two hours the attention of their listeners until the time came to meet the train for Tewkesbury: and it may safely be affirmed that the inspection was more thoroughly enjoyed and appreciated by those who had found time to follow the instructions given in the programme, viz., to read beforehand the two articles in *Good Words* for 1892 from the loving hand of the Dean of Gloucester, or even an epitome of the same in No. 3 of "The Grosvenor Series" of our Cathedrals, entitled "The Great Abbeys of the Severn lands." In *Good Words* the Dean in a lucid manner compares the interior arrangements of Tewkesbury Abbey on a slightly smaller scale with its sister foundation of Gloucester, indicating the similar architectural design, and their dissimilarity by the introduction of Gothic "casing" or "veneering," subsequently called Perpendicular, upon the old Norman work at Gloucester, whereas the "casing" at Tewkesbury is pure Decorated in style. In Gloucester it is interesting to look upon the earliest specimens of Perpendicular work in our kingdom, and delightful to feast one's eyes upon lierne groining of exquisite lightness and design.

This is not the place to attempt even in epitome a description of this noble edifice, since pages would be required to do justice to it. The student should obtain *Records of Gloucester Cathedral*, 1882-3, Vol. 1, and Vol. 2, 1883—4, in which he will find articles by Freeman, T. Gambier Parry, the Bishop of Durham, Sir W. V. Guise, F. S. Waller, and many other eminent authorities.

Some interesting early historical reading will be found in an article by the Very Rev. H. D. M. Spence, Dean of Gloucester, in *Good Words*, 1892, page 388, under the heading "How I found the remains of Osric, King of Northumbria," the founder of Worcester Abbey, buried A.D. 729.

Similar remarks may be made of Tewkesbury Abbey, whose architecture and history are lovingly pictured, and whose sacrilegious desecration by the pursuing victorious Yorkists is feelingly pourtrayed in *Good Words* by the Dean of Gloucester. There are numerous local handbooks, of which the one which gives the most minute details is "Tewkesbury Abbey and its Associations," by the Rev. J. H. Blunt, of which the second edition has recently been issued. Mr. Thomas Blashill, the oldest member of our Club, who read a paper on Tewkesbury Abbey on August 14th, 1877, to the members of the Royal Archæological Institute, gave us *con amore* the particulars of the buildings with which he was well acquainted, and the verger,

Mr. Bannister, in conducting the party, exhibited the beautifu monuments for which it is justly renowned, and recorded the most recent restorations and munificent gifts of local contributors to the Parish Church. For the inhabitants have maintained their affectionate interest in it ever since their praiseworthy ransom of it at the time of the dissolution, 34th King Henry VIII.

The members were again fortunate, on their visit to Malvern Church, to have the exposition of its buildings, its stained glass, and its ancient tiles given by Mr. James Nott, author of "The Church and Monastery of Moche Malverne," and of "Notes of the ancient stained glass in the Priory Church of Great Malvern;" and the only complaint was that the limited time did not allow a longer study of their details. Mr. Nott very kindly distributed to each visitor plates descriptive of the highly interesting collection of ancient tiles fixed on the wall of the ambulatory.

The following is a list of the company:—Members: Rev Sir George H. Cornewall, Sir Herbert Croft, Count Lubienski-Bodenham, Revs. C. Burrough, A. Ley, Canon R. J. Livingstone, M. Marshall, A. Pope, R. Hyett Warner, M. G. Watkins, and R. Wood; Messrs. J. Edy Ballard, W. Mortimer Baylis, H. C. Beddoe, T. Blashill, R. Clarke, E. Conder, G. Davies, Luther Davis, H. Scott Hall, T. Hutchinson, C. J. Lilwall, T. Llanwarne, Dr. G. R. Leighton, J. Probert, C. Rootes, E. Stooke, J. P. Sugden, H. A. Wadworth, A. Watkins, H. Cecil Moore (Hon. Secretary), and James B. Pilley (Assistant Secretary). Visitors: Ladies—Mrs. Burrough, Miss Davies, Mrs. Davis, Miss Davis, Miss Gee (from Bath), Mrs. H. Scott-Hall, Mr. W. E. Scott-Hall (from Oxford), Miss C. Scott-Hall, Mrs. Hutchinson, Mrs. Ley, Mrs. Lloyd Williams, Miss L. Long, Miss L. D. Marshall, Miss Pilley, Mrs. Pope, Mrs. Probert, Mrs. Stooke, Miss Wadworth, and Miss Whittaker:—Gentlemen—Revs. T. Emmott, and W. E. Scott-Hall, Messrs. J. E. Ballard, W. C. Blake, William Davis (from Malvern), A. C. Edwards, H. Littledale (from Worcester), P. Marshall, A. Moore, James Nott, and Hugh J. Pitt.

The following paper was read:—

THE BATTLE OF TEWKESBURY.

By Sir Herbert Croft, Bart.

The Battle of Tewkesbury was the last decisive battle between the Houses of York and Lancaster, and was fought here on May 4th, 1471. The principal scenes of the action were in a meadow, half-a-mile south of the town, still known as "The Bloody Meadow," and the Vineyard.

Queen Margaret of Anjou was posted in an entrenched position in Tewkesbury Park, where, it is said, some remains of military works may perhaps be traced. This town in the Civil War was at different times in the hands of both parties. Twice it was garrisoned and lost —from negligence or cowardice.

Let me here shortly recapitulate events prior to the battle of Tewkesbury. After the victory on Candlemas Day, 2nd February, 1461, at Mortimer's Cross, on the banks of the Lugg, Edward (4th) became king, and soon fell a victim to the beauty of Elizabeth Wydevil, Lady Gray, whom he injudiciously married, instead of gaining foreign allies by marrying a foreign princess. In 1470, Louis XI., King of France, who had hitherto but faintly espoused the cause of the House of Lancaster, was visited by Nevill, Earl of Warwick (the Kingmaker) and the Duke of Clarence, his son-in-law, and also by Margaret of Anjou, Henry VI.s Queen. After a decent struggle, Margaret suffered her antipathy to Warwick to be subdued by Warwick's oath of future fidelity to Henry VI., and by the authority of Louis XI. To cement this new friendship it was agreed that Henry VI.'s son, Prince Edward of Lancaster, should marry Warwick's other daughter Anne, and to lull the probable discontent of Clarence, it was agreed that in default of issue by such marriage, Clarence should succeed to the Crown on Prince Edward's death. The only persons dissatisfied with this arrangement were the Duke of Clarence and his consort, who had followed Warwick with the prospect of succeeding his brother Edward IV. on the throne, and now saw another claimant. Edward of Lancaster interposed between himself and the object of his ambition. It is said that Clarence found means to assure Edward IV. that, when the occasion should offer, he could prove himself a loyal subject and affectionate kinsman, and Clarence certainly fought for York at Tewkesbury.

For ten years Edward IV. had been King, and his conduct at this crisis is almost inexplicable. If, says Lingard, we except the execution of some, and the banishment of others, among the adherents of Warwick, Edward IV. took no precautions and made no preparations to meet the approaching storm. His time was spent in gallantries and amusements; the two brothers of Warwick were received into favour,

and one of them, the recently created Marquis Montague, was honoured with the royal confidence. But when finally aroused to his dangers Edward IV. fought bravely enough.

His first battle in 1471 at Barnet (Herts) was fought on Gladsmoor Heath, and here he gained a decisive victory in a thick fog over the Lancastrians on Easter Day, 14th April, 1471, when the Earl of Warwick, the Kingmaker, and his brother the Marquis of Montacute or Montague, and 10,000 men were slain, or wounded. A column commemorative of this battle has been erected at the meeting of the St. Albans and Hatfield roads in Herts.

Tewkesbury followed soon after Barnet, here also Edward IV. gained a decisive victory over the Lancastrians, 4th May, 1471. Queen Margaret of Anjou was taken prisoner, but was ransomed in 1475 by Louis XI. for 50,000 crowns. Her son, Prince Edward of Lancaster, was taken prisoner by Sir Richard Croft, who, trusting to a merciful proclamation of Edward IV. that the Prince's life would be spared, gave up his prisoner to the King, but he was killed on the sameday either by the orders of the Duke of Gloucester (who afterwards forced the widow of Edward of Lancaster to marry him), or by those of the Duke of Clarence.

The Lancastrians had entrenched themselves, says Lingard, at Tewkesbury in a strong position at the end of the town, covered on the back by the extensive walls of the Abbey, and having in front and on the sides a country so intersected with dikes and hedges and lanes that it was "a right evil place to approach as could be well devised." Edward IV. began the attack with a heavy cannonade, which was returned with spirit. But it soon became evident that the King (Edward IV.) had the advantage in the number and weight of his guns, and the multitude of his archers, who poured showers of arrows within the Lancastrian entrenchments. Still the Lancastrians did not flinch. After some interval the Duke of Somerset, with a chosen band, stole by a circuitous route to the top of an eminence, near the foot of which was stationed a corps commanded by the King (Edward IV.) in person. Suddenly they charged it in flank, when, fortunately for King Edward, 200 spearmen who had been detached to a neighbouring wood, observing the movement, fell unexpectedly on the rear of the assailants, who were thrown into confusion, and fled for their lives. It may be that this failure disheartened the Lancastrians, whose defence grew weaker every moment. Soon the banner of the Duke of Gloucester, next that of King Edward himself, waved within the entrenchment, and Somerset, as we are told, suspecting the Lord Wenlock of treachery, rode up to that nobleman and at one stroke beat out his brains. The victory was won, and within a week or so, King Henry VI. was also among the dead, and so ended the Wars of the Roses.

THE GREAT EAST WINDOW OF GLOUCESTER CATHEDRAL.

STRAY NOTES BY JAMES NOTT.

IN a building like Gloucester Cathedral, so replete with interest—a very treasure house of interesting remains—the great east window of its choir, with its wonderful stained glass, rich colouring, height and width, appears before us, challenging the attention of every beholder. Hours might be profitably spent in its examination.

The general design of the window may be divided into three parts. The lower part and top consisting of a silvery expanse of white ornamental work, and the middle of a grand series of shrine work, rendered the more imposing by its towering centre and horizontal summit. Though richly coloured, especially towards the top, this part of the composition contains so much white as to prevent its forming a decided contrast with the rest of the window. The stone framework of the window is an early but decided and beautiful example of the Perpendicular style. Its glass belongs to the decorated style of glass painting. The red glass within it is of what is usually called "streaked," a kind of glass that ceased to be manufactured after the middle of the 14th century. The leading subject of the window is the enthronement of the Blessed Virgin. Of attendant angels only five are *in situ*. Figures of Saints Peter, Paul, John the Baptist, Thomas, and James the Less may be identified, with figures of Kings, etc., and there are still remaining Saints George, Lawrence, John the Evangelist, and St. Margaret. These figures, as might be expected, have been mutilated by the hazards of time, and many not very honourable patches appear upon them. The date of the window is not later than 1350. The heraldic shields are of very great interest, and amongst them is a group of the arms of some of the heroes of Cressy and the siege of Calais. The nobleman who gave the window is believed to be Lord Bradeston. He was of the county, and a favourite with Edward III., who in the fifth year of his reign conferred on him possessions near the city, which he had obtained through the influence of Queen Isabella. In 1860 this window stood somewhat in danger of a restoration which, however well meant, might, and probably would, have made utter devastation of its original import, design and general appearance; but through the intervention of the Archæological Institute, which met at Gloucester in that year, the Dean and Chapter wisely determined to preserve the precious wreck that remained by a re-leading of the whole, without attempting anything in the way of restoration. The glass of the window when taken down weighed, including the lead work, 35 cwt. It was re-leaded for £600, and thus the priceless remain was preserved from

any admixture of puzzling modern innovations or insertions. Estimates then made for its complete restoration ranged from £1,141 by one glass painter to as high as £1,700 by another. It is a matter of thankfulness that the Dean and Chapter did not adventure into such an expenditure.

Apart from the historical association which attaches prominently to this great window, its glory consists in the fine tone and rich hue of its glass. It is impossible to meet with white glass more solid and silvery in effect. The red is beautifully varied and is most luminous in its deepest parts, and the tone of the blue can hardly be surpassed. Modern glass of equally deep hue would be nearly opaque instead of being, as this Gloucester window is, clear and transparent, reflecting and etaining the light of Heaven in its gem-like luminosity.

Woolhope Naturalists' Field Club.

FOURTH FIELD MEETING, TUESDAY, AUGUST 30TH, 1898.

THE GULLET PASS, RAGGED STONE HILL, AND CHASE-END HILL, THE SOUTHERN END OF THE MALVERN RANGE.

THE Fourth Field Meeting this year in connection with the Woolhope Naturalists' Field Club was held on Tuesday, 30th August, for a geological excursion to the Gullet Pass, Ragged Stone Hill, and Chase End Hill, near Ledbury. Members from Hereford, while awaiting the arrival of companions by the Worcester train, took the opportunity of re-examining the passage beds of Old Red Sandstone which have again been exposed during the progress of the work of shortening the tunnel at this its western mouth. Many in the company missed the presence of the late Mr. G. H. Piper, who was always a spirited leader of the Club's excursions in this district, and whose papers on the subject of these Passage Beds have appeared in previous volumes of the *Transactions*. Carriages from the Royal Oak Hotel, Ledbury, conveyed the party to Holybush Pass, five miles distant. The weather was delightfully fine. The party were fortunate to be under the directorship of Dr. Theodore Groom, D.Sc., M.A., F.G.S., Professsor of Natural History at the Royal College of Agriculture, Cirencester, with the additional advantage of remarks by Dr. Charles Callaway, D.Sc, M.A., F.G.S., on "The Origin of the Gneisses and Schists of the Malvern Hills." Dr. Callaway has devoted many years to the microscopical and chemical examination of the rocks of the Malvern Hills, and knows their physical geology and stratification intimately. The company were also favoured with the presence and instructive comments of Professor Meldola, of London, Professor of Chemistry, and Chairman of the Corresponding Society of Field Clubs in Union with the British Association. Members of the Club present were the Rev. H. B. D. Marshall (President), Mr. J. E. Ballard, Mr. Philip Baylis, Mr. W. Mortimer Baylis, Mr. R. Clarke, Sir Herbert Croft, Mr. Luther Davis, Mr. James Davies, Mr. H. Easton, Rev. R. Evans, Mr. T. Hutchinson, Rev. Preb. W. H. Lambert, Rev. Augustin Ley, Dr. G. R. Leighton, Mr. J. Probert, Mr. H. W. Pumphrey, Col. T. H. Purser, Mr. H Southall, Mr. J. P. Sugden, Mr H. A. Wadsworth, Mr. A. Watkins,

THRASHING BEANS WITH THE FLAIL. IN THE VALLEY OF THE WHITE-LEAVED OAK.

Alfred Watkins, photo, August, 1898.

To face page 59.

Dr. J. H Wood, Mr. H. Cecil Moore, Hon. Secretary, and Mr. James B. Pilley, the Assistant Secretary. In addition [illegible] mentioned, the visitors included Mr. J. E. [illegible], Mr. [illegible], Mr. W. Davis, F.R.G.S., Mr. R. H. Evans, Mr. [illegible] Marshall, Rev. S. McArthur, Mr. James Nott, Mr. F. S. Prosser, Mr. A. [illegible], Mr. F. Shuttleworth, Colonel H. Wilson (Sittingbourne), and [illegible] Foresters from the Forest of Dean.

Having dismounted at the Hollybush Pass, the party [illegible] between Hollybush Hill and Midsummer Hill, over [illegible] ancient British town, the ancient reservoirs of which were [illegible]; thence, after a brief survey of the camps, northwards down [illegible] through the tall bracken to Gullet Pass, to examine the Quartzite, [illegible] collect Lower Cambrian fossils, some of the oldest in the world. [illegible]-an-hour was spent in this interesting place, and there [illegible] successful finds. Returning to the Hollybush Pass, the party [illegible] the Ragged Stone Hill, [illegible] the Hollybush Conglomerate [illegible] northern slope, the [illegible] at the top, and [illegible] eastern side, of the hill. [illegible] the geological [illegible] from the summit.

The peaked hillocks [illegible], or so-called volca[illegible] proved to be not only masses, but extensive bands, of intr[illegible] rock. A cavity in one of them was [illegible] quarrying. At the big quarry at White-leaved Oak, where the [illegible] went to observe the relation of the Hollybush [illegible] schists, Dr. Callaway gave his ideas of how the [illegible] metamorphosed by pressure, heat, and chemical [illegible]. [illegible] process was lucidly explained. Professor Meldola [illegible] chemist he had not examined the subject nor studied [illegible] reason whatever to doubt the results as [illegible] Callaway. On behalf of the Club, Mr. Moore [illegible] Professors for the kind manner in which they [illegible] instruction.

After visiting the inverted Black Shales [illegible] and collecting Lingula-flag fossils, time did not [illegible] walk to the inverted [illegible] search for Tremadoc [illegible] towards the carriage [illegible] Shales met with on the way. [illegible] An inspection was also made [illegible] shales at the quarry at Coal Hill [illegible] from an unsuccessful search for [illegible] by William Knight.

On the return to Ledbury [illegible] luncheon ready for them [illegible] President, in proposing [illegible], "Gentlemen, I have to propose to you [illegible] Club— the health of Her [illegible]—In

Dr. J. H Wood, Mr. H. Cecil Moore, Hon. Secretary, and Mr. James B. Pilley, the Assistant Secretary. In addition to the Professors already mentioned, the visitors included Mr. J. E. Ballard, Mr. Jasper Croft, Mr. W. Davis, F.R.G.S., Mr. R. H. Evans, Mr. R. Derham Marshall, Rev. S. McArthur, Mr. James Nott, Mr. F. S. Prosser, Mr. A. Sparkes, Mr. F. Shuttleworth, Colonel H. Wilson (Sittingbourne), and three Foresters from the Forest of Dean.

Having dismounted at the Hollybush Pass, the party ascended between Hollybush Hill and Midsummer Hill, over the site of the ancient British town, the ancient reservoirs of which were defined; thence, after a brief survey of the camps, northwards down the hill, through the tall bracken to Gullet Pass, to examine the Quartzite, and collect Lower Cambrian fossils, some of the oldest in the world. Half-an-hour was spent in this interesting place, and there were many successful finds. Returning to the Hollybush Pass, the party ascended the Ragged Stone Hill, visiting the Hollybush Conglomerate on the northern slope, the quartz-schist and felsite at the top, and along the eastern side, of the hill. Dr. Groom traced the geological panorama from the summit.

The peaked hillocks about here, or so-called volcanoes, were proved to be not only masses, but extensive bands, of intrusive igneous rock. A cavity in one of them was proved to be the result of artificial quarrying. At the big quarry at White-leaved Oak, where the geologists went to observe the relation of the Hollybush Sandstone and Archæan schists, Dr. Callaway gave his ideas of how the rocks had become metamorphosed by pressure, heat, and chemical action. This intricate process was lucidly explained. Professor Meldola remarked that as a chemist he had not examined the subject nor studied it, but he had no reason whatever to doubt the results as laid before them by Dr. Callaway. On behalf of the Club, Mr. Moore thanked the learned Professors for the kind manner in which they had imparted their instruction.

After visiting the inverted Black Shales at White-leaved Oak and collecting Lingula-flag fossils, time did not permit of an intended walk to the inverted Grey Shales, at the foot of Chase-end Hill for a search for Tremadoc fossils. Half-an-hour was spent on the way home towards the carriage rendezvous near Fowlet Farm, examining Black Shales met with on the way. Several interesting trilobites were found. An inspection was also made of the bands of diabase intruded in grey shales at the quarry at Coal Hill cottage. This place received its name from an unsuccessful search for coal which was made many years ago by William Knight.

On the return to Ledbury the excursionists found a capital luncheon ready for them at the Royal Oak. After the repast the President, in proposing the health of the Queen, said:—"Gentlemen, I have to propose to you the one and only usual toast of our Club—the health of Her most Gracious Majesty Queen Victoria—In

connection with this toast and the proposal that there should be some National Public Celebration shortly of the reign of Alfred the Great, I would say of the long line of Kings and Queens who have reigned over this country during the thousand years which have passed since the reign of King Alfred, that, though most, if not all of them, had good points in their characters, or in the way in which they ruled, yet we must place at either limit of that interval of a thousand years—Alfred our greatest King—Victoria our greatest Queen."

And in thanking the Professors, said :—

"We are honoured to-day by the presence with us of distinguished visitors. Dr. Callaway has unfortunately been obliged to leave us before luncheon; we still have with us one of the late Presidents of the Entomological Society, Professor Meldola, and Dr. Theodore Groom, Professor of Natural History at the Royal Agricultural College, Cirencester. I have to express the gratification of all who have joined in our Field Excursion to-day, at the presence with us of the gentlemen I have named, and to accord to them the hearty welcome of the Members of the Woolhope Club on this occasion. Our special thanks are also due to Dr. Callaway and Dr. Groom for their interesting and instructive remarks on the geology of the district visited by the Club to-day—indeed the manner in which Dr. Groom has acted as our guide and instructor to-day has been such as to stir up and inspire a fresh enthusiasm and interest in the study of geology. In connection with this science and with another, I would say that if Theology is, as has been said, the 'Queen of the Sciences," then Geology and Astronomy are her most loyal hand-maidens, on her right hand and on her left."

Dr. Callaway had been obliged to leave early to catch his train, but Professor Meldola responded, and in his office as chairman of the committee for selecting and classifying reports of Field societies for the British Association's annual report, paid a very high compliment to the valuable work of the *Transactions* of the Woolhope Naturalists' Field Club, and to the earnest way in which the members of the Club had evidently devoted themselves to local scientific work.

Dr. Groom also replied. He said that instead of being thanked for the instruction which he had given, he thought thanks were due from him to the Club for their invitation. It had given him very great pleasure to impart the results of his two years' investigation of the rocks of the Malvern Hills to so large and interested a party. Their enthusiasm was manifest, especially in the alacrity with which they scaled the various slopes for a proper investigation of the rocks (laughter and applause).

Mr. H. Southall made a few appropriate observations in reply to the speeches of the Professors.

The Hon Secretary (Mr. H. Cecil Moore), then referred to some business of the Club, and made some very important observations. He called attention to the fact that in his recent association with divers

other Field Clubs he had been frequently met by the remark that the Woolhope Club was far behind the age in not having any lady members. He had spent a week with the London Geologists' Association in the midland counties, when daily in company with forty or fifty gentlemen there were six or eight ladies, some of them as active as the gentlemen, not only in the field, but at home on their return in drawing specimens of the rarer fossils. For instance, the discovery of a beautiful specimen of the *Monograptus priodon* was hailed with delight, and it was immediately handed over to Miss Wood for illustration before being put into the museum. That lady had studied much the subject of these graptolites in Bavaria, in which subject she had done excellent work for Professor Lapworth. With reference to the election of candidates for membership Professor Meldola, who had had great experience of Field Clubs, and who in fact was the organiser of the Essex Field Club, strongly recommended that the members of the Woolhope Club should elect every candidate and make a naturalist of him. Mr. Moore went on to say that he had recently been converted to the same opinion. Money was required for the publications. Therefore the more members the Club had, the more they could improve their *Transactions* by illustrations, and the more they could publish. The general conclusion was that present members of the Club, especially the older members, should work more and more in order to stimulate every new candidate and convert him into a naturalist. For the carrying out of this object, it was to be hoped that some winter-evening meetings might be organised, as recommended in a letter which he had received from Mr. Thomas Blashill, the senior member of the Club. Mr. Moore quoted from the letter as follows: "I gather that Natural History languishes with you. The Club might undertake to educate, and not rely upon getting naturalists ready-made, one does not know how or where. If three or four members would get small classes together and give a few winter-evening demonstrations, recommend books, &c., and hold a few Spring field demonstrations, you would not only get recruits but keep up renewed interest in the Club." With reference to the large octavo volume which Dr. Charles Davison proposes to publish on "The Hereford Earthquake of December 17th, 1896," Mr. Moore said the list was open to subscribers up to September 15th at Messrs. Jakeman and Carver's. He had received a letter from the author, in which he stated that the number of subscriptions had risen to only 140, but very few libraries had subscribed as yet, and it was possible that several might do so before September 15th, but he was afraid that the number would fall short of 200. Therefore, members of the Club intending to subscribe for the volume at 10s. 6d. nett should do so without delay. It would be a great pity if so much labour as Dr. Davison had devoted for the last two years to the subject of the Hereford earthquake should never be given to the public, owing to want of local support. Herefordshire people ought to be especially interested in the subject.

Hereford-district members caught the 7-11 return train, all delighted with the day's excursion.

The editor acknowledges with thanks, the revision by Professor Groom, of the following notes on the geology of the district traversed to-day by the members.*

* Since the date of our visit to this locality an elaborate and logically worked out paper by Professor T. T. Groom, M.A., D.Sc., F.G.S., on "The Geological Structure of the Southern Malverns, and of the adjacent district to the West" has appeared on pages 129 to 169 of the Quarterly Journal of the Geological Society, Vol. 55 (1899). The paper is illustrated with three plates and twenty-one diagrams. The very interesting geology of this district is therein very minutely detailed.

The above paper has been followed by another equally skilful dissection of the complicated structure of the northerly continuation of the same range under the title of "The Geological structure of portions of the Malvern and Abberley Hills," on pages 138 to 197 with Map and thirty diagrams of the same Journal, Vol. 56, 1900.

"The Silurian rocks west of the hills are almost invariably inverted, and the Malvernian rock frequently can be found to be overthrust on to them. In several cases there is reason to suspect that slips of Silurian rocks are caught in infolds amongst the Malvernian rocks. Professor Groom concludes that the whole of this district, May Hill, the Old Red Sandstone tract to the west, the coalfields of the Forest of Dean, South Wales, and Bristol, and the Tortworth district, are traversed by a series of related folds, whose axes run in two chief directions intersecting at a considerable angle: the axial planes of one set tend to dip east, less frequently from the south; and this inversion affects the southern as well as the middle and north of the Malvern range. The Archæan rocks are thrust into various members of the Cambrian System in the south and of the Silurian System in the north. The intensity of the folding diminished west of the old ranges. The chief movement appears to have progressed in sections from north to south, and the western fronts of different sections show some tendency towards convexity in the direction of movement" (*Science Gossip*, 1900 Vol. 6, new series, page 350).

NOTES ON THE GEOLOGY.

By H. Cecil Moore.

Time did not permit of any protracted halt at the large quarry in Hollybush Pass of an intrusive rock of diorite penetrated by granitic rocks, all of the Archæan age. This material forms excellent metal for road repairs, and is so used locally; it is, however, inferior in durability to the unequalled basalt of the Clee Hills, well known to us under the name of Dhu stone. On ascending the hill in the hollow between the Hollybush Hill on the east and Midsummer Hill on the west, by the banks of the uppermost of the three reservoirs of the ancient British Camp here, Dr. Groom pointed out traces of Llandovery Sandstone, and of Lower Cambrian Quartzite and Conglomerate, which was seen *in situ* in the descent upon the northern side of the hill towards Gullet Pass.

A long halt was made in Gullet Pass itself, where all the hammers were busy at a small exposure of the Cambrian Quartzite at the base of the northern slope. This is a compact, close-grained rock, with an occasional mixture of bits of red granite, and is similar to the Cambrian Quartzite of the Lower Lickey, Nuneaton, and Wrekin Hills. The only fossil found in it to-day was the brachiopod Kutorgina (Obolella) cingulata, of which several specimens were found.

The return to Hollybush Pass was made along the western slope of Midsummer Hill. Across the cart-track route Dr. Groom pointed out outcrops of the Black Shales, and Hollybush Sandstone, and the site of igneous intrusive rocks in the contiguous knolls.

The Hollybush Sandstone is of Lower Cambrian age, and the Black Shales belong to the lower parts of the Upper Cambrian.

The ascent of the Ragged Stone Hill was next made. In the valley between the spurs the Hollybush Conglomerate is in continuation of the same strata as those previously seen between Hollybush and Midsummer Hills. Dr Groom explained from the summit of this hill the whole geological panorama displayed in all quarters. The descent was made along the south-eastern ridge, which gradually became more and more contracted towards the base. At the base was found a small quarry, where the relation between the igneous rocks and the Archæan Schists was introduced by Dr Charles Callaway, and treated more fully at the big quarry, about two hundred yards distant in the valley of the White-leaved Oak These quarries are in Gloucestershire. Dr. Callaway has added below a few notes explaining in a more detailed form the results of the metamorphosis of the mineral constituents of these rocks by the agencies of intense pressure, foldings, heat, and chemical changes.

Those members who were active enough to ascend the steep slopes of the big quarry, following their director, were rewarded in

witnessing at its summit the union of the Schists with the Hollybush Sandstone; the latter rock was essentially an ancient "greensand" with traces of Foraminifera. The hamlet of the White-leaved Oak was now reached, where the three counties of Gloucester, Hereford, and Worcester meet. The recent rains having washed the surface soils, the denudation thereby resulting exposed most favourably and strikingly the Black Shales on the road leading to Chase-end Hill. It was in this neighbourhood of White-leaved Oak that William Knight expended labour, time, and money in his fruitless search for coal.

Time did not permit a visit to the inverted Grey Shales at the foot of Chase-end Hill, where the upper portion of the Malvern Black Shales is exposed, in which the Hydrozoan Dictyonema sociale is found in the bed immediately above the Lingula Flags, a bed grouped with the Dolgelly and lower Tremadoc rocks. At Coal Hill Cottage bands of Diabase were examined intruded in the Grey Shales. This Diabase is essentially similar to the rock on the road between Eastnor and Hollybush, supposed to be intrusive in the Hollybush Sandstone; it occurs, however, in the Grey Shales. It is described by Mr. Teall in his "British Petrography," p. 245. Good descriptions of similar rocks may be found in Mr. Harker's little book "Petrology for Students."

On the return to the rendezvous at Fowlet Farm, half-an-hour was spent at the exposure of the Black Shales in the hedge bank leading from the village of White-leaved Oak. This formation has yielded trilobites of the genera *Sphaerophthalmus*, *Ctenopyge*, and *Agnostus;* and *Obolella* and *Lingula* amongst the Brachiopoda. The finds to-day included good specimens of the two first-mentioned genera. The various elevated ridges in this neighbourhood generally running tolerably parallel, and extending to the wood which here bounds the prospect, at Howlers's Heath, are formed by intrusive igneous rocks. Near Fowlet Farm the nature of the rock is seen in a quarry large enough to engulf a small cottage on the top of the knoll in the field south of Fowlet Farm. This quarry from its similarity to the crater of a diminutive volcano has deceived many a superficial observer. The high road from Ledbury crosses one of these * exposures about a quarter of a mile below Fowlet Farm, where the erupted rock may be seen on both sides of the road. Just before reaching Fowlet Farm, a heap of excavated material from a small water supply tank upon the lower part of the western slope of Raggedstone hill revealed the formation of Upper Llandovery or May Hill Sandstone. Here a beautiful *Lindströmia (Petraia)* was found.

Dr Groom's work in this district will serve as an useful aid to Government officials of the revised new Geological Survey when they reach this quarter of the kingdom. The whole of the ground traversed

* In that magnificent work "British Petrography," by J. J. Harris Teall, on page 245, the exposure is thus referred to:—"A typical ophitic diabase with ilmenite-plates and chlorite occurs as a dyke in the Hollybush Sandstone between Eastnor Castle and Midsummer Hill."—N.B. from Dr. Groom's recent examination of this locality for 'Hollybush Sandstone' read 'Grey Shales'—Ilmenite is an oxide of iron.

to-day has been minutely delineated in his geologically coloured map, and we are ambitious enough to hope that the volume of *Transactions* of our Club may chronicle its intricacies after they have been given to geologists generally in the Journal of the Geological Society. The Club to-day has been fortunate in the attendance of Dr. Charles Callaway, who has written three papers in the Journal of the Geological Society on the origin of the gneisses and crystalline schists of the Malvern Hills. His first paper was presented to the Society in 1887, Vol. 43, page 525. The second paper in 1889, Vol. 45, page 475, and his third paper in 1893, Vol. 49, page 398. Further microscopical, laboratory, and field, study has enlarged his belief in the powerful efficacy of dynamo-metamorphism, and his deductions are proved by chemical analysis. Scientists are yearly becoming converted to his theory.*

The Chase-end is the last hill of the Malvern range southwards, and is probably so called from being the southern termination of the great Malvern Chase, for a lengthy description of which reference should be made to the paper on "The Forest and Chase of Malvern," by Edwin Lees, in the *Transactions* of the Malvern Field Club, printed in 1870. It is sometimes called Keys-end. Edward I. gave the whole Chase to Gilbert de Clare, "The Red Earl" of Gloucester and Hertford (not Hereford), who is said to have begun digging a trench here in A.D. 1287. This trench defines the boundary of the right of chase of the Bishops of Hereford from the Chase of Malvern. It can to this day be traced along the ridge of the hills dividing the county of Hereford from Gloucester at the Chase-end, and from Worcester in the northerly direction. Commencing at Chase-end it is continued northwards on the eastern side of the ridge of Ragged Stone and Hollybush Hills, thence under the name of the Shire ditch over Swinyard Hill, forming the boundary between Herefordshire and Worcestershire This boundary is on the eastern ridges of Hollybush Hill and of Ragged Stone, where there is a triangulation survey elevation of 839 feet. Gloucestershire comes in as a wedge in the hamlet of the White-leaved Oak, the boundary southwards between Gloucestershire and Worcestershire being along the summit 626·1 feet high of Chase-end Hill. Coal-hill cottage is in Gloucestershire.

In the days of Edward I. the "Red Earl" swore that if ever he caught an adherent of the Bishop of Hereford, who had palaces at Colwall, at Whitbourne, and at Bosbury, in chase of hart or stag across that dyke he should lose his right hand. In 1196, John, Earl of Moreton (Lord of Glamorgan), granted the Bishop of Worcester licence

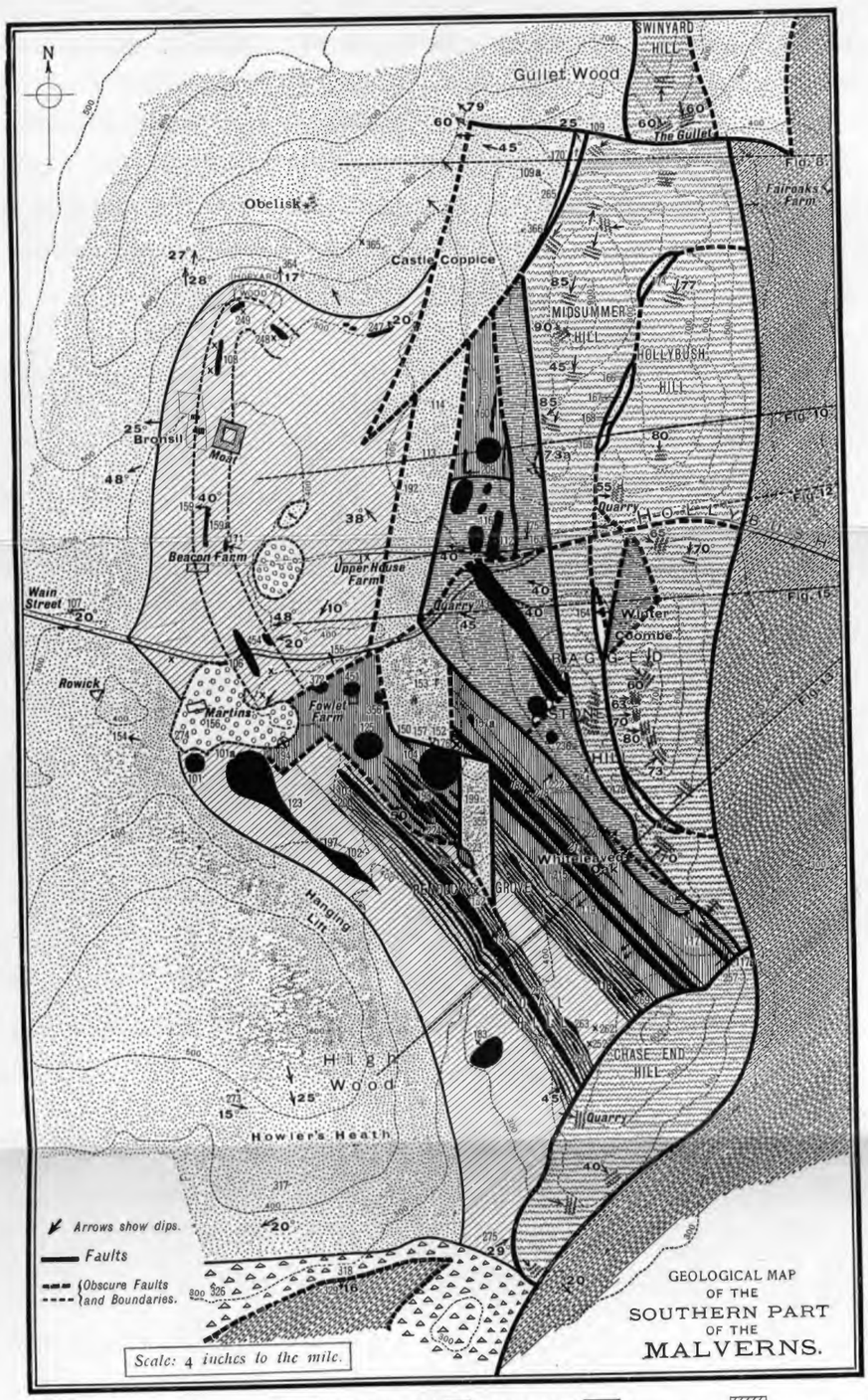
* Students should read in the Proceedings of the Cotswold Naturalists' Field Club for 1897-1898, Vol. XII., Part III. "Recent discoveries in the Geology of the Malvern Hills by C. Callaway, D.Sc., F.G.S., read on April 18th, 1898. On page 241, he writes "All the Crystalline rocks of the Malvern Chain, excepting the Volcanic Mass at the Herefordshire Beacon, are in their origin igneous and plutonic, not aqueous and sedimentary. The apparent stratification is due to pressure, not to deposit under water. The Crystalline condition is not superinduced upon an original fragmental structure, but is itself either original or a recrystallization under new conditions." In the continuation of the paper details are given in order to make the theory clear.

to assart (dig up) land in Malvern Forest (see "The Land of Morgan," page 114, by George T. Clarke). Probably about 1255 was drawn up the agreement, of which we have a copy, between Earl Richard and the Bishop of Worcester concerning Malvern Chase. From the same work (page 144) we read that the Earl and Countess threw up an earthen bank along the crest of the ridge, to which Giffard, Bishop of Worcester, objected as an encroachment, thus re-opening the dispute about the Chase. This was settled by an agreement signed at Tewkesbury, October, 1291, by which the Bishop, or in his absence the Prior and Chapter of Worcester, was to have annually from the Earl two fat bucks and two fat does.

The Geological Map for this district is 43 N.E., price 3/-. The Ordnance Survey Maps, on the scale of 6 inches to 1 mile, are Herefordshire, Sheets, 42 N.W. and 42 S.W., price 1/- each; and on the scale of 1 inch to 1 mile, sheet 216, New Series, price, 1/-. embraces the whole of the geological ground in the course of the day's explorations.

For further information about this locality the following references to the *Transactions* of the Woolhope Club will be found useful:—For the diagram of the succession of palaeozoic strata dipping westward from the Malvern Hills see 1893, opposite page 22. For the passage beds of the Old Red Sandstone and Lower Silurian at Ledbury Railway Station see 1883, page 16, and 1884, page 136. A revised edition with a photograph is to be found on pages 310 to 313, of the volume for 1895, 1896, 1897* A diagram of the ancient British Camps and hut dwellings on Hollybush and Midsummer Hills will be found in the volume for 1889, opposite page 376, and it is again introduced. For a detailed description of "Camps on the Malvern Hills," by F. G. Hilton Price, see 1880, page 217.

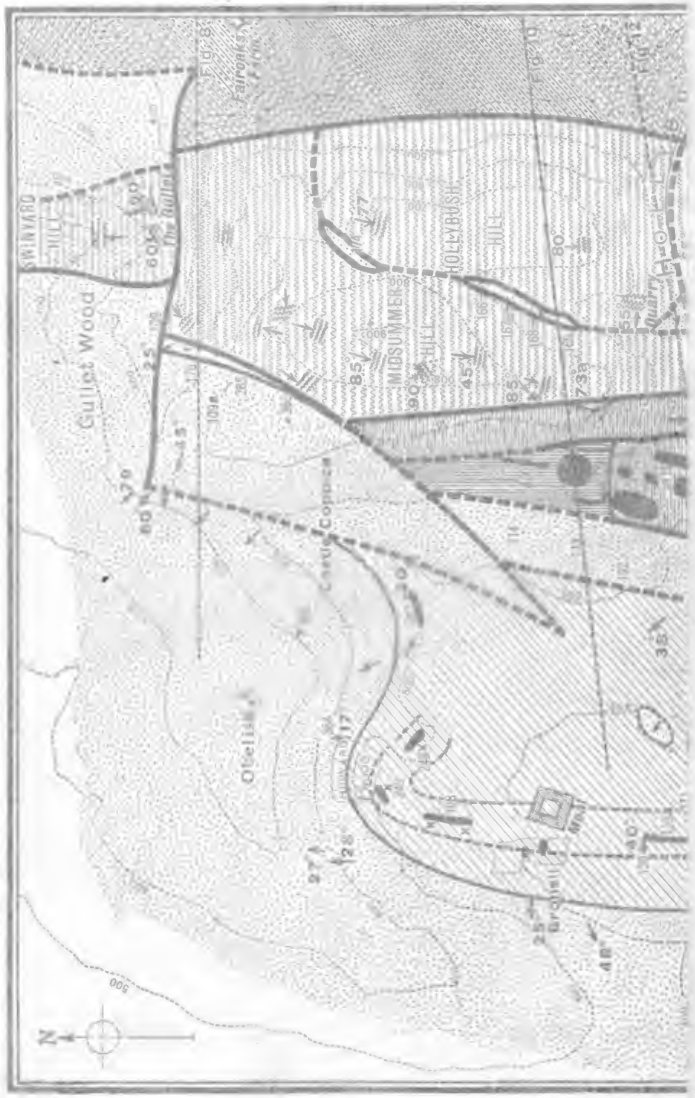
* It must be borne in mind that the tunnel has been recently shortened and the present western face of the tunnel has been (1899) removed a distance of about 52 yards further east. H.C.M.



NOTE.—One of the bands of basalt occurring in the Black Shales on the western side of Midsummer Hill has been omitted in this map: it is shown in fig. i, p. 132 of the "Quarterly Journal of the Geological Society," Vol. 55, 1899. Further, the small fault immediately to the left of H in the word "Hollybush," and south of the dip arrow marked 55°, is incorrectly reproduced. Its Southern termination should be about one-sixteenth inch more to the West; this would show the Northerly direction seen in the actual exposure.

This Geological Map, by Professor T. T. Groom, D. Sc., F.G.S. is reproduced from Plate 13, Vol. 55, 1899, of the Quarterly Journal of the Geological Society by his permission, and that of the Council of the Geological Society.

Between pages 66 and 67.



NOTES ON THE ORIGIN OF THE GNEISSES AND SCHISTS OF THE MALVERN HILLS.

By C. Callaway, D.Sc., M.A., F.G.S.

The two quarries at the southern end of the Ragged-stone Hill, which were visited by the Club on August 30th, afford good examples of the process of schist-making in the Malvernian rocks. The small quarry at the extremity of the south-eastern spur of the hill illustrates the conversion of an acid plutonic rock into schist, while the larger quarry at the south-western end is the best example in the entire Malvern area of the transformation of a massive basic rock into an acidic schist. A few details of both these cases are here given. It may be premised that, according to the older geologists, the schistose structure in the Malvern crystallines was due to sedimentation, the rocks having been originally laid down under water in beds as sand or mud, and subsequently altered by heat and pressure into gneisses and schists. This view the writer directly traverses, and contends that the rocks were igneous in origin, and that the apparent stratification is due to crushing and shearing under enormous pressures subsequently to the consolidation of the mass. An outline of this theory will be presented in the following brief descriptions.

In the smaller quarry a felsite has been converted into a mica-gneiss. The felsite occurs as a dyke. It is seen at the summit of the hill, and it can be traced down the south-eastern spur to the quarry. At the upper part of the quarry the felsite is comparatively unchanged. Under the microscope it appears as finely granular, and without trace of parallel structure. As we trace it down the slope it is seen to become laminated, and to pass with a perfect gradation into a true schist. The felspathic substance of the felsite becomes, in part, differentiated into mica and quartz, which occur in lenticular folia. Thus a true gneiss, consisting of alternating laminæ of quartz, felspar, and mica, is formed out of the compact massive igneous rock known as felsite.

The section exhibited in the large quarry demonstrates the transformation of a coarse-grained diorite into a mica-gneiss, not very dissimilar to the gneiss formed from felsite. Along the northern slope of the quarry the transition has been traced inch by inch, and about forty microscopic sections have been examined. by which the field-work is confirmed in minute detail. At the eastern end of the section the rock is a massive diorite, composed in the main of large crystals of hornblende and soda-lime felspar. As we follow it westward, it is seen to become crushed and decomposed, and this crushing and decomposition is progressive, so that, at a distance of a few feet, the rock presents the appearance of a laminated grit, minute fragments of felspar

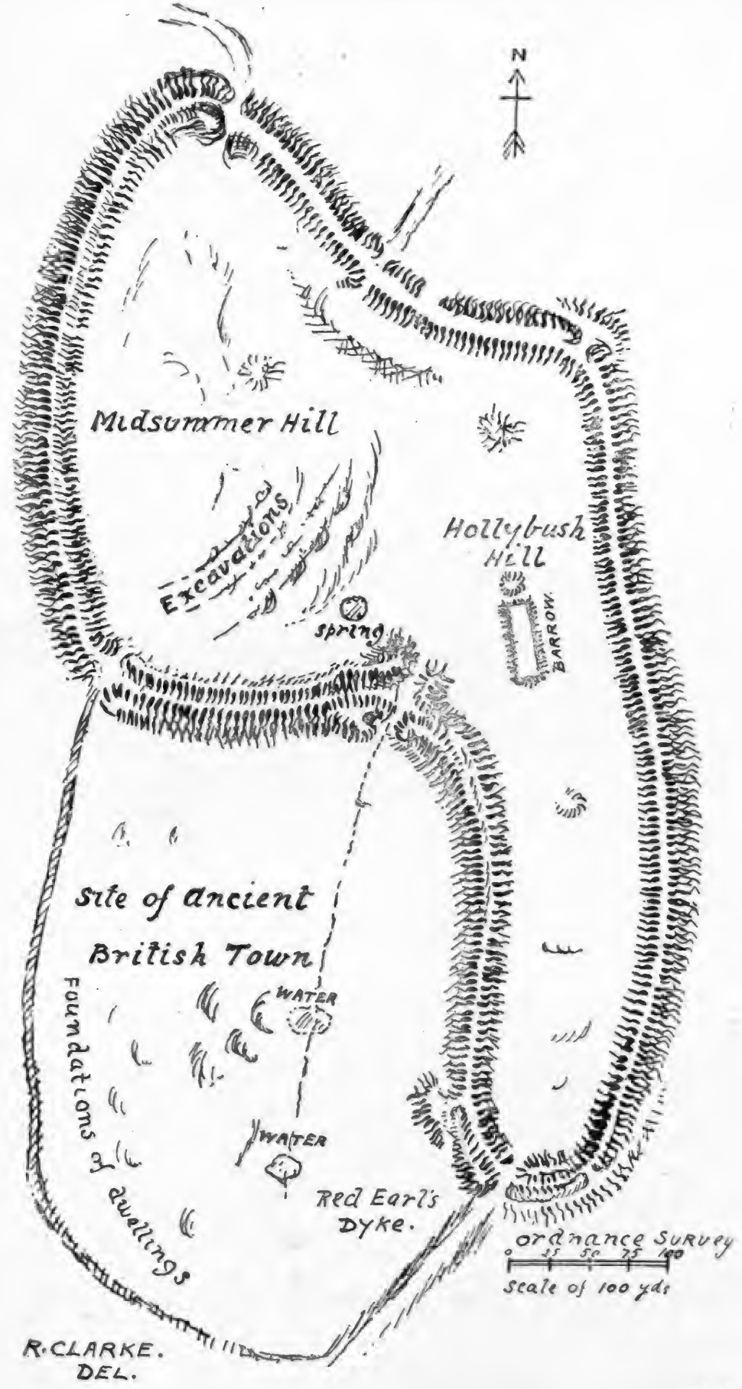
forming thin parallel layers alternating with seams of chlorite and iron-oxide, produced by the decomposition of the hornblende. Even an experienced field-geologist might be excused for mistaking this for a sedimentary rock, but an examination of the microscopic slides shows with absolute clearness its true origin.

This grit passes in a westerly direction into the gneiss. The evidences of pressure increase, and a reconstruction of the minerals takes place. A white silky mica (sericite) gradually comes in, and ultimately becomes prominent. Quartz and secondary felspar are generated, and alternate with the mica in lenticular folia. The hornblende has thus disappeared, and scarcely any of the original felspar is left, the crushed remains of a crystal here and there suggesting the primary state of the rock. Such a radical reconstruction of a rock is somewhat startling, but the difficulty will be largely removed if we reflect upon the conditions of the metamorphism. The pressures under which the changes were produced were incalculable, and the heat rose to a great height, sometimes to the point of fusion. The crushed mass was saturated with alkaline waters, which, at such temperatures, must have been capable of causing great chemical changes. Laboratory experiments are therefore no test of what can be effected in Nature's workshop.

Several chemical analyses of these rocks have been made. They show a progressive increase in the silica, and a fall in the proportions of lime and magnesia, the alumina, iron-oxides, and alkalies (potash and soda) remaining roughly constant. A portion of the silica has combined with alumina, potash, and iron-oxide to produce the mica, another part of it has united with alumina and soda to generate secondary felspar, and the residual silica survives as quartz.

These explanations will apply, *mutatis mutandis*, to all the schistose and gneissic rocks of the Malvern chain. The details of the work by which these results have been obtained may be studied in the papers of the writer.

SUPPOSED SITE OF THE ANCIENT BRITISH TOWN ON THE MIDSUMMER AND HOLLYBUSH HILLS.



To face page 69.

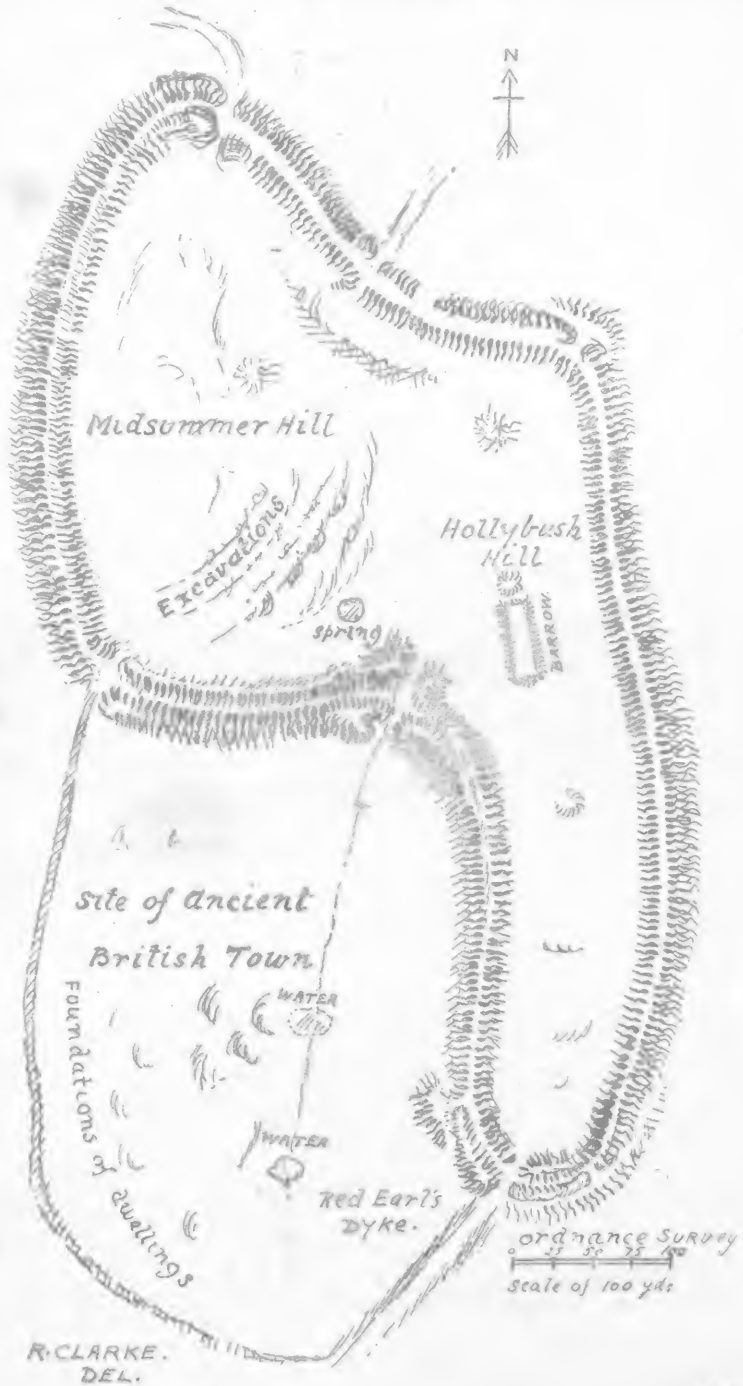
[If a reference be made to page [illegible] of the Volume of our *Transactions* of 1889, it will be observed that a paper was read by the late Mr. Piper on the subject of the Ancient British Camp on the Midsummer and Holly-Bush Hills. We owe the publication of this paper to his sister and executor, Miss Piper.]

THE CAMP AND ANCIENT BRITISH TOWN ON THE MIDSUMMER AND HOLLY-BUSH HILLS OF THE MALVERN RANGE, BY GEO. H. PIPER, F.G.S.

THE Cymry do not claim to have been the first inhabitants of Britain; they were simply invaders and foreigners; and were preceded by several earlier races. Professor Boyd Dawkins, who does not contend for the advanced antiquity of man assumed by some [illegible], estimated that the earliest Welshman emigrated into Europe along with the Pleistocene Mammalia of the pre-glacial age. This, I think, gives an antiquity greater even than Welshmen claim. There are in Wales two leading geological formations—the Silurian and the Cambrian. The former prevails in the land of the Silurian tribes, the [illegible] men who made so stout a fight against the Romans. The Cambrian rocks are seen beneath the Silurian, and are therefore older, implying a people more ancient than the Silures. But recently there has been the [illegible] announcement of the discovery of other geological strata beneath the Cambrian. These pre-Cambrian walls [illegible] that there were Welshmen of whose existence [illegible] have only just been made known to us by their [illegible].

The earlier or primitive races were cave-men of a low type, but as time advanced a rude civilisation grew up, tribes were organised, and governments established. The earliest notice of these people occurs in the pages of Herodotus, who wrote about the year B.C. [illegible]. The next writer who mentions the British Isles is Aristotle, who wrote about 340 years before Christ, but doubtless the Phœnicians traded here for metals long before the compilation of the records of the Greek historians. Tin and copper were in daily use among the Greeks, even as early as the days of Homer, and it is difficult to imagine where their large supplies of these metals could have been obtained elsewhere than in Britain. Intercourse with foreigners naturally served to increase the wealth and promote the civilisation of the Islanders; population grew with prosperity, and the people became divided into many tribes. We learn from Cæsar they were fierce in battle and well versed in the art of war. This knowledge could have arisen only in their internecine conflicts at home, as they had no foreign foes to encounter. The constant state of turmoil in which they lived involved the use of entrenched camps and fortified stations, or towns, and the spacious enclosure on the Midsummer and Holly-Bush Hills is one of them—large enough to

SUPPOSED SITE OF THE ANCIENT BRITISH TOWN ON THE MIDSUMMER AND HOLLYBUSH HILLS.



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The earlier or primitive races were cave-men of a low type, but as time advanced a rude civilisation grew up, tribes were organised, and governments established. The earliest notice of these people occurs in the pages of Herodotus, who wrote about the year B.C. 450. The next writer who mentions the British Isles is Aristotle, who wrote about 340 years before Christ, but doubtless the Phœnicians traded here for metals long before the compilation of the records of the Greek historians. Tin and copper were in daily use among the Greeks, even as early as the days of Homer, and it is difficult to imagine where their large supplies of these metals could have been obtained elsewhere than in Britain. Intercourse with foreigners naturally served to increase the wealth and promote the civilisation of the Islanders; population grew with prosperity, and the people became divided into many tribes. We learn from Cæsar they were fierce in battle and well versed in the art of war. This knowledge could have arisen only in their internecine conflicts at home, as they had no foreign foes to encounter. The constant state of turmoil in which they lived involved the use of entrenched camps and fortified stations, or towns, and the spacious enclosure on the Midsummer and Holly-Bush Hills is one of them—large enough to

contain not merely the fighting portion of the community, but the whole of the tribe and its belongings. To treat fortified positions such as this, and Wall Hills, Thornbury, and many other places in Herefordshire, as merely military camps is a great error; they were places of refuge for the whole of the people.

This, from its size and strength, must have been an important position, and is in my eyes an object of greater interest than the Herefordshire Beacon—admitting, nevertheless, that that remarkable structure is the most perfect British Camp in our country; its very perfection denotes it to be of more recent construction.

When occupied the earthworks were strengthened with a stockade of timber, and large gates guarded the entrances, the post-holes of the gates and stockade may be traced to this day. Labours such as these would not be difficult to men who could construct war chariots by hundreds and use them with the highest skill and most desperate courage.

To assign a date to this camp and town, or say by which of the past races it was constructed, is at present impracticable, but there are very good reasons to believe that future exploration—for this is virgin soil—may throw much light on the subject.

The length of the camp is 2,000 feet, and its circumference 5,700 feet. The site of the old British town, lying in the hollow between the hills and overlapped and protected by the camp, is about 700 feet. The height of Midsummer Hill is 937 feet; it has on the eastern side ten or eleven ranges of terraces, whereon as many as 244 hut hollows are visible, and others may be seen on the Holly-Bush Hill and in the hollow between the two eminences. Here the water, rising from two springs, was preserved for the use of the people in four different tanks. It is futile to suggest that the dams are modern, or were made for mere cattle ponds, as one dam only would have been sufficient for that purpose, and the best proof that they are not so required is that they have been cut through to facilitate the escape of the water.

On Holly-Bush Hill, within the walls of the camp, is a barrow of symmetrical form, 150 feet long by 32 feet broad, and about 3 feet high; it lies north and south, and has a slight trench around it. In the month of September, 1879, I was the means of having this barrow partially excavated. Although on the top of the hill, where customarily very little soil is found, there proved to be in every part opened soil to the depth of four feet. It had evidently been moved, and must have been carried there, as it could not have accumulated under ordinary conditions upon such a spot. Evidence of this was given by the fact that many pieces of Upper Llandovery Sandstone, and several pieces of quartzoze grit, probably from Rowick, were thrown out with some large pieces of Laurentian rock. Fragments of charcoal, two small pieces of burnt brick, one having the impression of a dog's foot, and a thin copper ring, were also found embedded in black earth at a depth of three feet, and ten feet from the west side. A few days after the

excavation had been made, with the slight results referred to, General Pitt Rivers arrived, who stated that he had been present at the opening of similar mounds in Oxfordshire and elsewhere without results, and at Dartmoor he had seen raised mounds which, *he was told*, were thrown up as artificial rabbit burrows. This may have been said at Dartmoor, but that at any period of the earth's history any men could have been found foolish enough to carry to the top of Malvern Hill soil sufficient to construct an earthworth 50 yards long, 10 yards wide, and 3 feet high, for the beatification of rabbits, I utterly decline to believe. It is alike repugnant to common sense and to the requirements of the country.

Mr. John E. Price, F.S.A, has taken a more reasonable view of the question, and remarks that some significance must be attached to the relics in the long barrow, and that the mound and its contents may be Roman after all, and be an illustration of a *Botontinus*, or one of the terminal marks which it was the practice of the surveyors of old to construct at the confines of territories. In defining the boundaries of land the *agrimensores*, or land surveyors, selected various signs, the future discovery of which would make the lines of demarcation clearly significant. At such limits they would deposit charcoal, broken pottery of various kinds and often purposely fractured, gravel, pebbles, pieces of metal, coins, pitched stakes, ashes and lime; over such a deposit they would erect a mound or hillock of earth.

My original opinion that the barrow is Roman, or post Roman, is unchanged; I utterly scout the rabbit theory, and as history tells us a great battle was fought on the Malvern Hills in the tenth century, when Athelstan drove the Cymry beyond the Wye, it is reasonably probable it took place within these entrenchments

Although the barrow has been cut into, it has not been thoroughly explored. Little as yet is known of the great camp and its remarkable surroundings. The science of these places has yet to be learned, and I quite believe a series of patient and careful diggings will reveal and make plain much that at present is doubtful and obscure.

THE FOSS ON THE MALVERNS.

AMONGST the papers of the late Mr. Geo. H. Piper, given to the Editor by Miss Piper, the following extracts are taken from a collection said to be in the possession of Sir Edmund Lechmere, of Rhydd Court. The deed relates to the making of the Foss on the Malvern Hills.

> "19 Ed. I., Tewkesbury, Saturday before the Feast of St. Dunstan, Godfrey Bishop of Worcester, Gilbert de Clare Earl of Gloucester and Hertford, and Johanna Countess of the same counties, to all faithful in Christ. Recites a dispute between Godfrey Bishop of Worcester, on the one part, and the said Earl and Countess on the other part, about a foss made by the Earl and Countess on the top of Malvern Hill on the land of the Bishop, to the nuisance of the said Bishop and Church of Worcester; by the intervention of friends, particularly Robert, Bishop of Bath and Wells, it is appeased; namely, that the Earl and Countess hereby grant to Godfrey and his successors two fat bucks on the vigil of the Assumption of the Virgin, and two fat does on the vigil of the Nativity of the Lord, out of their forest and chase of Malvern, yearly at his manor of Kemeseye; on failure, other two bucks and does within the octaves of the said terms, and doubled for every octave; on failure, they submit themselves to the King or the Bailiff, of any other whom the Bishop shall name, who may distrein them (the grantors). And they will give to the Prior and Chaplain of St. Mary, Worcester, when the see is vacant, or to their attorney asking for them, at the Castle of Hanlegh, the above bucks, &c. Godfrey, with the assent of the Prior and Chapter of Worcester, allows the foss to continue, and gives to the Earl and Countess in fee all their lands and messuages outside the foss and contiguous thereto towards Hereford. Seals of both the parties, and the seal of the Bishop of Bath and Wells, in whose presence the deed was made."

REMARKABLE THUNDERSTORM ON SUNDAY, AUGUST 21ST, 1898.

OUR member, Mr. H. Southall, F. R. Met. Soc., sent to the *Ross Gazette* of August 25th, the following letter:—

The thunderstorm of Sunday evening last, the 21st inst., was one of the most remarkable in my recollection, although I have known many more destructive in their effects in this neighbourhood. As an electrical display, continuing between three and four hours, it was magnificent. The continual roll or rumble of thunder, and the extraordinarily quick succession of the flashes of lightning for this unusually long period in our country was very striking, and gives an average, probably, of one second between the flashes. I calculate that quite 10,000 were visible at Ross. Most of them appeared in a horizontal rather than a vertical direction, as if passing from cloud to cloud.

The rainfall, accompanied by some hail about the size of marbles, yielded nine-tenths of an inch in little more than half an hour. The general trend of the storm was from S.W. to N.E., although occasionally it was rather erratic.

The nearly cloudless morn, and the very rapid overcasting of the sky mid-day, were remarkable features. The barometer gave little indications save a slight fall during the storm, which appeared to travel against the wind, but this is not unusual.

THE *AURORA BOREALIS* ON FRIDAY, SEPTEMBER 9TH, 1898.

OUR member, Mr. H. Southall, F. R. Met. Soc., wrote the following letter to *Symons's Monthly Meteorologieal Magazine* for October, 1898, page 138:—

"On Friday last, September 9th, an *aurora* was well observed here, which was probably the most brilliant, if not the most highly coloured, which has been seen since August 12th, 1890, not to go further back to the grand displays of 1847 and 1870-71. It was preceded by a magnificent sunset, the sky carmine to the zenith, and fine masses of clouds to the eastwards being illuminated with a pink light similar to that of snowy Alpine peaks, changing later to a deep copper shade.

"At 9 p.m. a large arch was seen spanning the northern horizon, a little to the west of north, and at an altitude of about 20°. The centre was dark and apparently transparent. Streamers were continually shooting upwards for fully 60° in height.

"The light given out was equal to that of a full moon, and was generally white, although with a tint of red occasionally. After midnight the exhibition gradually died away.—Yours, &c,

"HENRY SOUTHALL, F.R. Met. Soc.

"The Graig, Ross, September 12th, 1898."

THE HEAT-WAVE AND DROUGHT IN SEPTEMBER, 1898.

THE month of September was exceptionally dry, but was more remarkable for high temperatures.

The highest temperatures ranged from the 3rd to the 9th, and from the 14th to the 17th. In 1895, the intensity of the heat occurred at the end of the month, and was not so great as in the year 1898. At least a dozen readings were reported exceeding 90°; the highest temperature, 92°, was recorded on September 8th, at the Observatory, Cambridge; and on the same day 92.1° at Greenwich and at Kensington (Edith Road).

Reference to the regular table in *Symons's Monthly Meteorological Magazine* of Rainfalls at 50 Stations will at once show that the month was remarkably dry over the whole of England and Wales.

VERY WARM DECEMBER NIGHTS, 1898.

As we have received no records from any of the meteorologists of our Club of the remarkably warm nights of the early part of December, in order that the record should remain chronicled, we give an extract from *The Times* of December 7th, 1898, of a letter from Mr. G. J. Symons.

SIR,—I have recently had prepared abstracts of the meteorological observations made here during the 40 years 1858—97.

From them it appears that the highest *minimum* (*i.e.*, the warmest night) in December was that between the 27th and 28th of December, 1882, when the temperature did not fall below 52°.8.

This has been beaten on each of the last two nights, the *minimum* of the 5th being 52°.9 and of the 6th 53°.9, or 1°.0 above any other December night on record here.

It has been hotter for a short period in December previously, notably on December 5, 1888, when the *maximum* reached 58°.9, or 1°.8 higher than on the 4th in 1898, but for uniformly high temperature I can find no parallel to the following sequence:—

1898.	Min.	9 a.m.	Max.	9 p.m.
	Deg.	Deg.	Deg.	Deg.
December 3	—	51·2	55·2	51·8
„ 4	50·1	52·6	57·1	55·1
„ 5	52·9	53·9	54·9	55·0
„ 6	53·9	54·8	56·2	50·3

Your obedient servant,

G. J. SYMONS, F.R.S.

62 Camden Square, N.W., Dec, 6.

Woolhope Naturalists' Field Club.

ANNUAL MEETING, THURSDAY, DECEMBER 22ND, 1898.

THE annual meeting for the election of President and officers for the ensuing year was held in the Woolhope Club Room. The following were present:—The President (Rev. H. B. D. Marshall), Messrs. H. C. Beddoe, Spencer H. Bickham, J. Carless, Robert Clarke, Sir Herbert Croft, Gilbert Davies, T. Hutchinson, Rev. Preb. William Lambert, the Hon. and Very Rev. J. W. Leigh, Rev. E. J. Holloway, Capt. Dansey Oldham, J. P. Sugden, H. Vevers, Alfred Watkins, the Rev. H. Trevor Williamson, etc.

The usual accounts were passed and ordered to be paid.

Officers for the year 1899 were elected as follows: President, Mr. H. C. Beddoe; vice-presidents, Rev. H. B. D. Marshall, Sir Herbert Croft, the Hon. and Very Rev. the Dean of Hereford, and Mr. Alfred Watkins. Mr. Thomas Hutchinson was elected honorary secretary in place of Mr. H. Cecil Moore. It was proposed by the Rev. Prebendary Lambert, seconded by the Very Rev. the Dean of Hereford, and directed to be placed upon the minutes, that "This meeting of the Woolhpe Naturalists' Field Club desires to place on record its regret that its Honorary Secretary, Mr. H. Cecil Moore, is compelled by the pressure of professional duties to resign the office which he has held for twelve years, and their grateful appreciation of the services which he has rendered to the Club as Secretary both in organising and conducting its field meetings, and in the arduous work devolving upon him as editor of the *Transactions* of the Club, which were ten years in arrear at the time of his taking office."

Mr. Moore gave a report of the volume of *Transactions*, 1895, 1896, 1897. The volume contains an index of the *Transactions* 1893 and 1894, also of 1895, 1896, and 1897. A separate index of 1893—1894 has also been published, so as to give each member the opportunity of inserting it in his volume 1893—1894. It has been resolved that in future every volume shall have an index. The volume contains at the end eight separate papers, viz., (1) the Address of the President, H. Cecil Moore; (2) Roman coins found in Herefordshire, by H. Cecil Moore; (3) Great hoard of 18,000 Roman coins, with two plates, found at Bishop's Wood; by Mrs. Bagnall Oakeley; (4) *Pyrus minima*, by Rev. A. Ley, with plate; (5) Second report of the Committee for Promoting the Transcription and Publication of Parish Registers. N.B.—The first

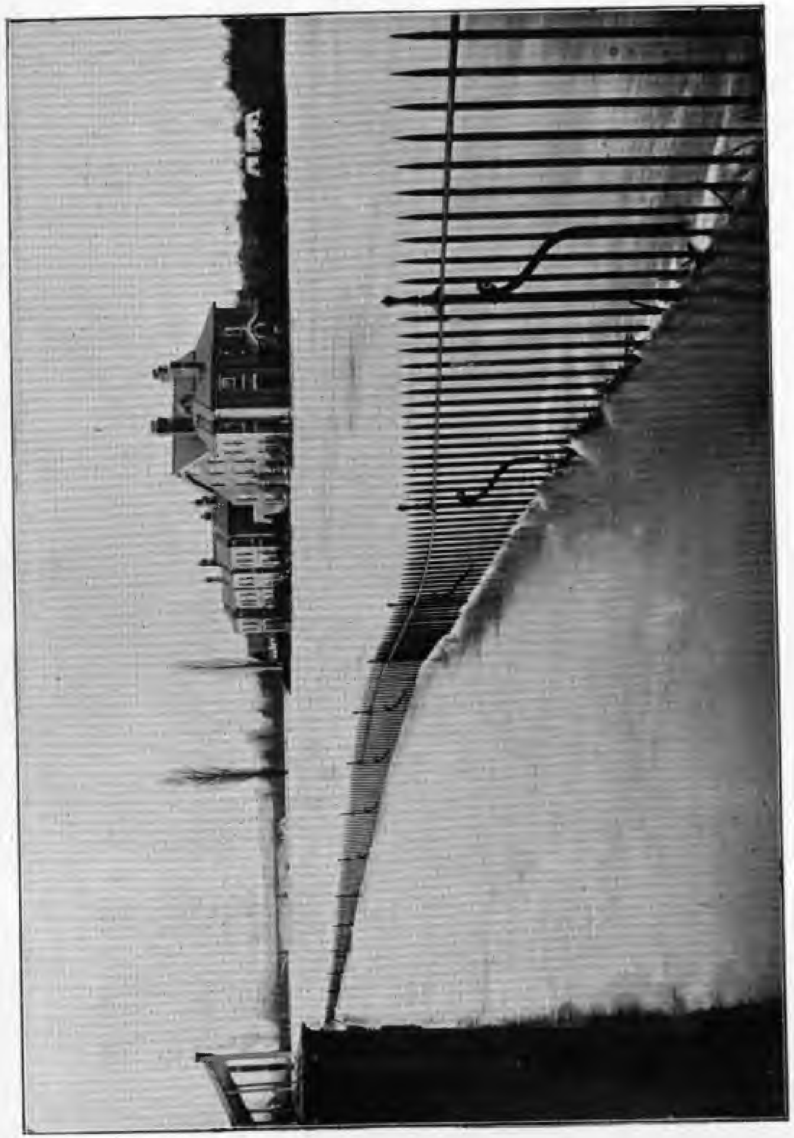
report is to be found at the end of the volume of *Transactions* 1890—1892. Only four parish registers in Herefordshire have been transcribed and published, viz., Sarnesfield, Stoke Bliss, Thornbury, and Upton Bishop. (6) Report of the Sub-Committee on a Photographic Survey of England and Wales; Forms of Schedule prepared by a Committee of the British Association for the Advancement of Science, appointed to organise an Ethnological Survey of the United Kingdom; (8) The collection, preservation, and systematic registration of photographs of geological interest in the United Kingdom. The volume contains altogether 485 pages. The illustrations include: The camps of Wapley (the Warren), Croft Ambrey, and Pyon Wood; map and section of the Severn Tunnel, showing geological strata; geological map and sections of the district of Aymestrey; the Battlefield Oak, the Blue Mantle cottages, and the Pedestal in commemoration of the battle of Mortimer's Cross; map of the Elan and Claerwen watershed, with sections of the proposed dams and the reservoirs in these two rivers; sections of geological strata at Droitwich and Stoke Prior; diagram exhibiting the injury to church spires and pinnacles in Hereford by the earthquake on December 17th, 1896; map indicating the parishes where serious damage occurredto buildings; the Passage beds between the Old Red Sandstone and the Upper Silurian at Ledbury Railway Station; one of the earthenware jars in which the collection of 18,000 Roman coins were found at Bishop's Wood, near Ross and Ruardean; map of the Forest of Dean district; plate of *Pyrus minima.*

RECORDS OF RARE EVENTS.

At 12.20 on Friday, December 17th, a house martin was seen by one of Rev. M. G. Watkins' sons (a gentleman not likely to make an error upon this subject) to fly twice round the Cathedral. Rev. M. G. Watkins reports that he has never seen one later than November 5th.

The Jerusalem artichoke has again blossomed this year in our county. For previous records, see Vol. *Transactions*, 1895, page 102.

Mr. Vevers brought for the Museum a section from the branch of an apple tree, showing long gallery burrowed out by the caterpillar of the Wood Leopard Moth (*Zeusera æsculi*).



NO. I. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. ABOVE WYE BRIDGE.

W. H. Bustin, photo.

To face page 77.

FLOODS OF THE [illegible]

HIGH TIDES IN WYE [illegible]

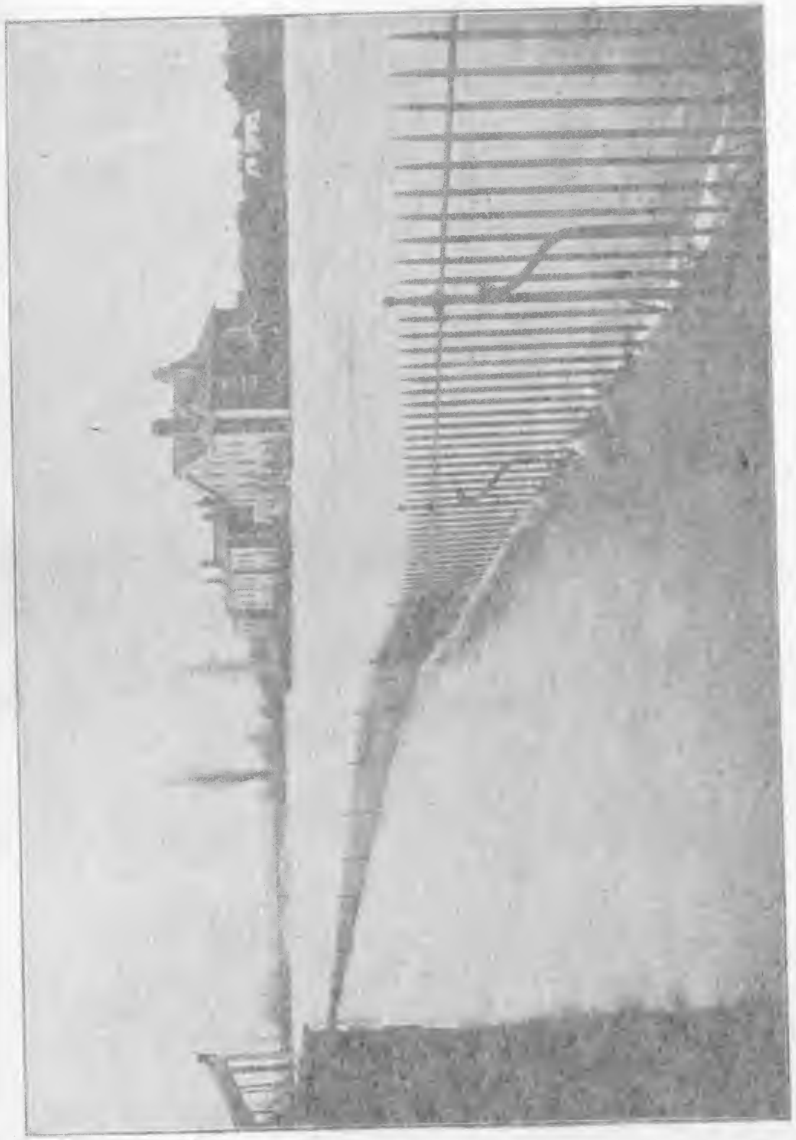
By H. [illegible]

WITH the aid of Mr. J. [illegible] Hereford, I have been [illegible] floods reduced to ord[illegible] the Woolhope Club to [illegible] with the levels marked [illegible]

It is not an eas[illegible] not only in a public place, but, at [illegible] legible view of the public, and out of the [illegible] tions, such as the five piers of Hereford bridge, [illegible] the water locally, raise the water level.

The position of the gauge on the central pier [illegible] bridge, erected by [illegible] *desiderata*, but, [illegible] cut-water of the pier, [illegible] one foot, more or le[illegible] below the actual water level. [illegible] directing his view along [illegible]

The most [illegible] are to be found upon the [illegible] yard of Mr. Carless, Veterinary Surgeon, [illegible] about sixty yards below the bridge, [illegible] the highest flood, namely, that of [illegible] who has for sixty years lived within [illegible] bridge, and who [illegible] the salmon [illegible] was formerly a tenant of [illegible] yard, and to him [illegible] the great flood of February [illegible], 1852. I myself am [illegible] the later records, fixed by [illegible] a large brass-headed [illegible] the wall. [illegible] primitive marks will now be superseded by an oak upright [illegible], upon which the dates of extreme floods will be recorded.



NO. 1. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. ABOVE WYE BRIDGE.
W. H. Bustin, photo.

Woolhope Naturalists' Field Club.

1899.

FLOODS OF THE RIVER WYE.

HIGH TIDES IN WYE AND SEVERN.

By H. Cecil Moore.

With the aid of Mr. J. Alfred Spreckley, of the City Surveyor's Office, Hereford, I have been able to get trustworthy records of previous high floods reduced to ordnance datum, and have obtained the sanction of the Woolhope Club to erect a cast iron plate in some eligible situation with the levels marked upon it from 1795 downwards.

It is not an easy matter to select an eligible site, which shall be not only in a public place, but, at the same time, in a situation within legible view of the public, and out of the influence of artificial obstructions, such as the five piers of Hereford bridge, which, by impounding the water locally, raise the water level.

The position of the gauge on the central pier of Hereford bridge, erected by Mr. John Lloyd, possesses the first two of the above *desiderata*, but, being situated a distance of three feet from the angle or cut-water of the pier, the gauge always reads, during a high flood, one foot, more or less, according to the velocity of the river, below the actual water level. This fact will be patent to any observer directing his view along the masonry courses of the pier.

The most trustworthy records of previous high floods are to be found upon the brick wall of the stables in the yard of Mr. Carless, Veterinary Surgeon, at the bottom of Gwynne Street, about sixty yards below the bridge, where a brass plate is fixed recording the highest flood, namely, that of February 11th, 1795. Mr. Stephens, who has for sixty years lived within one hundred yards of Hereford bridge, and who tenanted the salmon fisheries here of the Wye, was formerly a tenant of this yard, and to him we owe the record of the great flood of February 6th, 1852. I myself am responsible for the later records, fixed by driving a large brass-headed nail into the mortar course of the wall. These primitive marks will now be superseded by an oak upright frame, upon which the dates of extreme floods will be recorded.

Starting from the bench-mark on the wall of the Wesleyan Chapel, in Bridge Street, as his datum, Mr. Spreckley obtained the following levels :—

	FEET ABOVE ORDNANCE DATUM.
High water flood level of February 11th, 1795, on the brass plate in Mr Carless's yard ..	170·7
Summer level on Mr. John Lloyd's gauge on the central pier on the upper side of Wye Bridge	152·2
Difference in feet	18·5

This gives 18 feet 6 inches as the rise, sixty yards *below* the bridge, of the great flood of February 11th, 1795. N.B.—The rise of 20 feet has hitherto been handed down to us in our local records : the difference of 1 foot 6 inches is due to the impounding of the water *above* the bridge Compare 16 feet 3 inches, as recorded on Mr John Lloyd's gauge on the bridge, with 15 feet 7 inches in Mr. Carless's yard for the flood of January 22nd, 1899.

From this standard of 18 feet 6 inches for the flood of 1795 we determine the subsequent floods as follows :—

		Feet.	Inches.
Absolutely highest flood on record—	February 11th, 1795	18	6
Subsequent floods	February 6th, 1852	17	3
	January 22nd, 1899	15	7
	November 15th, 1894	15	3½
	November 11th, 1895	14	11
	January 1st, 1892 ..	14	4½

These rises of flood water are below those previously recorded in *Transactions*, 1892, page 235, and elsewhere ; but I consider that they are more exactly correct, because they are taken in a locality not influenced by immediate obstructions.

The flood of Sunday, January 22nd, 1899, was at its maximum about 2 p.m. at Hereford. Mr. H. Southall informs me that the time of highest flood at Ross was at 6 a.m. on Monday, January 23rd. At Ross the flood was 30 inches below that of February, 1852, and it exceeded by 2 inches the flood of November, 1894. At Hereford the flood was 20 inches below that of 1852, and it exceeded by 3½ inches the flood of 1894 It was 2 feet 11 inches below the highest recorded flood of February, 1795.

Since the date of the flood of January 22nd, 1899, the Hereford Town Council has erected a Kent's Automatic River Gauge and Recorder in a very appropriate situation, uninfluenced by obstructions, a mile higher up the river, near the intake to the City Reservoir supply.

The summer level at the automatic gauge is 152·9 feet above Ordnance datum.

NO. 2. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. ABOVE WYE BRIDGE.

W. H. Bustin, photo.

Between pages 78 and 79. To face No. 3.

NO. 3. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. ABOVE WYE BRIDGE.

W. H. Bustin, photo.

Between pages 78 and 79. To face No. 2.

NO. 2. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. ABOVE WYE BRIDGE.
W. H. Bustin, photo.

NO. 3. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. ABOVE WYE BRIDGE.
W. H. Bustin, photo.

Between pages 78 and 79. To face No. 2.

NO. 4. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. BELOW WYE BRIDGE.
THE MEADOW OPPOSITE THE PALACE GROUNDS.

W. H. Bustin, photo.

Between pages 78 and 79. To face No. 5.

NO. 5. FLOOD OF THE WYE AT HEREFORD, ON JANUARY, 22ND, 1899. BELOW WYE BRIDGE.
THE MEADOW OPPOSITE THE CASTLE GREEN.
THE VICTORIA BRIDGE, WITH THE INFIRMARY IN THE BACKGROUND.

W. H. Bustin, photo.

Between pages 78 and 79. To face No. 6.

NO. 4. FLOOD OF THE WYE AT HEREFORD, ON JANUARY 22ND, 1899. BELOW WYE BRIDGE.
THE MEADOW OPPOSITE THE PALACE GROUNDS.

Between pages 78 and 79. To face No. 5.

NO. 5. FLOOD OF THE WYE AT HEREFORD, ON JANUARY, 22ND, 1899. BELOW WYE BRIDGE.
THE MEADOW OPPOSITE THE CASTLE GREEN.
THE VICTORIA BRIDGE, WITH THE INFIRMARY IN THE BACKGROUND.

W. H. Bustin, photo.

Between pages 78 and 79. To face No. 4.

The summer level at the Bridge is 152·2 above Ordnance datum.

The summer level at the Diamond Jubilee Bridge, known as the Victoria Bridge, nearly half-a-mile below Hereford Bridge, is 151·9 feet above Ordnance datum.

For these levels I am indebted to Mr. Spreckley.

HIGH TIDES IN WYE AND SEVERN.

From Mr. F. H. Worsley Benison, of Livingstone House, Chepstow, by letter, dated February 22nd, 1899, I hear :—

With regard to the late tidal wave :—

The tide on Sunday morning, February 12th, 1899, was, as shown in the kitchen of the Bridge Inn, Chepstow, one inch lower than the tide of October 17th, 1883. See *Transactions*, 1892, page 320.

Although the tide at the Bridge Inn, Chepstow, was one inch *lower* than that of October 17th, 1883, as shown in the kitchen there, nevertheless, it was really *higher* than the October, 1883, tide over the meadows and railway line in the district below the mouth of the Wye (*i.e.*, the Mathern and Thornwell district). This, as I now believe, was not owing (as Mr. Sargent thought) to the general sinking of the land owing to the daily Severn Tunnel drainage by the enormous pumping engines, but to a cause more simple. In October, 1883, the wind blew more directly straight up the Severn and Wye, having less effect on the meadow district, but more effect in the river. The tide of Sunday morning, February 12th, 1899, was driven by a gale coming more *across country*, thereby flooding the meadows *more* and filling the river *rather less*.

At Tintern the tide on Sunday morning, February 12th, 1899, was $\frac{3}{4}$ inch *less* than the October, 1883, tide, as shown in the kitchen of the Anchor Inn at Tintern, the inn by the slip close to the Abbey. Altogether they had *seven* tides into the kitchen and other rooms.

Mr. Worsley Benison writes to me, under date March 2nd, 1899 :—"Our measurements this morning confirm the previous measurements. The rise from dead low water at the bridge to high spring tide is, as near as can be, 46 feet. Between that and the level of the October, 1883, tide in the kitchen of the Bridge Inn, is 3 feet 3 inches, which makes the rise of the great tidal wave 49 feet 3 inches. Next Monday week we are going to see what the height of the tide is at the railway bridge, for there is a considerable fall of the bed of the river between the two bridges."

On March 12th, 1899, he writes :—"The difference between the level of dead low water under the footbridge (the 46 feet measurement place) and the level of dead low water (below the weir), which is about 200 yards from the bridge, is just 2 feet. So that at *that* spot the highest spring tide rises 48 feet.

ORNITHOLOGY.

On the 24th January, a son of Rev. M. G. Watkins, of Kentchurch, picked up a perfect specimen of the Kittiwake Gull (*Larus tridactylus*) dead in a field before the Rectory. It was probably killed in the recent rough weather and gales. It was in immature plumage.

EARLY APPEARANCE OF THE CUCKOO.

April 3rd is an early date for the appearance of this migrant, on the evidence of Mr. John Weekes, writing from Kent in the *Times* of Wednesday, April 5th, who writes:—"I first saw it flying, and, waiting a few seconds, heard the well-known notes. Gilbert White's earliest is April 7th; my own, previous to this, is April 8th."

SANDGROUSE IN ENGLAND.

The interesting re-appearance of this bird must be recorded, especially as it is on the authority of our friend, Mr. John Cordeaux, whose paper on "The rush of Arctic birds on the east coast of Great Britain in the winter of 1894-5," appeared in *Transactions*, 1895, page 32.

He informs us that a flock of about thirty sandgrouse (*Syrrhaptes paradoxus*) (Pallas's) have frequented a comparatively limited area on the Lincolnshire Wolds since the end of January, the chief haunt being a sandy field of 24 acres, too poor for cultivation, and recently laid down in grass, on the northern slope of the Wolds, a very lonely and retired spot, so that it is possible for the birds to have remained quite unmolested during the winter; and the self-same spot whence the bird was first recorded in that county, on May 18th, in the great invasion in the year 1888.

Mr. Cordeaux notified the fact in the *Times* of April 1st.

It is satisfactory to know that the special Act of Parliament passed in 1888, making it a penal offence to destroy a sandgrouse in this country at any time of the year, is still in force. It was introduced by Mr. Sydney Buxton, but, unfortunately, too late to be of any practical use in 1888. It is hoped, however, that it may be of real value now, and, with the co-operation of the County Councils, enable the sandgrouse (as the preamble to the Act has it) "to become acclimatized in the United Kingdom."

The Act provides that any person in the United Kingdom who knowingly, or with intent, kills, wounds, or takes any sandgrouse, or exposes or offers for sale any sandgrouse, is liable, on conviction before a Justice of the Peace, to a fine not exceeding £1 for each bird.

The Act was originally passed for a limited number of years, but, luckily, has been since annually continued in the Expiring Laws Continuance Act; therefore the Act is still in force.

EXTRAORDINARY JOURNEY OF A BOTTLE.

Our member, the Rev. W. S. Clarke, The Thorn, Marstow, sends us the following account of the more than five months' journey of a bottle from the brook Garron, down the Wye, Severn, Bristol Channel, and across the sea to the North of Ireland:—

When visiting their uncle at Marstow, near Ross, Herefordshire, on September 14th last, Master Maurice Perkins, of 13, and Miss Mary Perkins, of 23, Fitzhamon Embankment, Cardiff, dropped a bottle containing their respective names and addresses into the brook Garron, a tributary of the Wye. This bottle was picked up by a fisherman on February 24th on the beach near Ardglass, County Down, on the north-east coast of Ireland, and has just been received at Cardiff. It is strange that a bottle should ever have got to the sea at all, because of the many turnings and of the overhanging twigs, which would be liable to intercept its progress. Presumably, the heavy floods of the beginning of the year carried it down to the Bristol Channel, after which the tides and currents conveyed it to the spot on which it was stranded.

ORNITHOLOGY.

ERRATUM.

On page 105 of Volume of *Transactions*, 1895, under the heading "Ornithology in Herefordshire," three lines from the bottom, the writer, Mr. Ashdown, has given a Pomatorhine Skua, as picked up dead *near Builth*.

Mr. E. Cambridge Phillips writing to me from The Rock, Bwlch, Breconshire, informs me that the bird was given to his brother-in-law, and that it was killed in Montgomeryshire.

Editor.

Woolhope Naturalists' Field Club.

Annual Meeting, Thursday, April 13th, 1899.

At the Annual Meeting, held in the Woolhope Club Room, the following members were present:—The President, Rev. H. B. D. Marshall, Mr. S. H. Bickham, Mr. Bird, Mr. A. E. Boycott, Colonel Campbell, Mr. J. Carless, Mr. R. Clarke, Mr. E. Du Buisson, Rev. J. E. Grasett, Rev. Dr E. Harris, Rev. A. W. Horton, Rev. Preb. W. Lambert, Rev. A. Ley, Mr. R. Lewis, Mr. H. Cecil Moore, Colonel T. H. Purser, Rev. A. Relton, Mr. J. P. Sugden, Rev. M. G. Watkins, Mr. T. Hutchinson, hon. secretary, and Mr. James B. Pilley, assistant secretary.

The Financial Statement represented a balance in the hands of the Treasurer of £114. It was, however, stated that the liabilities amounted to £123 13s. 0d., due to the printers for the Volume of *Transactions* 1895, 1896, 1897, now in the hands of all members not in arrears with their subscriptions.

The Annual Report of the Assistant Secretary (Mr. J. B. Pilley) represented the total number of members in 1898 as 212. This number reached its zenith, 231, in 1896. Nine new members were elected in 1898. Seven members had left; six members were struck off the list in compliance with Rule 12, passed at the Field Meeting at Mortimer's Cross, Aymestrey, on May 19th, 1896, which is as follows: "That any member whose annual subscription is twelve months in arrear shall not be entitled to any of the rights and privileges of membership; and any member whose annual subscription is two years in arrear may be removed from the Club by the Central Committee."

The losses by death were two—the Rev. Preb. Baldwyn Childe, and Mr. Henry Andrews.

The Receipts in 1898 were £98 10s. 0d., against £109 in 1897. The unpaid annual subscriptions at the close of the year amounted to £9.

The increase in the incidental expenses of the Assistant Secretary is due to the fees on the Ladies' Day on the occasion of the visit to the three Abbey Churches of Gloucester, Tewkesbury, and Malvern.

The Field Meetings were well attended. As many as 204 attended, or an average of 51 to each meeting.

Mr. Pilley's report concluded with an earnest exhortation to the members to pay their subscriptions, due on the 1st January, early in the year, so as to enable the Committee to determine the amount at their disposal for the expenses of publication of the *Transactions*.

Mr. Moore, on behalf of the Editorial Committee, strongly supported Mr. Pilley's exhortation on the ground that the balance in hand was exceeded by the liabilities, and that 70 pages were already printed of the Volume of *Transactions* of 1898, being portion of a paper of local interest on "The Mollusca of Herefordshire." Mr. Moore called the attention of the members to the immigration of a flock of sand-grouse (*Syrrhaptes paradoxus*) on a sandy field of 24 acres, recently laid down in grass, on the northern slope of the Lincolnshire Wolds, as reported by Mr. John Cordeaux in *The Times* of 1st April. Former great immigrations of this bird from the Steppes of Asia were in 1863 and 1888. A strange circumstance is that the first record in Lincolnshire of the recent invasion of the sand-grouse in 1888 was in this same spot.

The following places and dates of Field Meetings were fixed:—

May 25th, Thursday.—Much Marcle, for "The Wonder" land slip.

June 27th, Tuesday.—Symonds Yat.

July 27th, Thursday (Ladies' Day).—Cusop Dingle.

August 29th, Tuesday.—Elan Valley, for the Birmingham Water Supply.

Address of the Retiring President, Rev. H. B. D. Marshall.

Gentlemen,—My only duty now remaining is to make that statement of the past year's proceedings, which is required by Rule viii, to which may be added "such further observations as the out-going President may deem conducive to the welfare of the Club and the promotion of its objects."

The succession to the office and dignity which last year you so kindly conferred upon myself passes to a member of our Club whose valuable services in the past are a guarantee of his continued interest and co-operation in the future, and an assurance that, under his judicious rule, the high position which the Woolhope Field Club has held from its foundation will continue to be maintained.

Here it is proper to say that had the original election of a President for last year been carried into effect, you would now be listening to the "retiring address" of an able naturalist, whose contributions to the work and *Transactions* of the Club, of which he has so long been a member, are as instructive and interesting as they will be permanently valuable. We must all regret the inability of Dr. Wood, through pressure of other duties, to accept the office to which he was unanimously elected.

Time passes rapidly indeed, and it may not, so far, have occurred to some of our members, that the year after next (1901) will be the "jubilee year" of the Woolhope Club. It had occurred to my mind as possible that some of our "original members" or "founders" might have been still amongst us and on our rolls. Alas, none remain. Such therefore failing, I would venture the hope that out of the number of their immediate successors, we may be able to elect—or it may be re-elect, a "Jubilee President."

Presteign to Aymestrey—not exactly as the crow flies, but following, either on higher or lower ground, the more devious course of the river Lugg—was the fixture for our first Field-day in 1898.

Friday, May the 27th, found a goodly muster of members and visitors, some 40 strong, scaling the sides of the steeply rising mound on which once stood the ancient Castle of Stapleton; the existing ruins are for the most part those of a subsequent building, vestiges in the masonry pointing to a date not earlier than the 16th century. The glory has long departed of the original stronghold, one of those links in the chain of "Welsh Border" castles with which we in this district are familiar, and whose ruins tell us how hard and fast a line, not only of actual boundary, but also of national antipathy and separation, must have existed between English and Welsh long after the days of Saxon and Briton.

Growing freely amongst the lank grass on the steep slopes of the Castle mound was seen the somewhat uncanny plant *Hyoscyamus niger*, Black Hog bean, or common henbane, a plant poisonous in any quantity to man, and to most animals, yet goats and sheep will take a small portion of its foliage, and swine will eat it ravenously; it has had the reputation of causing madness in the human being. So strong was this impression in the Greek mind that there was derived from the name of this plant a Greek verb *ὑοσκυαμαω*, which signified "to be raving mad"

Leaving the Castle, and following the direction though not the deep watery course itself, of what from all appearance seemed to be a genuine "Keltic lane," we found ourselves gradually gaining the higher ground, from which a splendid view of this fine district began to unfold itself. A somewhat rapid descent into a valley, and then began the climb of the day, the ascent of Cole (or Cole's Hill) 1,097 feet. Here, while a welcome rest was being taken, and the remarkable view of the many hills far and near greatly enjoyed, an instructive and useful address was given by Mr. H. J. Marshall on the subject of "Trees and how to grow them." It was listened to with much interest, and the the thanks of the members present were heartily accorded to the writer.

It is to be regretted that the visit of the Club to this interesting spot does not appear to have found a solution of the peculiar marks of circular depressions on the top of the hill; they are described in an interesting account of the day's proceedings as "nine saucer-shaped circular hollows, about six feet in diameter, and in close proximity to each other." "Ancient Dwellings" (see Dr. Geikie's "Hours with the Bible,"* Vol. 2, p. 293, on remains of Amalekite dwellings or "tombs"),

* "The Amalekites. Remains of dwellings."—"There still remain on the Sinaitic peninsula some ancient dwellings which may possibly preserve the last trace of them . . . These are similar in form to the bothan or beehive houses in Scotland. Professor Palmer found similar houses, which he thus describes . . . . Their dimensions averaged 7 ft. high by 8 ft. in diameter . . . . They were circular with an oval top. The country all around is covered with them—every hillside having some remains of them on it. Close to the houses were stone circles, and similar circles were found also in the centre of a number, as if the houses had been used as tombs on the death of the owners, as in the case of the Indian of the Upper Amazon, mentioned by Wallace."

"hut circles," remains of "beacon fires," each theory seemed to leave something to upset it. As the writer of the report to which I have alluded puts it, "We cannot satisfactorily account for them." I am inclined to think that if ancient at all, they are very ancient, and may be the remains of circular tombs or burial places; their inconvenient proximity to one another would be against their having been abodes of the living. It is easy to imagine how every vestige of superstructure would long since have disappeared, and only the ground depression be remaining.

The temptation to linger in so interesting and beautiful a spot had to be resisted, so, after a walk of some distance along the ridge, a quick descent was made to Kinsham Court. Here the Club was most hospitably received by Mrs. Evelyn, in the absence from home of Mr. Evelyn. For those who had not before visited the very lovely surroundings of this charming residence, a delightful surprise was in store; this was the view, looking directly down from the edge of the garden terrace, of the justly admired Kinsham dingle—a magnificent gorge, along the depth of which, some hundred feet below, winds the river Lugg. Our attention was called to the fact, that here at this mansion of Kinsham in the days when it was a residence of the Harley family, Lord Byron was an occasional visitor. To "the Lady Charlotte Harley" addressing her as "Ianthe," the poet dedicated the first two cantos of "Childe Harold." "That young Peri of the West," as he apostrophises her in his dedication, had not then "completed her eleventh year." Allusion was made in an interesting report of this visit of the Club to Kinsham, to a statement that it was here that Byron wrote most of his "Childe Harold"; in his preface, however, to the first and second cantos, the poet himself says, "the following poem was written for the most part amid the scenes which it attempts to describe; the scenes attempted to be sketched are in Spain, Portugal, Epirus, Acarnania, and Greece." Referring to the publication of "Childe Harold," and the reception of the poem in the country, Lord Byron said, "I awoke one morning and found myself famous." Internal evidence goes to shew that Byron wrote also the third and fourth cantos abroad (see note on Stanza 67 in Canto iii., also a letter to Mr. Murray in Moore's "Life of Lord Byron." Vol. iv., p. 54).* "Childe Harold" was begun in 1809, and ended in 1818.

After an inspection of Kinsham Church (where there is an interesting piscina) our course lay gradually downwards into the Lugg Valley; from this a detour was made by some of the party to visit the

† The first Canto was commenced, as Lord Byron's diaries inform us, at Joanina, in Albania, on the 31st of October, 1809, and the second was finished on the 28th of March in the succeeding year at Smyrna. These two Cantos, after having received numberless corrections and additions in their progress through the press, were first published in London in March, 1812, and immediately placed their author on a level with the very highest names of his age. The impression they created was more uniform, decisive, and triumphant than any that had been witnessed in this country for at least two generations. . . . . The third Canto was finished at Diodati, near Geneva, in July, 1816. The fourth was begun at Venice in June, 1817, and finished in the same city in January, 1818, and being shortly afterwards published in London, carried the author's fame to the utmost height ever reached."—From "Works of Lord Byron," edited by Thomas Moore, Esq.

sites of the ancient "Abbey" and "Nunnery" at Lymebrook—some "remains" exist of the Abbey—no very clear account is given of these religious houses, and the evidence as to their origin and history appears to be somewhat conflicting. Continuing our walk through lanes of sticky Silurian mud, and along meadows sodden by recent rains, and so following the course of the river Lugg, we eventually arrived at Mortimer's Cross Inn. Here, waiting for us, we found the good Vicar of Aymestrey, who on more than one occasion has welcomed with much kindness and a salutation of church bells, the visits to his parish of a Field Club which looks upon Aymestrey and its natural history treasures with peculiar interest. The long walk and the lingering halts at the pleasant places which we had visited made us rather late in arriving at Mortimer's Cross, and so the well-earned dinner was a somewhat hurried business. There was just time, however, to propose "The health of the Queen," and, in doing so, to express the pleasure felt by the members of the Woolhope Club at the "Birthday honour" recently conferred by Her Majesty on a distinguished member and former President, Sir James Rankin, Bart., M.P., a contributor of valuable papers to its *Transactions*. The thanks of the members attending this day's Field Meeting are especially due to Mr. Britten for his able guidance during the day, as also to the Rev. R. W. T. Hunt, Rector of Byton, and to the Rev. Leonard Edwards, Vicar of Lingen, for much interesting information, and for their kindness in meeting and accompanying the members of the Club in the long walk of the day.

Lists of plants and birds observed during the day's walk have been supplied by the Rev. Augustin Ley and by Mr. Donald Mathews, of Redditch. Growing on a wall at Presteigne was a white-blossomed specimen of the Ivy-leafed Toad-flax (*Linaria Cymbalaria*), a plant which has had an undeservedly "bad name" in reference to its medicinal properties "It formerly acquired much celebrity as being one of the ingredients of that terrible poison known in France as the '*Poudre de succession.*' . . . . It is not much more than a century ago since the art of slow and secret poisoning had acquired such perfection, that the celebrated Tophania, a woman residing at Naples, sold her cruel compound, and found so many ready to share her wickedness, that she is said to have caused the death of six hundred persons. Garelli, the physician to Charles VI., King of the two Sicilies, analysed her poison, and found it to be composed of an arsenical oxide dissolved in a liquid called '*Aqua Cymbalaria*,' which was made of the Ivy-leafed Toad-flax. Water distilled from it is, however, simply an astringent, and by no means a powerful one."—From Anne Pratt's "Flowering Plants of Great Britain."

Typical summer weather favoured our Second Field Meeting on Thursday, June 30th. The day's programme was a drive of ten miles from Llanfihangel Station to Capel-y-ffin, a walk thence up the Honddu Valley, through the Bwlch yr Effengyl or "Gospel Pass," and so down in a northerly direction to the Church of Llanigon.

The fifty to sixty members and visitors who took part in this excursion will not soon forget the delightful drive on the glorious June morning through the sweet vale of Ewyas. Nature, at her best, seemed to have put on her freshest garb in order to welcome those who loved her, not only for her outward beauty, but for her inexhaustible store of instruction. After a drive of some six miles the carriages were halted at the ruins of Llantony Abbey. Here a general dismount took place, the halt being made not so much for general inspection of the remains of the Abbey as for that portion of it which is now used as the Parish Church of Llantony, the restoration of which has been completed since the last visit of the Club. The vicar of Cwm-y-yoy here kindly met us and pointed out the more interesting features of the interior of the church. The nave is 52ft. long by 19ft. wide, the chancel 34ft. long by 15ft. wide. There is a small north porch. The chancel appears to have been at one time shut off from the nave by gates or folding doors; some remains of a hinge or hinges are still to be seen. The Transactions of the Club already contain much full and reliable information touching the history and archæological interest of the Priory of Llantony, to which several visits have been paid by our Society.

It may be useful here to state that a full and interesting account of this Priory of the Canons Regular of St. Augustine was published in the *Builder* newspaper of January 7th in the present year. There was also given an authentic plan of the Monastery, a reproduction of which might very usefully find a place in the next volume of *Transactions*. Half an hour's stay at this fascinating spot was only too brief, but time not allowing of delay, the further drive for four miles up the valley soon brought us to Capel-y-ffin. On occasions of previous visits these four miles have had to be walked. Whether we owe it to the establishment of the modern Monastery of Father Ignatius (the "Monks of old" were great civilizers, why not also their modern successors?) or to the enterprise of a County Council that this once rugged and narrow way can now be driven over with a fair amount of comfort I am unable to say; perhaps a share of credit is due to both. A hurried visit was here made to the Church of the modern Monastery, the magnificent interior of which is fully described in the records of the Club for the year 1891, so also is the Church of Capel-y-ffin—well named the chapel of the boundary, for hard by is the meeting place of the boundaries of two countries, three counties, and three dioceses. Leaving Capel-y-ffin we now started on the walk to Llanigon.

In the year 1708 a dispute having arisen as to whether Capel-y-ffin was a chapelry of Glasbury or Llanigon it was decided by the Ecclesiastical Court that it belonged to Llanigon. At Capel-y-ffin we had arrived at an altitude of 1,050 feet above sea level; by the time we had reached the "Bwlch" or pass at the head of the Honddu Valley, three miles from Capel-y-ffin, an altitude of 1,800 feet had been attained. Here a splendid view presented itself. As the writer of an account of the day's proceedings observes "The country for miles spread out before us;

hills succeeded hills and valleys valleys ; in the far distance some of the mountains of North Wales were visible ; it was indeed a superb sight which will dwell long in the memory of those who saw it." The Woolhope Club has now visited the two easternmost valleys formed by the parallel ranges of the Black Mountains. In 1897 we perambulated the Olchon Valley ; on this occasion the Valley of the Honddu ; the latter to my mind the least interesting of the five valleys—the three yet unvisited I know would amply repay the physical efforts of a day's walk through each, either from the point of view of an observant naturalist or of a lover of wild and beautiful scenery. The keen air at the Bwlch made it too cold to wait long, or it would have been interesting to identify as far as possible the many mountain heights nearer or more remote. A slight variation from the day's programme was here made, it being decided, on the suggestion of the vicar of Llanigon and Colonel Thomas, who had now joined the party, to follow the course of the Cilonw Valley down to Llanigon instead of that of the Digedi. We missed therefore in one part of the latter route an old lane so deep and narrow that I think it would have been unhesitatingly pronounced to be one of those ancient ways treated of in Mr. Morgan Watkins' interesting paper on Keltic Lanes. Our deviation from the programme however gave us an opportunity of visiting the old and interesting farmhouse of Pen-y-worllod (anglice, "head of the mead"). Here resided one William Watkins, an officer in the Parliamentary army, and an active opponent of Charles I. Of him it is recorded in Jones' History of Breconshire that he did not forget that certain Church property with which he had to deal (when on a committee) "was intended for charitable purposes, and that charity begins at home." From Pen-y-worllod, a short downhill walk soon brought us to the Parish Church of Llanigon. Here in church and churchyard there were not a few points of interest. It was curious to see that the belfry or ringing chamber of three bells was a room or loft over the church porch. In Jones' History of Breconshire the interior of this church is quaintly described as follows—"The floor is not paved nor is there any ceiling under the roof, the walls of the nave are bedaubed with caricatures of death and time, a wretched imitation of the King's arms, and many a holy text strewed around, instead of which a little white lime would be more ornamental, and I fear have an equal effect in promoting the devotion or loyalty of the parishioners The chancel is ceiled, and a small school kept here." Church restorations have not always deserved the name, but there can be no doubt that the Church of Llanigon, as we saw it, must have been an improvement from what it was when visited by the historian of Breconshire.

The church inspected, a move was made to the schoolroom near at hand ; here, by the kindness of the vicar, Colonel Thomas, of Llanthomas, and the ladies of Llanigon, a most hospitable reception awaited us. Never was the cup which cheers more refreshing, to say nothing of the other good things with which the tables, bright with wild flowers of the parish, were loaded. Here a paper entitled "Notes on Llanigon

Parish," was read by the vicar, the Rev. W. E. Morgan, and a most interesting paper it was, full of information, and a model of what such "Parish Notes" should be. It well deserved the appreciation with which it was listened to, and the thanks which were accorded to the writer of it. Our entertainers were heartily thanked also for the kindly welcome with which we were received. Mr. Morgan's paper included a few notes supplied to him by Miss C. A. Thomas on the Birds of the parish, and by Miss E. B. Thomas on the Flora, this list included some rare species. Miss Thomas showed us a coloured drawing of the rare plant "Myrrhis odorata," or Sweet Cicely, which had been found by her. The notice of this plant in the "Herefordshire Flora," states that it is "native in one of its stations, probably naturalised in the others." In old times it appears to have been "much cultivated for its pleasantness in salads, and its great physical virtues ; its root was held to be as effectual as that of angelica to preserve from infection in the time of plague"

Mr. Morgan's paper concluded, the proceedings of the Second Field Day came to an end. To those who had attended it it had afforded an instructive and thoroughly enjoyable day's outing.

The Third Meeting included Gloucester, Tewkesbury and Malvern. "An instructive and enjoyable day." Such also was the conclusion arrived at with reference to the Third Field Meeting of the year by a writer, to whose report of the day's proceedings I must partly refer, for the rest depending on hearsay, not having myself been present at this meeting. How could he have described it as otherwise than "enjoyable and instructive," for was it not the "Ladies Day"? Thursday, July 28th, was a day of counter attractions, or the opportunity of a visit by the Woolhope Club to three such Churches as "Gloucester Cathedral," "Tewkesbury Abbey," and "Malvern Priory," would have been still more largely taken advantage of. As it was, some 70 or more members and visitors attended. By the careful forethought of the hon. secretary an excellent arrangement had been made with the Railway Companies, by which each place was visited with the least possible trouble and at the least possible expense. In fact a "small circular tour" was carried out. A trip by water from Gloucester to Tewkesbury had been suggested, but it was found to be impracticable on this occasion, and as "things" and weather turned out, it was a case of "All's well that ends well." A more important loss of what might have been was the absence abroad on this occasion of the Dean of Gloucester, who had kindly written to Mr. Moore that, had he been in residence, he would have been very pleased to have shown the Woolhope Naturalists' Field Club party over the Cathedral. "It would have been" (as has already been said) "an intellectual treat to have heard the salient features of such a building as Gloucester Cathedral explained by one who knows it and loves it." The members and visitors were however, duly "conducted" over each portion of the Cathedral, including the crypt. Two hours were spent in the inspection, and as far as the sound of the large organ, undergoing a tuning, would allow, were spent enjoyably and profitably. Much more

time might well be given to an examination of this famous Cathedral, and a day or more might well be spent in visiting the many other objects of historical and archæological interest, which it does not appear to be generally known abound at Gloucester, not the least of which is the little which remains of the once famous Llantony Secunda, younger sister (or should I say "daughter"? of the famous and (certainly by the Woolhope Club) better known "Llantony Prima" of Monmouthshire.

At Tewkesbury Abbey, which was next visited, the party had the great advantage of hearing the various points of historical and architectural interest, pointed out by one of our former Presidents and an authority on his subject—Mr. Thomas Blashill. Other interesting information was given by the verger, who ably conducted the party during their inspection of this most beautiful Abbey Church, so nobly restored and so justly regarded with pride and affection by the inhabitants of Tewkesbury. The historical interest of this visit of the Club to Tewkesbury was much added to by the contribution of an interesting paper kindly prepared and read by Sir Herbert Croft on "The Battle of Tewkesbury."

At Malvern the Priory Church was duly visited, and here the party had the advantage of listening to a graphic description of the Church, and especially its windows, by Mr. James Nott, who also contributed to the day's proceedings some interesting and important "Notes on the great east window of Gloucester Cathedral."

Tuesday, August 30th—as delightful and bright a summer's day as could be desired for a visit to the Malvern Hills, was the date of our Fourth Field Meeting—its special purpose being a geological excursion to the Gullet Pass, Holly Bush Hill, and Chase End. This was a geological day of the "old sort," and so ably conducted as to excite the enthusiastic interest of even "non-professionals;" some forty members and visitors attended; among the latter we were favoured with the company of Dr. Theodore Groom, D.Sc., M.A., F.G.S., Professor of Natural History at the Cirencester Agricultural College; Dr. Charles Callaway, F.G S., D.Sc. and M.A., and of Professor Meldola, Professor of Chemistry. After a pleasant drive from Ledbury to the Holly Bush Pass, the first portion of our walk to the Gullet Pass lay between the Holly Bush and Midsummer Hills, over the site of an ancient British town with its lines of entrenchment and remains of ancient reservoirs. Arrived at the Gullet Pass, the serious work of the day began, and hammers were soon being busily plied in search of Lower Cambrian fossils, some of the oldest in the world, but the especial object of search was the fossil known as *Kutorgina cingulata*, some specimens of which were soon found.

Returning to Holly Bush Pass, along the western slope of the Midsummer Hill, from which the extensive view westward and southward was greatly enjoyed, noticing as we passed along the cart track the black shales, to which attention was called by Dr. Groom, we now ascended the Raggedstone Hill. Here Dr. Groom kindly explained the geological panorama unfolded in all directions. Descending the

southern slope of the hill, our next object was the "Big quarry in the valley of the White-leafed Oak." Here are seen the relations between Holly Bush Sandstone and Archæan schists. On this subject Dr. Callaway favoured us with a short address, in which he pointed out that the crystalline rocks of the Malvern chain, formerly supposed to be aqueous, was really igneous, and that they were metamorphosed into their present condition by power of pressure, crushing and shearing and folding of force simply incalculable. Dr. Callaway, in support of his theory, the result of many years chemical and microscopical study of the Malvern rocks, kindly contributed to the record of the day's proceedings a few notes on the origin of the gneisses and schists of the Malvern Hills. Time, unfortunately, did not allow of the intended visit to the Chase-end, the last hill southwards of the Malvern Range, so after a visit to the rock at Coal Hill Cottage, where bands of diabase intruded into the grey shales were examined, and then a not unsuccessful search for trilobites on the way to Fowlett's Farm, where the carriages were rejoined, the return to Ledbury was soon accomplished. The members of the Club—especially those geologically inclined—were fortunate in having Dr. Groom as their "guide, philosopher, and friend" during the day's walk. He seemed to know every inch of ground visited. The pleasure and profit derived from his instruction and guidance, together with that given by Dr. Callaway and Professor Meldola, were gratefully acknowledged in the course of the walk by the Hon. Secretary, and subsequently by the President after the luncheon.

Dr. Groom, in reply, expressed the pleasure he felt in imparting the results of his two years' investigation of the Malvern rocks to those who had been present.

Professor Meldola also replied, and in his office as chairman of the committee for examining Transactions of Field Clubs in union with the British Association, congratulated the Club on the high estimation in which its *Transactions* were held by his committee. He also, in view of his experience of Field Clubs, remarked on the advisability of electing every candidate for membership, and "making a naturalist of him."

Mr. Moore, in some very interesting remarks on the work and composition of the Club, supported this recommendation by quoting the opinion of a member who had written to him that "the Club might undertake to educate, and not rely on getting naturalists ready made—one does not know how or where." Mr. Moore also mentioned the subject of lady members, and some advantages to be derived from the acquisition of such an addition to our numbers. Looking back generally upon the field meetings of the past year, I may speak of them as having certainly produced that combination of the *utile cum dulci* which is their object—the weather, always so important an element, certainly contributed to the enjoyment. The success of last year's and of many previous years' meetings has been largely due to the forethought and economy with which each day's arrangements were planned and carried out by our late hon. secretary, whose services to the Club, and

really hard work done in the promotion of its objects, cannot be too strongly acknowledged. We owe much to Mr. Moore, and we rejoice that we retain his valuable services in connection with the editorial work of the Club. The recent volumes of *Transactions* are his "glory," and that of his editorial colleagues. We are glad that he is succeeded in the hon. secretaryship by a gentleman whose heart is in the welfare and the work of the Woolhope Club. I must not close this notice of the Field Meetings without thanking Mr. Spencer Bickham for the kind proposal made by him that either on the occasion of the Tewkesbury or Ledbury Field Days the Club should have visited his grounds and interesting collections of plants. We regret that the exigency of time and trains did not permit our taking advantage of so kind an invitation. We hope, however, that this is only a pleasure deferred, and not for long. I should add that Mr Bickham has kindly said that in the eveut of any winter meetings or lectures being organized, he would be happy to assist by giving a lecture.

The old institutions of fungus forays and the "fungus dinner" are (it is to be hoped only temporarily) suspended. Surely their restoration is desirable. The study of mycology, in which at one time the Woolhope Club held a foremost place, must not be allowed to drop out and be forgotten.

The Fungus Field Day, it will be remembered, was held as an additional meeting at the end of our "season." It has often occurred to me to suggest that in the place of the old Fungus Foray we might have a special "archæological day" in addition to the ordinary field meetings. The Woolhope Club for many years past has taken up the archæology of the county and adjacent districts, and will, I trust, continue to do so. Originally formed for the study of Natural History alone, the Club has drifted into archæology and cannot go back. The multiplicity of societies is an inconvenience known and felt, and it would be a pity that any rival society should ever be thought necessary for the separate investigation of our local antiquities. I notice, however, that in the 1893 volume of *Transactions*, *Rule I.*, it has for the first time the additional words "and archæology" inserted, so that the purpose of the Club is now described as "for the practical study in all its branches of the natural history and archæology of Herefordshire and the districts immediately adjacent." This study is an officially recognised part of our constitution, and in connection therewith I would venture to urge the attention of members to the subject of Ecclesiastical Archives—a work of investigation and research, which, whether in connection with Diocesan, Cathedral, or Parish Registers, is as important as it is interesting. We are happy in having as our new President a gentleman officially in charge (I believe I am right in saying) of the Diocesan Registry, and we are also happy in having on our list of Vice-Presidents the Dean of our Cathedral Church. I feel sure that I may take for granted that every encouragement and possible assistance would be kindly and readily given by these distinguished members of our Club to any who may take up the work of compiling

e.g. a "Parish History," or of obtaining and publishing what is so much to be desired—a List of the Incumbents of each Parish from earliest times. The Parish Register Society, instituted for printing the Parish Registers of England and Wales, some of the Reports of which have been embodied in our Volumes of *Transactions* deserves the co-operation which it asks for; and here are opportunities of interesting work for those "rural clergy," with reference to whom a reviewer of the recently-published Volume of *Transactions* makes an allusion, that they are "not particularly energetic though often capable enough;"—a slightly sweeping generalisation which a glance down the index list of contributors to the Woolhope Club *Transactions* would, at any rate, have modified. For there he would have seen the names of such country parson Woolhopians, as Lewis of Aymestrey Symonds of Pendock, Crouch of Pembridge (three times President), Cooper Key of Stretton, Davies of Moorcourt, Robinson of Norton Canon, La Touche of Stokesay, Bevan of Vowchurch, Phillott of Staunton, Webb of Hardwick, Havergal of Upton Bishop—to say nothing of the present Incumbents of Sellack, Kentchurch, Clehonger, Moccas, Breinton, Prebendary Elliot (a geologist, twice President), all "rural clergy," energetic as well as capable workers, who have left, and are leaving their mark as Naturalists on the recorded work of our Club.

Of the above-mentioned two have been removed by death during the half-year. In the Rev. J. D. La Touche, an honorary member of this Club, we have lost one who was ever ready to join our excursions and to impart to his hearers on these occasions the results of his own knowledge and experience in connection with the science he loved so well. His "Handbook" on the study of the Geology of Shropshire is on the bookshelves of many of us, and is a standard work on the subject. It is recorded of him, in a memorial notice in the *Guardian* newspaper, that he never lost an opportunity of impressing on his brother clergy the danger to religion which arose from the tendency on their part to stand aloof from science, and to misunderstand scientific men.

The Rev. Charles John Robinson, D.C.L., of the Univ. of Durham (my predecessor at Norton Canon), will be remembered as the author of works known as the "Castles" and "Manor Houses" of Herefordshire; he was President in 1875. Another of our hon. members lately removed by death—an eminent clergyman in the diocese of Norwich—should here be mentioned, the late Rev. Canon Du Port, a regular visitor on the occasions of our Fungus Forays and a contributor of papers on mycology.

There are many subjects, more or less directly bearing on the scope and purpose for which nearly half a century ago the Woolhope Club was formed.* The general advancement of true science in its

* For instance, the Federation of Field Clubs, for the purpose of co-operation or of making joint protests or representations in cases which seem to call for interference—a protest for instance against the further tapping of the river Wye in its upper waters; a joint representation to the Egyptian Government that some restriction should be exercised in view of the risk of the practical extinction of big game, by a possible host of hunters into the re-gained territory of the Bahr el Gazell

various branches, apart from our own local studies, must ever be to the members of a Club like this, an unceasing source of interest and congratulation. Any concession, on the other hand, to popular prejudice in a backward direction, such *e.g.* as that with which medical science has been rebuffed by recent legislation, is of course, a matter of regret, if not of consternation, and we can only hope that the unreasonable prejudice of the "anti-vaccinationist" may not bring about such results as may involve the innocent with the guilty in a direful common catastrophe.

All good Naturalists will rejoice at the near prospect of the exploration on a larger scale than has hitherto been attempted of the regions of the Antarctic Circle. Recently the good ship "Southern Cross" sailed from Hobart, Tasmania, on an Antarctic expedition. The President of the Royal Geographical Society stated the other day that a donation of £25,000 recently given towards the equipment of a British Antarctic Expedition would bring up the funds in hand to a total of £40,000. "By a successful expedition" (Sir John Murray recently told the members of the Royal Geographical Society) "into this vast and marvellous Continent, every department of natural knowledge would be enriched." No one could doubt, he added, that an Antarctic expedition would bring back collections and observations of the greatest interest to all Naturalists and Physiologists.

But to come nearer home—the subject is a well-worn one, but the reckless and unnecessary destruction of animal life still cries aloud for unceasing vigilance and protest.

Many denizens of our fields and woodlands still suffer from the "bad name" which they never deserved. The moment some *rara avis* appears, for instance, the "ineradicable instinct of the gunner" asserts itself; the "bump" (or bumpkin) "of destruction at once decrees the stranger's execution." Mr. Ruskin is stated to have once remarked that "if an angel visited England her 'sportsmen' would be out with their guns to shoot the winged visitant."

No effort should be spared to induce game preservers to forbid their keepers to use that most cruel implement of bird capture, and bird torture, well called the "detestable" pole trap. It is harrowing to think of the long long hours, nay even days and nights, of bodily suffering, during which the poor bird hangs or is held fast by one or both of its legs in such lingering torture of pain and thirst, that you might well imagine that the startled agony of fear which Lord Tennyson has described as that of

> "A wild thing taken in a trap,
> Which sees the trapper coming through the wood,"

would be changed into a grateful welcome of its persecutor if only it might be put out of its misery.

It would appear from an article in the new *Century Review* for the present month, that a fresh persecution of the owl tribe is on foot, for by the latest decree of fashion that harmless necessary bird is to

provide ladies with certain "feather trimmings" for the spring. More persistent endeavours than ever should be made to stay the slaughter of a bird not only harmless, but positively beneficial by reason of the numbers of rats and mice which it destroys, especially on occasions when these animals become so numerous as to be a pest and a nuisance to a whole neighbourhood. "Our ancestors, wiser than we, knew better than to destroy the owls," (so writes Lord Cathcart in the *Agricultural Journal*), "and always made in their great barns ingress for owls, an owl-hole, with often a stone perch. The destruction of many of our feathered friends for the purposes of ornamentation has been carried too far, and the contemplated raid on the owl should excite great indignation."

The motto of the Woolhope Club is: "Hope on, hope ever." I may be permitted, perhaps, to suggest an inferential maxim, viz. this, "Work on, work ever," for there is, indeed, an illimitable field for work and for study in the great realm of Nature. The longest life is immeasurably too brief for even the busiest worker, and the most patient investigator, to accomplish that which he fain would accomplish, to find out that which he fain would find out. Many a generation must come and go before our own scientifie posterity will be able to pronounce the dissolution of the Woolhope Field Club, on the plea that its work is done.

In the marvellous field of entomology, far beyond that which has been done, and done so well, there is infinite scope for study and observation, and as Professor Meldola, himself a high entomological authority, remarked in conversation, there is much need for the further pursuit of this science, beyond those particular branches which have been mostly studied. What a fascinating and fertile subject for study and observation is that of the aquatic insects! And here I am glad to remember that we are to have embodied in our next volume of *Transactions* a full and valuable paper on the "Mollusca of Herefordshire," by Mr. A. E. Boycott and Mr. Bowell. Will no member take up the subject of the "Fishes of Herefordshire"? a subject which the late Dr. Bull is said to have especially desiderated from one or other of our members.

Then there is geology, that eminently Woolhopian science, which may be said to have given our Club its name, and which seems always to infuse such a spirit of enthusiasm into its students, and to touch its exponents with a power of eloquence in imparting their knowledge such as our older members will recollect to have listened to from the lips of the gifted writer of "Malvern Chase,"—a volume of pure delight and information to the lovers of Natural as well as of English History—or such as we have all listened to from the late Rev. J. D. La Touche, so valuable and frequent a contributor to the *Transactions* of our Club. In connection with the unbounded region which lies open before the present and future students of geology there is an interesting paper published in a recent number of *The Monthly Review of Natural Science*, in which the writer reminds us that many years ago

Professor Darwin "called attention to the imperfection of the Geological Record, showing that the discoverable fossils in the rocks can only give a very limited idea of the plants and animals which have tenanted the Globe at different periods of its past history." He pointed out how small a percentage of known types of life had sufficient hard parts to be preserved in a fossilized state. The writer goes on to notice how the discovery of new fossils has progressed in all parts of the world at an astounding rate since Darwin called attention to the incompleteness of the Geological Record. He mentions the remarkably early Devonian organism *Palæospondylus gunni*, of which he says, "whether a lamprey or not, it is the single known representative of its group and implies the former existence of a great race of which we are acquainted with no other member. This fossil occurs on the Caithness flagstones which were deposited in an 'Old Red' lake Every exposure has been searched by expert collectors, yet *Palæospondylus* has only been found in one very thin stratum in a single quarry where it occurs, not as a rarity, but in countless numbers. It seems as if a shoal of the species had been accidently destroyed and suddenly covered up. It is a fortunate accident that a quarry was opened at that precise spot." This shows what a "find" may any day reward the geological hammer; and this interesting example of the "Imperfection of the Geological Record" bears upon the possible stores of yet unknown wonders lying before the student. Members of the Woolhope Field Club may recall to mind and apply to the present time a message of encouragement once sent to our geological members by Sir Charles Lyell, through Mr. Symonds, of Pendock, with the repetition of which I will conclude my remarks: "Tell them (ran the message) to continue their field work with steady perseverance and new wonders will reward their labours."

Gentlemen, I thank you for the patience with which you have listened to me, as well as for the unvarying kindness which I have received in my endeavours to discharge, to the best of my ability, the duties of an office, the honour of holding which I so little deserved.

Woolhope Naturalists' Field Club.

FIELD MEETING, THURSDAY, May 25TH, 1899.

MUCH MARCLE, PUTLEY, THE SITE OF THE LANDSLIP OF 1571, KNOWN AS "THE WONDER," DEVEREUX POOL IN STOKE EDITH PARK, AND TARRINGTON.

ON Thursday, May 25th, a large party entrained at Hereford for Ledbury. The company from time to time increased, so that at some periods the number amounted to about seventy; the following were present:—The Rev. H. B. D. Marshall (who, in the absence of Mr. Beddoe, acted as president), Mr. C. D. Andrews, Mr. J. Edy Ballard, Rev. J. Barker, Mr J. H. Barratt, Mr. W. Mortimer Baylis, Mr. C. P. Bird, Mr. G. M. Brierley, Mr. G. Child, Rev. W. S. Clarke, Mr. R. Clarke, Dr. A. J. H Crespi, Mr. Arthur Cutfield, Mr. Luther Davis, Rev. P. H. Fernandez, Rev. J. E. Grasett, Dr. A. E. Green, Rev. Dr. E. Harris, Rev. A W. Horton, Rev. E. J. Holloway, Rev. Preb. W. H. Lambert, Dr. G. Leighton, Mr. C. D. Lilwall, Mr. J. W. Lloyd, Mr. H. J. Marshall, Mr. Norman H. Matthews, Rev. R. T. A. Money-Kyrle, Mr. H. Cecil Moore, Mr. W. Pilley, Rev. T. O. Philpott, Col. M. J. G. Scobie, Rev. F. S. Stooke Vaughan, Mr. J. P. Sugden, Mr. H. A. Wadworth, Mr. T. Hutchinson (hon. sec.), and Mr. James B. Pilley (assistant hon. sec.). Visitors: Mr. J. C. Brierley (Rochdale), Mr. T. Davies (Crickhowell), Mr. Du Buisson, Mons. Froude, Mr. A. J. Garstone, Rev. G. L. Gerold, Mr. James Gordon (Manchester), Mr. F. Herbert, Mr. J. M. Hutchinson, Rev. C. P. Lee, Rev. D. Basil Martin, Col. Middleton, Mr. C. E. Moody, Rev. C. L. Money-Kyrle, Rev. G. D. Pagden, Mr. Bruce Swanwick (Cirencester), and Rev. George Swift.

At Ledbury Mr. Edy Ballard displayed a collection of recent finds discovered in carrying out the new Sewerage Works of the town. The finds consisted principally of horse shoes, and ox shoes, or tips, of various sizes and patterns, and small smoking pipes of the seventeenth century, found at depths of from 5 feet to 9 feet in the streets of Ledbury whilst excavating for the laying of the sewer pipes.

Mr. Ballard also exhibited what appeared to be the top of a Norman Cross, in freestone, with elaborately carved interlaid patterns on the front and sides. This piece of masonry was found by Mr. Ballard's father amongst the ruins of Much Cowarne Church, when he visited it with the object of making a sketch of the church after the damage inflicted by lightning in 1847.

After a drive from Ledbury of about three miles south-west, a short deviation of about a quarter of a mile out of the main road to Much Marcle was made for the purpose of visiting Preston (Priests' town) Church in Gloucestershire, a small structure dedicated to St. John the Baptist, notable for an interesting Norman doorway, surmounted by a tympanum containing a sculptural representation of the *Agnus Dei*, with a cross. The doorway is approached under a 14th century porch. Mr. Robert Clarke took a photograph of the tympanum, and supplied the following notes respecting the Church.

Preston Church consists of a nave, chancel, bell turret at the west-end, containing two bells, a south aisle added in 1859, when the church was restored; some Early lancet windows in the chancel, an old altar slab refixed as an altar table; and some 17th and 18th century monuments. The register dates from 1616.

Close to the Church is situated Preston Court, a very fine half-timbered mansion of six gables, now partly covered over in stucco, of the late 16th or early 17th century style; it has a fine porch with a room above it; in the interior is some fine old panelling.

In the meadow on the east of the churchyard grows a very fine pollard oak and a wych elm, of which a photograph was taken by Mr. Robert Clarke. The girths of both trees were taken at 5 feet from the ground; the wych elm measured 28 feet 2 inches, and the pollard oak 32 feet 9 inches. There are three other ancient oak trees in the same parish, within a quarter of a mile of this tree which have, at 5 feet from the ground, the following circumference:—27 feet 8 inches, 24 feet 10 inches, and 21 feet 3 inches.

Seats being resumed in the carriages, the members were met at Much Marcle Church by the vicar, Rev. C. L. Money-Kyrle, who pointed out the principal features and monuments. The fine yew in the Churchyard was found to have a girth of 28 feet 9 inches, at 5 feet from the ground. This large girth is not far behind that of the yew tree in the churchyard at Peterchurch, which had in 1866 a girth of 28 feet (see the photograph in Transactions, 1866, page 245), increased to 30 feet, according to measurements taken (see Transactions, 1882, p. 167; and 1888, p. 221).

Another rival yew tree is in Kentchurch Park, recorded by Rev. M. G. Watkins, Rector of Kentchurch, to have a girth of 30 feet at the height of 4 feet 6 inches above the ground (Transactions, 1877, page 133).

NOTES ON MUCH MARCLE CHURCH.

By Robert Clarke.

Much Marcle Church, dedicated to St. Bartholomew, is a large structure, consisting of a nave with north and south aisles, a central tower, and a long chancel with a chapel on the north-east. There are several ancient monuments remaining. Under an Early 14th century

OAK TREE (from which [illegible]) IN PRESTON CHURCH, (GLOUCESTERSHIRE)
R. Clarke, photo.
To face page 98.

After a drive from Ledbury of about three miles south-west, a short deviation of about a quarter of a mile out of the main road to Much Marcle was made for the purpose of visiting Preston (Priests' town) Church in Gloucestershire, a small structure dedicated to St. John the Baptist, notable for an interesting Norman doorway, surmounted by a tympanum containing a sculptural representation of the *Agnus Dei*, with a cross. The doorway is approached under a 14th century porch. Mr. Robert Clarke took a photograph of the tympanum, and supplied the following notes respecting the Church.

Preston Church consists of a nave, chancel, bell turret at the west-end, containing two bells, a south aisle added in 1859, when the church was restored; some Early lancet windows in the chancel, an old altar slab refixed as an altar table; and some 17th and 18th century monuments. The register dates from 1616.

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OAK TREE (ON THE LEFT), ELM TREE (ON THE RIGHT), NEAR PRESTON CHURCH, (GLOUCESTERSHIRE)
R. Clarke, photo.

To face page 98.

canopy in the north wall of the chancel, on an altar tomb is an effigy of a lady carved in freestone, her head resting on a cushion. She wears a close head dress tight under the chin, her feet resting on a dog, her right hand resting on her chest, her left hand holding beads. The drapery is long and flows over the sides of the carved panel below.

In the carved canopy over the arch are several shields carved and emblazoned alternately Mortimer and Grandison. This effigy is supposed to represent Blanche, wife of Sir Peter de Grandison and daughter of Roger Mortimer. The Mortimer arms on the large shield are emblazoned barry of seven sable argent on a chief gyronny, an inescutcheon sable. On the smaller shield the bars are five instead of seven. The inescutcheon on the Mortimer arms is generally argent, and the other tinctures are different. Grandison arms Paly of six argent and sable on a bend gules three eagles displayed or.

In the north-east chapel (removed from another part of the Church) is an altar tomb in freestone, bearing the effigies of a knight and his lady, 14th century: the knight in armour; a pointed helmet bordered with a coronet of fleur de lys resting on another helmet; the crest is gone, but remains of feet indicate a lion or other animal. His feet rest on a lion. The lady is in a long flowing plaited dress, a collar of jewels around her neck, the hair at the sides in network with a rich fillet around her head, which rests on a cushion supported by two young knights in mail, her feet rest on two dogs with collars and bells. On the sides of the tomb are niches with demi angels holding blank shields, the emblazoning gone. The effigies are supposed to represent Hugh Lord Audley and Isolde Audley.

In the Kyrle Chapel is the recumbent effigy of Sir John Kyrle, Bart., and his wife Sybilla, daughter and heiress of Philip Scudamore, Esq., beautifully carved in marble, with the arms of Kyrle and Scudamore on the lower part of the tomb, the date of which would be about 1628.

Wooden Effigy.—On a windowsill in the south aisle is placed a recumbent wooden effigy of a civilian, 5ft. 10in. in length, resting on a flat platform 6ft. 11in. long by 1ft. 6½in. wide. He is dressed in a close-fitting tunic or coat nearly reaching to the knees, close-fitting sleeves buttoned from the elbows to the wrists. The front of the tunic or dress is buttoned the whole way down. There is a short cape over the shoulders. Query? whether this is a hood worn down. The neck is bare, and the hood may be the upper part. Below the loins (and not around the waist) is a plain girdle buckled in front with the long strap end hanging down; on the right side is buckled a small purse or bag, The face (bare-headed) has flowing locks on each side, parted in the centre, with a moustache and short-pointed beard; the head rests on an oblong cushion. The right leg is crossed over the left; the shoes are pointed, a portion of the right shoe is gone. The feet rest on a dog or lion, of which the tail curls around the left foot. The effigy and

platform or slab are carved out of one piece of oak, hollowed out at the back to allow for shrinkage and cracks. Bloxam, an authority on effigies, assigns it to the middle of the 14th century (Art. 1350 *Archæological Journal*, vol. xxxii.), For a period of nearly two hundred years after the time of the Crusades it was customary to make cross-legged effigies.

In this part of the Kingdom wooden effigies are rare. One representing a priest exists in Clifford Church. In Abergavenny Priory Church is another, originally painted in colours, of a cross-legged knight in armour.*

MORTIMER'S CASTLE.

Adjoining the Churchyard on the north is a large and lofty moated mound called Mortimer's Castle. Traditionally the tower of the Church was built in the 15th century from the ruins of the Castle. In the adjoining field traces of outworks are visible.

HELLENS.

A mansion east of the Church, formerly the home of the Walwyn family, now in the possession of C. W. Radcliffe Cooke, Esq., M.P. for Hereford, was visited. In Norman times a family called De Helion owned the property, and from them the present name of the house is derived. The house contains some features of interest, part being (Mr. Cooke informs us) of the date of Henry VII., and part erected, or restored, in the time of Charles I., viz., 1640. In the lower portion are remains of 16th and 17th century work, square-headed stone mullioned windows, some ancient brick chimneys, and moulded string courses. The mansion contains an old oak staircase in the front hall, and a circular wooden staircase from the floor to the upper rooms. In the kitchen and scullery are some finely moulded oak beams in the ceilings; this part is supposed to have been the old large hall. In the mansion is an Elizabethan wood chimney piece which for a period of about ninety years had been fixed as a reredos in Much Marcle Church. When the church was restored in 1878 this reredos was again removed and restored to its original building, Hellens.

Near the mansion is the octagonal brick pigeon-house illustrated in Mr. Alfred Watkins's paper on page 14 of "Transactions, 1890," with the initials of Fulke and Margaret Walwyn $\left(\frac{1641}{\text{F. M.}}^{\text{W}}\right)$ worked in the brickwork, and in the iron vane is cut E. W, 1783

* There is an interesting wooden effigy in the Church of Eaton-under-Heywood, near Church Stretton.—EDITOR.

The following notes on Mortimer's Castle by the late Mr. George H. Piper, have been presented by his sister and executor, Miss Piper :—

MORTIMER'S CASTLE.

BY THE LATE MR. GEORGE H. PIPER.

The parish of Much Marcle possessed at an early period two baronial residences (see Ellingham). One of these, as is indicated by the name, was occupied by the Mortimer family, a portion of Much Marcle (Blount says two-thirds) having been granted to Edmund de Mortimer by King Edward I. in recognition of important services. The grandson of Edmund was the ambitious Roger de Mortimer, whose intrigues with Queen Isabella, and the part he took in the murder of her husband, have procured for him a bad eminence in the history of his country. He was hanged in 1330, and his body is generally supposed to have been conveyed from the Grey Friars in Smithfield, where it was first buried, to Wigmore, the seat of his ancestors. Blount, however (following, perhaps, some well-founded tradition), asserts that the stone monument in Marcle Church, with its two effigies, was erected in memory of Roger de Mortimer and his wife Joane, daughter of Peter de Genevil, and that the former is there interred. As there are no arms or inscriptions upon the tomb to help in deciding the point, we must leave the subject with the remark that there are several known instances of duplicate monuments being raised in commemoration of the same individual. (See *Herald and Genealogist*, Vol. 1).

The last Earl of March devised his share of Marcle to Thomas Walwyn for life (Blount's MS), and out of the ruins of the Castle was constructed the tower of the Church, "wch is not of a meane forme" (Harl. MS., 6726). On the accession of Edward IV., the heir of the Mortimers, this portion of the manor returned to the Crown, and was purchased in the reign of Queen Elizabeth by Thomas Kyrle of Walford, a scion of a family which produced two such eminent, but widely discordant, members as John Kyrle, the loyal "Man of Ross," and his kinsman the rebel Colonel, one of Cromwell's most active officers. (See Goodrich and Hereford).

The son of the purchaser was created a baronet in 1627 and his eventual heiress, Vincentia Kyrle, married Sir John Ernle, Knt, and conveyed Marcle to her husband. Their son, John Kyrle Ernle, had an only daughter Constantia, who, having no issue by her husband Viscount Dupplin, settled her estates on her kinsman and heir, James Money, son of Francis Money, of Wellingborough, by Elizabeth Washbourne, grand-daughter of Sir John Ernle. A baronetcy was a second time conferred on the family at the Queen's coronation in 1838, but the first baronet, Major-General Sir John Money, who assumed the additional name of Kyrle, died without issue and thus the title became extinct, but the estates passed to his younger brother the Rev. William

Money Kyrle, whose third surviving son is their present * possessor. In the 17th century the site of the Castle near the church and the moat around it could be clearly traced (Harl. M.S. 6726), but are now almost effaced.

MUCH MARCLE PLACE-NAMES.

GREYTREE.

By Rev. P. J. Oliver Minos.

Much Marcle, in Wimestrail Hundred, Domesday, is an extensive parish, and includes Marcle, Wolton, Bickerton, Rushall, and Kinnerston. That King Harold II. owned this estate is still evidenced by such place-names as "Harold" and "Harold's Well." So, also, "Mortimer's Keep" points to the once powerful family of the Mortimers; the farm "Chandos," until lately, belonged to the Duke of Buckingham and Chandos. The hamlet "Wolton" (wold—uncultivated land; ton—town) suggests its proximity to an older cultivated ton or settlement. This was, doubtless, "Oldbury" (contracted from wold-burg—a fortification on or near the wold), *i.e.*, the British caer (ca—to enclose), or Anglo-Saxon gwal—wall. Strange to note that these two words of different languages (but referring to the same thing) should, in course of time through confusion of tongues, be combined to give a name to a farm, "Caerswall"! This caer was originally a British camp; but afterwards occupied by the Romans, who drove the the British to "Welsh-court" Close to the camp is a farm called "Bounds," from B. bawn—an enclosure for cattle. This enclosure communicates through a sheltered dingle with a strong spring of water by Caerswall. North of the camp is "Netchfield" (now Firs Farm), from A S. nettes—cattlefield; this was, perhaps, the grazing ground. Below the "Bounds" is "Venning," from wen or gwen—fair or beautiful; ing—meadow; on the opposite side is "Bodenham," perhaps from A.S. boden—low or moist; ham—home. Boden-heim, in Germany, seems to be the same name. On the N. of "Netchfield" is "Mescot," from B. maes—field; A.E. cote—shepherd's hut; also "Noggin," from B. cnwch, A. S. Knock—an isolated hill; cyn—chief or principal. Nearer the camp are "Nuttall," perhaps from A. S. hnote—a nut (hazel); eald—old; and "Puckmore," from pucca, a name; more—a tract of wild land.

Rushall is probably a contraction of Ruashall (compare Rushope in Herefordshire). Rua would be a British name of a person. Kinnerston ls probably a modern form of Kinners, or Kimmers-waest-ton, Kimmer being a corrupt form of Cymba, or Gumba. That Rushall (*i.e.*, Rua's residence and the land round about) originally extended beyond the present limits is to be detected by the names of two farms, "Hall Court" (B. cwrt—the residence of the feudal lord), and "Hall

* The date of Mr. Piper's manuscript is not given.—Editor.

End" (A.S. en or end—the utmost extent of an estate). The former is now in Rushall; the latter in Kinnerston. Not far from "Hall Court," and on the opposite side of the road, is a meadow called "The Mors." This meadow was undoubtedly bounded by a deep moat, which in several places is still over six feet deep, and broad. "The Mors" (A.S., mor—a tract of wild or neglected land) is not unlike the popular name "Quarry Wood" in signification; they tell us of a site where once stood a castle. This castle was called Ellingham Castle (see "Robinson's Castles"). Probably the name Ellingham is an instance—so noticeable in Anglo-Saxon—of the initial H dropped. If so, Ellingham would be Hellingham; and Hellingham would be Helyg or Helygen-inegaham. Helygen (g silent in pronunciation) is undoubtedly Helyen or Helyon—an old family name in these parts. There is in Much Marcle parish church an unique wooden cross-legged effigy, supposed to be of Sir Walter or Sir John Helyon, who accompanied Edward I. to the Holy Land. (By the way, the old custom of carrying this effigy at the head of every funeral, pointed very forcibly to the tradition that it represented a "Soldier of the Cross," though in civil dress). The last of the family was Walter de Helyon. The modern rendering of "de Helyon" is certainly Hellens (i.e., Hellen's)—the name of the residence of C. W. Radcliffe Cooke, Esq, M.P., for the city of Hereford. Near Ellingham Castle, and on the other side of the moat, my attention was arrested by the curious names of two small farms, viz, "Walker" and "Gatchapen." "Walker" is from A. S. Wealcere—a fuller of cloth; "Gatchapen"—gat—cheapın or chippen (from gadr—seat—ceap—market) seats in or of a market. Thus these names bear witness to some of the trades or businesses carried on outside the castle walls and grounds.

The above notes do not exhaust the place-names in Much Marcle; but, they are sufficient to show the foot prints or trails of the people who settled in the locality in days gone by.

P. J. Oliver Minos, M.R.A.S., F.E.I.S.,
Vicar of Garway, Hereford.

Leaving the parish of Much Marcle, seats were resumed in the carriages and the drive was continued through Little Marcle to Putley Church, where the members were met by Mr. John Riley of Putley Court. We are again indebted to Mr. Robert Clarke for the following Notes:—

PUTLEY CHURCH

This is a small edifice consisting of a nave and chancel. On the north side is a walled-up Norman doorway. The Church and churchyard occupy the site of a Roman villa. On reference to *Transactions*, 1882, page 258, we read that on digging the foundations of the north wall of the Church "Mr. Thomas Blashill discovered several Roman flue tiles and flange tiles, with numerous bricks bearing upon them the marks of sandals, woven cloth, cat's feet and thumb marks, together with Roman

pottery. He exhibited them at a meeting of the Woolhope Club on March 9th, 1876, see *Transactions*, 1876, page 167, and afterwards at a meeting of the British Archæological Association (Journal, Vol. xxxii, page 250). In the following year Mr. Riley found, on his estate at Putley, a number of Roman wall tiles, roof tiles and pottery." In the restoration of the Church, such fragments of Norman and ancient masonry as were found were collected and for their safe preservation built into the north wall of the Church. In the churchyard are the remains of a churchyard cross, with steps, a portion of the shaft remaining and in this is placed the head of the cross, formed of an excellent hard-grained sandstone, remarkably well preserved, of a date ascribed to the 13th Century, containing the crucifixion on one side, the Virgin and Child on another side, and on the other two sides figures of St. Andrew and St James, or a prelate. This cross is illustrated in the "Gentleman's Magazine" for August, 1795, page 200. Very few heads of churchyard crosses are now remaining in this county. There is one at Bosbury, King's Caple, Hentland, and one in Hereford, which was formerly in the parish of Madley.

It would be interesting to find the quarry from which comes the excellent well-preserved sandstone forming the head of the cross. It might possibly be the quarry referred to by the Rev. P. B. Brodie, F.G S., in his paper on "The Passage Beds in the neighbourhood of Woolhope," in *Transactions*, 1870, page 273, in the following words :—"At Putley, near the road from Ledbury to Woolhope, to the north-east of the latter village, a remarkable bed of very hard horizontal Sandstone, composed mainly of small pieces of quartz in a sandy matrix, over-lying a stratum of white and yellow clay used for making tiles, may be seen in a brickyard to the depth of about three or four feet, the block of sandstone averaging about two feet in thickness," &c.—See *Transactions*. Under the pocket lens the appearance of the sandstone of the head of the cross reminded Mr. Moore of the Cambrian quartzite.

The new vestry was damaged by the earthquake of December 17th, 1896. The chimney has been rebuilt in consequence of a severe crack in it, and several cracks were made in the walls and arches of the windows.

Leaving the church, the members walked to Putley Court, the residence of Mr. Riley, erected in 1712. Here refreshments were kindly provided by Mrs. Riley, and after an inspection of the four-gabled timber-framed pigeon-house (see *Transactions*, 1890, page 17), and the handsome Cedar of Lebanon, 16 feet 4 inches in girth at five feet from the ground, the party was conducted by Mr. Riley over his farm of 36 acres devoted to fruit culture The fruit trees presented a healthy clean appearance. The petals of the early apple trees strewed the ground with a snowy white sheet, an evidence of the absence of the

pottery. He exhibited them at a meeting of the Woolhope Club on March 9th, 1876, see *Transactions*, 1876, page 167, and afterwards at a meeting of the British Archæological Association (Journal, Vol. xxxii, page 250). In the following year Mr. Riley found, on his estate at Putley, a number of Roman wall tiles, roof tiles and pottery." In the restoration of the Church, such fragments of Norman and ancient masonry as were found were collected and for their safe preservation built into the north wall of the Church. In the churchyard are the remains of a churchyard cross, with steps, a portion of the shaft remaining and in this is placed the head of the cross, formed of an excellent hard-grained sandstone, remarkably well preserved, of a date ascribed to the 13th Century, containing the crucifixion on one side, the Virgin and Child on another side, and on the other two sides figures of St. Andrew and St James, or a prelate. This cross is illustrated in the "Gentleman's Magazine" for August, 1795, page 200. Very few heads of churchyard crosses are now remaining in this county. There is one at Bosbury, King's Caple, Hentland, and one in Hereford, which was formerly in the parish of Madley.

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ANCIENT CROSS IN THE CHURCHYARD, PUTLEY.
R. Clarke, photo., 1899.

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winter moth, and other smaller moths, whose depredations in the blossoms cause the withering of the petals, converting them into a rusty decayed condition before falling.

Plums, with gooseberries and currants as an undercrop, are the principal culture; the gooseberries are in prolific bearing, and the largest fruit will be picked in a few weeks by women and children. Rows of strawberry roots possess good shoots promising plenty of blossom. Apple and pear trees are not extensively cultivated here. Putley has suffered similarly with other districts from the excessive wet, cold, and frost throughout the month of May.

THE LANDSLIP AT KYNASTON KNOWN AS THE WONDER.

THIS is the name given to the remarkable landslip which occurred in this locality in the year 1571, not 1575 as given in some records, which has been so quaintly described by Camden and others. In the first edition of Camden the date given is 1571 : in Symonds's *Records of the Rocks*, page 206, the date 1575 is given. Sir Richard Baker's chronicle gives the date more precisely :—" On February 17th, at six o'clock p m., in the 13th year of Elizabeth [1571] . . . &c." Camden ascribes the earthquake to that " which the naturalists call Brasmatia," page 578. According to Aristotle, Brasmatia are earthquakes attended by a violent shaking. The movements of the landslip continued, according to one account, from Sunday evening until Monday noon; and, according to another account, for three days. Amongst other and various notices of this landslip a reference is to be found in Samuel Butler's " Hudibras," Part III., Canto II., line 1125 :—

> " Inchant the king's and churches' lands
> T'obey and follow your commands;
> And settle on a new freehold,
> As Marcly-hill had done of old."

The Rev. H. B. D. Marshall read the following account of this occurrence from an old book entitled *Admirable Curiosities, Rarities and Wonders in England* : " Marclay Hill is in the east part of the county, and began to open up itself in the evening, and this hill with a rock made at first a mighty bellowing noise, and then lifted up itself a great height and began travelling, carrying along trees which grew upon it, sheepfolds, and flocks of sheep abiding thereon. In the place whence it was moved was a gaping distance 40 feet wide and 80 ells long. Passing along it overthrew a chapel, removed a yew tree in the churchyard from west to east, thrust before it highways, houses, and trees, made tilled ground pasture, and turned pasture into tillage. Having walked from Sunday evening till Monday noon it stood still and moved

no more mourning (? mounting) to a hill 12 fathoms high." Camden writes as follows :—"Near the conflux of the Lugg and the Wye eastward a hill which they call Marclay Hill did in the year 1575 (? 1571) rouse itself as it were out of sleep, and for three days together shoving its prodigious body forward with a horrible roaring noise and overturning everything in its way raised itself (to the great astonishment of the beholders) to a higher place by that kind of earthquake, I suppose, which the naturalists call Brasmatia.

The church or chapel of Kynaston was involved in this landslip, and it is believed that the Yew Tree, the roots of which are still visible in the hollow below the deep cutting in the Upper Ludlow rocks at the cross roads half way up the hill leading to the Cockshoot, originally stood in, or close to, Kynaston churchyard. The irregularities of the ground on the right hand side as you proceed up the hill from Hall-end to the Cockshoot indicate the disturbances of the ground surface created by this landslip. The site of the chapel is believed to have been just behind the ash tree here prominent. The late owner of the farm, Hall End, recollects his father (Mr. Matthews) building some of his farm buildings from the buried masonry here discovered of the old precipitated chapel; and in some old drawers of this house was found a collection of coloured glass, exceedingly thick, which probably formed the windows of the chapel. The bell of the chapel, now in Homme House, Much Marcle, was also found.

The entire area of the landslip was of the geological formation known as the Upper Ludlow, in which is found an abundance of fossils, amongst which the most common are Chonetes lata and Rhynconella.

This Ludlow formation here consists of a series of beds of clay and limestone. The clay is of an unctuous character, and is reduced to a soapy state by the percolation of water. It can be easily understood how a landslip can readily be produced when the superincumbent weight of a mass of limestone rests upon an inclined plane separated from the stratum below by one of these clay bands in which the water has been arrested.

The same causes produced the landslip about 3 miles north-west of this locality, on Dadnor's Hill, above Dormington, one mile west of Stoke Edith house, when, as reported in the *Hereford Journal* of March 20th, 1844, more than three acres of ground, bearing 40 oak trees, slipped a distance of 200 yards and produced the chasms and broken irregularities of rocks there evident.

THE BELL, OR BELLS, FROM KYNASTON CHAPEL.

[A long correspondence upon this subject took place in the *Hereford Journal*, commencing September 30th, 1893.]

Tradition has it that two bells were dug up, and that they were hung espectively at Stoke Edith and at Homme House.

THE WONDER OAK, 36 FEET 6 INCHES IN GIRTH AT 5 FEET FROM THE GROUND.

R. Clarke, photo, 1899.

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[illegible] the story respecting the Stoke Edith bell. We have [illegible] testimony of Mr. [illegible], the present [illegible] who has been employed nineteen years in the park. "My [illegible] at Stoke Edith [illegible] years, and my father [illegible] fifty-one years. My grandfather [illegible], and my father [illegible] the bell which now [illegible] was formerly fixed [illegible] called the [illegible] Park, and [illegible] bell when the [illegible] to poach the deer. It was the duty of the [illegible] assistance on the approach of the poachers. [illegible] where it was fixed upon the highest [illegible] which bears to this day the name of Chapel [illegible] to the mansion, [illegible] Thomas the [illegible] grandfather was that it [illegible] It was at the mansion [illegible] head game keeper. [illegible] and fixed upon a branch [illegible] a time bell for the [illegible] to its present position [illegible] gardener to Mr. E. T. Foley."

[illegible] the Stoke Edith bell carries its history back to 1802.

[illegible] Paul Foley having clambered up and inspected the bell finds [illegible] border near the top, in raised letters and very distinct, the date [illegible] Hence it cannot be a bell from Kynaston chapel the landslip of [illegible] from 1571.

[illegible] with respect to the Homme House bell. Colonel E. [illegible] informs us that there is a bell at Homme House which, [illegible] family and local tradition, was dug out of the ruins of [illegible] either at the end of the last century or the beginning [illegible] century, and was taken to his grandfather as lord of the [illegible] at Homme House it remained for some [illegible] present the bell is regularly rung to call [illegible] it also rings the curfew.

[illegible] upon the bell.

THE WONDER OAK.

This ancient pollard oak, 36 feet 6 inches in girth at 5 feet from the ground, stands in a meadow of [illegible] House Farm, in the parish of Woolhope, now tenanted by Mr. [illegible] Hodges. It was visited on the way from Mr. Riley's Fruit Farm to the Cockshoot. There are two more ancient pollard oaks in the same field, the largest of which was found to have a girth of 29 feet at 5 feet from the ground. A photograph of the Wonder Oak was taken by Mr. Robert Clarke.

THE WONDER OAK, 36 FEET 6 INCHES IN GIRTH AT 5 FEET FROM THE GROUND.

To face page 107.

First let us take the story respecting the Stoke Edith bell. We have the following testimony of Mr. George J. E. Cooke, the present park-keeper, who has been employed nineteen years in the park "My grandfather was employed at Stoke Edith sixty-one years, and my father has been employed here fifty-one years. My grandfather came as game-keeper in the year 1802, and my father tells me that the bell which now hangs in the garden was formerly fixed upon a hill, then called the Large Slatchett, in Devereux Park, and used as an alarm bell when the Dean Forest miners came to poach the deer. It was the duty of the night watchers to ring it for assistance on the approach of the poachers. My father can point out the spot where it was fixed upon the highest point of the red deer park, which bears to this day the name of Chapel Knoll." The bell was removed from the Devereux Park to the mansion, when Henry Butt was the head park-keeper and William Thomas the under keeper. Mr. Butt's account of it to my grandfather was that it was one of the Kynaston chapel bells. It was at the mansion in 1802 when my grandfather came to Stoke Edith as head game keeper. In the year 1834 it was removed from the mansion and fixed upon a branch of a lime tree in the garden to be used as a time bell for the workmen. Here it remained a short time before removal to its present postion by Mr. Brown at that period gardener to Mr. E. T. Foley."

Thus the Stoke Edith bell carries its history back to 1802.

Mr. Paul Foley having clambered up and inspected the bell finds upon a border near the top, in raised letters and very distinct, the date 1690. Hence it cannot be a bell from Kynaston chapel the landslip of which dates from 1571.

Secondly, with respect to the Homme House bell. Colonel E. Money-Kyrle informs us that there is a bell at Homme House which, according to family and local tradition, was dug out of the ruins of Kynaston chapel either at the end of the last century or the beginning of the present century, and was taken to his grandfather as lord of the manor. Before it was hung at Homme House it remained for some period at Priggles Farm. At present the bell is regularly rung to call and dismiss workmen engaged in the park ; it also rings the curfew.

There is neither inscription nor date upon the bell.

THE WONDER OAK.

This ancient pollard oak, 36 feet 6 inches in girth at 5 feet from the ground, stands in a meadow of Hoar House Farm, in the parish of Woolhope, now tenanted by Mr. Charles Hodges. It was visited on the way from Mr. Riley's Fruit Farm to the Cockshoot. There are two more ancient pollard oaks in the same field, the largest of which was found to have a girth of 29 feet at 5 feet from the ground. A photograph of the Wonder Oak was taken by Mr. Robert Clarke.

With reference to the leafing of the oak and ash, it was observed to-day (May 25th) that not a single ash tree was in leaf, whilst oak trees by hundreds were in full leaf. The ash tree, always behind the oak in leafing, is this year, very conspicuously several weeks behind.

Mr. Riley continued to conduct the members to the Cockshoot on the summit of the hill. Proceeding up the hill from the Cockshoot towards the top of Seager Hill, rising in Sheepcote Hill to 892 feet (Ordnance Map, 34, S.E.) for a distance of about 200 yards, a large exposure of Aymestrey limestone is seen on the left-hand side of the road. It is this formation which gives the pear shape to the upheaval of the Silurian mass of the Woolhope elevation, constituting as it does nearly three-fourths of the summit of the belt.

From the Cockshoot the members proceeded over pasture land, under the guidance of Mr. Cook, one of the keepers on Lady Emily Foley's estate, to the south-eastern edge of Devereux Pool to measure the girth of the fine oak tree there growing; the girth at 5 feet from the ground was 21 feet 3 inches. A beautifully balanced Wych Elm in the Middle Park, a few hundred yards north of the pool, had a girth of 19 feet 5 inches at the same height, 5 feet from the ground. Through the Middle Park the party walked by Tarrington Common to the Foley Arms, Tarrington.

Mr. Robert Clarke supplied the following Notes on

TARRINGTON CHURCH.

The church has a nave, chancel, a very fine tower at the west end and a north aisle added at the end of the last century. On the south side of the nave is a Norman doorway, and the Norman door on the north side was taken out and rebuilt in the 18th century aisle when that was erected. There is a very fine Norman arch with piers to the chancel arch; the upper part of the arch was restored with the fragments found in the work when restored a few years ago. There are two very interesting small Norman windows in the north wall of the chancel with Norman carvings inside and outside. Under a canopied arch of the 14th century is an effigy of a lady in the style and dress of that period—the name of the lady is lost. In the churchyard are the remains of steps, large base, and portions of the shaft of the ancient churchyard cross. The church is dedicated to St. Philip and St. James. The register dates from 1567.

At 5.30 p.m., cold luncheon was served at the Foley Arms. Five members were elected, and the names of four candidates were proposed to be balloted for at the next Field Meeting.

After luncheon Mr. Moore made some remarks explanatory of geology of the district, demonstrated and rendered the more intelligible by a copy of the coloured geological plan of the Silurian upheaval surrounding Woolhope, and the section exhibiting the subsequent

denudation, which illustrations are to be found opposite page 164 of *Transactions*, 1891. He also recorded some of the more rare birds of this locality, and exhibited photographs of the Eastwood oak tree nearly two miles from the Foley Arms on the road to Ledbury, and of the Old oak at Coxall in the parish of Eyton nearly three miles from Leominster.

BIRDS OF THE TARRINGTON DISTRICT.

The Hobby has nested between Tarrington and Seager Hill every year for the last seven or eight years. The Pied Flycatcher nests in Stoke Edith Park. Wild Duck and Coot breed in Devereux pool. The Little Grebe also nests here as it does on many pools in Hereford shire. The Nightingale is not much heard in Stoke Edith Park, but on the eastern side it is met with. Every year it is heard in Eastwood, two miles east of Tarrington. During the last four or five years Herons have nested in front of Canon Frome Court. In 1895, a Black Redstart was caught in the house, after the severe winter of that year. Mr. Hutchinson to-day saw two male Red-backed Shrikes

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THE GEOLOGY OF THE WOOLHOPE DISTRICT.

References to the geology of the Woolhope district in the *Transactions* of the Woolhope Field Club are numerous, as will be seen in the many indexes to the various volumes. Amongst others may be mentioned :—The first paper read to the Club on July 20th, 1852, referring to the very first meeting of the Woolhope Club on May 18th, 1852. This paper was not printed at the time, but will be found in *Transactions* 1894, page 260.

The Geology of the Woolhope district is ably given by Rev. Robert Dixon in *Transactions*, 1867, page 170.

The Silurian Rocks of Hagley Park, by Hugh Strickland, are treated in *Transactions* 1870, page 167, where reference is made to Murchison's Silurian System, page 185.

See again *Transactions*, 1870, page 273, for a paper on "The passage beds in the neighbourhood of Woolhope," by Rev. P. B. Brodie.

"The Ludlow and Aymestry Rocks of the Silurian System," are treated by Mr. George Piper, F.G.S, on page 39 of *Transactions*, 1883.

"The Passage Beds at Ledbury," with an Illustration, are given on page 136 of *Transactions*, 1884, and are treated in still greater detail on page 310 of *Transactions*, 1897.

A few Fossils found at Perton are recorded in *Transactions*, 1886, page 53.

In *Transactions*, 1891, page 160, is a paper by Rev. J. D. La

Touche, in which, on page 161, when treating of the denudation of the Woolhope Valley, he refers to Murchison's Siluria, page 492.

A coloured geological plan of the Woolhope district, with a section, accompanies Mr. G. H. Piper's paper on page 164 of the same volume of *Transactions* of 1891.

The Maps, on the scale of 1 inch to 1 mile, for the district explored to-day are:—Much Marcle and The Wonder are at the extreme north-east corner of Sheet 215; consequently the following four maps are required for the surrounding country:—198, 199, 215 and 216. On the scale of 6 inches to one mile:—for Ledbury, 41 N.E., for Much Marcle, 41, S.W., for Putley, Kynaston, and The Wonder, 41 N.W., for Seager Hill and Stoke Edith 34, S E. On the Ordnance Map the date 1575 is given for the landslip.* Eastwood Oak is on 35 S.W, 8¼ miles from Hereford, 5¾ miles from Ledbury.

Excavation of Ancient Camps in Herefordshire—In the programme a notice was given of the promised handsome contribution by Dr. Sorby, L.L D., of £10 annually for the above object, provided that he was supported by the Woolhope Club. It was notified that at least £50 would be required from the members. Dr. Sorby writes:—"There are camps in the Shropshire and Herefordshire district, the date of which is open to much doubt. Opinions have been formed with inadequate data. Some may be before Roman times, others may be Roman, and others post Roman. By careful exploration difficulties may be cleared up. In a great camp in Epping Forest, excavated by my friends, much was learned, and interesting objects discovered, not a trace of anything Roman, it being a pre-Roman camp with stone implements, &c. Possibly some of the camps in your district may be of such early date. At all events it seems to me interesting to ascertain the date in a satisfactory manner," &c. Not a single letter having been received in answer to the appeal, Dr. Sorby's project has fallen to the ground.

The members returned to Hereford from Stoke Edith Station, the Great Western authorities having arranged for the 6.25 p.m. train from Worcester to stop at Stoke Edith.

* We believe 1571 to be the correct date.—EDITOR.

EASTWOOD OAK.

Alfred Watkins, photo., 1900.

No. 1. Between pages 110 and 111. To face No. 2

THE OAK AT COALL, EYTON, NEAR LEOMINSTER.

No. 2. Between pages 110 and 111. To face No. 1

EASTWOOD OAK.

Alfred Watkins, photo., 1900.

No. 1. Between pages 110 and 111. To face No. 2

OLD OAK AT COXALL, EYTON, NEAR LEOMINSTER.

T. H. Winterbourn, photo.

No. 2. Between pages 110 and 111. To face No. 1

OAK TREES ON THE LAWN, CROFT CASTLE.

T. H. Winterbourn, photo.

No 3. Between pages 110 and 111. To face No. 4.

SPANISH CHESTNUT TREES IN CROFT PARK.

T. H. Winterbourn, photo.

No. 4. Between pages 110 and 111. To face No. 3.

OAK TREES ON THE LAWN, CROFT CASTLE.

T. H. Winterbourn, photo.

No 3. Between pages 110 and 111. To face No. 3.

SPANISH CHESTNUT TREES IN CROFT PARK.

T. H. Winterbourn, photo.

No. 4. Between pages 110 and 111 To face No. 3.

FURTHER LARGE TREES IN HEREFORDSHIRE, NOT PREVIOUSLY RECORDED IN TRANSACTIONS.

By H. Cecil Moore.

THE EASTWOOD OAK.

On the main road from Tarrington to Ledbury, on the left hand side, about 8¼ miles east of Hereford, and 5¾ west of Ledbury, is the Eastwood Oak, near East Wood, which has a girth of 22 feet 1 inch at 5 feet from the ground.

To view it, take the train to Ashperton and walk back to Stoke Edith Station, a distance of nearly 4 miles. It lies nearly midway between the Stations.

The Photograph was taken by Mr. H. Cecil Moore.

OAK AT COXALL.

In a field on the right bank of the river Lugg at Coxall, in the parish of Eyton, at the distance of about two miles from Leominster, is an old Oak which has a girth of 34 feet 3 inches, at 5 feet from the ground, and 36 feet at 6 feet from the ground.

The Photographs were taken by Mr. T. H. Winterbourne, photographic artist, of Leominster.

OAK TREES ON THE LAWN OF CROFT CASTLE.

The largest of these monarchs is now a pollard, and in its stag's horn stage of decay. Its boughs project in a remarkably uniform manner from a height of fifteen feet from the base. This tree girths 25 feet at the height of 5 feet from the ground.

The Photograph was taken by Mr. Winterbourne.

OAK TREE AT HOLGATE, KINGSLAND.

The hollow trunk of this tree forms the footpath gateway entrance to Holgate, in the village of Kingsland, Herefordshire

The Photograph was taken by Mr. Winterbourne.

OAK AT EARDISLEY.

On a rough night in February, 1891, a huge limb of this tree fell causing great alarm. In 1894 a second fell, and during one of the terrible gales of November, 1895, another immense branch came down. Other of the spreading branches have been lopped off on account of the

dangerous propinquity of the Great Oak British School, the Calvinistic Methodist Chapel, and some Cottages, and at present there are only seven of the larger upright branches remaining, of which the highest towers to a height probably of 120 feet. On account of the position of the tree and its spreading gnarled roots, it is not easy to calculate with precision the girth at 5 feet from the ground. I estimate it at 29 feet.

ELM AT LEOMINSTER.

This lofty Elm grows in a meadow called "The Elms," on the north side of the eastern road to Ludlow, commonly called the Stockton Road. It is just outside the boundary of Leominster and in the parish of Kimbolton. At 5 feet from the ground it has a girth of 23 feet, and its height taken by a quadrant, is fully 130 feet.

The Photograph was taken by Mr. Winterbourne, of Leominster.

ELM AT KING'S ACRE, HEREFORD.

The Elm tree at King's Acre, on the left hand side of the Hereford and Hay Road, opposite the Bay Horse inn, distant about two miles from Hereford, is a remarkable tree, not so much from its girth (20 feet) at 5 feet from the ground, but more especially for the enormous girth of the three branches which fork upwards from the trunk at the height of 12 feet from the ground, the highest branch attaining a height probably of 130 feet. Each of these three branches is as large as an ordinary large elm tree. The branch overhanging the road has been cut down.

AVENUE OF CHESTNUT TREES IN CROFT PARK.

This avenue of magnificent Chestnut Trees is referred to in *Transactions* 1896, page 116, and elsewhere. The largest, nearly the last tree on the right-hand side, proceeding along the western drive from Croft Castle to the Lodge near Mortimer's Cross, has a girth of 24 feet at the height of 5 feet from the ground.

The Photograph was taken by Mr. Winterbourne, of Leominster.

ENORMOUS OAK BLOCK.

Early this year, 1899, an enormous Oak Block was conveyed through Hereford. It came from the grounds of Rev. G. H. Davenport, of Foxley, and was destined for the "heel" of the gates at Grimsby Docks, for the Great Central Railway, formerly known as the Manchester, Sheffield, and Lincolnshire Railway.

After the wet weather of December the ground was soft. Mr. Bamford, the agent, informs me that numerous horses were engaged, and they removed the block about one hundred yards in one day. Two owners of traction engines having viewed the tree declined to undertake its removal. Finally Mr. Flowers of Aconbury undertook and carried out the work, at the expense however of the fracture of his steel rope. valued at about £20.

The first length of the block was 42 feet to the forking, the

OAK TREE AT HOLGATE, KINGSLAND

T. H. Winterbourn, photo.

ELM TREE NEAR LEOMINSTER

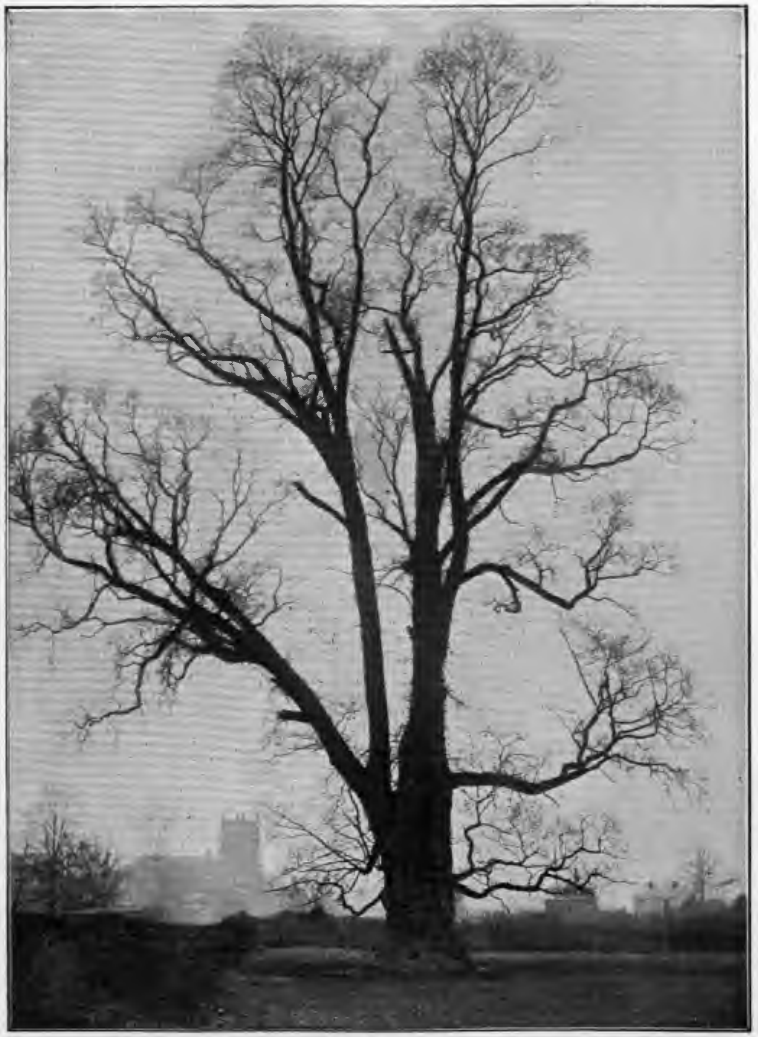
T. H. Winterbourn, photo.

No. 6. [illegible] To face p. 1

OAK TREE AT HOLGATE, KINGSLAND

T. H. Winterbourn, photo.

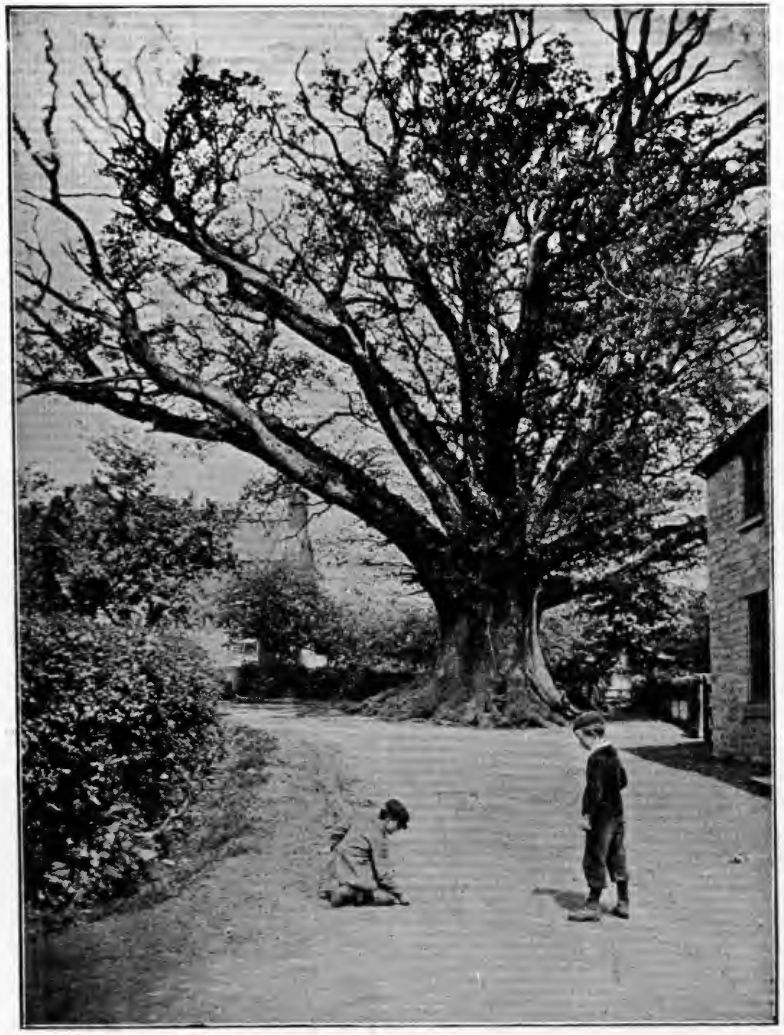
No. 6. Between pages 112 and 113. To face No. 6.



ELM TREE NEAR LEOMINSTER.

T. H. Winterbourn, photo.

No. 6. Between pages 112 and 113. To face No 5



THE GREAT OAK, EARDISLEY.

Alfred Watkins, photo., 1894.

No. 7. Between pages 112 and 113. To face No 8.

THE GREAT OAK, EARDISLEY.

Alfred Watkins, photo., 1894.

No. 7. Between pages 112 and 113. To face No 8.

KING'S ACRE ELM.

Alfred Watkins, photo., March, 1892

No 8. Between pages 112 and 113. To face No. 7.

length of each of the two forks being 18 feet, or a total length of the block 60 feet. When standing at the base of the fallen tree, the thickness of the block reached the line of a man's eyes, thus the tree may be said to have had a diameter at the base of at the very least 5 feet, or say 16 feet in circumference.

I obtained the above dimensions from Mr. T. R. Groom, timber merchant, through whose hands it passed on its transport northwards. He informed me that "there was no blemish in the block, no dead knot the size of your finger the whole way."

He estimated the contents of the block at 320 cubic feet, and its deadweight at 15 tons.

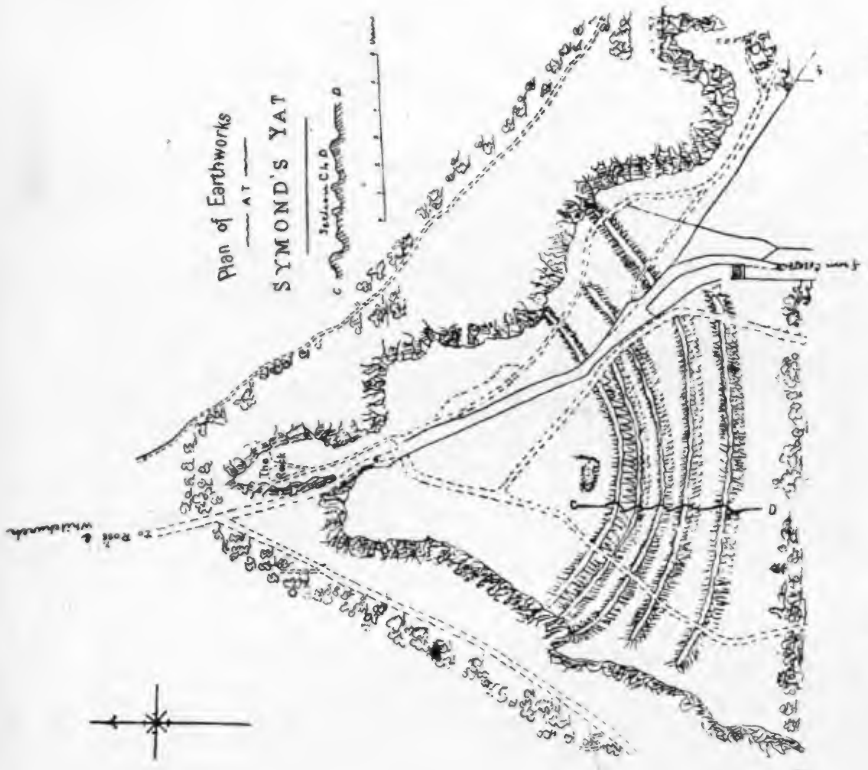
Woolhope Naturalists' Field Club.

SECOND FIELD MEETING, TUESDAY, JUNE 27TH, 1899.

COLDWELL ROCKS, SYMOND'S YAT, THE CAVES, AND THE DOWARD HILLS.

THE Second Field Meeting, held at Symonds Yat as its head quarters, embraced in its programme a walk of two miles from Lydbrook Junction Railway Station along the summit of the Coldwell Rocks (oftentimes miscalled the Twelve Apostles, which latter rocks are situate three miles above Chepstow) to Symonds Yat, a nearly two miles trip in boats beyond the Seven Sisters rocks to the lower end of Martin's Pool, with a halt, in passing, for the inspection of the caves in Lady Park Wood, an ascent of the Little Doward Hill, thence a four miles walk over the Great Doward Hill by King Arthur's Cave in Lord's Wood, to refreshment after labour at Davis's Rocklea Hotel, Symonds Yat. The attendance was large: 58 sat down to luncheon, and 62 took seats in the boats The following members and visitors attended :—Mr. H. C. Beddoe (President), Mr J. Edy Ballard, Mr. Philip Baylis, Mr W. Mortimer Baylis, Rev. H. A. Bennett, Mr Spencer H. Bickham, Mr. Arthur E. Boycott, Mr. G. M. Brierley, Mr. J. P. Brown, Mr. R. Clarke, Mr. Truman J. Cooke, Mr. Luther Davis, Rev P. H. Fernandez, Rev. J. E. Grasett, Mr. G. H. Hadfield, Rev. E. Harris, D.D., Rev. E. J. Holloway, Rev. W. H. Lambert, Mr. R. Lewis, Dr Gerald Leighton, Mr. W. G. Lloyd, Rev. H. B. D. Marshall, Mr. Norman H. Mathews, Mr. T. D. Morgan, Mr. G. H. Phillott, Rev. A. Pope, Dr. Scudamore Powell, Dr. W. Elliott Price, Mr. J. Probert, Mr. H. W. Pumphrey, Mr. C. Rootes, Mr. W. H. Steward, Mr. J. P. Sugden, Mr. E. Stooke, Mr. W. Thorpe, Rev. Preb. C. Warner, Rev. Morgan G. Watkins, Mr. G. W. Wheeler; Mr. T. Hutchinson and Mr. H. Cecil Moore, Hon. Secs. and Mr. James B. Pilley, Assistant Secretary. Visitors: Mr. W. Blake, Mr. W. Brown, Lieut.-Colonel Currey, Mr. W. Davis (Malvern), Mr. W. Edwards (Cardiff), Rev. T. Emmott, Mr. W. Froude, Mr. A. J. Garstone, Mr. E. A. Gowring, Mr. W. E. Groom, Mr. E. J. Hatton, Mr. J. M. Hutchinson (Natal), Mr. R. Irwin, Mr. Charles Machen, Rev. R. M. S. Onslow, Mr. G. N. Wheeler, Mr. F. N. Williams.

The geological features of the neighbourhood were explained by Mr. Moore to the party assembled on the top of Symonds Yat, where, as also after luncheon, a few of the most rare plants of the district were exhibited.



R. CLARKE DEL.

To face page 115.

Mr. Moore, by the aid of diagrams, traced the thin layer of Carboniferous shale, succeeded beneath by the Carboniferous Limestone and the Millstone Grit, surrounding the Coal Measures of the Forest of Dean. The rock of Symonds Yat on which the flagstaff is fixed is Carboniferous Limestone, which forms the grand scenery of bold cliffs on either side of the gorge separating these rocks from the Doward Hills, a deep-sea deposit mainly made up of remains of microscopic life. Shallow waters afterwards prevailed, and considerable sandy sediment, brought down by rivers formed the Millstone Grit, and a condition of still greater shallowing favoured a luxurious vegetation to the decay of which we are indebted for our Coal Measures.

The geological maps of the northern parts of the Forest of Dean are Hereford 43 S.W. horizontal section 12, vertical section 7, and Hereford 43 S.E., horizontal sections 12, 13, 15, vertical sections 7, 12, 15. For the Ordnance Survey Maps of the locality see *Transactions* 1895, page 46.

The height of Symonds Yat, where the flagstaff is erected, is 502 feet—see *Transactions* 1895, pages 46 and 49. On page 49 of the same volume a reference is made to the rise of 18 feet of the Wye at Symonds Yat in the flood of February 6th, 1852.

This promonotory of rocks was at some unknown period made defensible by a line of four or five earthworks extending from the eastern to the western inaccessible escarpments. On the conclusion of Mr. Moore's address, the members paid a visit of inspection to these earthworks, the significance of which will be better understood by an examination of the plan prepared by Mr. R. Clarke.

The Flora of the Dowards by the late Mr. Burton M. Watkins are printed in *Transactions*, 1881, pages 52 to 85, and additions on the Mosses, by Rev. A. Ley, in *Transactions*, 1890, pages 132 to 143; the Botany of Symonds Yat, by Mr. Southall, in *Transactions*, 1875, page 121, and 1878, p. 84, to which we have now to add the recent discovery by Rev. A. Ley of *Pyrus decipiens* in Coldwell Wood, which is in Gloucestershire. Strangers to this locality were struck by the numerous specimens of Pyrus aria, the Whitebeam, with its conspicuous silvery leaf, and a few saw the more rare Pyrus rotundifolia growing on the top of the cliffs in Mr. Machen's grounds, Coldwell Rocks, about sixty yards from the top of Symonds Yat. This Pyrus rotundifolia, formerly latifolia, was first named as a British plant from this locality.

Some idea of the botanical wealth of this immediate district may be formed by the publication of the following list of plants identified by Rev. A. Ley, which were collected a few days subsequent to our visit by the members of the Caradoc and Severn Valley Field Club, who made Symonds Yat their head quarters for a few days for their "Long Meeting" of 1899:—

Pyrus torminalis, P. aria, P. rupicola, P. latifolia, P. aucuparia, P. intermedia, Helianthemum vulgarius, Viburnum opulus, Cornus

Mr. Moore, by the aid of diagrams, traced the thin layer of Carboniferous shale, succeeded beneath by the Carboniferous Limestone and the Millstone Grit, surrounding the Coal Measures of the Forest of Dean. The rock of Symonds Yat on which the flagstaff is fixed is Carboniferous Limestone, which forms the grand scenery of bold cliffs on either side of the gorge separating these rocks from the Doward Hills, a deep-sea deposit mainly made up of remains of microscopic life. Shallow waters afterwards prevailed, and considerable sandy sediment, brought down by rivers formed the Millstone Grit, and a condition of still greater shallowing favoured a luxurious vegetation to the decay of which we are indebted for our Coal Measures.

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Pyrus torminalis, P. aria, P. rupicola, P. latifolia, P. aucuparia, P. intermedia, Helianthemum vulgarius, Viburnum opulus, Cornus

sanguinea, Rubra peregrina, Galium Mollugo, Asperula odorata, Scabiosa Columbaria, Senecio crucifolius, Serratula tinctoria, Hieracium Pilosella, H. lariophyllum, H. planifolium, H. pellucidum, H. pachyphyllum, H. stenolepis, H. glaucovirens, H. sciaphelum, Ligustrum vulgare, Cephalanthera grandifolia, C. ensifolia, Ophrys muscifera, Habenaria, Chlorantha, Luzula Forsteri, L. pilosa, L. Borreri, Carex digitata, Melica nutans, M. uniflora, Festuca sylvatica, Inula Conyza (not in flower), *Aquilegia vulgaris, and Paris quadrifolia.*

Our lepidopterists have sent the following list of the captures and observations of the day :—

The following Lepidoptera were taken and observed by Mr. J. M. Hutchinson—

Taken.	Observed.
Satyrus ægeria	*Pieris brassicæ*
Thanaos tages	*Satyrus janiria*
Hesperia sylvanus	*Cœnonympha pamphilus*
Hesperia linea	*Lycæna alexis*
Euchelia jacobæa	*Iodis lacteria*
Ephyra omicronaria	*Asthena candidata*
Asthena blomeri (2)	*Cabera exanthemaria*
Minoa euphorbiata	*Melanippe montanata*
Abarxas ulmata	*Tortrix viridana*
Lomaspilis marginata	*Penthina pruniana*
Larentia pectinitaria	*Penthina ochroleucana*
Acronycta psi	*Pardia tripunctana*
Olindia ulmana	*Sericoris lacunana*
Pterophorus fuscodactylus	*Harpella geoffroyella*

Mr. Boycott saw Apatura iris (2) one on each side of the river, and Mr. J. B. Pilley saw Argynnis paphia and a few A. selene. A. adippe was also seen.

In addition to the above the following species were taken by Mr. Edwin Osier :—

Argynnis euphrosyne
Lycæna ægon
Sphinx ligustri
Macroglossa stellatarum
Boarmia repandata
Timandra amataria

And by Mr. W. Blake :

Vanessa atalanta
Epinephele tithonus
Epinephele hyperanthus

Symonds Yat and the Doward Hills have often been visited by the Club, and their special natural history features have been chronicled,

as will be seen on reference to the various indexes of the volumes of *Transactions*. The members are now to be congratulated on the addition of a supplemental chapter of the local history from the pen of a native, who for half a century has been as familiar with the Forest as Hawkeye was with his Canadian home, "every nook and corner of the neighbourhood having resounded to the crack of his gun." We refer to the excellent paper by Mr J. P. Brown, which the members had the pleasure of listening to after luncheon, and which is now printed below :—

NOTES ON THE DISTRICT OF THE FOREST OF DEAN.

By J. P. Brown.

I have been requested, as a native of this district, to make some few remarks, and hope they may not be uninteresting to the members, inasmuch as I have been intimate with the locality for 50 years, and have had opportunities of noting the many changes that have taken place during that period.

The geology, botany, and natural history of "The Forest of Dean" and its surroundings have been so well treated by various local and other authorities, that I need only remark that there are few places more interesting to lovers of these sciences—and will only venture very briefly to allude to the places we have seen to-day.

The Royal Forest of Dean, which formerly covered the whole of the triangular area between the Severn and the Wye, from Gloucester to Chepstow on the south-west, and from Gloucester along the Leadon Valley by Newent to Ross on the north-west, is one of the most ancient in the kingdom.

Its history dates back to Edward the Confessor, 1042, and it is mentioned in Doomesday Book as having been exempted from taxation by him. Tradition says that William of Normandy was hunting here when news came of the capture of York by the Danes, and even at that time the iron forges of the Forest were mentioned—but the iron industry, such as it was, flourished long before that period, and the remains of the old Roman cinder heaps containing pieces of large size, and the "Scowles," or pits, where the outcrop of the iron was worked, proves this; whilst in later years in the parish of Whitchurch the ore was smelted with wood charcoal in large quantities, several remains of the old Bloomeries being still visible. The back of an old kitchen fireplace at Lewson bears the date 1637, and is said to have been cast in the parish. Just below the railway station, on the opposite bank of the river, were large forges with a weir across the river and locks for the passage of boats.

These works, called the New Weir Forges, were leased from the Duke of Kent, who had rights in the district. A weir also existed at Old Forge, about two miles up the river. Both these weirs have

disappeared, but at low water the foundations of the New Weir may occasionally be seen.

The Forest of Dean, under Canute the Dane, was ruled as now by the Verderers, and under the Forest laws their powers were those of life and death ; the penalty for killing the King's deer was for a freeman a fine, but a serf was liable to lose his skin, which was nailed upon the Court House door as a warning The Verderers had certain rights to venison for themselves, but without the King's authority no deer could be killed. This ancient Court is still in existence, the Court House being the well known Speech House, and in all matters within its jurisdiction there is no appeal ; neither can any barrister or counsel appear to plead, which may without prejudice be said to simplify the procedure.

The whole Government area is stated to be about 22,000 acres, about 15,000 being under timber and plantation. The portion of the "Forest" we have seen to-day is known as the High Meadow Estate, and was purchased by the Government in 1817. The Lords Wood, on the Whitchurch or Herefordshire side, was purchased seven years later, the whole containing about 5,000 acres It is stated that the Duke of Wellington was offered this estate by the Government, but he declined it in favour of Strathfieldsaye, one of his reasons being that it was "too much like the Pyrenees."

In this district is to be found almost in its original purity some of the ancient blood of the Silures, those men of whom Tacitus wrote in his history of Agricola, who fought hard for their liberty against the iron hand of Rome, and were only conquered at last by that wonderful second Legion whose head quarters were at Isca Silurum, whose roads are still to be traced by the kerbs still left upon the surface. The descendants of these "Silurians," with their dark complexions and easy manners, are still the free miners of the Forest, and are a race of themselves.

That the country on both sides of the river was a "Debatable Land" is evident from the many camps and entrenchments still to be traced, as well as the remains of a double line of castles extending along the Welsh frontier. Those at Symonds Yat, with their five lines of curved entrenchments facing S.W., are of very ancient construction, and evidently intended both to guard the approaches of the river and also to oppose an attack from that quarter. It is probable that the gorge of the work next the Yat was closed with a stockade. A tradition exists that the Danes landed at Gatcombe, on the Severn, and marched across the Forest to the Wye, but being attacked and surrounded found their graves in the Slaughter Valley just below. It is possible there may be some truth in this, as there is another place in Gloucestershire, on the Cirencester side, known as "Slaughter," where undoubtedly a Danish force was destroyed.

The camp on Little Doward is evidently British, but was probably occupied by a Roman detachment, as some coins of the time of Victorinus were once found there, whilst the parish church of Ganarew,

built on the site of the much older one, and dedicated to St. Swithin, is reputed to be the burial place of the unfortunate Vortigern.

From the very meagre historical data forthcoming it appears that the men of Herefordshire were loyal to the King during the Civil War, and possibly the influence of the Lords of Raglan and Goodrich Castles had much to do with this. On the other hand, the men of Gloucestershire were mostly for the Parliament. Possibly the garrisons of St. Briavels, Goodrich, and Pembridge Castles made incursions, but the nature of the country was against any important operations.

Whilst upon this subject we should not forget that the men of the Archenfield or Ross Division of Herefordshire bear an honourable name for bravery, and Domesday Book is still in existence containing for them amongst other rights and privileges that of fighting in the van.

Time will not permit of more than a very brief and imperfect sketch of the history of this most interesting district, and I will now, therefore, allude to the great changes which have occurred since I first knew it.

I do not recollect the deer which at one time were very numerous, but I have heard much about their destruction. The late Major Trafford, of Michaelchurch, told me he was present, and he and my father both mentioned the fact of the deer taking to the water at Martin's Pool and being shot in the river. The order for this was given owing to the damage done to the farmers' crops, notably at Hadnock Farm, then in the occupation of my great uncle, and also on account of the poaching, the sympathies of the district being entirely with the poachers. An old friend of ours used to be out in the standing corn at night, and eventually was caught in the act of shooting a deer, and after a fight was consigned to Monmouth Gaol. I have heard him say he never had a better time in his life than he had in prison, as everything good was brought him by his friends, including unlimited port wine, of which I know he was a judge. When I was a boy the river was much more used as a waterway than at present, a large trade being carried on between Bristol and Hereford by barges and lighters, whilst a considerable quantity of coal found its way to the landing places on the backs of donkeys and mules. My friend Mr. Rootes, I believe, has amongst he books of Messrs. Pulling and Co. memoranda throwing light upon the wine and cider trade of that time carried on between the two cities, whilst the local lime trade was considerable. Nearly all the heavy traffic not carried by water passed through Whitchurch by stage waggon. Many of our farm workmen were old bargees, and I have heard several Rabelaisian tales of the varied delights of "Hereford." The general idea with them was that the "Foresters" did not like water, and when crossing the ferry were accustomed to say to the boatman in the vulgar tongue, "Don't thou shuck the boat." The railway has altered all this; as we know.

The meadows opposite the caves, known as the Biblin Meadows, were leased from the Crown for many years by my family, the lease at

that time including the shooting on both sides of the river. As children our great delight was to come every year to the sheep washing in the river. The place was a veritable fairyland to us, and the Government keeper, or woodward, as he was called, was the best representative I have ever seen of Cooper's "Hawkeye," or "Pathfinder."

I came in for the end of this good time as the lease expired, and other arrangements were made as to the shooting, but I attribute much of the strength and activity I still enjoy to the severe training of many a hard day in the Forest. The bag was generally small, but nearly always included a couple of woodcock. Occasionally two or three couple were killed.

I omitted to say when speaking of the trade in lime that it was the custom to send for it by waggon as far as Withington, beyond Hereford, cider being sent down and lime taken back.

Until the railway came, the district we have been through to-day was one of the most secluded in England, and I am afraid from the writings of old travellers that my own parish had an unenviable reputation; one is especially unkind, and mentions that the whitewashed cottages on the Doward Hill, although lovely to look at were not always abodes of bliss. At that time sheep stealing was very common, and there being no police force in existence other than the village constable, vigilance committees were called into requisition, of whom great things were expected. I am afraid from what I have heard that these were not always successful in apprehending the offenders, and some accounts went so far as to say that the members were generally refreshing themselves after their exertions at the very time the crimes were committed. The last of these offenders was for many years known as the Hermit, and lived in a cave on the Doward, and until the sanitary and other authorities interfered, his business flourished.

The church of Whitchurch, like Hentland, is dedicated to St. Dubricius, and the parish still contains many farms and fields retaining the Welsh prefixes Llan, Tre, Pen, and Cae. A most interesting terrier of the parish, written about 150 years ago by an old rector, is in the possession of my brother, and shows how the small farms were in many cases amalgamated. In my recollection the remains of the ancient chapel of St. Wolstan were to be seen in the woods belonging to that farm. The name of my old home "Lewson," is apparently Flemish, and in the opinion of a well-known antiquary, the late Mr. Webb, the fact that there is an ancient water mill here, and that another mill, known as the Tuck Mill, is adjacent, would suggest that the cloth industry might have flourished in this district.

Time will not allow of my doing other than scant justice to the charms of my native district. I can but hope that the members have enjoyed the day as I have, and I may be pardoned for being a little too enthusiastic over it, as the happiest days of my life were spent here, in the company of those most dear to me, many of whom rest near by.

To re-visit these scenes, where I am fortunate to have a "local

habitation," is one of my greatest pleasures, and especially here, where every rock and glade has its memories, one can obtain rest from business cares, and thankfully experience something of a quietness and peace that is denied to many.

A chapter on British Reptiles is added to the Club's *Transactions* by the paper on "British Snakes," partly read by Mr. Thomas Hutchinson, but brought to an abrupt conclusion by the arrival of the train to convey members to their homes.

BRITISH SNAKES.

By T. Hutchinson.

There are three species of snakes in Britain, namely, the common snake, the smooth snake, and the adder or viper. They none of them occur in Ireland, the legend being that St. Patrick drove them all out of that island.

The Common Snake, Tropidonotus natrix, is distributed widely all over Europe, including England and Scotland, being most abundant in the southern counties. I have never seen it in Herefordshire, but it occurs at Whitchurch, Fownhope, Stoke Edith, Cradley, and other places in the county. It frequents as a rule low lying land in neighbourhood of water, to which it readily takes on the slightest alarm. It swims with a graceful sinuous movement, carrying its head just above the surface. Its length varies from three to five feet, or even more. I once saw one at Lancing that a boy had killed as it was going into its hole. In pulling it out he broke three or four inches off the tail. I saw it measured, not with a tape I admit, but in the rough and ready way of school boys, and we made out that the portion that remained was over five feet. This and one caught at Clapham some years ago which measured five and a half feet (Mr. J. J. Walker, R.N., of Sheerness, being my authority) are far the largest I have ever seen or heard of. The colour is greeny gray on the back, toning off into yellow on the sides and belly with black blotches down the sides and a double row of small black spots down the back. The head is broader than that of the adder and has no black marks upon it. It can be distinguished, however, at a glance by the two bright yellow spots just behind the head one on either side the neck, and the tail is long and tapering. The eyes are on the top of the head, doubtless placed there to enable it to see its prey as it darts after it along the ground. It does not raise its head and strike as the adder does. It is quite harmless but will defend itself and bite when attacked. It feeds on frogs, mice, small birds, eggs, lizards, newts, fish, and lobworms, and is easily tamed. The common snake is purely oviparous and lays eggs which are white, 18 or 20 in number and rather smaller than a sparrow's, the whole batch appearing as if agglutinated together. They are laid in hot beds, dung

hills, and among dead leaves, the parent snake taking no further interest in them, leaving them to be hatched by the heat of their surroundings and the young to fend for themselves from the first. In the spring this snake, in common with others, sheds its skin, and it is then very lively and fierce. When enraged it emits a most pungent and disagreeable garlic-like odour, which is quite perceptible 20 yards off. It hybernates at the bottom of hedges, in hollow trees, &c., and large numbers are often found together Snakes, unlike lizards, have no moveable eyelids. The slough comes off inside outwards, the reptile crawling out of it as it were, and I have seen the perfect slough of a South African species which contained the slough of the outer membrane of the eyes. The jaws of snakes are expansive, the bones of the upper and lower jaw separating so as to allow the prey to pass whole into the body. To say that a snake has scales is somewhat misleading, because they will not scrape off like those of a fish.

The Smooth Snake (*Coronella lævis*). This species is widely distributed on the Continent of Europe, but in England has an exceedingly restricted range, being confined to the district immediately to the west of the New Forest about Bournemouth, and even there it is by no means common. I believe it was not known as a British species till the year 1862. The prevailing colour is greenish brown, the scales being remarkably smooth. It is about 18 inches long and much more like the adder in appearance than the common snake, but its habits are very similar to those of the latter. It is more active and very fierce in its disposition, but is quite harmless and is easily tamed. It feeds entirely on lizards. It is ovoviviparous, the young being born alive, about six in number, and the little ones have the habit of twisting their bodies into a figure of eight while basking in the sun It seems to prefer rough, stony places.

The Adder or Viper, *Pelias berus*, is the only British venomous snake and is common throughout England, Scotland, and Wales, and it abounds in many parts of this county. It ranges also over Western Europe and even beyond the Arctic Circle in Scandinavia. It is very variable in ground colour, ranging from brownish gray to rich deep yellowish brown or deep olive, occasionally approaching to blackish, but these differently coloured ones are all of one species. It is easily recognised from the common and smooth snake by a series of contiguous diamond-shaped black spots down the middle of the back, extending from the head to the extreme end of the tail, which is much thicker than that of the common snake. The head, too, has a V shaped mark on it and is more triangular and much more contracted at the neck than either of the two harmless species. The structure of the head is remarkable, the eyes slightly protrude from the sides so that it can see its prey when its head is raised to strike. Mr. M. C. Cooke, in his book "Our Reptiles and Batrachians," gives a very clear description of the poison apparatus. He says "it consists of the *gland* in which it is secreted, the *duct* or canal along which it travels

and the *fang* by means of which it is injected. The gland is placed at the side of the head and consists of an assemblage of lobes. The substance is soft and yellow with a spongy appearance. The duct or canal through which the poison is conveyed to the fang is a narrow cylindrical tube swelling in the centre of its course into a kind of reservoir and terminating at the base of the fang. This latter is a tooth in the form of a tube much longer than the other teeth and curved. It is placed in the jaw one on each side of the mouth. Behind these are the similar shaped but smaller fangs of replacement. On the outer surface of the fang near the apex is an elongated opening or slip from which a canal passes through the hollow in the interior of the tooth and is united to the duct which communicates with the poison gland. These fangs fall backwards and lie concealed in a groove of the gum when not in use." The same author says that the poison of snakes still appears to have some reputation amongst medical men in the East for "rumbling in the bowels." The adder feeds on mice, birds, toads, frogs, &c., and is very voracious. I have heard of as many as three toads being found inside one adder and four young nearly full-fledged larks in another. The adder lies torpid during the winter. It is sluggish in its habits, gliding away quietly when approached. All authorities agree in saying that it will not attack unless handled or trodden on, when it strikes quickly enough. They also say that when striking it cannot reach above two-thirds its own length, the action requiring that its tail should be on the ground. My friend Mr. John P. Brown tells me that in August, 1897, he was walking up the road near the top of Credenhill Camp when he came across an adder in the middle of the road curled up with its head erect keeping guard over a dead or dying mouse. He walked out of the roadway intending to pass it at a distance of at least five feet, when to use his words "it flung itself against my leggings." Doubtless the poor thing thought it was going to be robbed of its dinner, and it may have, unperceived by Mr. Brown, made two springs, getting some assistance from its tail as it passed over the ground, but certainly in this instance it did attack and struck at a greater distance than two-thirds its length. The largest adder I have ever heard of measured 26½ inches. Dr. Leighton, of Grosmont, is my authority, and he has kindly sent me a photograph which I produce. I am indebted to Mr. Brown also for the following incidents About thirty years ago he was shooting near Newton Common, in the parish of Welsh Newton—three miles west of where we now are—and he had with him a favourite spaniel. On passing across an open space caused by charcoal burning, he saw an adder, which he shot and blew in half, the dog rushed in to see what the game was and the adder seized the dog by the lip, who ran off howling with the adder's head sticking to his jaw. The dog did not return when called and was lost in the wood. The next day Mr. Brown went to look for him and found him in a very weak condition, his neck being much swollen, and he died the day following. On another occasion Mr. Brown was shooting in the same neighbourhood when his dog,

another spaniel, was bitten by an adder. He got hold of the dog, took him to a farmhouse, gave him as much milk as he could drink and I believe a milk bath. That dog recovered. The bite of an adder is very seldom fatal to man. The best remedies are—first of all it should be well sucked, then a free incision of the place bitten, and plenty of brandy or any other spirit applied both outwardly and inwardly. Hartshorn and oil applied the same way are also good. About thirty years ago adders used to swarm in what was then a young larch plantation on the Croft side of Bircher Common, and on one occasion in the year 1866 while on this plantation I heard a most violent hissing, and on looking through the trees I saw a pair of adders coiled together and gliding quickly over the grass approaching the direction where I was standing. They were so intent on what they were about that they did not see me, and would have passed on but I killed them both with the blow of a stick; one measured 23 and the other 22 inches. The adder is ovoviviparous, that is the eggs are fully formed in the body of the mother and are hatched at the moment of laying, the young from 10 to 20 in number being actually born alive, and the parent snake looks after them for some time. The question whether adders, and some other ovoviviparous snakes and lizards swallow their young in time of danger and give them a temporary refuge down their throats has of late been much discussed and still remains a disputed point. Many eye-witnesses maintain they have seen it happen while many scientific men say it is impossible. Sir Thomas Browne, a well known physician in the time of Charles II., in his "Enquiries into Vulgar and Common Errors," 1646, writes upon the subject as follows:—"The young ones will upon any fright, for protection, run into the belly of the dam, for then the old one receives them in at her mouth, which way, the fright being past, they will return again, which is a peculiar way of refuge, and although it seems strange is avowed by frequent experience and undeniable testimony." Isaak Walton, in his "Complete Angler," referring to "viviparous snakes," says, "does breed her young alive, which she does not forsake, but bides with them; and in case of danger will take them all into her mouth and swim away from any apprehended danger and then let them out again when she thinks all danger to be past. These be accidents that we anglers sometimes see and often talk about." Coming to more recent times; in the year 1895, there was a long and rather heated correspondence in *The Field* on this subject; many persons asserting that they have at one time or another seen the adder swallow its young, and certainly their evidence seems overwhelming. But doctors and scientists, amongst whom is that eminent naturalist, Mr. Tegetmeier, doubt if such a thing is possible, they quite believe that those who assert they have seen it are saying what they believe to be true but that they are mistaken. They say it is against all the laws of nature; that the gastric juice which is very powerful in snakes would soon kill the young even if they were not suffocated for want of air. Amongst the best records of those who say they have seen an adder swallow its young are

(1) Mr. G. A. St. Crois Rose, his brother and a friend. Their account is that while shooting in Wigtonshire they watched some young adders crawl into the old one's mouth, that they killed the old adder, cut her head off, and the young ones then crawled out of that end of her body (see *The Field*, 9th and 16th February, and 2nd March, 1895); (2) Mr. T. U. Chamberlain says on a hot July day he came across an adder with young, which crawled into the parent's mouth. She was then killed and eight young ones extracted still alive (see *The Field*, 16th February, 1895; (3) In the same paper Mr. F. C. Cobden, the cricketer, vouches for a similar occurrence seen by his two sons, who killed the old adder, and he says the young ones constantly came out from and again disappeared down the parent's throat; (4) A gentleman, who signs himself "F. D. T." (in *The Field* 2nd March, 1895), says "at Aspley Woods, in Beds, there in the broad sandy rides where no vegetation exists to hide the view, I have watched adders and their young previously to killing them, and can positively declare that their young do seek shelter inside the parent if suddenly surprised or alarmed." Mr. M. C. Cooke, in his most interesting book "Our Reptiles and Batrachians," quotes many instances of both adders and lizards swallowing their young. On most subjects the above evidence would be considered conclusive, but in this case it is not so. A letter from Mr. Tegetmeier which appeared in *The Field*, March 2nd, 1895, gives very clearly and concisely the position taken up by those who contend that all these people and many others who say they have seen this take place are in some way or other mistaken. He says: "In writing on this subject and offering a reward for definite proof of the performance I have but one object in view—namely, that of ascertaining the truth. I am quite aware that the balance of opinion is in favour of the female adder so protecting her young, but I maintain, that if she does so, positive proof, which is not difficult to obtain, has never been produced, and the onus of proof lies on those who make the assertion. At the same time, I am desirous of accumulating trustworthy evidence on the question, and on asking Mr. Frohawk, a skilled practical naturalist, if he could assist me in the matter, he suggests writing to "Brusher" Mills, the well-known viper catcher of the New Forest. He did so, and received the following reply:—"Sir,—In answer to your letter of this morning, which I was very pleased to get, asking for information on adders, I can tell you that it is a fact that the young do (go into the mouth of the old one), as you have stated, and if you or any other gentleman would like to come and see for yourself, I shall be most pleased to show you on the last week in July or the first week in August. I have had a long experience with adders and snakes. The number of adders I have caught in fourteen years is 3,186, and I have seen hundreds go in and out of the old adder's mouth. She will hold them till danger is out of her way. I am willing to show this to any gentleman who likes to come and see me at the time.—HARRY MILLS (Clay Hill, Lyndhurst, Hants. Feb. 27th)." As far as ocular testimony is concerned, I do not think any stronger could be produced;

and all that now remains to settle this disputed point is the dissection by a skilled anatomist of a viper that has been killed after the young have been seen to take refuge in her æsophagus, for obtaining which I hope to again offer the reward at the time mentioned by Brusher Mills. —W. T. TEGETMEIER." Then we come to the letter from the same pen which appeared in *The Field*, of the 14th September, 1895. As it is very long I will only quote part of it.

DO VIPERS SWALLOW THEIR YOUNG?

"I am really sorry to interfere with such a pleasantly written statement, but I may inform the authors and their readers that I journeyed to the New Forest in July, in company with a very good naturalist and well-known artist, Mr. Frohawk, to whom Brusher is personally known. We failed to see any adders swallowing their young in time of danger, and were told there were none to be seen at that time. Necessarily my occupation prevented me staying the whole of July and August in the forest for the purpose of witnessing this supposititious performance. I therefore took what appeared to me the next best steps for the purpose of solving the vexed question. I supplied Brusher with a wide-mouthed bottle of requisite size, filled with methylated spirit; and this was carefully enclosed in corrugated packing paper, placed in a box duly directed and stamped for the parcel post. Brusher was to secure an adder that had swallowed her young, place her in this bottle of spirit and forward it to me—the inducement [offered] being the exchange of a miniature of Her Gracious Majesty executed in gold at the mint. Brusher expressed his perfect readiness to accept this commission.

"In the course of last week I duly received a package all in perfectly good order. There was a viper contained in the spirit, which arrived safely; and in order to make assurance doubly sure. Brusher posted to Mr. Frohawk another box containing another adder. The letter accompanying these two packages stated that "he did not know how many young ones are there." Nothing apparently could be more satisfactory. Brusher Mills—the most experienced viper catcher in the world, who has caught his thousands and seen hundreds swallow their young—had sent for examination two vipers. Mr. Frohawk, not being an anatomist, kindly placed his specimen at my disposal. I accepted the responsibility, but as some persons might imagine that I was prejudiced in the matter, I thought it desirable that the adders should be opened by some other person rather than myself. I availed myself of the services of Mr. W. Pearson, who has been Prosector for many years, and whose exquisite preparations and dissections in the museum testify to the delicacy and accuracy of his work. The vipers were taken out of the spirit, and pinned down on the back to a long slab of cork used for the purposes of dissection. The skin and walls of the body were first opened, and carefully pinned back, so as to expose the whole of the viscera. In both cases the pharynx, the gullet, and the stomach were

laid open their entire length, with the discovery that the stomach of both the specimens was absolutely empty—there being no trace of young vipers or of any food in either one or the other. It was seen, on performing this operation, that the gullet was too small for any number of young snakes to be contained within it. On pursuing the post-mortem, we found that the oviduct in one of the specimens contained no ova, and in the other there were several undeveloped ova the size of grains of wheat.

On writing to Brusher for further particulars of the capture, Mr. Frohawk received from him the following letter:—

"Sir,—The adders sent you were female adders in young When I come across an adder that has swallowed its young I will send it along to you.

BRUSHER MILLS."

"Clay Hill, Lyndhurst, Sept. 5, 1895."

"The explanation doubtless is that the young vipers (which are born alive, and at the time of birth are perfectly well developed and exceedingly active), are seen surrounding the parents as they are produced. If the approach of any person disturbs them, they with great facility conceal themselves in the grass or adjoining herbage. The persons who disturb them do not merely believe what they see, but they fancy they see what they believe—a very common mistake that is made in hundreds of instances as well as in viper catching; and they say the young snakes went down the throat of the parent—a statement which is readily accepted by persons who believe in the miraculous. This explanation, doubtless, will not satisfy the credulous, nor have I the slightest ambition to do so.

"The whole affair is too ludicrous for further discussion; but a £5 reward is still in evidence, if anybody should seriously believe that he is able to prove the above fact.

"W. B. TEGETMEIER."

And the matter now rests as it did then, the £5 reward being still unearned. My friend Mr. Edwin Stooke, of Hereford, has told me that many years ago, on Exmoor, he once, shooting, saw an adder swallow her young, that he stamped on her, which burst her open, and the young adders came out of her side. That, however, carries the matter no further than others have done, but Mr. Robert Clarke, whom members of this Club will recognise as a man who knows what to observe and how to observe it, informs me that in the year 1868 he went one Sunday morning for walk with two friends in Hainault Forest, near Chigwell. An adder crossed their path and went into a bush. One of his friends beat it out and killed it. He asked Mr. Clarke if he had ever seen an adder's fangs. He then got a forked stick, which he placed across the neck of the reptile close to the head, and then cut its

head off with a knife, and immediately he had done so four or five young adders, about four inches long, came out of the throat where the head was cut off, one after another, and his friend killed each one as it appeared. That is good evidence, although the young were not seen to enter the old one's mouth. She was killed on the move, so that the young could not have been concealed beneath her, neither could they have come out of her throat if they were unborn.

There is, however, only one satisfactory way of settling the question, and that is, as Mr. Tegetmeier says, by dissection, and if any member of the Club has ever the opportunity of killing an adder that has been seen to swallow its young, if he will tie a string round its neck, put it in a bottle, and send it to me, I will take care that it is dissected by a trustworthy anatomist, and I should much like the name of the Woolhope Club to be associated with settling this vexed question.

NOTE.—Since writing the above paper I have seen a book by Mr. H. E. Forrest, hon. sec. of the Caradoc Club, entitled "Fauna of Shropshire," which contains an excellent account of the adder, and amongst other interesting incidents quoted by Mr. Forrest are the following :—"Mr. Ramsbotham, of Meole Hall, Shrewsbury" (who happens to be an old schoolfellow of my own), "has a viper (taken in 1889) which was put into an empty bottle and there left for nearly 24 hours. Upon the bottle being filled with spirit, a full-grown lizard (*Lacerta vivipara*) crawled out of the viper's mouth. This proves three things—(1) That a viper sometimes eats lizards though its food usually consists of mice and frogs; (2) that it sometimes swallows its prey without using its poison fangs; (3) that a lizard can exist for nearly 24 hours in a snake's gullet. This last point has an important bearing upon . . . does the viper swallow its own young."

Another incident quoted by Mr. Forrest is that "Mr. Harold Peake, of Ellesmere, sent for exhibition three young vipers (taken near that town), each of which had two small hind legs." Mr. Forrest remarks "these are believed to be unique." But before I had the pleasure of seeing the 'Fauna of Shropshire," Mr. John P. Brown told me that he had seen a small snake with legs at Lewstone, in the parish of Whitchurch. I did not refer to this in my paper because I thought he might have confused a snake and a slowworm (*Anguis fragilis*). The appearance of rudimentary legs in the latter would not have been so remarkable.

THE REPTILIA OF THE MONNOW VALLEY.

THEIR DISTRIBUTION AND RELATIVE FREQUENCY.

BY GERALD LEIGHTON, M.B., C.M.

I. A. Order—*Ophidia.*
Sub-order—*Ophidia Viperiformes.*
Family—*Viperidae*
Genus—*Pelias.*
Species—*Berus.*
Common Name—*Adder or Viper.*

This member of the Reptile group presents some interesting peculiarities in the Monnow Valley, which, I think, are worth drawing attention to and recording. The special locality that these remarks refer to is that part of the Monnow Valley extending from Pontrilas to Skenfrith and especially where the valley is flanked on the one side by Garway Hill and on the opposite side by the Graig. The river here is the boundary between Herefordshire and Monmouthshire.

(*a.*)—*Frequency of occurrence.*—My attention was first drawn to this point in the following way. When I first came to Grosmont, I began to make inquiries as to the reptiles of the district from that class of the community which I find the most useful for such a purpose, viz., gamekeepers, woodmen, poachers, etc. I was at once struck with the unanimity of the replies I got to my queries. One and all replied almost in these words, "There's no snakes about here, sir, *only adders.*" Or, "There's plenty of adders about, but *no snakes.*" Now experience has taught me, that the class of observers referred to are generally trustworthy as to their *facts*, but that their interpretation of their observations is not always correct. My first impression was that there could be no doubt on one point, viz., that one snake was common in the district, and the other two relatively rare. This is what one would naturally expect; the relative frequency of the three British snakes in most localities being as follows :—

1.—Tropidonotus natrix (Ring-snake) most common.
2.—Pelias Berus (Adder) next.
3.—Coronella laevis (Smooth snake) the most rare.

b.—*Length.*—But my further inquiries among these people hardly seemed to bear this out, for I found that all agreed in placing the average length of the local snake at about 24 inches. Now the averages generally accepted are :—

Ring-snake	40 inches
Adder	18 inches.
Smooth snake	24 inches.

Further, I found that these men considered a snake of the kind they were familiar with, very large if it reached 26 or 27 inches, very small if under 20 inches.

These were the results of the inquiries I made during the winter months of 1895, and I eagerly looked forward to the summer when I could make my own investigations. But the conclusion I came to was—and I give it to show how one can be misled by trusting to mere theoretical considerations—that the *smooth snake* must be very common in the district and the adder and ring snake rare. I was led to this conclusion on account of the *size* given me, viz., 24 inches, as I conjectured that if the ring-snake were common there would be many over three feet long, and the average length of the adder is much less than the figures given me. I thought how interesting it would be if this turned out to be the case, that the rarest snake of all was the most common in this valley. The event proved otherwise, but, in my opinion, not less interesting.

(*c.*)—*Poisonous.*—As the winter went on and I talked more with the men on the estates around, I was forced to think my first conclusion—the one just given—a wrong one. For I found that many of the keepers, &c., had stories of these local snakes which pointed to their being poisonous, and some said they had seen them swallow their young, and others knew of dogs and lambs and cattle being killed by the bite. They all agreed that the snakes were as a rule 24 inches or so in length and persisted in calling them "adders, not snakes" or "vipers, not snakes." Then I thought to myself, there can be no doubt that the common local snake is a poisonous one, so it must be the adder as they say, and no doubt they very much exaggerate the size, as people are very apt to do, judging merely by guess work and not a tape measure. These were my conclusions prior to the summer of 1896, when I began to investigate the matter for myself, the result being, as I stated, not what I expected, but just as interesting.

As the warm weather arrived I began to look out for myself, and I was soon rewarded. In a few months I had secured a dozen specimens. Each snake I caught I showed to some of my former informants and asked if that were the same kind they said they had often seen. The answer invariably was "Yes, that's the adder I told you was common about here." And they were perfectly right—adders they all were. But what about the size of them? Well, I will give here the size of the first six adders I caught, because the same figures apply to many I have taken since, and because this list includes both the larger and smaller I have seen.

No. 1.—	Caught near	Pontrilas,	length ...	$26\frac{1}{2}$	inches.
„ 2.—	„	Skenfrith,	„ ...	$23\frac{1}{2}$	„
„ 3.—	„	at Grosmont,	„ ..	$28\frac{1}{2}$	„ (largest)
„ 4.—	„	Graig Hill	„ ...	23	„
„ 5.—	„	Kentchurch Park...		$21\frac{1}{2}$	„
„ 6.—	„	Pontrilas	„ ...	$19\frac{3}{4}$	„ (smallest).

No. 3, taken close to Grosmont village, is the largest I have caught, and No. 6 is the smallest. Note that this list covers the whole area to which I have limited these investigations; viz., from Pontrilas neighbourhood to Skenfrith. So then, here was the point cleared up: the snake most common in the Monnow valley from Pontrilas to Skenfrith was the adder, and the average length of the adder in that valley works out at $23\frac{3}{4}$ inches or about 2 feet. I have taken many adders during the last three years here, but I have never seen one (measured) larger than the one I have preserved, $28\frac{1}{2}$ inches long, nor have I come across any others as small as $19\frac{3}{4}$ inches. It is safe to say that three out of every four adders in this valley are about 24 inches long. This is a most interesting fact and at once the question suggested itself to me; Why are the adders here so large and so comparatively common? I do no more just now than put the question for the members to answer for themselves, because I am working at the point myself and find it by no means easy to account for. I would only say now that no doubt it is a case of "the survival of the fittest," and the line to be followed up must be to ascertain what are the conditions of reptile life as regards food, surroundings, etc., which are particularly found in this locality, and which apply specially to adders. This brings me to the next question, viz, Are there *no other snakes* in this district but adders? Gamekeepers, farmers and poachers all told me there was no other kind of snake here but the adder, which, of course, meant that they had never seen any other kind.

For two and a-half years I never saw any other snake in the valley, and I had come to regard the adder as our sole local snake. However, on September 26th, 1898, I saw a ring-snake on the drive leading to Kentchurch Court, the keeper having caught it just as I came up. It is a most beautifully marked specimen (I have it preserved now) but only $24\frac{1}{2}$ inches long—presumably a young one. This is the only ring-snake I have ever seen in the valley or within four miles of it. They become common as one gets down the Monmouth side of the Graig Hill towards Llantilio Crossenny. The smooth snake I have never seen here at all—nor can I get any evidence of its local existence. I have shewn my specimen of Tropidonotus to many local residents and none of them have ever seen one here before. So that up to the present (1899) from the evidence I have collected and from my own investigation I think one is justified in regarding the following as established facts:—

1.—That in the Monnow Valley, from Pontrilas to Skenfrith, the adder (Pelias berus) is relatively common.
2.—That it grows to a much larger size than usual, the average in this area being 2 feet long.
3.—That the ringed snake is extremely rare in this area, not breeding there.
4.—That the smooth snake is not found at all.

Of course, subsequent investigation may cause these conclusions to be modified, but as far as I know and can ascertain from three years work, the above represents the distribution of the Ophidia in the Monnow Valley

ADDERS KILLED IN MONNOW VALLEY, NEAR GROSMONT.

1.—Tump Ewyas Harold	$26\frac{1}{2}$	inches.
2.—Skenfrith, Monnow Bank	$23\frac{1}{2}$	,,
3.—Tresenney, Grosmont	$28\frac{1}{2}$	,,
4.—Graig Hill	23	,,
5.—Kentchurch Quarry	$21\frac{1}{8}$	,,
6.—King Street, Pontrilas	$19\frac{3}{4}$	,,
7.—Wild's Wood, Kentchurch	24	,,
8.—Little Birches, Grosmont	26	,,

SUMMER, 1896.

Photographs of No. 1 and No. 3 were shewn by me on the occasion of Mr. Hutchinson's paper being read. (Symond's Yat, 1899). I shall be delighted to shew these specimens to any members of the Club who take an interest in this subject and who may happen to be in Grosmont.

DO ADDERS SWALLOW THEIR YOUNG?

Since the attention of members of the Club (and its is hoped through them the attention of the public) has been drawn to the above question, Dr. Gerald Leighton has published the following letter in our local newspapers :—

In most places where adders or vipers are at all common (as in the Monnow Valley) there is a widespread conviction that the female adder will take the young adders into her throat if disturbed (as a means of protection).

I have never yet been fortunate enough to observe this, though I have looked long and often, but I know some people who say they have seen it happen.

To secure evidence on the point I should be greatly obliged if any of your readers who have seen this occurence would send in the details of it in writing, stating :—

(*a*). Date of occurence.
(*b*). Place.
(*c*). Whether the adder was afterwards killed.
(*d*). If opened, by whom? Were young found, and if so, how many?
(*e*). What size was the young?
(*f*). Name and address of witnesses.

Should any of your readers happen to see this phenomenon and kill the adder, I should take it as a great favour if they would send me the adder to dissect.

GERALD LEIGHTON, M.B.
Grosmont, Pontrilas, R.S.O., near Hereford.

Of course, subsequent investigation may cause these conclusions to be modified, but as far as I know and can ascertain from three years work, the above represents the distribution of the Ophidia in the Monnow Valley

ADDERS KILLED IN MONNOW VALLEY, NEAR GROSMONT.

1.—Tump Ewyas Harold	26½	inches.
2.—Skenfrith, Monnow Bank	23½	,,
3.—Tresenney, Grosmont	28½	,,
4.—Graig Hill	23	,,
5.—Kentchurch Quarry	21½	,,
6.—King Street, Pontrilas	19¾	,,
7.—Wild's Wood, Kentchurch	24	,,
8.—Little Birches, Grosmont	26	,,

SUMMER, 1896.

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GERALD LEIGHTON, M.B.
Grosmont, Pontrilas, R.S.O., near Hereford.

THE TWO LARGEST ADDERS IN G. R. LEIGHTON'S COLLECTION.
26¾ inches and 28½ inches respectively from left to right.
G. R. Leighton, photo.

To face page 132.

DISCOVERIES IN KING ARTHUR'S CAVE.

The following copy of a letter from Professor Owen, dated British Museum, W.C., July, 1870, has been presented by Mr. Chas. E. Machen, of Bicknor:—

Sir,—I have to acknowledge the receipt of your letter of the 13th inst., and of the box of specimens from King Arthur's cave, Dean Forest, to which it refers.

THESE SPECIMENS CONSIST OF

(*a.*)—Two shed molar teeth of the Mammoth (*Elephas primigenius*).

(*b.*)—Several molar teeth, including Milk teeth of young individuals of the *Rhinoceros tichorhinus*.

(*c.*)—Fragments of bones, chiefly of limbs, and an astragalus of *Rhinoceros tichorhinus*. Most of them show marks of teeth of a large bone-gnawing animal.

(*d.*)—Molar teeth and a small pastern-bone of a horse of the species from Kent's Hole, Torquay, described and figured in Owen's British Fossil Mammals, as *Equus fossilis*, p. 383, fig. 143.

(*e.*)—An upper molar tooth and astragalus of the great fossil Ox. (*Bos primigenius*).

(*f.*)—Portions of shed antlers, more or less gnawed, of the Reindeer (*Cervus tarandus*).

(*g.*)—Right upper canine tooth of the great Cave Hyæna *Hyæna spelœa*).

The above fossils exemplify the same association of extinct species which has been discovered in other localities and bone-caves of Britain inhabited by the Hyæna at the close of the Glacial period. The great woolly and hairy elephant is represented by shed, and much worn, teeth which have been carried in to be gnawed at leisure by the hyænas in their retreat.

The shed antlers of the great Reindeer have been picked up by the prowlers and introduced for the same purpose. Young individuals of the hairy Rhinoceros have been dragged bodily into the cave. The bones of the full-grown may have been brought away from a carcase outside.

The wild horses appear to have been caught, killed, and introduced; only the hardest parts, as the teeth and the harder bones, appear to have escaped the crushing teeth and digestion of the hyænas.

Some fragments of bone gnawed on all sides and verging near complete destruction attest the work of destruction carried on in the cave.

The series of specimens above noted would be of use in the Department of Geology of this Museum as being from a cavern locality not previously represented by Fossil remains.

I am, etc.,

(Signed) RICHARD OWEN.

Woolhope Naturalists' Field Club.

THIRD FIELD MEETING (LADIES' DAY), THURSDAY, JULY 27TH, 1899.

CUSOP CHURCH, CUSOP DINGLE, AND THE BLACK MOUNTAINS.

The pretty dingle of Cusop, near Hay, has been previously visited by the Club. A photograph of one of the four venerable yew trees at the four angles of Cusop churchyard appears before page 145 of the volume of *Transactions* for 1866. The excavation of the tumuli at Twyn-y-beddau, near the artillery camping ground, at the foot of the Black Mountains, visited on 25th May, 1871, is recorded on page 1 of *Transactions* 1871, concerning which we need only say that a quantity of charcoal, burned bones, a few flint flakes, and a whetstone were the only contents found, and that the late Rev. T. W. Webb, of Hardwick, editor of "Memorials of the Civil War in Herefordshire," was of opinion that the tumuli occupied the site of two separate interments; also that the last battle fought in this locality was so recent as the time of Edward III.

Another visit to Cusop is recorded in *Transactions* 1889, page 360.—To-day, Thursday, 27th July, after an interval of ten years, a ladies day was made the occasion of a revisit. In the earlier part of the day the atmosphere was clear after the rain of the previous day, and the distant hills stood out boldly, but in the afternoon it became somewhat hazy, and the heat of the July sun would have been overpowering had it not been tempered by the breezes upon the elevated ground which had been by that period reached by the pedestrians.

The very low summer level of the river Wye, along the course of which the journey sometimes lay, was a subject of general observation. Our City Surveyor informed us that the river had not reached so low a level since the year 1887. We obtained the information from the authorities at Hay that the lowest summer level of the river at Hay was estimated to be 299 feet 3½ inches above Ordnance datum. At Hereford it is computed at 152 feet. This makes a fall of 147 feet 3½ inches in 29 miles, or a little above five feet in one mile.

At Hay Station the party were met by Archdeacon Bevan, honorary member of our Club, and by our members, the Rev. W. E. T. Morgan, and Mr. Charles J. Lilwall. Under the guidance of the latter gentleman the party was conducted to Cusop Church, distant about one mile, over which they were shown by the Rev. G D. Pagden, the rector.

Upon the site of the old castle, contiguous to the church, a paper on "Cusop, its Church and Castles," was read by Mr Lilwall This was followed by a paper read by the Rev. J. Barker on "The Wergin stone and Hoar stones." Miss Thomas, of Redwing, Cusop, also gave a few details referring to the death of William Seward, the Martyr, who lies buried in Cusop churchyard.

Descending from the site of Cusop Castle down to the road alongside the Dulas brook, here the boundary between Herefordshire and Breconshire, the ascent was made of the Breconshire declivity to the artillery camping ground, where the business of the Club was transacted. Seven members were elected, and three candidates were proposed and seconded.

Luncheon was served in the artillery mess room, where the catering and other general arrangements by Mr. Stokoe, of Hay, received the well-deserved commendation of the large party, who are indebted to Mr. Lilwall not only for his suggestions, but also for the excellent way in which they were carried out.

Before two o'clock the party broke up and dispersed in various directions, the most favoured point of attack, perhaps, being the summit of the northern ridge of the Black Mountains, from which advantageous elevation the Rev. W. E. T. Morgan pointed out the geographical outlines of neighbouring counties. Pen-y-beacon, 2,219 feet high, at the north-western angle of the ridge is situated in Breconshire, whilst its north-eastern angle, and the whole of the eastern side of the Black Mountains extending to the water-shed at the summit, for a distance of eight miles to the Hatteral Hills at the southern extremity is in Herefordshire; the highest point in this county, 2,306 feet, is found about one mile south of Pen-y-beacon. For further observations upon this locality see *Transactions* 1897, pages 257 to 277.

The distance from Hay Station to the artillery camping ground is a little less than 2½ miles. A bench mark, 845·8 feet is found near the camping ground, whence the ascent to Pen-y-beacon may be considered another 2½ miles, and occupies over one hour steady walking.

Amongst the remarkable events of the day it must be recorded that one of our members, the Rev. Prebendary Warner, on this his 81st birthday, was one of those who scaled the Black Mountains. The distance is computed altogether as a walk of 10 miles with an ascent from Hay—say 330 feet above sea level to 2,219 feet.

No rare birds were seen, the wheatear making itself most prominent. The reports of the botanical finds have not yet been received. Dr. Wood, of Tarrington, recently found Gymnadenia albida in Cusop Dingle, also a specimen of a prettily coloured Gymnadenia, which looks like a hybrid between G. albida and conopsea. Rev A. Ley reports the discovery of a species of Lady Fern in the Grwyne Valley which he classifies as Athyrium watsoni.

On their descent from the Black Mountains the mountaineers took tea at the artillery mess room, and were not prepared for the grateful hospitality provided by Mrs. Robert Griffiths at her charming residence in Cusop Dingle. Those who had not essayed the mountain heights were kindly entertained by Mrs and Miss Bevan *al fresco* on the lawn of Hay Castle, where Archdeacon Bevan pointed out the alterations and improvements made since the Club last visited the Castle in 1897.

The whole party became re-united at Hay Station, and after an enjoyable day reached Hereford before eight o'clock.

The Ordnance Maps for this district, on the scale of one inch to one mile, are Sheets 197 and 214. On the scale of six inches to one mile: for Hay, No. 30 N. E. and 30 S.E; for Cusop Hill and Artillery Camp, No. 31 S. W.; for Cefn Hill, Craswall Abbey and Pen-y-beacon, No. 37 N. W.

The following is a list of members and visitors :—The President, Mr. H. C. Beddoe; Rev. Joseph Barker, Mr. A. E. Boycott, Lieut.-Colonel J. E. R. Campbell, Mr. J. Carless, Mr. R. Clarke, Mr Gilbert Davies, Mr. Luther Davis, Rev. P. H. Fernandez, Mr. G. H. Hadfield, Rev. R. Harington, Mr. W. M. Haywood, Rev. A. W. Horton, Mr. F. R. Kempson, Rev. Preb. W. H Lambert, Mr. Charles J. Lilwall, Rev. Canon R. J. Livingstone, Mr. J. W. Lloyd, Rev. H. B. D. Marshall, Rev. C. L. Money-Kyrle, Mr. Charles E. Moody, Rev. W. E. T. Morgan, Mr. G. H. Phillott, Rev. Andrew Pope, Dr. Scudamore Powell, Mr. J. Probert, Mr. C. Rootes, Mr. W. H. Steward, Mr. J. P. Sugden, Rev. Preb. C. Warner, Rev. R. Hyett Warner, Mr. A. Watkins, Rev. H. T. Williamson, Mr. Ernest T. Woodward, Mr. T. Hutchinson, Hon. Sec, Mr. James B. Pilley, Assistant Secretary.

Visitors—Ladies: Misses Barker (2), Miss Britten, Mrs. Campbell, Misses Carless (2), Miss Davis (Malvern), Miss Diamond, Mrs. Grier, Miss Grier, Mrs. Haywood, Mrs. E. J. Holloway, Misses Holloway (3), Mrs. T. Hutchinson, Miss Frederica Jones, Miss Edith Jones, Miss Kempson, Miss Livingstone, Miss Lloyd (Kington), Misses Derham Marshall (2), Mrs. Moody, Mrs Phillott (Cheltenham), Mrs. Prideaux, Miss Pope, Misses Riley (3), Miss Rumsey, Miss St. George Ireland, Mrs. Thomas, Misses Thomas (3), Mrs. Cecil Trehearne, Mrs. Alfred Watkins, Miss Weymss, Mrs Yorke (London), and Mrs. Pagden.

Gentlemen: Rev. John Barker, Rev. W. G. Boyd (London), Masters Campbell (2), Rev. J. Davies (Hay), Mr. Diamond, Mr. W. Froude, Rev. J. L. Gerold, Mr. Horton, Mr. R. Irwin, Mr Derham Marshall, Capt. T. L Morgan (Hay), Rev. G. D. Pagden, Capt. Barton Phillipson, Rev. Canon Prideaux, Mr. H. A. Prothero (Cheltenham), Mr. Riley, junr.

CUSOP—ITS CHURCH AND CASTLES.

By Charles J. Lilwall.

We learn that the name of Cusop has been variously written, such as "Ceushope," "Caushope," and "Keushope," but the etymology in the British language from "Ceu" or "Caw" a hollow, and "hope" a hill, seems fully to describe the situation of Cusop, being placed in a hollow, formed by Cusop hill on the east, and the Hainalt hills on the west, which unite towards the south in a low lying hill which runs right across the valley and forms the watershed in this district.

Cusop Church, which we have seen to-day, presents a very different appearance to what it did previous to the restoration in 1857. Outside, the church was then covered many coats deep with Reformation whitewash, while inside, a lath and plaster ceiling covered the whole church.

At the restoration the outside whitewash was scraped away, disclosing the walled up priests' doorway in the north wall of the nave.

Inside, the ceiling was taken down, opening up the fine 14th century roof.

But if these restorers of 1857 made these undoubted improvements to the church, they swept away at the same time a very great deal of antiquarian interest, and have in a great measure altered the whole character of the building.

The three lighted 14th century east window in the chancel was taken out, and the present one inserted. The two side windows of the same date however remain.

All the windows in the nave, which were Norman, were also removed, with the exception of one behind the south door; this, and the interesting arch communicating between the chancel and the nave, stamp the character of the church.

Round the course of the arch was originally an ornamentation; this has been all chipped away, with the exception of a small fragment still to be seen inside the chancel.

Over the arch was a handsome rood loft, the entrance to which, as was always the case, was by a flight of steps from the chancel. The walled-up doorway is still to be seen.

The ancient porch was also removed with its stoup and bells over head. One bell was inscribed Lewis Watkins, the other Phillip David, and both had the date 1670.

At the restoration the present porch was erected, also the belfry, and new bells were hung. The floor of the church was made deeper by seven inches: in doing this the old pavement was taken up and a large quantity of bones removed, these were all re-interred in the churchyard.

Cusop church is dedicated to St. Mary, and was built by the Monks of Llanthony, or rather re-built by them on probably an older foundation, towards the end of the 12th, or the beginning of the 13th, century.

The Prior and Convent of Llanthony were the patrons of the living, down to the dissolution of the monasteries, when the patronage was sold by the Crown to Nicholas Arnold with the Llanthony estates, from whose family it was purchased by Edward Harley, and until recent years was the property of the Earls of Oxford and Mortimer.

Behind the colouring, the walls of the chancel are covered with frescoes. That on the north wall represents a female figure, probably the Virgin Mary, to whom the church is dedicated. This was discovered some three years ago.

I have been unable to find any dedication crosses on the outside walls of the church.

Inside there is a decided dearth of memorial tables, one only remaining on the south wall. The following was inscribed on an escutcheon affixed to the same wall :—

"The coat of arms of Sir Thomas Duppa, Knight. He was the eldest son of Thomas Duppa, Lord Archbishop of Canterbury, and father of Robert Duppa, of Castle Town. Robert Duppa's son was Baldwin Duppa, of Hollinbourne Court, in the county of Kent. Robert Duppa was grandfather to Richard Lewis, of Broad Meadow, in the county of Hereford, Gentleman. Richard Lewis departed this life January 25th, 1772, aged 78 years."

I regret that this tablet was removed some years ago by a former Rector, who sent it to a member of the Duppa Family.

On the same wall was another tablet :—"James Butler, Gent., he gave six shillings per annum, charged on a tenement in the occupation of William Harry, to the poor of the parish."

This has also been removed, but at what time I do not know.

The yew trees in the churchyard are undoubtedly among the finest in the county, that opposite the south door was measured by Duncumb in 1804, and he gives the measurement at four feet from the ground as twenty feet in circumference. The trees were measured by the Club when they visited Cusop in 1889.*

Opposite the Lych Gate, and on the green formed by the cross roads, stood in olden days the parish whipping post and stocks. The old building down the lane on the right, now covered with a slate roof and converted into two cottages, was, in the days of Queen Elizabeth, the Rectory, and is still called the Old Rectory House. In the garden of the cottage occupied by Mr. Lewis stood twenty-five years ago the Tythe Barn.

Close to the Church and separated only by a road is the site of the Norman Castle of Cusop. I say the site, for not a vestige of any masonry above the ground remains. When I was a boy, an old man by name Thomas Williams, used to tell me that he well remembered a portion of the gateway of the Castle standing, but the demands of parish roads and farm houses have assisted nature in the task of demolition.

*See *Transactions*, 1889, page 360 ; also 1866, page 246.

From "Castles of Herefordshire and their Lords," we learn that the earliest occupants of Cusop Castle were the Clanowes, whose names occur among the representatives of the county in the reigns of Edward II. and III. and Richard II.

One of this family, Phillip de Clanowe, was an adherent of the Earl of Lancaster in the Baron's wars, and took part in the rather summary act of justice by which Piers Gaveston, the favourite of Edward II , lost his life on the scaffold.

The King pardoned him, but could not detach him from the Baronial party, and we find him following the Earl of Hereford, who had joined Lancaster, in his opposition to the Despensers, and again committing felonies for which he needed and obtained the royal pardon.

Phillip's son, Sir John Clanowe, Knight of the Chamber, was associated in the reign of Richard II. with another Herefordshire Knight, Sir Nicholas Sarnsfield, K. G., in a somewhat curious mission.

They were to notify to Sir William le Scrope (afterwards Earl of Wiltshire) that the jewel which Scrope was to offer at the throne of St. Cuthbert at Durham, as a penance for certain transactions and misprisions committed against Walter, the Bishop of that See, should not be of less value than £500.

An heiress of the Clanowe family married Sir John Pointz, of Iron Acton, and the next possessor of Cusop Castle about whom we have been unable to obtain any information, is Henry ap Griffith, Lord of the Manor, temp. Edward IV., who, as tradition says, was owner of Newcourt in the Valley of Doure.

He was the ancestor of a branch of the Vaughan Family, through whom the property, united with Dorstone, Moccas, and Bredwardine, descended to an heiress who married a Cornwall.

Sir George Cornewall, Bart., at the beginning of the present century, parted with it in exchange to Mr. Walter Watkins, of Llydyadyway.

The site of the Castle is now the property of Mrs. Bowen.

Cusop Castle was one of a chain of fortresses built to protect the English border at a time when the English and Welsh were sworn foes. It is supposed to have been more of a fortified house than a castle, and was probably very much the same sort of building as Stokesay Castle, on the borders of Shropshire, not strong enough to stand a siege, but quite sufficient to repel any ordinary attack

The spot upon which we are standing was occupied by the Castle itself, and traces of the moat remain.

The stables and outbuildings occupied a portion of the meadow adjoining.

While draining in this meadow a few years ago, a stone ball was found, which will be shown to day.

Duncumb, the historian of Herefordshire, in his account of Cusop, says :—"Cusop had formerly two castles."

He describes the site of the Norman Castle, and then continues:—"The second Castle or rather entrenchment, for there are no signs of mason work except round a spring, was anciently styled 'Llygad,' signifying in the British language 'an eye,' and referring to the great height of its situation and its commanding prospect."

In course of time, there is no doubt the name "Llygad" became corrupted into "Llygod," meaning "a mouse" and hence the name of Mouse Castle.

It is pretty certain that the Normans never fortified Llygad, and we must go back to the Roman occupation of this country as the time when those deep entrenchments were thrown up which still can be traced in the wood round Mouse Castle, and especially on the north, where the ditch is very deep.

On the summit of the hill, and in the middle of the camp is a square platform measuring twenty yards across and raised about twenty-two feet higher than the rest.

Llygad was no doubt used by the Romans as a signalling station. It was in full view of the great military camp at Boatside, on the Radnorshire side of the River Wye, and any movement on the part of an enemy could be immediately signalled to the main body.

The masonry work round the spring mentioned by Duncumb has long since disappeared, the spring, however, still remains within the lines of fortification.

There is yet another Roman Camp to speak about. A few hundred yards away on the other side of the valley, there are distinct traces of a camp to be seen in the meadow adjoining the Lower House farm. This was no doubt an outpost of the main body quartered at Boatside, and would protect the trackway which led from Abergavenny to Brecon, and which we know as the Forest road.

In Norman times a small fortification, probably nothing more than a watch tower, stood in what is now an orchard behind the Nant-y-glasdwr farm house, where watch and ward was kept.

Some of the members of our Club will no doubt pay a visit this afternoon to the Tumuli on the plateau of the Black Mountains, and known as Twyn-y-beddau, or the place of the graves. Sad and silent witnesses of a battle having been fought there in far off times: and there is a tradition, handed down from father to son, among the people of this neighbourhood, that the water of the Dulas was dyed red for three days with the blood of those who are supposed to have vainly endeavoured to stem the current of invasion, and who on that lonely and now forgotten battle-field fell in defence of their homes and their country.

THE MARTYR'S GRAVE.

By Miss Isabella Thomas, Redwing, Cusop.

Hay is a pretty town on the banks of the Wye, fifteen miles from Brecon. This picturesque town lay on the direct route from England to Trevecca in Wales, where so many pioneers for God's truth in those days lived and died.

As Stephen's martyrdom gave Christianity its greatest apostle, so Seward's blood became the seed of the Church at Hay, or perhaps the result of Wesley's sermon at Pentwyn, Clyro, in 1747. Just about this time a great religious revival was taking place, when men like John Wesley, Whitfield, and many others came to the fore, as itinerant preachers William Seward was Whitfield's travelling companion in his second voyage to Georgia (U.S.A.). He was a gentleman of large property, but of meagre education and inferior talents.

He travelled through Glamorganshire with Howel Harris. Two years later William Seward was passing through the town of Hay from Badsey in Worcestershire, probably making his way to Trevecca. At one end of the town is an open plain or green, which now bears the name of "Black Lion Green." Above is the portion of the old town wall, and below runs the little brook (Dulas), which divides England from Wales. There stood the man of God pointing these people to the "True Light of the World."

For awhile this "eager anxious throng" listened to him in silence. Presently one in the crowd cast stones at him, and several of the bystanders were injured. One cowardly ruffian standing behind the preacher, hit him with a huge stone, and Seward fell senseless to the ground. With his dying breath he prayed for his murderer, entreating that the man should not be punished. "And when he had said this he fell asleep."

The man who hurled the stone lived to be an old man, but, alas! unchanged, and his death-bed was attended with peculiar horrors.

Beneath a giant yew tree in Cusop churchyard, about a mile from the spot, the remains of the good man were interred, and the spot is known as the

"MARTYR'S GRAVE."

A well-worn stone tell the story of his life and death.

Here lyeth the body of William Seward, of Badsey, in the county of Worcester, Gentleman, who departed ys life Octr. ye 22nd, 1742 Aged 38. "To me to live is Christ, and to die is gain." Philippians. chap. ye 1st, verse ye 21st.

If earth be all.
Why o'er and o'er a beaten path
You walk and draw up nothing new,
Not so our martyred Seraph did
When from the verge of Wales he fled.

In 1857, my father, the Rev. Kearsey-Thomas, curate-in-charge of this parish for seven years, restored Cusop Church. He also caused the tomb of William Seward, which was broken and the writing illegible, to be restored and re-lettered.

THE WERGIN STONE AND HOAR-STONES.

By the Rev. Joseph Barker.

Near the third mile-stone on the highway from the city of Hereford to Bodenham and Leominster, in a meadow on the right-hand side, about fifty yards from the road, stands the Wergin or Worgin stone, no doubt a very ancient one, and a puzzle to antiquaries. Properly speaking it is one stone upon another, the lower forming a base upon which stands erect a shaft or pedestal, not unlike to a broken road-side cross; and apparently without having gone through any cutting or dressing with chisel or other tool. The shaft is indeed what I believe is called "conglomerate," a mass of pebbles cemented together. The base stone, standing on an average about a foot from the ground, is rather circular, but irregular, and measures in circumference twelve feet, in diameter three feet six inches; having on the south side a cavity, evidently tooled out, four inches deep and sloping inwards. The shaft stands five feet high from the centre of the lower stone, its circumference in the lower portion being four feet eight inches, and at the widest upper part five feet four inches. On its front surface upper part it measures twenty-three inches across, and seventeen at the lowest part.

Now as to the meaning of Wergin, Worgin, or Wurgin Stone, who will tell us? and a quarter of a mile futher on the road too is "Worgins Bridge," named as I imagine from the ancient stone. At one time I thought "Worgin" or "Wergin" might have some relation to the Anglo-Saxon, "Weregild" ("Wer" man and "geld" satisfaction), which was a composition by which, according to the customs of the Anglo-Saxons, Franks, and other Teutonic peoples, homicide, and other heinous crimes againt the person were expiated. And very interesting would it be, did time permit, to note how the established progressive rate of "Weregild" for homicide varied at different times and among different Teutonic tribes, from the Weregild of the *ceorl* or peasant to that of the King. This conjecture, however, I do not hold to, though I still fancy the stone was one on which money payments may have been made, and the cavity mentioned may have been the receptacle for the money. Many of the ancient payments were contributions, or acknowledgments, or fines, or licences—difficult now to be understood through the change of the tenure of land or its ownership. In some cases the greater benefit is gone, the minor preserved; as "weorth," a fine or price paid for licence to drive cattle along a certain road or roads.

In my native county of Warwick, five and a half miles from

WERGINS STONE.
Alfred Watkins, photo. 1900.

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WERGINS STONE.

Alfred Watkins, photo. 1900.

To face page 142

Coventry, at the top of Knightlow-hill, just within the parish boundary of Ryton-on-Dunsmore, there is still remaining the base of an old cross on a mound of raised earth with a hollow of basin shape into which money payments are paid to this day. In Mr. S. Timmin's "History of Warwickshire," among many other curious customs, this one is thus described—"Here at this stone is annually collected for the Duke of Buccleuch, by his steward, on Martinmas Eve, at sun-rising (November 11), what is called "wroth-money," or "ward-money," from the various parishes in the Hundred of Knightlow. The tumulus on which the cross rested is about thirty or thirty-five feet square, with sides running parallel to the road, having a large fir tree at each angle, of which the people round about say that the four trees represent four knights, who were killed and buried there. The portion remaining of the cross is thirty inches square at the top, with a hole in the centre to receive the shaft. It date was probably *tempore* Edward III. There is a mason's mark on one side in the shape of a cross, six inches long, which shows that it was set up by a master mason of his trade guild. The wroth-money has been collected from time immemorial, excepting for a few years at the beginning of the present century; but the Scot family subsequently revived it, or "kept up the Charter," as it is locally called. In 1879, at 6-45 in the morning (November 11), the wroth-money was collected. There were thirty-four persons present to witness the ceremony. The steward, having invited the party to stand round the stone (the original custom was to walk three times round it) proceeded to read the "Charter or Assembly," which opens thus: "Wroth silver collected annually at Knightlow Cross by the Duke of Buccleuch, as Lord of the Manor of the Hundred of Knightlow." The next proceeding was the calling over of the names of the parishes liable to the fee, and the amount from each, when the parish, by the representative present, cast the required sum into the hollow of the stone. The amounts collected and the several parishes are next named, and the total of nine shillings and three pence half-penny. No one seems to know (not even the steward of the Duke himself) why or for what purpose the money was originally collected, nor why one parish should pay more than another. The custom is supposed to be of pre-historic origin, (confirmed by the Saxon Charters), and to have some connection with the primitive Aryan custom of fabulous times."

I may just mention that I read an interesting notice in the *Coventry Standard* of last November of the custom having that week been observed as in previous years; and that the steward, tenants and others afterwards repaired to Dunchurch for breakfast, always provided at the Duke of Buccleuch's charges.

But if our Wergin stone was not one of those on which in former times money payments for certain usages and customs, as I think no, unlikely, were made, was it a boundary stone, such as those "hoar" stones, so named, and still to be seen in different counties of England, but, alas! too often unnoticed, neglected, and left to decay?

THE FOLLOWING EXTRACT IS FROM CAMDEN'S BRITANNIA, P. 582, ADDITIONS, EDITION 1695.

"Between Sutton and Hereford, in a common meadow called the Wergins, were placed two large stones for a water-mark, the one erected upright, and the other laid athwart. In the late civil wars, about the year 1652, they were removed to about twelve score paces distance, and nobody knew how; which gave occasion to a common opinion that they were carried thither by the Devil. When they were set in their places again, one of them required nine yoke of oxen to draw it."

FROM DUNCUMB II., p. 189.—"Near the middle of the Wergin meadow is the large stone, probably designed at a distant period as a boundary. During the civil wars, it was stated to have been carried in the night to a considerable distance from its original situation, and that twelve yoke of oxen were hardly equal to restore it to its former site. The particular object of this delusion is not ascertained. Blount, in his MSS., thus briefly noticed it amongst what he termed the wonders of Herefordshire. "In the Wergins lies a stone that was so wondrously removed in the last age, and since called the "Devil's stone." The authors of the quarto Britannia, have been somewhat more diffuse on the subject. They thus describe it :—"Between Sutton and Hereford, &c., &c." and Duncumb then quotes the above from Camden's Britannia.

For the strange history of the removal of the Wergin stones by a strong wind see also "Memorials of the Civil War in Herefordshire," by the Rev. T. W. Webb, vol 1, p. 17, where a drawing is given. See especially the quaint letter "Strange Newes from Hereford," dated February 23rd, 1641, on page 333 of vol. 2.

Mr. Barker exhibited a photograph of the Wergin stone, and also of Wergin's bridge, both taken by Mr. Rogers, schoolmaster, of Eardisland. The bridge is over the river Lugg, three miles from Hereford.

HOAR-STONES.

On our first Woolhope meeting this year we visited at Putley the Wonder Oak tree on "Hoar" House Farm, where possibly a "Hoar" or boundary stone might still be found; and not far from Presteign, between Wapley-hill, and the King's Turning, a small farm is still called "Hoar" Stone Farm. Then we have "Hoar"-withy in the parish of Hentland, on the old road between Hereford and Ross, which I opine means "Boundary-withy Tree," or as commonly called "Sallytree." "Hoar," in Scotland "Hare," is an ancient word for bound, limit, hinderance, and the same I believe as the Greek "oros," the Latin "ora," the Celtic and Welsh "or" and "oir." It is said also to be the *Armoric "Hare," the Anglo Saxon "or," "ord," and "ori," the

*Armoric.—The language of the inhabitants of Armorica, the ancient name for Brittany L'Armoricus—Celt, "ar," on "mor," the sea).

obsolete Irish "ur and or"; which have all one and the self-same meaning, namely, a bound or limit, and the Hoar-stone is consequently nothing more than a land mark or stone of memorial, describing the boundary of property whether of a public or private nature.

TEDSTONE DELAMERE HOARSTONE.—Through the parish also flows the brook from Sapey, remarkable for its finely flavoured trout and its romantic beauties. It is also remarkable for a traditionary account of a miracle which is still implicitly credited by the common people. According to this account, a mare and her colt having been stolen in the night from a neighbouring farmer, some centuries past, his daughter (with whom the mare was a great favourite) prayed that she, attended by some of the servants in the family, might be enabled to trace the retreat of the thief by the footsteps of the animal stolen; these footsteps were discovered without difficulty until the pursuers reached the brook, but on the opposite side no vestige whatever was discoverable. It then seemed to the damsel that the robber might have taken his booty down the rocky channel of the stream in order to evade detection. She had not proceeded far along its bank before she exclaimed, "My prayers are heard, for see here are the marks of their hoofs in the solid rock." Directed by these supernatural impressions, it is understood that she and her attendants proceeded and discovered the robber in a most romantic spot equally interesting, and called "*the Hoar-stone*." The wild grandeur of the later spot is perhaps not excelled by the celebrated *Vaucleuse of Petrarch. Many pretended vestiges of the mare and colt are still pointed out in the channel of the brook by the credulous peasantry, and many more have been cut away by the felon chisel to deck the simple mantelpieces of the rustic naturalist

But I must not prolong this "Sermon on Stones," but will end with a good wish for our Woolhope Club, a hope that it will still go on and prosper: "Hope on—Hope ever" is our motto—with a reminder too of another stone we read of, one erected by Samuel to commemorate a great victory, and inscribed "Eben-ezer" (the stone of help) and "Hitherto hath the Lord helped us." (I. Sam. vii., 12).

† A village and fountain in France, twelve miles east of Avignon.—*Duncumb II., p. 196, 197.*

ORNITHOLOGY.

NOTES FROM BRECONSHIRE.

Mr. E. A. Swainson, of Woodlands, Brecon, forwards for publication the following ornithological notes from our neighbouring county of Breconshire. The extracts are reproduced from *The Zoologist* with the following headings :—"The Cirl Bunting in Breconshire," (Nov., 1898); the "Garden Warbler, Lesser Whitethroat, and Lesser Redpoll in South Wales," (1891, p. 355); and "The Grasshopper Warbler in Breconshire," (May, 1899, p. 221).

"THE CIRL BUNTING IN BRECONSHIRE.—At the present time the Cirl Bunting (*Emberiza cirlus*) is a firmly established resident in this county, and is to be found in at least five or six localities. Mr. Howard Saunders, in his 'Manual of British Birds,' states that this species, he believes, was unknown in Wales until Mr. E. C. Phillips obtained one on March 15th, 1888, near Brecon; and, as most of our bird books describe it as being rare except in the South of England, perhaps a few notes as to its status in this county may be of interest. I first observed it on a hill-side named Sunnybank, which rises from the back of my house, on June 4th, 1890, when I found a nest containing four eggs, at the same time identifying the sitting bird as a Cirl Bunting. A few days afterwards I heard two male birds of the same species in song near the site of the nest. One of these I shot, and it is now in my collection. Since that date it has become resident on the above-named bank, where it nests yearly, and where I hear its song almost daily during the summer. Since that year it has also been gradually spreading over the county, and nearly every summer its song is to be heard in some fresh locality. It seems partial to hill-sides furnished with gorse and isolated elm and oak trees. The following are some of the places where it occurs, and probably nests: High Grove, Tallylyn, Sennybridge, and Glanusk. I have obtained several specimens for myself and friends; a pair in my collection are in full adult plumage, and a bird which I obtained for the Hereford Museum is an immature male with breast colour bands not well marked. Of four Cirl Buntings' nests I have found here, two were in gorse bushes, one on a bank among coarse herbage, and one in a bramble. The eggs in my collection, which I took here from three nests, are all of the same type, and have a greenish white ground, boldly marked with blackish streaks and spots. They are distinct, and could not well be mistaken for eggs of any other of our birds. The Cirl Bunting is one of our most persistent songsters; its monotonous metallic trill is to be heard from about the first week in April to the middle of August. When I first heard it the trill seemed to me rather like that of the Lesser Whitethroat; I am of opinion now, however, that the song of the latter is more musical and softer. Singing as it does generally near the top of a tree and often out of sight, it is much more easily recognized by the ear than the eye.—E. A. SWAINSON (Woodlands, Brecon)."

"GARDEN WARBLER, LESSER WHITETHROAT, AND LESSER REDPOLL IN SOUTH WALES.—Most of the books on birds describe the Garden Warbler (*Sylvia hortensis*) as being absent from, or very local in, Wales. This is, however, by no means the case as far as Breconshire is concerned. Having closely observed this species for a good many years here, including the last six nesting seasons, I find it is not uncommon in all suitable localities in a great portion of this county; and I am sure any observer who is acquainted with its rapid, deep, mellow warble, and looks for it here, will come to the same conclusion. I could name at least twenty different places in this neighbourhood where it occurs every season. It is not as common as the Blackcap (*Sylvia atricapilla*) and is found in the same kind of places as this bird—namely, small woods and bramble thickets, and to a less extent in large woods. I have found the Garden Warbler to be one of the shyest of birds. It appears to have the greatest objection to being seen, and were it not for its beautiful, loud warble, it would be very difficult to find. I have, however, often obtained a good view of it by means of a binocular glass and careful stalking; and the three or four specimens I have wanted for myself and friends I have obtained without difficulty. Its song is to be heard here from the last week in April to the first week in July. I have found a good many of its nests near Brecon, and knowing the likeness of its eggs to those of the Blackcap, have always used great care in identifying the species. The eggs I have found here have been much of one type, lighter in colour than those of the Blackcap, and not, as a rule, likely to be mistaken for them. The chief difference is, however, in the nest, which in the case of the Garden Warbler I have found to be a plain grass-stalk structure, with very little hair-lining, and not ornamented with moss, cobwebs, and roots, as the nest of the Blackcap generally is. In 1887 I found a Garden Warbler's nest in an unusual situation—namely, in a little beech tree, about five feet from the ground. This nest, with one of the four eggs it contained, is now in the Natural History Museum, South Kensington. A pair or two of this species nest yearly in a wood and large shrubbery within a hundred and fifty yards of this house, and, in the season, I hear them singing almost daily from my garden. This year one of their nests was placed in a blackthorn bush in the above-mentioned wood, and contained four eggs, the first of which was only laid on the 19th June. I have also observed the Garden Warbler in several parts of Radnorshire. Mr. Harting, in 'Our Summer Migrants,' expresses the hope that naturalists will examine into the truth of the alleged absence from Wales of this bird, and publish the result of their investigations. I trust they will do so, and that this fine songster will be found to visit other Welsh districts besides those above mentioned. Another summer migrant, the Lesser Whitethroat (*Sylvia curruca*) is generally described as being very rare in Wales. I became well acquainted with this little bird and its song in South Shropshire, where it is rather common, and find it pretty evenly distributed in suitable places in the neighbourhood of Brecon. The usual date of its arrival here is in the

third week of April. It can hardly be called common, but I could point to at least a dozen different localities where it can be heard and perhaps seen near Brecon. I have obtained here two specimens which I wished for without difficulty. Like most of the summer songsters, it is far oftener heard than seen, but the quivering trill which forms the end of its song is so loud that its presence is betrayed at a long distance. I have now and then, when within three or four yards of this bird, heard the low, sweet warbling notes of its song for half a minute without a break. The Lesser Whitethroat may occur here wherever there are trees, tall hedges or bushes, except in the depth of large woods. Its chief haunts are, however in country lanes, the double line of tall hedges forming a great attraction to it, and here it generally nests. It seems sometimes to forsake its nest without apparent cause; of three nests I have found, all of which were in lane hedges, I only obtained eggs from one. I have known the eggs taken on several occasions by other collectors. Three nests which I have are much like the vignette in Yarrell's 'British Birds,' small and shallow. I do not find Wales mentioned in the books on birds as a district in which the Lesser Redpoll (*Linota rufescens*) breeds, but it no doubt does so every year near Brecon. I have noticed it every summer here for some years, but this season it has been unusually common, and I have often heard its musical little trill and triple flight-note about the alder swamps and adjacent hedges. In June last I found two nests of this bird placed in honeysuckle growing in tall hedges, each containing fresh eggs. Both nests had the usual lining of white down, but one was peculiar in having a quantity of honeysuckle bark-strips interwoven among the grass round the outside of the nest. This beautiful little nest contained four eggs, of a bright blue-green, blotched, two of them very boldly, with reddish brown.—E. A. Swainson (Brecon)."

"The Grasshopper Warbler in Breconshire.—As might be expected from the nature of the country, the Grasshopper Warbler (*Sylvia locustella*) is not uncommon in Breconshire. We have here most of the conditions in which this little summer migrant delights, such as rushy meadows with grass tussocks here and there, neglected fields containing clumps of stunted blackthorn bushes and brambles, dingles furnished with little alder bushes, and dry wastes of low cover. In places of this kind it nests, and may be heard singing during the season, the favourite haunt being round Llangorse Lake, where it may be termed common. I first heard the unmistakable little trill of this bird when I came to live here fifteen years ago, and found the first nest on May 29th, 1886. It was placed in a tuft of rushes, and contained five fresh eggs, two of which, with the nest, are now in the Natural History Museum, South Kensington. I have since found five more nests. Eggs from three sets in my possession are mostly zoned; one clutch taken on June 9th, 1893, is unusually highly coloured. Every nest is wonderfully well concealed. If it contains eggs the sitting bird disappears at once in the nearest cover; if there are young, both birds come back and

commence creeping and tumbling about, wings and tails spread, within three or four yards of a bystander's feet, uttering a rapid metallic 'tick.' For some years I tried to shoot a male bird before the nesting season, but without success, owing to the persistent way in which it keeps out of sight when singing; and I have been obliged to content myself with a pair of nestlings, which, set up in a nest, make a nice little case. With a bird like this, which is often heard, but seldom seen, the song is all-important for identification purposes. In this case it seems to me to be precisely like the sound made in drawing out a line from a small Trout fishing-reel, the check spring of which happens to have the right pitch. During fifteen years, the earliest date on which I have heard the song is April 15th, and the latest July 24th. It is sometimes to be heard in July in fields of standing wheat.—E. A. Swainson (Woodlands, Brecon)."

THE PIED FLYCATCHER IN BRECONSHIRE.

Note by Dr. Howells of Talgarth.

In the contribution on this subject by Mr. Swainson in 1893, the haunt of the Pied Flycatcher seems confined to the basin of the Usk. I have lately seen a pair in the Crickadarn Wood, about a quarter of a mile from the Wye; and a fine male bird close to Talgarth, on the Llynfi, a tributary of the Wye.

Plentiful at Aberedw 1910-

Woolhope Naturalists' Field Club.

FOURTH FIELD MEETING, TUESDAY, AUGUST 29TH, 1899.

VISIT TO THE WORKS OF THE BIRMINGHAM WATER SUPPLY FROM THE ELAN VALLEY.

Never perhaps within the memory of the oldest inhabitant had the river Wye been so low as it was when on Tuesday, August 29th, the Hereford Corporation, by invitation of the Woolhope Field Club, visited the site of the proposed Water Supply to the city of Birmingham, to afford a similar daily compensation into the river Wye of twenty-seven million gallons. The Kent's "Automatic River Gauge and Recorder," of the city water department at the intake to the city water supply registered as low as eleven inches below zero, the datum of ordinary summer lowest level, which at this locality is 152.9 above Ordnance datum of sea level. The City Surveyor had previously recorded nine inches below the zero datum at Wye Bridge, in the year 1887. This latter datum line is the standard which was fixed by the preceding City Surveyor, Mr. Curley, on the central pier of Hereford bridge, and it is 152.2 above Ordnance datum of sea level. This low condition of the river enabled the writer to walk dryshod above the two northern arches of Wye Bridge, and also dryshod above the southern arch to the starlings and foundations of the adjacent piers; in fact, the river is to-day only flowing through three of the six arches. It may be mentioned here that the corresponding standard lowest summer level at the Victoria Bridge is 151.9 above sea level; this is accounted for by the fall of one foot in the river bed in the distance of about a mile and a half below the recently fixed Gauge at the city intake.

After a drought of two months' duration, on Wednesday, 23rd, the western portions of our kingdom were to a greater or less extent affected by cyclonic disturbances moving northwards along the Irish and Scotch coasts, which occasioned falls of rain in Ireland on Thursday 24th, and in Scotland generally on Friday, 25th, also a few showers at many places in Wales and in the West of England. On Saturday, 26th, some rather heavy falls occurred on the extreme south-west coasts. On Sunday partial showers fell in the neighbourhood of Hereford, and in the city itself. On Monday, at 10-15 a.m., a sharp shower of short duration fell over Hereford, with an electrical outbreak which disturbed the telephonic system; during the storm the overhead telephonic wire in Friars Street leading to Mr. Gethen's office was ruptured. On Monday evening the barometer had risen from 29.8 to 29.9. At six o'clock on Tuesday morning it had fallen back to 29.8, and it was in

CABAN COCH.

Alfred Watkins, photo, April, 1899.

No. 1. Between pages 150 and 151. To face No. 2.

NANT-GWYLLT VALE. NANT-GWYLLT CHAPEL OF THE FORROFOUNDE.

Alfred Watkins, photo., April, 1899.

No. 2. Between pages 150 and 151. To face No. 1.

CABAN COCH.

Alfred Watkins, photo, April, 1899.

No. 1. Between pages 150 and 151. To face No. 2.

NANT-GWYLLT VALE. NANT-GWYLLT CHAPEL IN THE FOREGROUND.

Alfred Watkins, photo., April, 1899.

No. 2. Between pages 150 and 151. To face No 1.

dull, unsettled weather that the party of more than one hundred and twenty left by special train for the visit to the large works in progress in the Elan Valley.

Leaving Hereford at 7-25, Rhayader was reached punctually at 9-20, and no time was lost in settling into our seats upon the planks in the six open trucks, each capable of holding twenty. These had been most considerately placed at our disposal by the permission of the Chairman of the Water Department, City of Birmingham; and Mr. Yourdi, the superintendent resident engineer, Elan Valley Waterworks, had regulated the times of arrival and departure, allowing an interval of half-an-hour at each of the four dams, so as not to clash with the paramount regular train service of the Corporation railway. Mr. Yourdi had deputed Mr. C. A. Cooke to accompany us and to act as our director.

Shortly afrer emerging from the tunnel at a distance of about one mile from Rhayader, we entered, at Elan Valley Junction, upon the ten miles of Birmingham Corporation railway to the uppermost dam. Assuming that every member of the Woolhope Club ot two years' standing has read the thirty pages of closely-printed matter descriptive of the dams and the reservoirs, and that every recent member has read, as recommended in the programme, "The Future Water-Supply of Birmingham," 3rd edition, by Thomas Barclay, copiously illustrated, price only 3/6, it would be supererogatory to recapitulate such a mass of detail. On June 23rd, 1896, the majority of our party witnessed the conditions of these works at a period of three years less two months from the date of their commencement on August 29th, 1893. To-day, in the commemoration of the sixth anniversary of their inauguration, we are able to look upon the work of six years, and to draw our conclusions as to the probability of their completion by June 27th, 1902, being a period of ten years from the date of the Royal assent to the Bill.*

CABAN COCH DAM.

After a railway journey of about three miles, our first halting place at 9-45 was at Caban-coch dam, where, in 1896, we witnessed the excavations for the foundation on the Breconshire side, which in some places had been carried to a depth of 30 feet below the bed of the river in order to secure a firm foundation free from natural fissures through which leakage might occur. To-day we find the masonry superstructure upon each side of the river, built up to the height of 40 feet, the river, divided by a temporary dam, passing through the culvert of 16 feet in diameter on each side, whilst the workmen are excavating the intermediate portion in the middle of the river. The extent of this dam across the valley when completed will be 600 feet, and its height will be

* Since this volume has been in press we have been able to ascertain the cost of the works up to date March 31st, 1900, which we now give. The amount expended on the works in the Elan Valley during the year 1899-1900, ended on March 31st, was £170,218 17s. 0d., giving a total expenditure of £829,131 17s. 1d.—EDITOR.

120 feet to 122 feet. The river bed is 700 feet above the Ordnance datum; the top water level of the reservoir will be 820 feet above Ordnance datum. On the 8th October, 1896, a foundation stone was laid in the outlet end of the culvert on the Breconshire side of the river by Mr Lawley Parker, Chairman of the Elan Water Supply Committee, and on the 28th May, 1897, a stone was laid, 25 feet above the foundation stone, by Councillor James Smith, Lord Mayor of Birmingham. The situation of Caban-coch Dam is about seven-eighths of a mile below the confluence of the rivers Elan and Claerwen. The capacity of the reservoir, extending about $4\frac{1}{8}$ miles up the Elan Valley, and $2\frac{1}{8}$ miles up the Claerwen on the west, will be about 8,000,000,000 gallons. When full this reservoir will have an area of about 500 acres. The drainage of the entire area, a length of $12\frac{1}{2}$ miles from north to south, and $8\frac{1}{2}$ miles from west to east, covers 45,562 acres, or seventy-one square miles, portions of which will be impounded by the two reservoirs Pen-y-gareg and Craig-goch higher up the valley of the Elan. The flood discharge is reckoned at 15 cubit feet per acre per minute, or a total of 683,430 cubit feet per minute, or 300,000,000 gallons in twenty-four hours. The top water level of Caban-coch reservoir will extend very nearly to the base of Pen-y-gareg dam.

The geological formation here is Silurian grit and conglomerate, an exceedingly hard stone. An enormous amount of masonry has been excavated from the adjacent quarry on the Radnorshire side or left bank of the river. The masonry has also been supplemented by supplies from Builth and from Pontypridd in South Wales, of a stone of the Pennant formation. The direction of this dam is N.N.W. and S.S.E.

For further observations of the Caban-coch dam see "Transactions of the Woolhope Club," 1896, page 159; also see "The Future Water Supply of Birmingham," 3rd edition, by Thomas Barclay.

COMPENSATION WATER.

The river Elan has been flowing with a volume of four million gallons daily for a considerable time, but the long continued drought has reduced this daily discharge to three million gallons, as computed to-day (August 29th,) by the gauge at the weir which has been built across the river about three hundred yards below Caban-coch dam.

The daily compensation water will be delivered from Caban-coch dam, and has been fixed by the Act at twenty-seven million gallons, or nine times the supply of the natural discharge of the river to-day. An important provision guaranteed in the Bill for the benefit of the salmon fisheries, and cleansing of the river by artificial spates, must always be borne in mind, namely, one-fifth of the twenty-seven million gallons daily compensation shall be occasionally reserved each day for a fortnight, and discharged during forty-eight hours together with the daily allowance.

THE SUBMERGED DAM AT CAREG DDU.

Leaving Caban-coch dam at 10.15, the Corporation railway brought us to a convenient halting place close to the mouth of the tunnel, under Foel hill, the commencement of the intake for the

THE SUBMERGED DAM.

Alfred Watkins. photo., April, 1899.

No. 3 Between pages 152 and 153. To face No 4.

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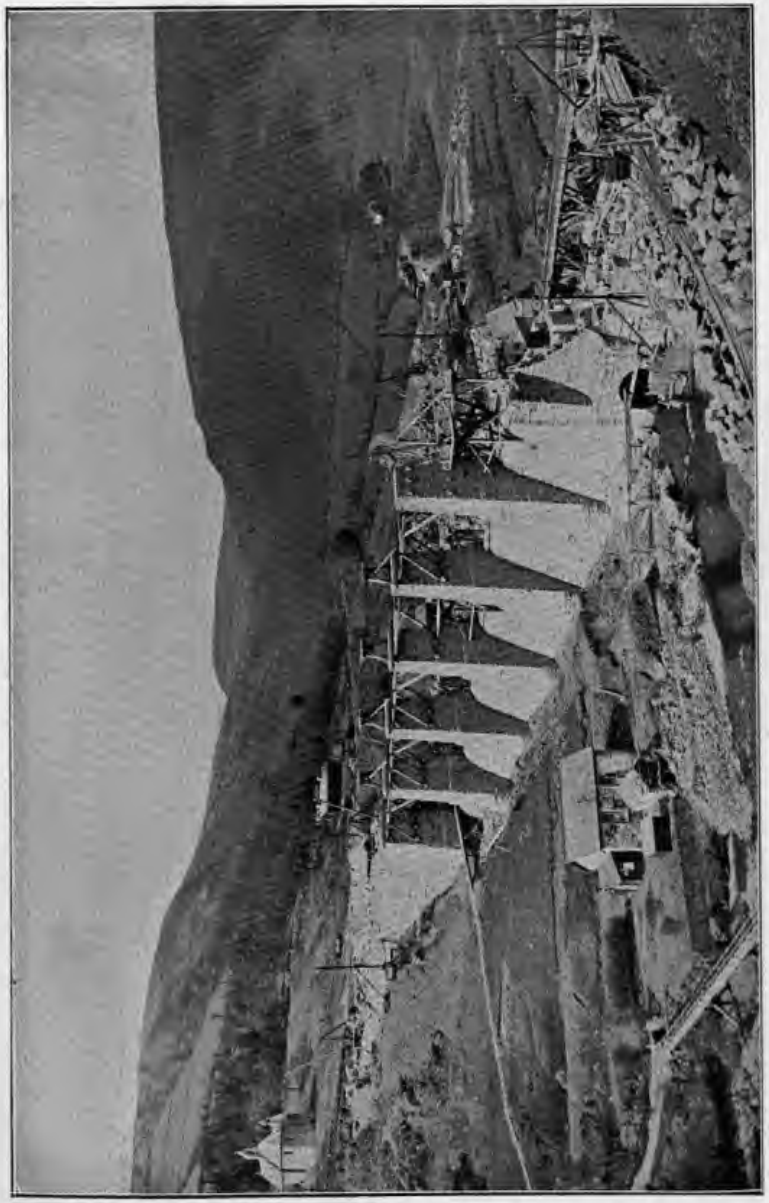

THE SUBMERGED DAM.

Alfred Watkins, photo, April, 1899.

No. 4. Between pages 152 and 153. To face No. 3.

27 million gallons daily supply to Birmingham, a few yards above the submerged dam.

The ingenuity and object of this dam have been explained on page 162 of *Woolhope Transactions*, 1896. Its situation is a little south of the middle of the four miles extension of reservoir between Caban-coch dam and Pen-y-gareg dam. Its name "Submerged" gives its explanation. Its crest, 780 feet above Ordnance datum, is 40 feet below the top water line (820 feet) of the Caban-coch reservoir, in which it is submerged. In any long continued drought, should the reservoir fall to the extent of 40 feet, then the crest of the submerged dam will be visible, and the water above (or behind) the submerged dam will be here impounded and retained solely for the daily supply of Birmingham, whilst the daily compensation to the Wye will be solely drawn from that portion of the reservoir below (or in front of) the submerged dam.

A further supply will be drawn through a tunnel under the hill Dol-y-mynach, communicating with the river Claerwen, which will have a dam erected across it at such an elevation as to gravitate into Caban-coch reservoir above the submerged dam at Careg-ddu.

This is a pretty spot and presents interesting features. The progress of the work has been great since our visit in 1896, when we witnessed the process of depositing the massive stones, "plums," as the navvies called them, in the foundation of the dam. On October 19th, 1897, the river was passed through the culvert of the submerged dam. So far as the dam is concerned it is practically finished, but a great deal of work remains yet to be executed to carry the road over the reservoir here upon seven segmental arches, of 48 feet span each, resting upon piers built upon the dam. The piers are completed up to the springs of the arches, and the two arches upon the further western side, or right bank of the river, are already commenced.

Much interest was displayed by the visitors in the solution of the object of this submerged dam, and in the inspection of the mouth of the tunnel, the invert or arched floor of which is at the height of 770 feet above Ordnance datum, in order to supply the storage reservoir of Birmingham at an elevation of 600 feet above Ordnance datum. The rate at which the water will travel over this course of 73½ miles is rather less than two miles an hour, in fact the journey of any given portion of water along the entire course will occupy as much as forty hours, or more than a day and a half. As a general rule the fall in the tunnels and in the cut and cover conduits will be about 1 in 4,000, or about 16 inches in one mile; whereas the fall in the syphons and iron pipes will be about 1 in 1,760, or a fall of three feet in one mile. The length of the Foel tunnel is 7,160 feet, or very nearly one mile and a third; the headings were joined on the 7th April, 1899.

The geological formation here is slaty, and the direction of this dam is N.E. and S.W.

Leaving the submerged dam at 11, the Corporation train, running up the mountain slope on the north-eastern side of the valley, landed us at Pen-y-gareg dam at 11.15.

PEN-Y-GAREG DAM.

This dam is situated in a charming spot, nearly midway in a bend which the river here takes for the length of a mile from west to east. It was not until the month of April, 1895, that the Corporation railway was sufficiently completed up to this point to enable the workmen to commence the excavations for this dam; they were finished by the end of the year 1896. Building operations were much suspended and interrupted in the winter of 1896, but on 22nd December, 1897, the culvert, 18 feet in diameter, was completed, and the river was diverted through the dam.

The dam is built across the valley to a height apparently of 60 feet. When completed it will have a extent of 525 feet, and a height of 128 feet. The base of the dam is practically on a level with the top water of the Caban-coch reservoir below it. The extent of this reservoir to the next dam at Craig-goch will be two miles, and the top-water level of the reservoir will be 945 feet above Ordnance datum. When full it will have an area of 124 acres, and a capacity of 1,320,000,000 gallons of water. A small island will exist near the upper extremity of the reservoir.

The geological formation is slaty, and the direction of the dam is N.N.E. and S.S.W.

Leaving Pen-y-gareg dam at 11-45, after a delightful inspection of half-an-hour, we scaled the ladders into our trucks and continued our course along the north eastern slopes, arrived at Craig-goch dam at 12 o'clock.

CRAIG-GOCH DAM.

This is the uppermost of the four dams on the river Elan. Considering its distance, eight miles from Elan village, and the amount of preliminary work in the construction of the railway, including a deep cutting through solid slaty rock, it was a matter of surprise to find so much progress here made.

Instead of making a culvert in the base of this dam for the passage of the river during the execution of the dam, a tunnel was bored through the solid rock at its eastern extremity. The water was turned through this tunnel on 29th January, 1898, and the dam has been built to a height of 60 feet above the foundation. When completed the extent of the dam across the valley will be 625 feet, and its height 120 feet. The top-water level of the reservoir will be 1,040 feet above Ordnance datum, and its length will be two miles. When full it will have an area of 217 acres, and a capicity of 2,000,000,000 gallons.

The largest feeder of the river Elan is on its right bank, about three hundred yards above Craig-Goch dam; its name is Calettwr.

The geological formation here is slaty in character. The direction of this dam is N.E. by E. and S.W. by W.

At 12-30 the engine driver blew the whistle of his locomotive, and the party resumed their seats for the return journey of eight miles

PEN-Y-GAREG DAM. (FRONT OR OUTER FACE).

Alfred Watkins, photo, April, 1899. *p. 5.* *no. 155. To face No 6*

PEN-Y-GAREG DAM. (FRONT OR OUTER

To face No. 6

PEN-Y-GAREG DAM —(BACK, OR INNER FACE.)

Alfred Watkins, photo, 1899.

No. 6. Between pages 154 and 155. To face No. 5.

to Elan Valley Hotel. A halt was made above the dam at Pen-y-Gareg for the purpose of allowing a large party of pedestrians to detrain and walk over Y-Foel hill. The route taken by the pedestrians was as follows :—Leaving the road near the hut of the Resident Engineer in charge of the Pen-y-gareg dam, they followed the pathway between the hills. When the track became difficult to discern, bearing in mind that the railway was upon the right hand, they diverged sharply towards the right and made for the highest point. From this summit the larch plantation at the foot of the hill opposite, and near the Elan Valley Hotel, was visible. Descending by the track on the south-east face of the hill the Elan Valley Hotel came into view, and it was reached after a walk of about three miles from the Officers' quarters above Pen-y-gareg dam. Shortly after one o'clock the destination, Elan Valley Hotel, was reached, and those of the party who were desirous of leaving Rhayader by the ordinary train leaving at 3-50, sat down to an excellently prepared dinner before their walk (or drive) of two miles and three-quarters to Rhayader Station.

The work of the Birmingham Corporation from its junction with the Cambrian Railway at what is termed the Elan Valley Junction, is conspicuous along the whole ten miles of railway. Their permanent roads, substituted for the old roads which will be submerged, are models, and the glory of the cyclist. The temporary huts for the various colonies along the line of route are well-built and furnished. The organization at each dam seems perfect. The huge masses of stone which are transported in the trucks, and deposited in the beds of concrete prepared for them, strike the spectator with astonishment. Some of the boulders exceed one ton in weight. The weight of each load of stone and of cement and concrete moved by the travelling cranes is recorded—a system which not only acts as a check upon each day's work, but assists in the calculation of the entire mass of the super-structure opposing the weight of the water pressure. In some places we witnessed the masonry revetments of the sloping banks of the reservoir—very necessary under newly-made roads—and especially on the exposed banks of Caban-Coch reservoir, where the waves created along the sides of the funnel-mouthed gorge will exceed in height the wave of the Severn bore. At the apex of the funnel, or Caban-Coch gorge, the winds are powerful enough at times to make walking difficult to any one but a strong man.

RAINFALL.

The following statistics of the rainfall here are interesting :—

The mean annual rainfall at Nantgwyllt, recorded by the late proprietor, Mr. R. Lewis Lloyd, for a period of twenty years, commencing 1871, was 63.78 inches. The gauge was at an altitude of 768 feet above sea level. The mean altitude of the watershed is 600 feet higher. Mr. Mansergh calculates "the rainfall on the gathering ground at 66 inches, and thinks it possible, with sufficient storage reservoirs, to collect 40 inches."

The rainfalls registered during the last few years are as follows :— In 1894, 71.83 inches ; in 1895. 53.36 inches ; in 1896, 56.59 inches ; in 1897, 66,13 inches ; in 1898, 56.49 inches. This makes an annual average rainfall of 60.88 inches. These measurements are given in Symons's *Monthy Meteorological Magazine*, and are taken from the new gauge at Nantgwillt, on an elevation of 764 feet above Ordnance Datum*

The question was frequently asked—How long will it be likely to take to fill the reservoirs? As the *time* required depends entirely upon atmospheric conditions, concerning which it is useless to make any forecast, it is preferable to answer this question by a computation of the number of inches of rainfall required approximately to fill the reservoirs.

Taking 101 tons per acre for each inch of rainfall, and a ton of water weighing 224 gallons, we have $101 \times 224 = 22{,}624$ gallons per acre for each inch of rainfall.

The area of the watershed is 45,562 acres. One inch of rainfall upon this area would produce $45{,}562 \times 22624 = 1{,}030{,}794{,}688$ gallons.

The capacities of the Reservoirs are :—

Caban Côch	...	...	7,540,000,000 gallons.
Pen-y-Gareg	..	...	1,320,000,000 „
Craig Gôch	...	...	2,000,000,000 „

Making in the aggregate a capacity of 10,860,000,000 gallons.

Making no allowance for absortion and evaporation, and assuming that all the rainfall was collected, it would take 10.54 (say $10\frac{1}{2}$) inches of rain to fill the reservoirs.

Taking Mr. Mansergh's computation that 40 inches may possibly be collected out of a total average rainfall of 66 inches as a basis of calculation, it would require a rainfall of about 17.40 inches to fill the reservoirs, or, roughly, rather more than one-fourth of the average annual rainfall.

A hitch in the proceedings of the Woolhope Naturalists' Field Club being, if not hitherto unknown, at least faded out of memory, it becomes necessary to chronicle the following event, as bearing upon the extraordinary exhilarating effect of the mountain air of Radnorshire. The hour for dinner was 3.30 p.m. So inviting was the aspect of the viands, confectionery, and delicacies, not omitting bottled Herefordshire cider, neatly spread upon the tables under a canvas tent, and so favourable was the report of those who had to catch the 3.50 train, and had dined sumptuously, that the postponement of feasting proved as irresistible as the mess of pottage to Esau. The consequence was that, when the President, the two Secretaries, and the Assistant Secretary arrived very hungry at 3-30 p.m., with some of the resident engineers as their guests to commemorate the sixth anniversary of the 29th August, the date of the commencement of the works, it was with difficulty that

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Alfred Watkins

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CWM-ELAN HOUSE.

Alfred Watkins, photo., 1899

No. 7. To face page 156

a quorum could be constituted to give the health of the Queen, thanks to our director, Mr. C. A. Cooke, to Mr. A. Horne, to the officials at each of the dams, and to Mr. Yourdi in particular, and to eat the —— oh! how aggravating! Here comes the Editor insisting that the copy goes to press instanter.

A good general idea of this magnificent engineering work will be obtained by perusal of the previous article in *Transactions*, 1896, pages 150 to 180. Everyone interested in more minute details should read "The Birmingham Water Supply," 3rd Edition, 1898, by Thomas Barclay, published by Cornish Brothers, Birmingham.

The following is a list of the company:—

MEMBERS.—President (H. C. Beddoe), C. P. Bird, J. A. Bradney W. E. Britten, J. P. Brown, Captain G. Bourne, Rev. C. Burrough, Colonel J. E. R. Campbell, E. L. Cave, C. Child, Rev. W. S. Clarke, R. Clarke, Dr. A. J. H. Crespi, G. Cresswell, Sir H. Croft, E. Du Buisson, C. Fortey, Rev. J. E. Grasett, G. H. Hadfield, C. Hardwick, Sir R. Harington, Rev. R. Harington, Rev. Dr. E. Harris, E. J. Hatton, Rev. M. Hopton, Major-General E. Hopton, Rev. A. W. Horton, Dr. W. Howells, Rev. A. G. Jones, J. Lambe, Rev. Prebendary W. H. Lambert, C. E. Lilley, Rev. Canon Livingstone, T. Llanwarne, J. W. Lloyd, W. G. Lloyd, C. E. Machen, Rev. H. B. D. Marshall, H. J. Marshall, Rev. B. Martin, Norman H. Matthews, C. E. A. Moore, Edgar F. Morris, Walter Pilley, Rev. Andrew Pope, John Probert, Colonel P. H. Purser, Sir James Rankin, Stephen Robinson, Charles Rootes, Colonel M. J. G. Scobie, Edwin Stooke, J. F. Symonds, Lieut.-Colonel Evan Thomas, Guy R. Trafford, Rev. R. Hyett Warner, Rev. Preb. C. Warner, G. W. Wheeler, Rev. H. Trevor Williamson, E. P. Woodward, T. Hutchinson and H. Cecil Moore (hon. secretaries), James B. Pilley (assistant secretary).

VISITORS.—R. Andrews, R. H. Barneby, S. Beeson, Mrs. C. P. Bird, T. Blinkhorn, R. Bright, Mrs. Britten, Mrs. Burrough, Wilfrid Carless, Mrs. E. L. Cave. Miss M. Chave, Mrs. W. T. Chave, T. Ward Clarke, C. A. Cooke (engineering staff), H. A. Counsell, Jasper Croft, James Davies, J. Davies, jun., A. Dryland, Miss Durrant (France), A. C. Edwards, Charles Fowler, W. E. Groom, Mdlle Giranden (France), Mrs. Griffiths (Hay), E. Gurney, Alfred Hatton, W. Hewitt, J. Hibbert, Miss Hopton, E. M. Hopton, Mrs. Horne (Richmond), A. Horne (on engineering staff), C. Horton, J. M. Hutchinson (Natal), Samuel Jacob, Captain Judge, Frederick King, H. B. Lambert, John Lingen (Sydney), R. W. Livingstone, Mrs. W. G. Lloyd, John Marchant, D. Marshall, jun., Mrs. Martin, G. Wells Meats, James Mitchell, Captain F. L. Morgan, Dr. Morgan (Swansea), Mrs. H. C. Moore, Mrs. Edgar F. Morris, Mrs. J. Probert, Henry Rogers, Dr. Small (Dorchester), Mrs. Alfred Watkins, Mrs. Wheeler, Archer White, and Charles Witts.

TREASURE TROVE IN RADNORSHIRE.

A REMARKABLE DISCOVERY NEAR RHAYADER.

This is such a remarkably interesting find that the Editors of the *Transactions* are of opinion that it should be recorded fully as reported in the *Hereford Times* of July 1st and July 8th, 1899.

"There was a crowded attendance at the Magistrates' Room, Rhayader, on Wednesday afternoon, when Mr. Hugh Vaughan-Vaughan, district Coroner, conducted an inquest with reference to certain articles of jewellery which were found a month ago by a young man named James Marston, in the Carreg-gwynion Rocks, about a mile and a half south of Rhayader, whilst engaged in a fox-hunting expedition. A jury was empannelled including General John Ramsey Sladen (foreman), Messrs. Richard Morgan, Edward Williams, David Lloyd (Argoed), J. Williams-Jones, Edward Vaughan, George M. Jarman, Thomas E. Evans, F. L. C. Richardson, C. F. Böhm, John Roberts, W. H. Morgan, John Price, and W. R. Jones.

The articles of jewellery, which are described below, were produced by Col. S. W. Williams, who, in his capacity as High-Sheriff of the county, is the legal custodian as representing the Crown. The fact that Col. Williams is one of the greatest authorities on antiquarian subjects in Wales, makes his office as custodian peculiarly appropriate. The articles were produced, and arranged on the table in front of the jury by the finder, and were the objects of the keenest interest. Col. Williams, at the outset, stated that he was specially requested by the British Museum authorities not to allow the articles to be handled, as the work was very delicate.

The Coroner, addressing the jury, said they were summoned that day in what was a very unusual inquiry—probably the first held in Radnorshire, or at all events the first for a very long time. When the Coroner received notice that gold, silver, or plate had been found, it was his duty to summon an inquest and ascertain who was the finder, and to whom it belonged. The law, said the Coroner, was rather antiquated, and he proceeded to quote from a statute, 4th Edward I., which enacted that the Coroner should enquire as to who were the finders, where it was, and whether anyone was suspected of having found or concealed a treasure. The finder had done what was perfectly right. When he learned that the things belonged to the Crown, he gave information to the High-Sheriff, and acted straightforwardly all through. As to what was "treasure trove," the Coroner explained that where there was any gold, silver, or plate, which had been hidden in any house, or the earth, or other private place, the owner thereof being unknown, that property belonged to the Crown or its grantee. If the owner had parted with the property in such a manner as to abandon it altogether, the first finder was entitled to the property. Before the jury could find that the

articles belonged to the Crown, they would have to be satisfied that somebody hid them, and did not throw them away and abandon them. If he (the Coroner) went into the street and threw his money away, the first finder, and not the Crown, was entitled to it. He thought the jury would be satisfied that whoever hid these articles put them into the rocks for the purpose of having them again. If not, the finder might be entitled to them. They would explain more fully later what would become of the goods.

James Marston said he lived at Triangle Cottage, Cwmdauddwr. He found the articles produced on May 26th, when he went up to the Carreg-gwynion Rocks, Nantmel, to look for foxes. He was just coming away, when, walking by a rock, he happened to put a bar he carried into a crevice, with the intention of causing a stone to roll down the hill. When he shook the stone, part of these things fell out; but not all. He found the rest in the crevice. He could not have put his hand in—hardly the point of the bar. There was a crack between two veins, and the opening went down. There was nothing round the articles. He produced everything, except a bit of the bracelet, which he sent up to London to have tested. Col. Williams explained that in London they treated the metal as ordinary gold. In that respect the articles were worth a few shilliings, but as articles of antiquity they were worth he did not know how many pounds.—Marston added that he handed the articles over to the High-Sheriff when he knew it was his duty to do so.—By Mr. W. R. Jones: Witness found no case of any kind.

Colonel Williams said the articles were received by him from James Marston, and he held them, in accordance with law, as High Sheriff. By his advice, they had been submitted to Mr. Reed, director general of antiquities at the British Museum, and witness had been in correspondence with Mr. Reed thereon. Mr. Reed wrote that the Treasury minute of 1860 was now out of date, having been superseded by one of 1886, which decreed that the full value—less 20 per cent.—of articles found should be given to the finder. Under the minute of 1860, the Treasury only paid the bullion value, and before then the Treasury took the articles altogether. Now the Crown gave, not the bullion value, but the value as antiquities, which was largely in excess of the bullion value. Mr. Reed added that the articles were clearly Roman in the main, with late Celtic work; but he could not say anything about their value. He deprecated the handling of the gold ornaments, as they were very fragile. Colonel Williams said the ring spoke for itself. The bracelet was imperfect, owing to the fact that, as Marston told them a part had been sent to London to be tested. His opinion was that the bracelet was distinctly Celtic work of the very highest possible character. The clasps, one each side, were beautifully enamelled, in the finest character of late Celtic work. The interlaced work was distinctly Celtic, and was not built up of wire, but was composed of minute granules of gold adjoining each other—now a lost art. The earliest jewellery—Etruscan or Greek jewellery—had come down

to Irish times. As to the date, his opinion was the articles dated back to early in the present era. It might be A.D 100 or A.D. 200; possibly even earlier. The necklet was incomplete, although all was there that was found. No doubt the original robbers split it up. There would probably be two armlets, and perhaps a set of earrings, and the original robbers divided the spoil, and this was the share of one of them. The stones in the necklet, so far as he knew, were not of great intrinsic value; but he was not qualified to give an opinion. The stones were rudely cut and polished; but there was very exquisite and beautiful work in the setting. At each corner there was a perfect little leaf, with granulated scrolls. The ring was a Roman ring of a well-known type. The gem was an onyx, having engraved thereon an ordinary ant. He supposed it was a Gnostic ring, on many of which were engraved very curious figures. The articles would remain in his hands until the Coroner had communicated with the Treasury. In his official capacity as High Sheriff he was the proper custodian. Then they would be sent up to London to be valued by a committee of experts. On that valuation the Government would pay Marston, the finder, the full intrinsic value, less 20 per cent. The ornaments were those of a lady, and there was not the slightest doubt that they were hidden. It was an unique "find" for Wales. A great number of gold articles had been found in Ireland; but in Wales he only knew of the gold breastplate found near Mold 60 years ago.

The Coroner told the jury they had to be satisfied the things were "treasure trove"—that they were hidden and not thrown carelessly on one side. It would then be his duty to report the facts to the Crown, and no doubt Marston would, as the High Sheriff said, receive the full value less 20 per cent.

Colonel Williams: I think Marston acted most straightforwardly and honestly (applause).

Mr. R. Morgan suggested that the jury should make a representation to the Crown as to this; the Coroner and Colonel Williams said that would be done.

A verdict was drawn up setting forth that on the 26th of May, 1899, one gold ring, set with onyx and engraved on the setting an ant, a portion of a gold necklet of nine pieces—eight links set with stones and one link with the stone missing—one small piece of gold scroll, a small plate of embossed gold—all forming part of the necklet, and a gold armlet in four pieces, were found by James Marston, of Cwmdauddwr parish, hidden in the ground on Carreg-gwynion Rocks, in the parish of Nantmel, and which articles were of ancient time hidden as aforesaid. and the owner could not now be known.

A photograph of the spot was handed round during the inquiry, from which it appeared that the articles were originally placed on a shelf in the rocks, and that the stone displaced by Marston had been detracted owing to the elements for hundreds of years, eventually exposing the hiding-place. The gold ring is very massive, weighing

more than five sovereigns weight; but the other articles are, as already stated, very fragile, and their value consists in the beautiful workmanship.

Rumour estimates the antiquarian value of the articles at two or three hundred pounds, so that Marston is a lucky man.

An effort is being made to secure for the Cardiff Museum the valuable articles of ancient jewellery discovered near Rhayader by a young man named James Marston, as reported in last week's *Hereford Times*. It appears that on the discovery becoming publicly known, the curator of the Cardiff Museum (Mr. Ward, F.S A.) telegraphed to the High-Sheriff of Radnorshire (Mr. Stephen W. Williams) congratulating him on the discovery, and in a letter which followed, Mr. Ward said, judging from the reports in the Press, the find was of the greatest importance, and the articles should not be allowed to leave the Principality. He did not know what steps were being taken to secure that end, but if they (the treasure trove) could be retained in Wales by purchase, he felt sure his committee would unhesitatingly purchase, especially as their Museum was in the most densely populated part of the Principality.

At a meeting of the Cardiff Museum Committee, held under the presidency of Councillor C. A. J. Ward, a long discussion took place on the discovery in Radnorshire, and a strong feeling was expressed that the valuable objects found by Marston should find a home in Wales.

It was mentioned that the treasure trove had been promptly appropriated by the Crown. Commenting on this incident, Dr Vachell said it emphasised the extreme desirability of having a National Museum for Wales. The Committee unanimously decided to make application to the Crown for the custody of the Radnorshire relics.

A DESCRIPTION BY COLONEL WILLIAMS.

Colonel S. W. Williams gives the following description of

THE RING.

"In my opinion the ring is distinctly of Roman workmanship. The onyx with which it is set has been engraved at a very early period. This can be seen by the fact that the interior of the engraving is highly polished—a characteristic of Egyptian, Greek, and Roman gems"

THE NECKLET.

"The stones with which the necklet are set are cornelians with the exception of two, which are blue stones, the quality of which is not at present known. The one, however, may be an amethyst or sapphire, but is more probably of blue paste. Between each section of the necklet set with stones is a small plate of embossed gold with a somewhat peculiar ornament thereon of Celtic type. The filigree work round the stones is of very beautiful character, composed entirely of

exceedingly small granules of gold fused together very much after the type of some of the Etruscan jewellery in the British Museum. Each section has been hooked together with hooks and eyes, which are covered by the gold plates. The necklet is incomplete. The portion that has been found consists of nine sections, one stone is missing. It would rather appear as if the person who hid it had only obtained a portion as his share of the loot, and one armlet and a ring. Originally probably the treasure consisted of a complete necklet, two armlets, a ring, and possibly other articles of jewellery, and in dividing the spoil this appears to have fallen to the person who hid it in the rock."

THE ARMLET.

"The armlet is of a distinctly different character from the work in the necklet. It is a solid plate of gold with interlaced wire-work, the pattern being of the same character, and resembling the work upon the Celtic crosses of Wales. It was originally in two pieces, hinged together, and fastened probably by a gold peg attached to a delicate chain, forming part of the armlet. The clasps or hinge are ornamented with scroll work of most distinctly late Celtic or Irish work. The scroll has conventional leaves, filled with blue and green enamel. It is also ornamented with three lines of granulated work and four lines of twisted wire. It is altogether a most admirable specimen of Celtic art. The work shows great refinement and delicacy of design, and is quite equal to anything that has been found in Great Britain, and is surpassed by none of the very beautiful gold work in the Copenhagen Museum, where there are such very fine specimens of gold ornaments of the Viking age."

THE BREAKING OF THE ARMLET.

Colonel Williams added that the most unfortunate matter in connection with the armlet was that it had been broken since it was found, and that one of the clasps was melted down to ascertain the most useless fact, viz., the assay value of the gold, which was found to be 22½ carat, with a very small percentage of silver. This was owing to total ignorance on the part of the persons concerned of the great value of this very beautiful object, and it is much to be regretted that it will involve a considerable pecuniary loss to the finder.

THE VALUE OF THE ARTICLES.

Asked as to the value of the articles, Colonel Williams referred to the sum which had been mentioned in the papers, £300 to £500. He said it was entirely wrong to have stated any sum. The value would be settled by a committee of experts appointed by the Government, and the full value, less 20 per cent. would be given to the finder. There was no foundation for the statement that had been published.

A SUGGESTION.

Colonel Williams said it would be a very advisable thing if illustrations of objects of antiquity, such as flint, stone, and bronze weapons, could be hung up in the elementary and public schools, so that the children might be taught that such objects have a value far beyond their intrinsic worth. This might lead to the discovery of many

objects of antiquity that now are lost, and, moreover, a few words should be added explanatory of the law of Treasure Trove, more especially as referring to any object of silver or gold that might be discovered.

Colonel Williams added that he had heard from Earl Dysart, principal solicitor to the Treasury, who wrote that the Treasury claimed the articles, and requesting that they should be forwarded to him. This had been done.

Some excellent photographs of the articles were taken by Mr. John Jones, of East Street, Rhayader.

THE BORE AND THE TIDES IN FUNDY BAY.

In *Nature* for June 15th, 1899, Vol. 60, page 161, there is an abridged report by Prof. G. H. Darwin, from an advance copy of the Report for 1898 of the Tidal Department of the Survey of Canada sent by Mr. W. Bell Dawson.

The average speed of the bore is 8.47 miles per hour, the maximum being 9.61 miles. The greatest recorded height of the bore is 5 feet 4 inches.

In the number for July 27th, page 291, Sir J. W. Dawson invites attention to the Report when issued wherein the phenomena of the "Bore" are for the first time described, illustrated by maps and sections, and tabulated.

Further notes are given by Mr. W. H. Wheeler, in the number for September 14th, 1899, page 461.

The highest recorded tide is known as the "Saxby tide," which occurred in 1869. Mr. Wheeler writes :—"The low water-mark for that tide is not given, but taking the lowest low water level recorded, the range of that tide in Cumberland Bay was 52.80 feet; the ordinary spring tide range there being 45.80 feet."

In the second paragraph of his communication Mr. Wheeler remarks:—"The extreme recorded difference between high and low water at Chepstow* is 53 feet, being the same as the "Saxby," or record tide in the Cumberland Basin, Nova Scotia." Also that "The rise of the mean level of the sea in both cases is about the same, or from 22 to 23 feet."

In the eleventh paragraph he informs us that at Chepstow the rise above the mean level of the sea is 23½ feet.

Compare these measurements with those given in *Woolhope Transactions* for 1892, page 320, and Vol. 1899, page 79, for the height of the highest spring tide at Chepstow.

H. Cecil Moore.

* At the mouth of the Wye in England.

LAMMAS LANDS.

A GLANCE AT RURAL ENGLAND BEFORE THE BLACK DEATH IN 1347.

By W. J. Humfrys.

A traveller leaving Hereford by the main road which leads eastward through Ledbury to Worcester and the Midlands would notice soon after he left the city a large stretch of pasture land lying on both sides of the road and covering without hedge or fence many hundreds of acres.

If he were curious enough to enquire to whom this land belonged, he would learn that it is known as Lugg Meadow, that it is common from Lammas (that is the 2nd August) in each year until Candlemas, but that the strips of it are held in severalty during the other six months of the year, and he would notice stones marking the boundaries of the different properties.

If our traveller had any extensive acquaintance with the history of this country, he would at once recognise a survival of a custom that formerly prevailed in some shape or other not only throughout England, but over a very large part of Europe.

He would learn, too, if he pursued his enquiries, that in the parish of Lugwardine, through which he was passing, are still to be found traces, rapidly disappearing however, of the time when the arable land was cultivated on a kind of co-operative system, and there never having been in Lugwardine an Enclosure of Common Fields with the Allotments and Exchanges that characterize such an enclosure, the land is in many places still owned in strips or ridges, a common field being the property of numerous individuals each entitled to a number of plots of small size, some a couple of acres in extent, some smaller, some larger.

Until a period within the memory of men now living this condition of things prevailed very largely both in Herefordshire and elsewhere, while if we look back to the beginning of the century before the Enclosures, which have within the last hundred years changed the face of the country, were completed, we shall find that although something approaching three millions of acres had even then been enclosed since the commencement of the reign of George III., over seven millions which have since been enclosed were still in common fields and waste lands.*

It is, however, no part of the object of this paper to attempt to describe the condition of the country side, or the state of agriculture in

* Lecky, "History of England in the 18th Century," chap. 21.

the Georgian era, but rather to glance at the origin of this mode of cultivating and holding land, as such an enquiry will lead us into what has always seemed to me to be one of the most interesting of the Bye-ways of English history.

We can trace the system of co-operative agriculture of which these common or unenclosed fields were a part to a period long prior to the Norman conquest, if indeed they were not among the institutions introduced by our English forefathers on their first settlement in this country, while Mr. Seebohm and writers of his school would trace back their origin to an even earlier civilization.

They are described in the literature that has come down to us from Saxon times and in the returns collected in Domesday Book, while at all events at a somewhat later date, in the 13th century, the Manor Rolls afford us information of the highest value.

There are two institutions that stand out as landmarks in the early history of this country, the Village Community and the Manor. From the time when the lawyers. who moulded our jurisprudence after the Conquest, had impressed on English law the doctrines so dear to the feudal nobility, it may be stated in general terms that the Manor was, and that for centuries it continued to be, the administrative unit of English Society. To a very great extent this was true of Saxon times, though we can find in many parts of England traces of free Village Communities subject to no seignorial jurisdiction, but apparently a group of joint cultivators of the land on which they dwelt.

Such villages were very generally absorbed at or after the Conquest into the various manors, which, if the common bond of association before the Conquest, became almost the universal one after it. The mode of cultivation of the lands of the free village and of those of the manor was, so far as the system of co-operative husbandry was concerned, very similar, though from the obligations and duties to the Lord of the Manor, which often formed so heavy a burden on the feudal tenants, the dwellers in the free villages were exempt. But even where the manor had become the recognised division of the shire or hundred, in many instances the vill, or village, retained its identity, albeit forming a part of the manor; and as regards some of the larger manors, the various vills or townships of which the manor was composed, though the inhabitants owed fealty, paid rents, and rendered services to the same lord, and did suit at the same Court, were yet for the purposes of agriculture treated as entirely distinct districts, each village cultivating its own territory, and possessing a separate organization both as regards officials and services and sending its own representatives to the County Courts.*

It would have been impossible for such huge manors as that of Leominster, extending over 80 hides, or nearly 10,000 acres of land, or that of Tewkesbury, which was still larger, to have been regulated or

* Pollock and Maitland, "History of English Law," Vol. I., p. 597.

governed unless on some such principle of sub-division, while as regards both manors held in ancient demesne, and some of those of which, though not so held, the King was for the time being the immediate lord, the position of the tenants was one of still greater privilege.*

Throughout the country we shall find the population grouped as village communities in most instances under the headship of a lord, and divided into various grades. The great majority were villeins or of the villein class, but there were some freemen in many, if not in most, manors, and in the later days the lawyers taught that the presence of free tenants or suitors was necessary to the existence of a manor, but this was hardly the case either in Saxon or in the earlier Norman days.†

The peasants were men of various degrees and known by various names, the villeins proper generally occupying a virgate of 30 acres, or sometimes even a larger quantity of land, sometimes part of one only, and the cottagers and labourers held three or four acres, or perhaps even a smaller quantity; but all joined in the common acts of husbandry, and all rendered services to the Lord of the Manor, to whom a large tract of land usually belonged, and who exercised over the tenantry a jurisdiction, not as we shall see of an altogether despotic kind, and received in return rents paid sometimes in money, sometimes in produce, and who was also entitled to certain labour services from the dwellers on the manorial estates.

The arable of the village, by far the most important part of the land, as upon it the community principally depended for its food, was usually cultivated under a three years rotation of crops, and for this purpose was commonly divided into three fields, though a two field system was frequently adopted.

In addition to the arable fields were the meadows from which the hay for winter use was obtained, and the commons or waste lands over which the cattle of the villagers depastured all the year round, and sometimes there were woods which supplied fuel, and in which the swine fed on the acorns. A few enclosures there may have been, a few acres of demesne perhaps adjoining the Manor House, a few plots like our modern cottage gardens close to the humble dwellings, but, as a rule, as well the demesne lands of the Lord, as the lands held in villeinage, were scattered throughout the common fields, cultivated in the manner I am about to describe.

The arable lands were open fields divided into half acre strips and apportioned among the tenants of the manor. The holding of each tenant did not lie in a compact patch but was formed of strips scattered, not only over different fields, but over different parts of the same field. The necessity for dividing the land of each cultivator between the fields is obvious, inasmuch as one of those fields lay fallow every year, while,

* Maitland, "Domesday Book and Beyond," p. 112. Vinogradoff, "Villeinage in England," chap. 3.

† Pollock and Maitland, op. cit., p. 588. See also "Select Pleas in Manorial Courts," Selden Society, Introduction, pp. 16 sqq.

where the three course system of husbandry prevailed, another grew a crop of corn, and the third was planted in the spring, sometimes with corn, sometimes with vetches, beans, or peas.*

But why the holding in each field should not have lain together, but consisted of half acre strips lying apart from each other, is not so clear. It has been suggested that it had its origin in a scheme for giving to each tenant an equal proportion of good and of inferior land,† but may it not rather be due to some arrangement for co-aration? Nothing is clearer than that the very land measures were based on a system of ploughing with the old English plough drawn by eight oxen. The virgate or yard land, commonly containing 30 acres, was the quantity allotted to the owner of a pair of oxen, as the bovate, or half virgate, was the portion of the owner of a single ox, and the hide containing 120 acres suggested the possession of a complete eight ox team.

It is obvious then that the cultivation must have proceeded on some system of joint labour It is true that the records of the Manors refer to the number of ploughs and teams, but they were clearly not all the property of the lord, and as a tenant was seldom the owner of more than a fraction of a hide, the ownership of a whole team by an individual must have been rare.

And then provision must have been made for others than the owners of the oxen ; some remuneration was fairly due to the owner of the plough, something also to the ploughman, and something to the driver. And in the ancient laws of Wales occurs a curious illustration of the method by which this remuneration was provided. There, where the system of co-aration is treated as based on contract, it is provided in effect that the produce of the partnership should be divided thus :— Of twelve strips, or erws as they are termed in the original, the produce of eight go in a specified order to the owners of the eight oxen ; of two more, one to the ploughman and one to the driver, while that of the remaining two is left, one for the owner of the irons, *i.e.*, the ploughshare and ironwork of the plough, and the other for the repair of the woodwork.‡ I am not aware of any English evidence of a similar division of the strips in the common fields or of their produce, but we may fairly infer that in the early times at all events some similar custom prevailed.

But the co-operation seems not to have extended further than the ploughing. Each man sowed his own strip and gathered his own crop—while from harvest until the time of ploughing the cattle of the village roamed over the stubbles.

And as regards the meadows, for the purpose of the hay crop, the strips in these meadows were held in severalty, but as soon as the hay was gathered, usually about Lammas day, the 2nd August, till

* Seebohm, "English Village Community," p. 11.
† Vinogradoff, "Villeinage in England," pp. 235 sqq. Maitland, "Domesday Book and Beyond," p. 380.
‡ Seebohm, "English Village Community," p. 121.

Candlemas, the 2nd February, the cattle of the manor were depastured on these fields, as they were throughout the year on the waste or common lands.

But while the greater part of the land of each Manor or township seems to have been held by villeins whose normal holding was a virgate, there were many inhabitants occupying a cottage and plot in the common fields, and these are referred to in the records as cotsetlas, or more commonly as bordarii or cottarii, and they, too, were bound to render certain specified services to the lord, and in all probability received some remuneration for their labour on behalf of the community, though the Manor Rolls give us no information on this head.

It is quite clear, too, that some of the villeins held larger tracts of land than others. For example, in one of the Manors of the Abbey of Westminster we find that the bailiff or præpositus holds half a hide, the priest a hide, while there are fourteen villeins with a virgate and a half apiece, and 35 with only half a virgate apiece, 46 bordarii each occupy 8 acres, two others 5 acres apiece, and 20 cottarii have 26 acres between them.* Again, although the acre was commonly of the standard size, that is, 40 poles in length and 4 roods in breadth, there are many instances of smaller and some of larger acres, and the virgate of 30 acres, and the hide of 120, is by no means universal ; in Gloucestershire, for instance, we read of virgates of 40, 38, 36, and 28 acres.†

The services rendered both by the owners of virgates and by the cottarii and tenants of small plots are defined in many of the records, and are referred to later on, and there are traces of rules and customs governing the duties of the tenantry towards each other, as, in one manor, the terms are expressly stated to bind the tenant to discharge not only his duties to his lord but also those he owes his neighbours, and we find a tenement forfeited because the holder would not dwell in it nor cultivate it, nor "do any neighbourliness to his neighbours," and the same tribunal that enforces the rights of the lord fines a man for not paying his shepherd, and assesses damages done by a trespass on standing corn. In short, the lord's commands and the byelaws made by the community are enforced by the same tribunal, and the distinction between the two classes of regulations is not very well defined, as injunctions to buy beer at the lord's brewhouse, and to offer poultry to him for sale before offering them elsewhere, are mingled with injunctions which affect the well-being of the population of the manor rather than the interests of the lord.‡

A system of agriculture such as this must have needed not only rules and regulations of an intricate character but some authority capable of compelling obedience to such rules. In the free villages that authority was exercised by the Village Moot, an institution that merged

* Seebohm, "English Village Community," p. 93.
† Maitland, "Domesday Book and Beyond," pp. 373 sqq. Seebohm, op. cit., p. 55.
‡ Pollock and Maitland, "History of English Law," Vol. 1, pp. 614, 615.

in the Manor Court, and influenced the constitution of such courts whether in fact the manor had taken its origin in the free village or not. But of the procedure of these Village Moots and of the manner in which they conducted their business and enforced their decrees, no records have come down to us, and I turn therefore to the manorial system, for the rolls and other records of the manors afford very valuable information as to the habits of the peasantry and the manner in which the men of the early Plantagenet days lived and cultivated the soil, and we may well believe that the methods of agriculture were very similar during the period that stretches from the times of the Saxon Kings down at all events to the Black Death.

The distinction that runs through our early history between the freeman and the man who is not free, must not be pressed too far. In Saxon times there were two distinct classes of the unfree, the geneats and geburs, who were serfs probably attached to the soil and bound to render certain tributes of work and labour, more or less defined, to the lord, and the theows, whose condition would seem to have been not dissimilar to that of the slaves under the Roman Empire, their limbs and indeed their lives being subject to the good pleasure of their master.* After the Conquest this class gradually merged in the class above them, while on the other hand the humbler freemen seem as the result of the oppression of the Norman nobility to have been reduced into the same class,† and at the time of the earliest manorial documents the peasantry may be divided into the free tenants, the liberi homines, and sochemanni, of Domesday, and the villeins occurring under various names in the rolls of different manors, but the term included as well the class known as geneats and geburs in the Saxon period, as also many of the smaller freemen of that time, and on the other hand the slaves or theows.

A typical manor consisted then of a lord and his tenantry partly free, but for the most part unfree, who cultivated the manorial lands, rendered suit and service to the lord in various ways, and formed the homage or jury at the manor courts.

At the head of the officials of the manors was the Seneschal, or Steward, the direct representative of the lord, who presided at the manor courts, audited the accounts, conducted the sworn inquests and extents, and decided all questions that arose as to the course of husbandry or the like, and kept the rolls and other manorial documents, and was, at all events in the later part of the period with which we are dealing, expected to take care that the entries in those records of the manor were accurate.‡

The same individual very often filled the office of Steward in respect of all the manors belonging to the same owner, but it was different with the inferior officers. For each manor, and in the case of

* Andrews, "The Old English Manor," p. 145 sqq., p. 196. Seebohm, op. cit., chap. 5.
† Maitland, "Domesday and Beyond," p. 35; ibid, p. 62 sqq. Pollock and Maitland, op. cit., p. 414.
‡ Vinogradoff, op. cit., p. 318.

large manors such as Leominster or Tewkesbury, for each vill, or township, the lord appointed a bailiff, or beadle, to collect his rents and enforce the performance of the work and other duties of the tenants, to manage the home farm, and generally to protect the interests of his employer. The tenants on their part were represented by a reeve, called in the Latin records the *præpositus*, elected by the peasantry, or, technically, by the homage, who was looked upon as the representative of the village community, superintending, by the side of the bailiff, the performance of the labour, and generally of the work for which the villeins were liable to the lord, and representing in company with four others the township in the Hundred and County Courts. In short, the duty of the reeve appears to have been to protect the various classes of unfree tenants from oppression by the officials of the lord, and also, in conjunction with the bailiff, to regulate the ploughings and other acts of co-operative husbandry to which I have referred. The office was probably a survival from Saxon times, and then combined the duties of the lord's bailiff and the people's reeve, and the liability to serve it is recognized as a distinct mark of villeinage.*

There were in addition to these more important positions several less important services performed by particular individuals, some of them rendered to the inhabitants as a body, such as those of the messor, who took charge of the harvest, the shepherd, and the swineherd, and others of that class; some rather to the lord, among whom we read of the gatekeeper, and of the cook and the scullions of the greater Abbeys.†

The lands of the manor consisted of the demesne lands, of lands held by free tenants, which appear to have been originally granted by the lord out of his demesne, and of the lands held in villeinage. But as regards as well the freemen as the villeins, they were bound as a condition of their tenure to pay certain rents in money or in produce, and to render certain specified services in work and labour; and the distinction between the freeman and the villein is by no means as well defined as it has been sometimes assumed to be. In order, however, to form any kind of conception of the position of the peasantry, it is essential that we should appreciate the condition of the country in the period with which we are dealing, that prior to the Black Death.

Assuming that the tenants were bound to render certain dues in money, in produce, and in labour, the main distinction between the freeman and the villein must have been that the former had a right of appeal to the King's Court, and that, so far as he was concerned, the authority of the Lord and of the Manor Court was very limited.

Even if however, the right of a freeman to appeal to the King's Court existed everywhere, it can have been of very little value from a practical point of view in the case of the humble boor, whose implements of husbandry constituted his only wealth, whose travels had

* Vinogradoff, p. 190.
† Ibid, p. 322.

extended probably no further than to the county town, and even such visits were probably few, who could neither read nor write, and whose only friends and counsellors were his fellow labourers, and perhaps the Village Priest.

If it be said that the freeman was at liberty to quit his holding and seek employment elsewhere, and that the villein was not, is not such a distinction seen to be more or less unreal when we bear in mind that to leave the manor involved for the tenant the loss of his house and means of subsistence, and where in those days was he to find another? While, on the other hand, escape cannot have been difficult if the villein, though technically bound to the soil, were capable of earning a livelihood elsewhere. From the point of view of status I fancy there was comparatively little practical difference in these early times between the free and unfree; and the real distinction depended upon the nature and character of the duties which the tenant owed for his holding.*

The main test by which villein services were distinguished from those attaching to free holdings was their uncertainty. But that does not suggest that there was no limit to the labour the lord might demand from a villein, but rather has reference to his right to require the performance of any kind of work he might select, while the nature of the work to be performed by freemen was defined. A liability to perform certain boon works, for example, to mow or to reap for a certain number of days during hay time or harvest, appears to have been a service that might be rendered in respect of a freehold, but on the other hand where we find the duty of the tenant described as being to give a certain number of days' labour a week, the nature of the work to be done resting with the lord, that at once points to a tenure that is not free.†

It is clear, however, that the rendering of villein services did not in itself affect the status of the tenant, as we read of freemen holding land in villeinage and performing villein services in respect of it,‡ though the instances of freeholds being held by labour services are so rare that, in the common phraseology of surveys and similar documents, the tenements in which rent prevails are described as "free tenements," and those which have to render labour services bear the name of servile holdings.‖

The rents were rendered both in money and in produce, but, as time went on, there was a tendency to commute the render of produce for fixed money rents, and I suspect this was most common where the lord was the owner of several manors, and in the case of villages that lay at some distance from the lord's residence.

The Abbey of Westminster, for instance, had estates in Worcestershire, and the carriage of provisions for 100 miles or more must have been a serious matter in the 12th and 13th centuries.

* Pollock and Maitland, op. cit. 613. Vinogradoff, p. 218.
† Vinogradoff, pp. 298, 299, and authorities there cited.
‡ Vinogradoff, pp. 80, 143.
‖ Ibid, p. 167.

But the maintenance of the lord's establishment, whether it were the Castle or other abode of a noble, or a religious house as a Priory or Abbey, depended on the yield of the estate, and this consisted in part of the rents in money or kind paid by the tenants, and in part of the produce of the demesne.

As an example we find that in one Royal manor in Wiltshire the village has to provide 3,000 loaves in the year for the King's dogs, while the Black Book of Peterborough tells us of one village that supplied to that Abbey yearly four rams, five ells of cloth, ten chickens, and 300 loaves.* It will be noticed that in both these cases the liability is spoken of as that of the village, and very frequently estates of a great Baron or Abbey were so taxed as that each should yield a supply, or, as it was then termed, a farm, sufficient for the lord's necessity for a specified period, as a day or a fortnight, and out of this practice seems to have arisen a custom of the letting by the lord either to an individual, or sometimes to the tenants as a body, of the lord's dues, leaving, in the latter case, the collection and apportionment to be managed by the villagers.

But, whatever the method in which the rents were collected, and the performance of the services secured, the obligations were not enforced by any mere arbitrary exercise of the good pleasure of the lord.

The Manor Court, over which the steward or seneschal presided, and of which tenants formed the homage or jury, took cognizance of all such matters. It would be entirely beyond the scope of this paper to discuss the character of the manorial courts and their jurisdiction and practice. It is sufficient to remark in passing that modern research seems to shew that some of the doctrines collected by Lord Coke, and adopted by subsequent writers, were not applicable to the period we are considering, and at all events for our present purpose we need only consider the manor court, or halimot, as it was termed, from the circumstance of its having been generally held in the hall of the Manor House. In later times this court was divided into two branches—the Court Baron and Customary Court, the former dealing with the affairs of the free tenants, and the latter with those of the villeins; though at the end of the 13th century we can trace complaints of this division of the court as an innovation.†

But, even if one Court were held for all the purposes of the manor, it does not necessarily follow that the duties and authority of the free and unfree tenants were identical. In some more important matters, as when a thief had to be hanged, the attendance of free suitors seems to have been essential;‡ but for the transaction of the ordinary business of the Court, the presentments might be made either by the whole Court, consisting apparently of such of the tenants of the manor as thought fit to be present, or by a jury of twelve who attended in obedience to a

* Maitland, "Domesday Book and Beyond," pp. 146 and 147.
* "Select Pleas in Manorial Courts," Selden Society, Introduction, p. 16 sqq.. and p. 60.
‡ Ibid, p. 71.

summons, and the obligation to attend was generally considered a burden.*

The duty of the tenants or the jury seems to have been confined to making presentments of offences or misdemeanours, the punishment, whether by fine or otherwise, being decided by the lord or his steward. In some cases perhaps the homage had some kind of voice even as regards the sentence,† though this is not altogether clear, and the presentments preserved in the Manor Rolls relate largely to acts done to the prejudice of the lord, possibly because the stewards were more careful to record such presentments than others in which the lord was not directly interested. And the Court had many functions to perform. The only mode of transferring or dealing with villein or unfree lands was by entry on the Rolls of the Manor, a practice that with some modifications has survived in the Court Rolls of Copyhold Manors to the present day. It was the Court of civil jurisdiction in which questions arising between the tenants were decided, and it had an exclusive authority in respect of all matters relating to lands (other than freeholds) holden of the manor, and to disputes about such lands whether as to inheritance, or seisin, or otherwise.

But the practice of the Court in connection with the every-day life of the community is what most concerns our present inquiry, and the circumstance that the Court was commonly held once in three weeks testifies to the extent of the business that was transacted there, and illustrates how complete was the bond that bound the villein tenant to his lord; albeit the obligations were fixed by the custom, and before the penalty for a breach of any of them could be enforced the jury of the Manor Court must present the offender.‡

Here and there indeed we read of a custom that would authorise the lord to expel the villein tenants from their holdings at his mere will, but I doubt if ever such a practice extensively prevailed, and I would rather believe that the will and pleasure of the lord of which we read so much did not "find expression in any capricious interference that would have wantonly destroyed rule and order in village life."‖

Gradually the custom was forming itself and obtaining recognition that the unfree tenants had rights in their holdings which were not to be interfered with, and that subject to the performance of the duties and services, children of the villein, or one of them, sometimes the eldest, sometimes the youngest, would succeed to his holding.

But the liabilities of the tenant were not exhausted when he had paid his rent and performed his tasks of labour. He must pay a fine to the lord whenever a daughter was married; his son might not take Holy Orders without some compensation being paid; he must submit to be tallaged or taxed, to pay heriots and reliefs, all sanctioned and limited in an imperfect way by custom; and in some cases he might not even

* Vinogradoff, p. 366.
† "Select Pleas in Manorial Courts": Introduction, pp. 65 sqq.
‡ Vinogradoff, p. 368.
‖ Vinogradoff, p. 172. See also "Domesday of St. Paul's," Camden Society, Introduction, p. 32

dispose of the produce of his holding without giving to the lord the right of preemption.* And it is with all such matters that the Manor Court was largely occupied, and I quote a few presentments taken at random.

A ploughman is presented for bad ploughing on the lord's land,† another villein for bad mowing;‡ the parson is declared to be in mercy inasmuch as his cow was caught in the lord's meadow;‖ a man is presented for stabbing his sister, and another for throwing stones at a neighbour's door in the night, offences which seem to have been treated as of equal gravity, as both offenders are sent to prison and subsequently discharged on payment of a fine of 2s.** Again we find a tenant fined 12d. for concealing a sheep, and another pays the lord a similar sum for a sheep lost while in his custody,†† and fines of 6d. each for subtraction of labour, and fines for trespasses of various kinds are very common. Sometimes the course adopted was to direct the remedying or removal of nuisances or things erected on the land, for instance it is presented that a bank has been wrongfully thrown up and there is a direction that it should be removed.‡‡

So we find at the same Court one tenant fined 12d. for not making suit at the lord's mill,‖‖ and fines are levied on several tenants for having contracted marriage without the lord's leave,*** but in the same Roll there are entries of payments by tenants to the lord of 4s. for leave to marry, while elsewhere so large a sum as £4 is paid for a similar licence.†††

Surrenders and admittances, sometimes apparently to carry out arrangements in the nature of sales, sometimes by way of a grant of the demesne, and sometimes of the children or representatives of deceased tenants to their holdings, are frequent. One dated in 1288 is so curious a form of primitive marriage settlement that I quote it from the Rolls of the Abbey of Bec. "Richard Loverd renders into the lord's hands a cottage with the appurtenances, and Emma Loverd, daughter of the said Richard, renders one acre of arable land, and Hugh Coverer is put in seisin of the same, and gives the lord 5s. for entry money and for licence to contract marriage with the said Emma, and will keep the said Richard in board, as well as he Hugh keeps himself, and will give him every year one garment and one pair of linen hose and one pair of boots and slippers."¶

It would be easy to multiply instances of the business transacted at these Courts, but the foregoing will illustrate the procedure and the

* Vinogradoff, p. 156.
† Select Pleas in Manorial Courts, Selden Society, p. 12.
‡ Ibid, p. 30.
‖ Ibid, p. 13.
** Ibid, p. 19.
†† Ibid, pp. 22, 30.
‡‡ Ibid, p. 23.
‖‖ Ibid, p. 30.
*** Ibid, pp. 27, 29, &c.
††† Ibid, p. 24.
¶ Ibid, p. 32.

kind of justice administered in those times. And the evidence of all these rolls entirely refutes the idea that has been sometimes suggested that England, in the days of the Norman and early Plantaganet Kings was a country in which personal freedom was enjoyed only by one class, and that law and justice only existed by favour of an aristocracy.

So far from this, I am inclined to believe that the peasant revolts that followed the enactments known as the Statutes of Labourers, and the other attempts to regulate wages, and to control the liberties of the working classes, were protests against attempts to introduce a new order of things, and that all such legislation was not only oppressive but novel.

However that may be, we may picture the state of the country-side during the period we have been considering. It was not identical throughout the Kingdom: and, doubtless, in the centuries that elapsed between the first settlement of the country under the Saxon Kings and the middle of the 14th century great alterations took place, some due to changes which may have been sudden and almost revolutionary, others to the gradual development of the customs and habits of the people, but, speaking in general terms, the condition of the country outside the towns was very similar throughout England.

The whole of the land lay open, the arable land in large fields cultivated on the co-operative principle we have considered, while the meadows were likewise unenclosed and were kept up for hay from Candlemas to Lammas; but, during the rest of the year, the cattle of the inhabitants of the township or manor wandered over them as they did over the stubbles between harvest and plough time. But the Lammas meadows must not be confused with the common or waste lands on which the commonable beasts were depastured during the whole year, and on which to a great extent the tenants depended for the maintenance of their flocks and herds. So great was the importance of these commons that elaborate regulations, some of which exist to the present day, were framed to prevent the use of the common lands by others than persons entitled as inhabitants or tenants to depasture on them, and those who were so entitled could only depasture such animals as they could winter at home. And the people who occupied and cultivated each tract of territory were of various degrees and classes. Usually there was a lord at the head owning a large part of the manor as his demesne, while the holders of the rest of the lands were bound to cultivate it for him, but the labour services were so regulated that they were not felt to be an unendurable oppression. In some cases the population dwelt under the shadow of a great castle or baronial hall, or of some great abbey or priory; more often the manor was one of many owned by some great noble or ecclesiastical body whose visits were infrequent but whose presence was always felt in the increasing liability to perform the services and to pay the rents in money or kind, a liability strictly enforced by the bailiff or steward.

The dwellings of the tenants lay sometimes together in a village,

sometimes they were in scattered hamlets, and round each was occasionally a small enclosure, and larger enclosures often lay adjacent to the residence of the lord, whether it were a castle or abbey, or a humbler manor house.

The services were enforced not only in the interest of the lord, but of the general body of cultivators. Each villein, according to the quantity of land he held, furnished the accustomed number of oxen to the common plough, and took his share in the common work, partly on behalf of the whole community, and partly in performance of the services due to the lord; and each cottarius and bordarius—each humble cottager, to use modern phraseology—took his share in the work as ploughman or reaper, as shepherd or swineherd, or in some such capacity, and received his accustomed reward, chiefly in produce, and perhaps sometimes in money.

Then there was the Manor Court at which all the disputes of the village or the manor were settled: the villeins who had neglected their service to the lord, or had broken the customs, or those who had wronged the community or their neighbours, were fined or otherwise punished; disputes of all kinds were tried and decided, and changes of ownership were sanctioned and recorded.

The customs and the procedure may have varied. In manors held in ancient demesne, and in some of the Royal manors, the position of the tenantry was a highly privileged one; and, on the other hand, in some the services may have been specially onerous; but save where, as was too often the case, the countryside was devastated by war or rebellion, the condition of all classes of the population was not an unhappy one.

Woolhope Naturalists' Field Club.

ANNUAL WINTER MEETING, FRIDAY, DECEMBER 15TH, 1899.

THE Annual Meeting for the election of President and Officers for the ensuing year 1900 was held in the Woolhope Club Room. The constitution of the officials was formed as follows:—President, The Hon. and Very Rev. J. W. Leigh, Dean of Hereford; Vice-Presidents Mr. H. C. Beddoe, Mr. Spencer H. Bickham, Sir Herbert Croft, and Sir James Rankin; the Central Committee: Mr. C. J. Bird, Mr. J. Carless, Mr. R. Clarke, Rev Preb. W. H. Lambert, and Mr. Alfred Watkins. All the remaining officials were re-elected, with Mr. T. Hutchinson and Mr. H. Cecil Moore as joint honorary secretaries. The delegates were elected as follows:—Rev. J. O. Bevan to the British Association. Mr. Thomas Blashill to the Archæological Congress, and Dr. T. A. Chapman Corresponding Member to the British Association.

Mr. Moore exhibited 104 printed pages of "Mollusca of Herefordshire," by Messrs. Boycott and Bowell, followed by a few pages of the *Transactions* of 1898 for the next Volume 1898—1899.

Extracts were read from a letter from our delegate, Rev. J. O. Bevan, on the recommendations of the Corresponding Societies of the British Association, in which an expression of regret was passed that the work of "Ethnographical" investigation was not taken up with sufficient earnestness The attention of our members was also drawn to the too little studied subject of "Underground Fauna," referred to in the address of the President of the Association.

With reference to the subject of the Woolhope Club Room, of which the Free Library Committee are proposing to make a "Reference Library" for the use of the general public, the following resolution was passed.—"That the General Meeting of the Woolhope Club authorize their Central Committee to meet and confer with the Special Sub-Committee of the Free Library, as to the best means for the establishment of a Reference Library in the Woolhope Club Room, with special instructions to see that the interests of the Woolhope Club in the user of the room are amply protected."

Mr. Hutchinson presented a List of the County Birds, compiled for publication in the volume of the *Transactions*.

Mr. Spencer H. Bickham gave a lengthy and detailed account of India-rubber, the result of twenty-five years observation and study, and exhibited over one hundred varieties from all parts of the India-rubber producing world, namely, from Brazil, from Central America, from the east and west coasts of India, and from Africa. He treated the subject botanically and commercially, and gave a description of all the trees which produce India-rubber, and the methods adopted to collect it. His address was fully illustrated by maps and diagrams.

The Dean, president-elect, presented two Schedules of Queries from the Local Records Committee, enquiring into arrangements now in operation for the collection, custody, indexing, and calendaring of Local Records, and as to any further measures which it may be advisable to take for this purpose.

It will interest members to know how Herefordshire has been represented during the past twelve months by the following extract from the official statement presented to Parliament of the additions made to the various collections in the British Museum:—

In the Department of Zoology: "Thirty Diptera collected in Herefordshire, presented by J. H. Wood, Esq., M.B.; fifteen Coleoptera from Herefordshire, presented by Lieut.-Col. Yerbury,"

In the Department of Geology; "150 fossil fishes, *Cephalaspis*, *Auchenaspis*, *Pteraspis*, *Onchus*, &c from the Passage-beds, Old Red Sandstone, also portions of the Ludlow Bone-beds; 286 Cephalopoda, 359 Lamellibranchiata, and 215 Gasteropoda, from the Passage-beds and Old Red Sandstone at Ledbury; 40 specimens of Bryozoa, &c., from various formations in the neighbourhood of Ledbury; 170 Trilobites and 12 Eurypterids from Upper Ludlow Rocks, the Downton Sandstone, Ledbury Shales, and Lower Old Red Sandstone, Ledbury Tunnel; 261 fossil Corals from the Passage-beds of Ledbury; and 36 Graptolites, &c, from Ledbury Tunnel, all from the collection of the late George H. Piper, Esq., F.G.S., of Ledbury."

The following members attended the meeting:—The President (Mr. H. C. Beddoe), Sir Herbert Croft, The Hon. and Very Rev. The Dean, Judge H. Lea, Revs. E. J. Holloway, Preb. W. H. Lambert, H. B. D. Marshall, and M. J. Watkins, Messrs. Spencer H. Bickham, C. P. Bird, J. Carless, R. Clarke, James Davies, E. J. Hatton, Norman H. Matthews, J. Probert, the Honorary Secretaries (Mr. T Hutchinson and Mr. H. Cecil Moore), and Mr. James B. Pilley, the Assistant Secretary.

MOLLUSCA OF HEREFORDSHIRE.

Mr. Walter E. Collinge has kindly informed us that he has identified the following species of slugs not recorded by us in a box of specimens from Hereford :—

Limax variegatus, Drap.
Agriolimax laevis, Müll.
Arion subfuscus, Drap.
Arion fasciatus, Nilss.
Arion intermedius, Norm.
Arion empiricorum, Fér.

Helicella virgata, da Costa.—The following note from Mr. W. Blake, of Ross, has recently appeared in the *Journal of Conchology* (Vol 9, p. 270, published 1st January, 1900), and constitutes the first published record of the occurence of this species in the county. There is now no reason to doubt that the species is truly indigenous in the neighbourhood of Ross:—

"NOTE ON THE APPEARANCE OF HELIX VIRGATA IN HEREFORDSHIRE.—My first acquaintance with *Helix virgata* in this county was two years ago, when I took the variety *lutescens*. Last year I again met with the type and two vars. (*lutescens* and *albicans*) in my garden on the outskirts of Ross. I have given specimens for comparison to several friends, and on October 12th one of my assistants informed me that while cycling that morning after rain his notice was attracted to a crackling sound from beneath the tyres of his machine. This he found to be due to a number of small snails, which turned out on examination to be *H. virgata*, spread over the road.—Wm. Blake, 2, Acacia Villas, Ross (Read before the Society, Nov. 8th, 1899)."

See *supra*, p. 104, "Mollusca of Herefordshire."

A. E. BOYCOTT.
E. W. W. BOWELL

2nd September, 1900.

A FEW METEOROLOGICAL OBSERVATIONS FOR THE YEAR 1899.

HEREFORDSHIRE has numerous careful meteorological observers who send their reports to Mr. Symons. The *Transactions* of the Woolhope Club afford an excellent medium for their observations. The members would hail with great satisfaction a summary of a series of yearly observations, and as the year 1901 will be the fiftieth year since the formation of the Club, it is confidently hoped that some one of the many capable members will supply the information demanded.

The opportunity is taken of publishing the few following letters which have reached us.

Mr. H. Southall, writing from the Graig, Ross, gives

THE RAINFALL AT ROSS IN 1899.

The rainfall, though about four inches more in amount than that of 1898, which yielded 21.42 inches, is still as much as 6.42 below the average per year of the twenty years, 1867—1886. We have now completed a series or cycle of thirteen dry years, commencing with January, 1887, but whether we have as yet reached to its close "deponent knoweth not." The following table will show the extent of the deficiency, and illustrate my assertion :—

	Rainfall at Graig. Inches.		Comparing with average 1867—86.		Rainfall at Graig. Inches.		Comparing with average 1867—86.
1887—	22·57	—	9·29	1893—	20·13	—	11·73
1888—	33·01	+	1·15	1894—	32·63	+	0·77
1889—	27·91	—	3·95	1895—	25·96	—	5·90
1890—	22·53	—	9·33	1896—	21·11	—	10·75
1891—	33·57	+	1·71	1897—	30 51	—	1·35
1892—	22·81	—	9·05	1898—	21·42	—	10·42
				1899—	25·44	—	6·42
				Average 13 years—	26·12	—	5·74

It will be seen from this account that only three out of the 13 years had any excess of rain, and that in these cases it was but a small one.

In 1888 it arose from the large fall in the months of March, July, and November, the rest of the year being very dry.

In 1889 the spring months (March, April, and May) were exceptionally wet.

In 1891, May, June, August, and October were much above the average, December slightly so; and in the year 1896 the autumn months (August to November) were wet, especially October. The

total accumulated deficiency now amounts to upwards of 74 inches, or equal in bulk to nearly two cubic miles of water in the catchment basin of the Wye, or enough to fill a reservoir 30 miles long by 11 wide, and 30 feet deep.

I propose in another letter, with your permission, to deal with some other characteristics of recent weather.

	Total Depth. Inches.	Greatest fall in 24 hours. Depth.	Date.	Number of days on which ·01 or more fell.
January	3·88	·64	21	20
February	2·77	·54	8	13
March	·63	·23	8	9
April	2·13	·39	13	23
May	2·23	·62	19	19
June	2·04	·65	19	9
July	·49	·20	11	12
August	1·06	·52	29	8
September	2·34	·53	6	17
October	2·95	1·04	1	13
November	2·30	·81	3	9
December	2·62	·79	28	19
	25·44			171

H. SOUTHALL.

The Graig, Ross,
January 2nd, 1900.

The following tabulated statement gives, as received from Sir James Rankin, Bart., M.P.,

THE RAINFALL AT BRYNGWYN FOR TWENTY-ONE YEARS

1879 ..	33·76	1886 ..	38·72	1893 ...	22·75
1880 ...	34·45	1887 ...	21.05	1894 ..	35·98
1881 ..	28·41	1888 ..	33·21	1895 ..	28·84
1882 ...	39·00	1889 ..	26·60	1896 .	23·31
1883 ...	33·73	1890 ..	22·42	1897 ..	35·50
1884 ..	27·48	1891 ...	35·32	1898 ..	23 52
1885 ...	28·99	1892 ...	25·44	1899 ...	29·92
Total	225·82	Total	202·76	Total	199·82
Average	32·26	Average	28·96	Average	28·54

Average for 21 years, 29·92

The rainfall at Ledbury is given by Mr. Spencer H. Bickham.

RAINFALL AT LEDBURY IN 1899.

The rainfall at Underdown, Ledbury, for the month of December was 3·07 inches, making the total for the year 1899, 25·68 inches, which is slightly above the average for the last 25 years, and 4 inches (or 18 per cent) more than fell in 1898.

The details of the monthly falls for the two years are interesting, and are—

	1898.	1899.
January	0·54 .	3·89
February	1·15 ...	3·07
March	0·66 ...	0·43
April	1·88 ...	2·09
May	4·27 ...	2·32
June	1·01 ...	1·57
July	0 93 ..	0·90
August	2·71 ...	1·25
September ...	0·36 ..	2·50
October	3·59 ..	2·55
November.. ...	1·89 ...	2·04
December... ...	2·58 ...	3·07
	21·57	25·68

The average rainfall for the 10 years—1884-1893—was 26·01 inches; and for the five years—1894-98—was 24·25 inches, making an average for the 15 years, ending 1898, of 25·42 inches.

SPENCER H. BICKHAM, F.L.S.

A remarkably low reading of the barometer, which is worthy of record, occurred here on Friday, the 29th December.

		Attend't Therm'tr
8 p m. Thursday, Dec. 28th it stood...	28·703 .	61
10 p.m. „ „ ..	28·650 ...	62
10 a.m. Friday, Dec. 29th „ ...	28·236 .	57
12 noon „ „ ...	28·214 ...	57
2 p.m. „ „ ...	28·150 ...	60
8 p m. „ „ .	28·096 ...	62
When it began to rise, and at—		
10 p.m. it stood at	28 146 ...	62
And on the next morning at—		
10 a.m. Saturday, Dec. 30th was ...	28·504 ...	56

The instrument which recorded these readings is a Negretti and Zambra standard barometer, and is placed 316 ft. 6in. above sea level. The exact position of Underdown is Lat. 52·1·55 N., Lon. 2.25·0 W.

SPENCER H. BICKHAM.

RAINFALL AT MUCH MARCLE FOR DECEMBER, 1899.—Total fall, 2·58 inches; greatest fall in 24 hours, ·61 on 28th; number of wet days, 20; average fall for December, 2·41 inches; rainfall for the year 26·52 in.; average, 28·40 in.

REMARKABLY LOW READING OF THE BAROMETER.

On December 29th an unusually low reading of the barometer was observed in many parts of the country. At Ledbury Mr. Bickham recorded as low a reading as 28·096, which, corrected for sea level, would read =28·336 inches. See *Symons' Monthly Meteorological Magazine* for 1899, page 177.

HOT WEATHER IN 1899.

In London on Friday, August 25th, the thermometer in the shade reached 90° (the hottest day in the year), following four or five days of gradually increasing temperature.

A gradual decided daily rise of temperature again occurred during the first week of September. On Tuesday, September 5th, the reading actually touched 89°, and the thermometer stood at 81° at six o'clock in the evening.

THUNDERSTORM.

The above exceptional heat was succeeded by storms in many parts of the country, especially the southern and south eastern parts

In London the storm did not last more than half-an-hour, but in that short interval a very heavy fall occurred, measuring 0·9 in. at Westminster and 1·0 in. at Brixton.

At Bournemouth the storm lasted four hours, and the rainfall was 1·49 inch.

The following details of the thunderstorm are given in *The Times* of Thursday, September 6th:—

"It is so long since we have had anything approaching to a torrential rain that, although to-day's storm did not here yield half an inch, some particulars may be of interest, especially as the brontometer gives details not otherwise easily obtainable.

Probably the storm was more severe in the S.W. and W.C. districts than it was here, though a quarter of an inch of rain in six minutes is a heavy fall.

Several flashes of lightning appeared to strike to earth between Primrose Hill and Oxford Street.

Your obedient servant,

G. J. SYMONS, F.R.S.

62, Camden Square, N.W.

DETAILS OF THUNDERSTORM 0 18 TO 1 6 P.M. SEPTEMBER 6, 1899.

Time.			Lightning. No. of flashes.	Thunder. No. of peals.	Barometer. Rise.	Barometer. Fall.	Rainfall.
p.m.	p.m.				In.	Ins.	In.
0 18	to 0 20	...	—	1	·000		—
0 20	0 22	...	—	—	·000		—
0 22	0 24	...	—	1	·000		—
0 24	0 26	...	—	1	·001		—
0 26	0 28	...	—	—	·002		—
0 28	0 30	...	—	6	·001		—
0 30	0 32	...	3	7	·003		—
0 32	0 34	...	0	4	·005		·05
0 34	0 36	...	8	7	·006		·05
0 36	0 38	...	1	5	·006		·04
0 38	0 40	...	6	Cont.	·007		·04
0 40	0 42	...	7	Cont.		·010	·08
0 42	0 44	...	6	Cont.		·009	·11
0 44	0 46	...	1	3		·010	·06
0 46	0 48	...	1	2		·008	·03
0 48	0 50	...	—	2		·005	·01
0 50	0 52	...	—	1		·007	·01
0 52	0 54	...	—	4		·006	—
0 54	0 56	...	—	—		·004	—
0 56	0 58	...	—	—	·001		—
0 58	1 0	...	—	—	·001		—
1 0	1 2	...	—	1	·006		—
1 2	1 4	...	—	—	·005		—
1 4	1 6	...	—	1	·004		—

NOTE.—The entry in the thunder column "Cont." implies that the peals of thunder were practically continuous, a fresh one beginning before the previous one had died out. A remarkable instance of this lasted nearly two minutes—viz., from 0 41 30 to 0 43 10 p.m."

ADDITIONS TO LIST OF HEREFORDSHIRE LEPIDOPTERA SINCE 1892, WITH NOTES OF CAPTURE, BY DR. J. H. WOOD.

(*Vide* Note, p. 108, Vol. 1887).

NOCTURNI.

SESIA SCOLIIFORMIS.—Black Mountains, 1895, by Mr. Watkins, and confirmed by Dr. T. A. Chapman.

PROCRIS GERYON.—Malvern district.

NOCTUÆ.

HADENA GLAUCA.—Black Mountains, 1892. Bred from a half-grown larva picked up 17th July, 1891.

PYRALIDES.

ENNYCHIA CINGULALIS.—Herefordshire Beacon, 1895. Not common.

BOTYS HYALINALIS.—Doward, 1899. Moderately common.

SCOPARIA MURANA.—Black Mountains, 1892. Sitting on the rocks on the Olchon Taren.

CRAMBITES.

CRAMBUS CHRYSONUCHELLUS.—Herefordshire Beacon, 1895. Abundant.

MYELOIS CERATONIÆ.—Hereford, 1894. A specimen bred by Dr. Chapman.

EPHESTIA KUHNIELLA.—Hereford, 1896. Taken by Dr. Chapman.

PHYCIS HOSTILIS.

——— SPLENDIDELLA.

TORTRICES.

PHOXOPTERYX SICULANA.—Woolhope, 1895. Confined to Queen's Wood, Much Marcle.

EPHIPPIPHORA TURBIDANA.—Dorstone and Cusop Dingle, 1898.

——————— TRIGEMINANA. Doward, 1899.

STIGMONOTA DORSANA.—Cusop Dingle, 1898. Not uncommon in flowery upland meadows, flying in the afternoon at end of May and beginning of June.

DICRORAMPHA ACUMINATANA.—Woolhope, 1893. On limestone banks. Very local.

CATOPTRIA ÆMULANA.—Doward, 1899. Very common among golden rod.

CHROSIS AUDOUINANA.—Woolhope, 1895. One specimen Queen's Wood, Much Marcle.

——— TESSERANA.—Doward, 1899.

EUPŒCILIA DUBITANA.—Doward, 1899. Uncommon.

——— ANGUSTANA.—Woolhope, 1894. Common, but local.

EUPŒCILIA AMBIGUELLA.—Woolhope, 1895. Rare. Queen's Wood, Much Marcle.

——— RUPICOLANA.—Doward, 1899. Common.

TINEÆ.

SOLENOBIA POMONÆ.—Woolhope, 1894. The cases common on trunks of various trees.

SCARDIA GRANELLA.—Woolhope, 1896.

TINEA SPILOTELLA.—Woolhope, 1892. Common in the woods of the district, flying in the evening, and unmixed with *T. rusticella.*

——— FERRUGINELLA.—Doward, 1899. One specimen.

INCURVARIA ŒHLMANNIELLA.—Black Mountains, 1896. A single specimen by Dr. Chapman.

NEMATOIS SCABIOSELLUS.—Doward, 1899. Plentiful in one spot among *Knautia arvensis.*

HYPONOMEUTA PADI.—Tram Inn, 1895. Confined to a small boggy copse.

GELECHIA ALBICEPS.—Woolhope, 1894. A single specimen.

——— UNICOLORELLA.—Woolhope, 1892. Common.

——— LUTULENTELLA.—Woolhope. 1897. Rare.

ŒCOPHORA UNITELLA.—Woolhope, 1899. One specimen.

BUTALIS LAMINELLA.

ÆCHMIA DENTELLA.—Woolhope, 1892. The larvæ occasionally plentiful in the umbels of *Chærophyllum.*

ARGYRESTHIA SORBIELLA.—Black Mountains and Kington, 1893.

——————— DILECTELLA.—Westhope Hill, 1896.

——————— ARCEUTHINA.—Westhope Hill, 1896.

——————— AURULENTELLA.—Westhope Hill, 1896.

ORNIX SCUTULATELLA.—Woolhope, 1892. One specimen only.

——— FAGIVORELLA.—Doward, 1899. The empty larval tenements were in thousands upon the beech bushes, 10th August, 1887.

COLEOPHORA SICCIFOLIELLA.—Woolhope, 1895. Not common.

——————— IBIPENNELLA.—Woolhope, 1894. Rare.

——————— ARDEÆPENNELLA.—Woolhope, 1895. A single specimen.

——————— GENISTÆ.—Tram Inn, 1892.

——————— CONYZÆ.—Woolhope, 1892. Very local.

——————— INULÆ.—Woolhope, 1893 Confined to the margin of a small dried up pond, the only known locality for it in the kingdom.

——————— AGRAMMELLA.—Woolhope, 1892. The rarest of the rush species.

CHAULIODUS ILLIGERELLUS.—Ledbury, 1892. Local and uncommon.

CHRYSOCLYSTA SCHRANKELLA.—Dorstone, 1895. A single specimen at the Golden Well.

LAVERNA PHRAGMITELLA.—Woolhope, 1893. Common among *Typha angustifolia* and *latifolia*.

ANTISPILA TREITSCHKIELLA.—Doward and Ledbury, 1893. Uncommon.

ELACHISTA MONTICOLA.—Woolhope, 1893. Common, but local.

——— STABILELLA.—Woolhope, 1894. Rare.

——— ADSCITELLA.

——— RHYNCHOSPORELLA.—Black Mountains, 1894. Common.

——— TRIATOMELLA.—Woolhope, 1898. Local and uncommon.

——— DISPUNCTELLA.—Doward, 1899. Rare.

——— OCHREELLA.—Woolhope, 1895. Queen's Wood, Much Marcle. Rare.

LITHOCOLLETIS CERASICOLELLA.—Woolhope, 1894.

——— CONCOMITELLA.— Woolhope, 1895.

——— OXYACANTHÆ.—Woolhope, 1895.

——— SORBI.—Kington, 1897.

——— PYRIVORELLA.—Woolhope, 1899.

BUCCULATRIX BOYERELLA.—Woolhope, 1894. Rare.

——— FRANGULELLA.—Doward, 1899. Common, but very local.

NEPTICULA MINUSCULELLA.—Woolhope, 1894.

——— IGNOBILELLA.—Woolhope, 1893.

——— WEAVERI.—Black Mountains, 1894. Not common.

——— CONFUSELLA.—Woolhope, 1894.

——— CRYPTELLA.—Woolhope, 1896. Uncommon.

PTEROPHORI.

PTEROPHORUS PARVIDACTYLUS—Doward, 1899. Swarming among wild thyme.

——— BALIODACTYLUS.—Doward, 1899. Rare.

ERRATA AND CORRIGENDA.

PYRALIDES.

In Vol. 1887, p. 114.—For *Scoparia zelleri* read *S. cembræ*, which is included in the same list.

CRAMBITES.

In Vol. 1887, p. 114.—For *Phycis adelphella* (which is not a British species) read *P. hostilis*. See above.

In Vol. 1887, p. 114.—For *Phycis abietella* read *P. splendidella*. Ibid.

TINEÆ.

In Vol. 1887, p. 117.—*Depressaria douglasella* inserted in error.

" —For *Butalis fusco æneella* read *B. laminella*. See above.

" —*Butalis fusco cuprella* inserted in error.

" p. 118.—For *Elachista mergerlella* read *E. adscitella*. See above.

REVISED SUMMARY TO 1899.

MACROS—				
Diurni	... ...	44	out of	65
Nocturni	... ...	67	"	112
Geometræ	...	198	"	283
Cuspidatæ	...	24	"	33
Noctuæ	... ...	196	"	318
		529		811
MICROS—				
Deltoides & Aventiæ		9	"	15
Pyralides	... ...	44	"	77
Crambites	... ...	38	"	83
Tortrices	... ...	225	"	335
Tineæ	... ...	469	"	716
Pterophori	... ...	18	"	36
		803		1262
		529		811
		1332		2073

NOTE.—The Summary of Herefordshire Lepidoptera, Vol. 1887, page 108, does not include the additions made to the list up to 1892, the date of publication, but these are included in the Revised Summary, page 9 of the same volume. The above is a summary of the species contained in the lists up to date after deducting the Errata.

T. HUTCHINSON.

BIRDS OF HEREFORDSHIRE.

By T. Hutchinson.

As no complete list of the County Birds is to be found in the Transactions of the Club the following list is compiled from the various records scattered throughout the *Transactions*, "Notes on the Birds of Herefordshire," by the late Dr. H. G. Bull, the "Authenticated List of Birds of Herefordshire," by the late Mr. George Horne, and a few other sources.

The arrangement is that adopted by Mr. Howard Saunders, in his "Illustrated Manual of British Birds," Second Edition. The local names for the most part are taken from "British Birds' Eggs and Nests," by the late Rev. J. C. Atkinson, and as they are often characteristic they are given whether peculiar to the County or not.

Every species recorded as having occurred in the County is included in the list, but a few of doubtful occurrence are so marked.

The references to all birds mentioned in the *Transactions* are given, as well as the names of the authorities for the rarer species.

It is hoped that the list will be found of use to the members of the Club, and grateful acknowledgements are made for the kind assistance rendered by Mr. H. C. Moore, the Rev. M. G. Watkins, Mr. J. B. Pilley, Dr. R. Williams, Mr. Howard Saunders, and many others.

Aylstone Cottage, Hereford,
October, 1899.

ABBREVIATIONS AND AUTHORITIES QUOTED.

B.—Breeds in the County.
L. N.—Local and other names.
W. T.—*The Woolhope Club Transactions.*

Ashdown.—Ornithology in Herefordshire from 1889 to 1893, by W. C. Ashdown, F.Z.S. *Woolhope Club Transactions*, 1892, pp. 381-386.

Atkinson.—British Birds' Eggs and Nests by the late Rev. J. C. Atkinson.

Blathwayt, Mr. F. L., Bromyard.

Blight.—List of Birds Observed at Bredwardine during the years 1864 to 1869, by the Rev. Robert Blight. *Woolhope Club Transactions*, 1869, pp. 158-160.

Brown, Mr. William, Whitchurch.

Bull.—Notes on the Birds of Herefordshire, by the late Dr. H. G. Bull.

de Winton.—Natural History Notes (of Olchon Valley), by W. E. de Winton. *Woolhope Club Transactions*, 1897, p. 269.

Edwards, Mr. E. E., Hereford.

Forrest.—Fauna of Shropshire, by H. E. Forrest.

Horne.—Authenticated List of Birds of Herefordshire, by the late George Horne.

S. Hutchinson, Miss, Grantsfield, Leominster.

T. Hutchinson.—List of Birds Observed at Aylstone Cottage, Hereford, by T. Hutchinson. *Woolhope Club Transactions*, 1898, p. 26.

James, Mr. F. R., Hereford.

Ley.—The Occurrence of Rare Birds in Herefordshire, by Arthur Armitage, Esq, Vice-President, and the Rev. Clement Ley. *Woolhope Club Transactions*, 1869, pp. 71-77.

Lloyd.—Notes on the Occurence of Rare Birds in Herefordshire and Radnorshire, by Mr. James W. Lloyd, Kington. *Woolhope Club Transactions*, 1869, pp. 78-80.

Middleton.—List of Birds Observed Within Two Miles of Lingen, 1871-1873, annexed to paper by M. C. Middleton. *Woolhope Club Transactions*, 1873, p 82.

Moore, Mr. H. C., Hereford.

Pilley, Mr. J. B., Hereford.

Saunders.—An Illustrated Manual of British Birds (2nd edition) by Howard Saunders, F.L.S., F Z S., &c.

Southall.—Bird Notes, by Henry Southall, F.R. Met. Soc. *Woolhope Club Transactions*, 1884, pp. 223-226.

Watkins, Rev. Morgan G., Kentchurch.

Williams, Dr. R., Kingsland.—Curious Experiences in Birds' Nesting. *Woolhope Club Transactions*, 1896, pp. 147-149.

Wood, Dr. J. H., Tarrington.

LIST OF HEREFORDSHIRE BIRDS.

Order PASSERES.

Family TURDIDÆ.

Subfamily TURDINÆ.

MISTLE-THRUSH, *Turdus viscivorus*, (Linnæus).
L. N. Missel Thrush, Misseltoe Thrush, Misselbird, Stormcock, Screech Thrush, Holm-thrush, Holm-screech.

Common Resident—*B.*

W. T.—1869, pp. 72, 158; 1873, p. 82; 1898, p. 26.

SONG-THRUSH, *Turdus Músicus* (Linnæus).
L. N. Common Thrush, Throstle, Mavis.

Common Resident.—*B.*

W. T.—1869, p. 158; 1873, p. 82; 1892, p. 382; 1894, p. 258; 1896, p. 146; 1898, p. 26.

REDWING *Turdus iliacus*, (Linnæus).

Common Resident from August to March.

W. T.—1869, p. 158; 1873, p. 82; 1898, p. 26.

FIELDFARE, *Turdus pilaris* (Linnæus).
L. N. Blue-back, Blue-rump, Blue-tail, Felfit, Felty-fare, Jack-bird, Veldebird, Beldibird.

Common Resident from October to May.

W. T.—1869, p. 158; 1873, p. 82; 1898, p. 26.

BLACKBIRD, *Turdus Mérula* (Linnæus).
L. N. Merle, Ouzel, Black Ouzel, Amzel.

Common Resident.—*B.*

W. T.—1869, p. 158; p. 1873, p. 82; 1896, p. 146; 1898, p. 26.

RING-OUZEL, *Turdus torquátus* (Linnæus).
L. N. Ring Thrush, Moor Blackbird, Mountain Blackbird, Tor Ouzel, Rock Ouzel, Ring Blackbird.

Local Resident from April to September.—*B.*

W. T.—1869, pp. 72, 78, 158; 1873, p. 82; 1897, p. 269.

WHEATEAR, *Saxícola œnánthé* (Linnæus).
L. N. Fallow-chat, White-rump, White-tail, Fallow-smick, Fallow-finch, Chacker, Chackbird, Clodhopper.

Local Resident from March to October.—*B.*

W. T.—1869, p. 73; 1897, p. 269.

WHINCHAT, *Pratíncola rubétra* (Linnæus).
L. N. Grass-chat, Furze-chat, U-tick, Hay-tick.

Resident from April to October, generally distributed.—*B.*

W. T.—1869, pp. 72, 158; 1873, p. 82.

STONECHAT, *Pratíncola rubícola* (Linnæus).
L. N. Stone-chatter, Stone-clink, Stone-smick, Stone-chack, Stone-smith, Moor-titling, Chickstone, Blackcap.

Local Resident, frequenting hills and rough ground.—*B.*

W. T.—1869, pp. 72, 158; 1873, p. 82.

REDSTART, *Ruticílla phœnicúrus* (Linnæus).
L. N.—Firetail, Fireflirt, Brantail, Firebrandtail, Redtail, Kitty Brantail.

Common Resident from April to September.—*B.*
W. T.—1869, p. 158; 1873, p. 82; 1896, p. 148; 1898, p. 26.

BLACK REDSTART, *Ruticílla títys* (Scopoli).
L. N. Tithys Redstart, Black Red-tail.

Rare autumn and winter visitor.
One killed ar Kinsham, 1878.
A freshly killed specimen was brought to a bird-stuffer in Hereford, 1879.—*Bull. Horne.*
One at Canon Frome Court, 1895.
W. T.—1895, p. 9.—*Wood.*

REDBREAST, *Erithacus rubécula* (Linnæus).
L. N. Robin, Robin Redbreast, Ruddock, Robinet, Bob-robin.

Common Resident.—*B.*
W. T.—1869, p. 158; 1873, p. 82; 1896, p. 148; 1898, p. 26.

NIGHTINGALE, *Daúlias luscínia* (Linnæus).

Resident from April to September.—*B.*

Reported to have been heard at Dinmore, Fownhope, Dinedor, Ewias Harold, Sellack, Ashperton, How Caple, Wormbridge.—*Bull—Horne.* Haughwood.—*Pilley.* Kentchurch.—*Watkins.* Kimbolton.—*S. Hutchinson.* Near Ledbury and on the Dowards.—*Moore.* Knightwick.—*Blathwayt.*
W. T.—1884, p. 224; 1899, p. 109.

Subfamily SYLVIINÆ.

WHITETHROAT, *Sylvia cinérea* (Bechstein).
L. N. Haybird, Nettle-creeper, Haychat, Titty Whitethroat.
Common Resident from April to September.—*B.*
W. T.—1869, pp. 73, 158; 1873, p. 82; 1896, p. 148; 1898, p. 26.

LESSER WHITETHROAT, *Sylvia currúca* (Linnæus).
Resident from April to September, generally distributed.—*B.*
W. T.—1869, pp. 73, 158; 1896, p. 148; 1898 p. 26.

BLACKCAP, *Sylvia atricapilla* (Linnæus).
L. N. Blackcap Warbler.
Common Resident from April to September—*B.*
W. T.—1869, p. 158; 1873, p. 82; 1898, p. 26.

GARDEN-WARBLER, *Sylvia hortensis* (Bechstein).
L. N. Pettychaps, Greater Pettychaps.
Fairly common Resident from May to September—*B.*
W. T.—1869, p. 158.

GOLDEN-CRESTED WREN, *Régulus cristátus* (K. L. Koch).
L. N. Fire-crest, Gold-crest, Gold-crested Regulus, Golden-crested Warbler, Gold-crowned Kinglet.
A Resident, common from August to April. Rare in summer—*B.*
W. T.—1869, pp. 73, 158; 1898, p. 26.

FIRE-CRESTED WREN, *Régulus ignicapillus* (C. L. Brehm).
Rare Winter Visitor.
Seen at Sufton and Lyston.—*Horne.*
Also at Sellack.
W. T.—1869, p. 73.—*Ley.*

CHIFFCHAFF, *Phyllóscopus rufus* (Bechstein).
L. N. Lesser Pettychaps, Least Willow Wren.
Common Resident from March to October—*B.*
W. T.—1869, p. 158; 1873, p. 82; 1898, p. 26.

WILLOW-WREN, *Phyllóscopus tróchilus* (Linnæus).
L. N. Willow Warbler, Yellow Wren, Scotch Wren, Hay-bird, Huck-muck, Ground Wren, Oven-bird.
Common Resident from April to September—*B.*
W T.—1869, p. 158; 1873, p. 82.

WOOD-WREN, *Phyllóscopus sibilátrix* (Bechstein).
L. N. Wood-warbler, Yellow Wren.
Local Resident, from April to September—*B.*
W. T.—1869, p. 158.—*Blight.* 1896, p. 148.—*Williams.*

REED-WARBLER, *Acrocéphalus stréperus* (Vieillot).
L. N. Reed-wren, Night-warbler.
Rare Resident, April to September—*B.*
Tibberton, Moccas, Shobdon.—*Bull. Horne.*
W. T.—1869, p. 73.—*Ley.*

SEDGE-WARBLER, *Acrocéphalus phragmítis* (Bechstein)
L. N. Sedge-bird, Sedge-reedling.
Common Resident from April to September—*B.*
W. T.—1869, pp. 73, 158; 1873, p. 82.

GRASSHOPPER-WARBLER, *Locustélla nævia* (Boddaert).
L N. Reeler.
Local Resident from April to September—*B.*
Common in Ross district.
Occurs in Bromyard district—*Blathwayt*; Kingsland—*Williams*; and Kimbolton—*S. Hutchinson.*
W. T.—1869, p. 73.—*Ley.* 1873, p. 82.—*Middleton.* 1884, p. 224.—*Southall.* 1890, p 49.

Subfamily ACCENTORINÆ.

HEDGE-SPARROW, *Accéntor moduláris* (Linnæus).
L. N. Aizack, Isaac, Blue Isaac, Dunnock, Hedge Warbler, Shuffle-wing, Hempie.
Common Resident—*B.*
W. T.—1869, p. 158; 1873, p. 82; 1896, p. 147; 1898, p. 26.

Family CINCLIDÆ.

DIPPER, *Cinclus aquáticus* (Bechstein).
L. N. Water Blackbird, Water Ouzel, White-throated Blackbird, Wizzel, Brook-ouzel, Water-crow, Water-colly, Water-piet, Bessy-ducker.
Resident, generally distributed throughout the county—*B.*
W. T.—1868, p. 13; 1869, pp. 72, 78, 158; 1873, p. 82; 1884, p. 224.

Family PARIDÆ.

LONG-TAILED TITMOUSE, *Acrédula caudáta* (Linnæus).
L. N. Bottle Tit, Canbottle, Mummiruffin, Mumruffin, Ragamuffin, Long-tailed Mag, Bottle Tom, Long-tailed Capon, Long-tailed Pie, Caper Long-tail, Oven-builder, Poke-pudding, Mufflin, Canbottling, Feather-poke.

Common Resident—*B.*

W. T.—1869, p. 159; 1898, p. 26.

GREAT TITMOUSE, *Párus major* (Linnæus).
L. N. Oxeye, Blackcap, Great Tit, Great Black-headed Tomtit, Pickcheese, Sawyer-bird.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1896, p. 148; 1898, p. 26.

COAL-TITMOUSE, *Parus ater* (Linnæus).
L. N. Colemouse, Coalhead.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1896, p. 148; 1898, p. 26.

MARSH TITMOUSE, *Parus palústris* (Linnæus).
L. N. Coal-head, Black-cap, Willow-biter.

Resident, but not so common as the last-named—*B.*

W. T.—1869, p. 159; 1898, p. 26.

BLUE TITMOUSE, *Parus cæruleus* (Linnæus).
L. N. Tomtit, Bluecap, Willow-biter, Blue Tomtit, Nun, Blue bonnet, Billy-biter, Hickwall, Blue Mope.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1896, p. 148; 1898, p. 26.

Family SITTIDÆ.

NUTHATCH, *Sitta cæsia* (Wolf).
L. N. Nuthatch, Nutjobber, Wood-cracker.

Resident, generally distributed throughout the county—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1884, p. 225; 1896, p. 148; 1898, p. 26.

Family TROGLODYTIDÆ.

WREN, *Tróglodytes párvulus* (K. L. Koch).
L. N. Jenny Wren, Kitty Wren, Titty Wren, Cutty Wren.
Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

Family CERTHIIDÆ.

TREE-CREEPER, *Cérthia familiáris* (Linnæus).
L.N. Creeper, Tree-climber.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1884, p. 225; 1898, p. 26.

Family MOTACILLIDÆ.

PIED WAGTAIL, *Motacílla lúgubris* (Temminck).
L. N. Water Wagtail, White Wagtail, Black and White Wagtail Dishwasher, Wash-tail, Nanny Washtail.

Common Resident, but migrates southward in autumn—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1887, p. 145, *et seq*; 1898, p. 26.

GREY WAGTAIL, *Motacílla melanópe* (Pallas).

Common Resident, but migrates southward in autumn—*B.*

W. T.—1869, p. 159; 1887, p. 145 *et seq*; 1898, p. 26.

BLUE-HEADED WAGTAIL, *Motacílla flava* (Linnæus).

Rare. Spring and autumn visitor.

"Occurs regularly every season at Belmont, near Hereford."—*Bull.*
Only record. Doubtful.

W. T.—1861.

YELLOW WAGTAIL, *Motacílla raii* (Bonaparte).

Resident from April to September, generally distributed—*B.*

W. T.—1869, p. 159; 1887, 145, *et seq.*

TREE-PIPIT, *Anthus triviális* (Linnæus).
L. N. Pipit Lark, Field-titling, Field-lark, Tree-lark, Grasshopper-lark.

Common Resident from April to September—*B.*

W. T.—1869, p. 159.

MEADOW-PIPIT, *Anthus praténsis* (Linnæus).
L. N. Titlark, Pipit Lark, Meadow Titling, Moor Tit or Titling, Heather Lintie, Moss-cheeper, Ling-bird, Meadow-lark.

Common Resident, but partially migrates in autumn—*B.*

W. T.—1869, p. 159; 1873, p. 82.

ROCK-PIPIT, *Anthus obscúrus* (Latham).
L.N. Dusky Lark, Field-lark, Sea-titling, Sea-lintie.

Rare and Local Resident.

W. T.—1897, p. 269.—*de Winton.*

Family ORIOLIDÆ.

GOLDEN ORIOLE, *Oriolus gálbula* (Linnæus).

A rare visitor about the month of April.

"The bright plumage of this bird attracts the destroyer, and the species is thus prevented from nesting with us annually, as it would otherwise do."—*Saunders*.

The Museum specimens were obtained from Weston-under-Penyard, and The Chase, Ross.

It has also been observed at Stretton Sugwas.

At Hay Park, Ludlow, 1883.

A pair at Monnington-on-Wye, 1884.—*Bull. Horne.*

Family LANIIDÆ.

GREAT GREY SHRIKE, *Lánius excúbitor* (Linnæus).

L. N. Great Butcher Bird, Ash-coloured Shrike, Cinereous Shrike, Grey Shrike.

Rare autumn and winter visitor. Local.

Occurs in the neighbourhood of the Black Mountains.—*Bull.*

W. T.—1869, p. 72.—*Ley.* p. 78.—*Lloyd.* 1898, p. 26.—*T. Hutchinson.*

RED-BACKED SHRIKE, *Lánius collúrio* (Linnæus).

L. N. Lesser Butcher Bird, Flusher, Murdering-pie, Jack Baker.

A Resident from May to August, generally distributed throughout the county—*B.*

W. T.—1869, pp. 72, 158; 1873, p. 82; 1892, p. 382; 1899, p. 109.

Family AMPELIDÆ.

WAXWING, *Ámpelis gárrulus* (Linnæus).

L. N. Bohemian Waxwing or Chatterer, Waxen Chatterer.

Rare visitor.

One specimen reported "seen in the flesh at Baker's, Hereford, 1856," possibly the Museum specimen.—*Bull. Horne.*

Only record.

Family MUSCICAPIDÆ.

SPOTTED FLYCATCHER, *Múscicapa grísola* (Linnæus).

L. N. Beam-bird, Bee-bird, Rafter-bird, Post-bird, Wall-bird, Cherry-chopper, Cherry-sucker, Cobweb-bird.

Common Resident from May to September—*B.*

W. T.—1869, p. 158; 1873, p. 82; 1892, p. 282; 1898, p. 26.

PIED FLYCATCHER, *Múscicapa atricapilla* (Linnæus).

L. N. Coldfinch.

Rare Resident from May to September—*B.*

A pair shot at Sufton, 1839.

A pair seen at Aymestrey, 1834.

Occurs at Stoke Edith Park where it breeds —*Bull. Horne.*

Also at Downton and Eywood.—*Williams.*

And at Croft.—*S. Hutchinson.*

W. T.—1888, p. 257; et seq. 1890; p. 49; 1898, p. 26.—*T. Hutchinson.*

Family HIRUNDINIDÆ.

SWALLOW, *Hirúndo rústica*, (Linnæus).

L. N. Common Swallow, House-swallow, Chimney-swallow, Barn-swallow.

Common Resident from April to October—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

MARTIN, *Chelídon úrbica*, (Linnæus).

L. N. House Martin, Martlet, Martin Swallow, Window-martin, Eaves Swallow, Window-swallow.

Common Resident from April to October—*B.*

W. T.—1869, p 159; 1873, p. 82; 1898, p. 26.

SAND MARTIN, *Cótile ripária*, (Linnæus).

L. N. Bank Martin, Pit Martin, Sand Swallow, Bank Swallow, River Swallow.

Common Resident from March to October—*B.*

W. T.—1869, p. 159; 1873, p. 82.

Family FRINGILLIDÆ.

Subfamily FRINGILLINÆ.

GREENFINCH, *Ligurínus chlóris* (Linnæus).

L. N. Green Grosbeak, Green Linnet, Green Bird.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

HAWFINCH, *Coccothraustes vulgáris* (Pallas).

L. N. Common Grosbeak, Haw Grosbeak.

Commoner Resident than formerly—*B.*

W. T.—1869, pp. 79, 159; 1884, p. 224; 1892, p. 382; 1894, p. 259; 1895, p. 105; 1898, p. 26.

GOLDFINCH, *Carduélis élegans*, (Stephens).
L. N. Thistle-Finch, Gold-spink, Grey Kate, or Pate Proud Tailor, Goldie, King Harry, Red-cap.

A Resident, which the birdcatcher is exterminating—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

SISKIN, *Carduélis spínus*, (Linnæus).
L. N. Aberdevine.

Resident, rare in summer.

Seen at Llanwarne—*Horne.*
Letton Court, 1883, and near Ross—*Bull.*
Banks of the Wye, near Hereford—*Pilley.*
Occasionally at Bromyard—*Blathwayt.*
Frequently at Kentchurch—*Watkins.*
Occasionally at Ross—*Southall.*

W. T.—1869, p. 79—*Lloyd.*

HOUSE-SPARROW, *Passer domésticus* (Linnæus).
L. N. Spadger, Sparrow, Common Sparrow.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

TREE-SPARROW, *Passer montánus*, (Linnæus).
L. N. Mountain Sparrow.

A local Resident—*B.*

W. T.—1869, p. 79—*Lloyd.* p. 159- *Blight.* 1896, p, 148—*Williams.*

CHAFFINCH, *Fringílla cælebs* (Linnæus).
L. N. Pyefinch, Spink, Pink, Twink, Skelly, Shelly, Shell-apple, Scobby, Shilfa, Buckfinch, Horsefinch, Copperfinch, Whitefinch, Beechfinch, Wet-bird.

Common Resident—*B.*

W. T.—1869, p. 159; 1898, p. 26.

BRAMBLIN, *Fringílla montifringílla*, (Linnæus).
L. N. Mountain-Finch, Bramble Finch, Lulean Finch.

Resident from October to March.
Generally distributed.

W. T.—1869, pp. 74, 79, 159; 1898, p. 25.

LINNET, *Linóta cannábina*, (Linnæus).
L. N. Common Linnet, Grey Linnet, Red Linnet, Brown Linnet,

Whin Linnet, Linnet Finch, Red-head Finch, Greater Redpole, Rose Linnet, Lint-white, Lintie.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82, 1898 p. 26.

MEALY REDPOLE, *Linóta línária* (Linnæus).
Winter Visitor.
"It often occurs and is overlooked."—*Bull.*
Only record. Doubtful.

LESSER REDPOLE, *Linóta rufescens*, (Vieillot).
L. N. Common Redpole, Lesser Red-headed Finch, Rose Linnet.

Local Resident—*B.*

Seen at Moreton.—*Bull. Horne.*
One shot at Kimbolton.—*T. Hutchinson.*
Annually at Kingsland where it breeds.—*Williams.*
Common at Bromyard, Lugg Meadows, Hereford, where it breeds.—*Blathwayt.*

W. T.—1869, p. 74.—*Ley.* 1892, p. 382.—*Ashdown.***

TWITE, *Linóta flaviróstris*, (Linnæus).
L. N. Mountain Linnet, Twite Finch, Heather Lintie, Hill Lintie, Yellow-neb Lintie.

Uncommon Resident. Local—*B.*
*Seen at Peterstow.—*Horne.*
Black Mountains.—*Bull.*

Only record.

BULLFINCH, *Pýrrhula europæa* (Vieillot).
L. N. Bud, Budding Bird, Cock Hoop, Hoop, Hoof, Hope, Tope, Olph, Alp, Red Hoop, Nope.

A Resident generally distributed, but becoming rarer in many districts owing to the birdcatcher—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

CROSSBILL. *Lóxia curviróstra* (Linnæus).
L. N. Shell-apple.

An uncommon and irregular visitor, seldom remaining long in one locality.
Seen at Baker's in the flesh, 1855.
Specimen from Ross, 1889.
Believed to breed at Kington.—*Horne.*

** Lower Lugg Meadows, Lugwardine, April, 1900.—*James. T.H.*
* This was the Bramblin or Mountain Finch.—Vide W. T. 1869, p. 74.—*T.H.*

One shot at Kimbolton, 1869, and a small flock remained in the Gardens for a few days in April, 1887. *S. Hutchinson.*

A flock seen at Bromyard, December, 1894, and another March, 1895.—*Blathwayt.*

A large flock appeared at Withington, November, 1898, and remained for several weeks. They caused injury to the cider fruit by splitting and eating the kernels. A pair of these birds are in the Museum.—*Pilley.*

W. T.—1869, p. 74.—*Ley.* p. 79.—*Lloyd.* 1895, p. 104.—*Ashdown.*

Subfamily EMBERIZINÆ.

BLACK-HEADED BUNTING, *Emberíza melanocéphala* (Scopoli).

Rare.

"Very frequently met with."—*Horne.*

Only record. Very doubtful.*

CORN-BUNTING, *Emberíza miliária* (Linnæus).

L. N. Common Bunting, Bunting, Ebb, Bunting Lark.

Rare Resident.—*B.*

Has nested in the Lugg Meadows, Hereford, and at Mortimer's Cross.—*Williams.*

W. T.—1869, p. 159; 1873, p. 8.

YELLOW BUNTING, *Emberíza citrinélla* (Linnæus).

L. N. Yellow Hammer or Ammer, Yellow Yowley, Gold-spink, Yellow Yeldring, Yellow Yoldring or Yeörling, Yeldrock, Yellow Yite, Yoit, &c.

Common Resident.—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1884, p. 224; 1898, p. 26.

CIRL BUNTING, *Emberíza círlus*, (Linnæus).

L. N. French Yellow Hammer, Black-throated Yellow Hammer.

Resident, Local.—*B.*

Occurs at Callow Pitch, Birch, King's Caple, The Chase, Ross.—*Bull.*

Occurs at Kingsland.—*Williams.* And at Kimbolton.—*S. Hutchinson.*

Museum specimen shot at Bullingham.

W. T.—1869, p. 73.—*Ley.* 1884, p. 224.—*Southall.*

* *Evidently a mistake for Reed Bunting (E. Schæniclus), which is frequently called Black-headed Bunting.—T.H.*

REED BUNTING, *Emberíza schæniculus* (Linnæus).

L. N. Reed-sparrow, Black-headed Bunting, Water-sparrow, Mountain-sparrow, Black-bonnet.

Resident, generally distributed—*B.*—*Bull. Horne.*

W. T.—1869, p. 159.—*Blight.*

SNOW BUNTING, *Plectróphenax nivális* (Linnæus).

L. N. Tawny Bunting, Mountain Bunting, Snowflake or fleck.

Rare Resident from October to April.

Seen in the flesh at Baker's, 1854.

One shot at Pool Cottage, 1856.—*Bull. Horne.*

Hereford, 1881, and one shot at Moccas.—*Pilley.*

Seen occasionally in the neighbourhood of Kingsland.—*Williams.*

Family STURNIDÆ.

STARLING, *Stúrnus vulgáris* (Linnæus).

L. N. Common Starling, Stare, Sheep-stare, Solitary Thrush, Brown Starling.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1896, p. 148; 1898, p. 26.

ROSE-COLOURED STARLING, *Pástor róseus* (Linnæus).

L. N. Rose-coloured Ouzel or Pastor.

Rare Visitor.

The specimen in the Museum is labelled "Garway, 1858."—*Bull. Horne.*

Only record.

Family CORVIDÆ.

JAY, *Gárrulus glandárius* (Linnæus).

L. N. Jay-pie, Jay-piet.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1896, p. 149; 1898, p. 26.

MAGPIE, *Pica rústica* (Scopoli).

L. N. Pyet, Pianet, Madge, Mag.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

JACKDAW, *Córvus monédula* (Linnæus).

L. N. Daw, Kae, Jack.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82 1896; p. 148; 1898, p. 26.

RAVEN, *Córvus córax* (Linnæus).
L. N. Corbie, Corbie Crow, Great Corbie Crow.

Rare Resident—*B.*

Only found in a few of the wildest districts of the County—*Bull. Horne.*

A pair nested in the old Scotch firs at Kentchurch, till about 1880, when the keepers shot them. Saw two overhead in Kentchurch, August, 1889—*Watkins.*

W. T.—1869, p. 79—*Lloyd.* 159, *Blight.*

CARRION-CROW, *Córvus coróne* (Linnæus).
L. N. Crow, Corbie Crow, Flesh Crow, Gor Crow, Midden Crow, Black Crow, Black-neb, Hoody.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1896, pp. 147, 149; 1897, p. 269; 1898, p. 26.

HOODED CROW, *Córvus córnix* (Linnæus).
L.N. Royston Crow, Dun Crow, Norway Crow, Kentish Crow, Grey Crow, Grey-backed Crow, Bunting Crow, Scare Crow, Hoodie.

Rare visitor.

One shot at Llanwarne, 1850.
One at Perrystone, 1860.
At Letton, 1879.
Museum specimen from Kentchurch, 1889.—*Bull. Horne.*
Seen occasionally at Aymestrey.—*Williams.*

W.T.—1892, p. 382—*Ashdown.*

ROOK, *Corvus frúgilegus* (Linnæus).
L. N. Crow.

Common Resident—*B.*

W.T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

Family ALAUDIDÆ.

SKY-LARK, *Alaúda arvénsis* (Linnæus).
L. N. Lark, Field Lark, Lavrock.

Common Resident—*B.*

W. T.—1869, p. 159; 1873, p. 82.

WOOD-LARK, *Alaúda arbórea* (Linnæus).

Common Resident, but local—*B.*

W. T.—1869, p. 159; 1873, p 82.

Order PICARIÆ.

Family CYPSELIDÆ.

SWIFT, *Cýpselus ápus* (Linnæus).
L. N. Deviling, Black Martin, Screech, Screech Martin, Shriek Owl, Screamer, Squeaker, Skeer or Skir-devil, Cran.

Common Resident from April to August—*B.*

W. T.—1869, p. 159; 1873, p. 82; 1898, p. 26.

Family CAPRIMULGIDÆ.

NIGHTJAR, *Caprimúlgus europæus* (Linnæus).
L. N. Night-hawk, Goat-sucker, Dor Hawk, Fern Owl, Night-crow, Jar Owl, Churn Owl, Wheel-bird, Eve-churr, Night-churr, Puckeridge.

A common Resident from May to September—*B.*

W. T.—1869, p. 77; 1873, p. 82.

Family PICIDÆ.

Subfamily IYNGINÆ.

WRYNECK, *Ïynx torquílla* (Linnæus).
L. N. Cuckoo's-mate or leader, Emmet-hunter, Snake-bird, Long-tongue.

Resident from March to September—*B.*

W. T.—1869, p. 75; 1884, p. 225.

Subfamily PICINÆ.

GREEN WOODPECKER, *Gécinus víridis* (Linnæus).
L. N. Wood-spite, Rain-fowl, Rain-bird, Hew-hole, Yaffle, Whet-ile, Woodwall, Witwall, Popinjay, Awl-bird, Eaqual, Pick-a-tree, Yappingale.

Common Resident—*B.*

W. T.—1869, pp. 74, 159; 1873, p. 82; 1884, p. 224; 1895, p. 104; 1898, p. 26.

GREAT SPOTTED WOODPECKER, *Déndrocopus major* (Linnæus).
L. N. Pied Woodpecker, French-pie, Wood-pie, Whitwall, Great Black and White Woodpecker, Wood-nacker.

Resident, generally distributed throughout the county—*B.*

W. T.—1869, pp. 74, 79, 159; 1873, p. 82; 1884, p. 224.

LESSER SPOTTED WOODPECKER, *Déndrocopus minor* (Linnæus).

L. N. Barred Woodpecker, Hick-wall, Little Black and White Woodpecker, Crank-bird.

Resident, generally distributed throughout the County—*B.*

W. T.—1869, pp. 74, 84, 159; 1873, p. 82; 1884, p. 225; 1898, p. 26.

HAIRY WOODPECKER, *Déndrocopus villósus.*

There is a specimen in the Hereford Museum labelled "Garway, 1845."
It is recorded that two specimens are said to have been found in Yorkshire, but the species is not admitted to be a British one.—*Saunders.*
Very doubtful.

GREAT BLACK WOODPECKER, *Picus martius.*

This species is also not admitted to be a British one.—*Saunders.*
Bull says there can be no doubt of it having been observed in Herefordshire, and records two specimens at Frogmore, Ross, one at Ruckhall Wood, Eaton Bishop, 1874, one at Belmont, 1879.—*Bull.*
W. T.—1884, p. 22; 1889, p. 392; 1896, p. 111.
Very doubtful.

Family ALCEDINIDÆ.

KINGFISHER, *Alcédo ispida* (Linnæus).

Resident, generally distributed throughout the county—*B.*

W. T.—1869, pp. 38, *et seq* (nest), 76, 159; 1873, p. 82; 1894, p. 159; 1896, p. 148; 1898, p. 26.

Family CORACIIDÆ.

ROLLER, *Corácias gárrulus* (Linnæus).

There is a specimen in the Hereford Museum labelled "Goodrich, 1857."—*Bull. Horne.*
Only record.

Family MEROPIDÆ.

BEE-EATER, *Mérops apiáster* (Linnæus).

It is reported by *S. Hutchinson* that in 1875 a pair of this remarkable bird frequented the garden at Grantsfield, Kimbolton, for a period of about six weeks. It is to be regretted that no further record was kept.
Only record.
Note.—Mr. H. E. Forrest, in his book "Fauna of Shropshire," says, "A pair of Bee-eaters are said by Decie to have been "observed near Tenbury throughout one summer. No year "is stated, but about 1875."
This was the pair seen at Grantsfield.—*T. H.*

Family UPUPIDÆ.

HOOPOE, *Upúpa épops* (Linnæus).

Rare Visitor.

One seen at Callow 1847.
One at Baker's in the flesh 1856.
One shot at Bullinghope 1879.
One at Aylstone Hill, Hereford.—*Bull. Horne.*
W. T.—1892, p. 382.—*Ashdown.*

Family CUCULIDÆ.

CUCKOO, *Cúculus canórus* (Linnæus).

L. N. Gowk.

Common Resident from April to August, young birds sometimes remaining till October—*B.*

W. T. 1869, pp. 75, 160; 1873, p. 82; 1896, p. 147; 1898, p. 26.

Order STRIGES.

Family STRIGIDÆ.

BARN-OWL, *Strix flámmea* (Linnæus).

L. N. White Owl, Yellow Owl, Screech Owl, Gilly Howlet, Howlet, Madge Howlet, Church Owl, Hissing Owl.

Common Resident—*B.*

W. T.—1869, pp. 72, 158; 1873, p. 82; 1884, p. 224; 1896, p. 148; 1898, p. 26.

LONG-EARED OWL, *Ásio ótus* (Linnæus).

Resident, increased in autumn by migrants from the Continent —*B.*

One killed at Widemarsh, Hereford, 1878.
One shot at Lyde, 1881.—*Bull.*
Museum specimen from Wilton, Ross.
Has nested at Shobdon and Croft, and seen at Berrington.——*Williams.*

W. T.—1892, p. 381, *Ashdown.*

SHORT-EARED OWL, *Ásio accipitrínus* (Pallas).

L. N. Woodcock Owl, Short horned Howlet, Mousehawk, Hawk Owl.

A rare Resident, but increased in autumn by migrants from the Continent.
One shot at Kington.
Ross and Mordiford, 1839.
Marden, 1845. *Horne.*
One shot near Ross, 1890.—*T. Hutchinson.*

W. T.—1869, p. 78.—*Blight.* 1892, p. 381; 1894, p. 159.—*Ashdown.*

TAWNY OWL, *Sýrnium alúco* (Linnæus).
L. N. Brown Owl, Wood Owl, Hoot Owl, Ivy Owl, Jenny Howlet.

Common Resident—*B.*

W. T.—1869, pp. 72, 158; 1873, p. 82; 1884, p. 224; 1896, p. 149.

TENGMALM'S OWL, *Nyctala tengmálmi* (J. F. Gmelin).
A stuffed one without history is in the Hereford Museum.—*Bull.*
Only record. Very doubtful.

LITTLE OWL, *Athéne nóctua* (Scopoli).
L. N. Little Night Owl, Sparrow Owl.

Rare.

The Rev. F. O. Morris, in his book on British Birds, reports one specimen from Herefordshire, 1838.—*Bull.*
One specimen from Bredwardine.

W. T.—1869, p. 158.—*Blight.*

SCOPS-OWL, *Scóps giú* (Scopoli).
A pair of these birds was liberated at Fawley, 1862, but nothing more was heard of them.—*Bull.*
Only record.

Order ACCIPITRES.

Family FALCONIDÆ.

HEN-HARRIER, *Circus cyáneus* (Linnæus).

Resident, but becomes very rare—*B.*

Formerly frequented the neighbourhoods of Ross, Breinton, Monnington, and Bredwardine.
One shot at Weir End, Ross, 1873.
One taken at Whitney, 1878.—*Bull.*
One shot at Bedstone.
One seen Moccas Court.
At Llanwarne, 1854.—*Horne.*

One shot at Lewson, near Whitchurch, about 1880.—*Brown.*

W. T.—1869, p. 72.—*Ley.* p. 158.—*Blight.* 1873, p. 82.—*Middleton.* 1884, p. 224.—*Southall.*

COMMON BUZZARD, *Búteo vulgáris* (Leach).
L. N. Puttock.

Resident, becoming rare—*B.*

Bred at Bishopswood, 1881.—*Horne.* Occurred at Goodrich Castle, 1886, and at the Dowards, Penyard Wood, Ross, Peterchurch.—*Bull*

W. T.—1869, pp. 71, 72.—*Blight.* 1884, p. 223.—*Southall.* 1892, p. 381; 1894, p. 259.—*Ashdown.*

ROUGH-LEGGED BUZZARD, *Búteo lagópus* (J. F. Gmelin).

Rare autumnal Visitor.

One killed at Yatton Court, Kingsland, November, 1879.—*Pilley.*

W. T.—1884, p. 224.—*Southall.*

WHITE-TAILED EAGLE, *Haliáëtus albicílla* (Linnæus).

Rare Visitor.

A specimen was trapped at Hampton Court in the early *fifties.*—*Pilley.*
Another at Berrington, near Leominster, 1875.—*Horne.*
The Hereford Museum specimen was seen near Leominster and shot at Craven Arms, November, 1896.

W. T.—1896, p. 222.—*Ashdown.*

SPARROW-HAWK, *Accípiter nísus* (Linnæus).
L. N. Pigeon-Hawk.

Common Resident—*B.*

W. T.—1869, p. 158; 1873, p. 82; 1884, p. 224.

KITE, *Milvus ictínus* (Savigny).
L. N. Glead, Glade, Gled, Red Kite, Forked-tailed Kite or Glead, Puttock, Crotchet-tailed Puttock.

Resident, but become very rare, if not extinct, in the County—*B.*

The pair in Ludlow Museum were shot some years ago at Brampton Bryan Park, where they nested.
The last captured specimen was taken at Symonds Yat, and is in Hereford Museum.
One was also seen there in 1884.—*Bull.*
One killed at Strickstenning, Much Birch.—*Horne.*
One seen between Adzor Coppice and Lawton's Hope, August, 1899, by *J. P. Brown.*

W. T.—1869, p. 71.—*Ley.* p. 78.—*Lloyd.* 1884, p. 223.—*Southall.*

SWALLOW-TAILED KITE, *Elanoides furcátus.*

One reported to have been seen at Treago, 1854.—*Horne.*
Only record. Very doubtful.

HONEY-BUZZARD, *Pérnis apívorus* (Linnæus).

Rare Resident from May to November—*B.*

One trapped at Credenhill Camp, about 1861.
Male, killed near Ross.
Female, Newent-Wood where she nested, 3 eggs.
Three from Whitfield, 1880, where they bred.—*Bull. Horne.*
Bred at Whitfield, 1877, young birds taken and female trapped.
Bred at Bishop's Wood, Ross, 1895, eggs taken and old birds killed.—*Pilley.*
Museum specimen, Goodrich, 1879.

W. T.—1869, p. 72.—*Ley.* 1884, p. 224.—*Southall.* 1895, pp. 103, 105.—*Ashdown.* 1896, p. 111.

PEREGRINE FALCON, *Fálco peregrínus*, (Tunstall).

L. N. Hunting Hawk, erroneously Goshawk, by falconers Tiercel, (corruptly Tassel), Falcon (female), Red or Passage-hawks (immature birds), Haggard (after first moult).

Now a rare Visitor only, but formerly bred in the County.

The Hereford Museum specimens are two from Ross and two from Garnons.
One shot at Stoke Edith, 1855.
One at Alton Court, 1857.
One at Ross, 1865.
One at Leominster, 1866.
A pair seen at Letton, 1883-4.
One shot at Hill Court Ross, 1884.—*Bull. Horne.*

W. T.—1869, p. 71.—*Ley.* p. 78.—*Lloyd.* 1884, p. 224.—*Southall.* 1892, p. 381. 1895, p. 104.—*Ashdown.*

HOBBY, *Fálco subbúteo* (Linnæus).

Rare Resident from May to September—*B.*

It occurs most years at Stoke Edith.
It has been observed at Aconbury, Caplar, Haugh Wood, Bullingham, and Breinton.—*Bull.*
A pair nested on the Lever Hill, Kimbolton. They were shot, and the clutch of eggs is in the possession of *S. Hutchinson.*
A pair bred at Edvin's Wood, Bromyard, 1895.—*Blathwayt.*
There are several good county specimens in the Museum.

W. T.—1869, p. 71.—*Ley.* p. 78.—*Lloyd.* 1884, p. 224.—*Southall.* 1889, p. 338.—*T. Hutchinson.* 1892, p. 381; 1895, p. 103.—*Ashdown.*

MERLIN, *Fálco æsalon* (Tunstall).

L. N. Stone-falcon, Blue Hawk.

Rare Resident—*B.*

One killed at Kinnersley, 1845.
Seen at Llanwarne, 1858.—*Horne.*
A pair trapped at Bishopswood, 1883.—*Bull.*
One killed at Belmont, January, 1876.
One near Hereford, November, 1893.—*Pilley.*
One killed at Backney Common, near Ross, on December 18th, 1899.—*Wm. Blake.*

W. T.—1869, p. 71.—*Ley.* p. 158.—*Lloyd.* 1884, p. 224.—*Southall.* 1892, p. 381; 1895, p. 104.—*Ashdown.*

KESTREL, *Falco tinnúnculus* (Linnæus).

L. N. Windhover, Creshawk, Hoverhawk, Stannel or Stannel-hawk.

A common Resident, but becoming rarer.—*B.*

W. T.—1869, p. 158; 1873, p. 82; 1884, p. 224; 1896, p 147; 1898, p. 26.

OSPREY, *Pandion haliáëtus* (Linnæus).

L. N. Fishing Hawk, or Mullet Hawk.

A rare Visitor.

One shot at Fownhope, Oct., 1879.—*Bull. Horne.*

Only record.

Order STEGANOPODES.

Family PELECANIDÆ.

COMMON CORMORANT, *Phalacrócorax cárbo* (Linnæus).

L. N. Crested Cormorant, Corvorant, Great Black Cormorant, Cole Goose, Skart.

Occasional Visitor.

One was shot on the Wye, near Ross, 1856
One on the Lugg, near Kingsland, 1859.
On the Wye, near Hampton Bishop, 1876.
On a brook at Tarrington, 1878.
On the Lugg, near Mordiford, 1881.
The last two specimens are in Hereford Museum. *Bull. Horne.*

W. T.—1869, p. 77.—*Ley.* p. 80.—*Lloyd.* 1884, p. 226.—*Southall.*

SHAG, OR GREEN CORMORANT, *Phalacrócorax grâculus* (Linnæus).
L. N. Crested Cormorant, Crested Shag, Scart, Scarf.

Rare Visitor.

One killed on All Saints' Church, Hereford, 1876.—*Bull. Horne.*
One killed at Eardisley, February, 1898.—*Moore.*

W. T.—1892, p. 384.—*Ashdown.* 1898, p. 4.

GANNET, *Súla bassána* (Linnæus).
L. N. Solan Goose.

Rare Visitor.

One shot near Hereford, 1876.—*Pilley.*
One found at Peterchurch, and one shot by *Mr. F. R. James* near Mordiford, 1881.—*Bull. Horne.*
One picked up near Preston-on-Wye Vicarage, 1881.—*Rev. W. R. Shepherd.*

W. T.—1884, p. 226.—*Southall.*

Order HERODIONES.

Family ARDEIDÆ.

COMMON HERON, *Árdea Cinérea* (Linnæus).
L. N. Hern, Heronshaw, Heronseugh, Grey Heron.

Common Resident—*B.*

This year, 1899, the heron has nested in the following places in the county:—
Castle Green, Bredwardine, 6 nests.—*Sir George H. Cornewall.*
Garden Wood, Eywood, 3 nests.—*Lloyd.*
Small Wood, between Titley Station and Eywood, 3 nests, *ibid.*
Burfa Wood, near Knill (through which the county border runs), 4 nests, *ibid.*
The Park at Canon Frome Court, from 5 to 8 nests, and 1 other nest about 200 yards away.—*Wood.*
Letton 2 nests.—*T. Dew.*
On the island in Berrington Park Pool, 7 nests.—*C. Hill, keeper.*
W. T.—1869, pp. 160, 167*; 1873, p. 82; 1884, pp. 175, 225; 1892, 384; 1894, 258; 1898, p. 26.

SQUACCO HERON, *Árdea ralloides* (Scopoli).
L. N.—Buff-coloured Egret.
Rare Visitor.
One out of a flock of five shot at the Old Weir on the Wye, 1873.—*Bull. Horne.*
Only record.

*The Heronries of Herefordshire.

NIGHT-HERON, *Nycticorax griseus* (Linnæus).
L. N. Spotted Heron, Night Raven.

The specimen in Hereford Museum is labelled "Backney Marsh" *Bull. Horne.*

Only record.

LITTLE BITTERN, *Ardétta minúta* (Linnæus).

Rare Visitor.

One shot at Shobdon Court 1838.—*Rev. F. O. Morris "British Birds."*
The late Mr. Walcot, of Worcester, had a specimen of the male bird shot in Herefordshire.—*Bull.*

W. T.—1869, p. 80.—*Lloyd.*

COMMON BITTERN, *Botaúrus stellâris* (Linnæus).
L. N. Mire Drum, Butter-bump, Bog-bumper, Bittour, Bumpy-coss, Bull-of-the Bog, Bog-blutter, Bog-jumper.

A Resident, formerly not uncommon, but now rare, if not extinct.
The Museum specimen was shot at Eastnor Castle 1854.
Other specimens have been shot at Backney Marsh 1854, Staunton-on-Wye 1861, Staunton Common 1861, Fawley 1879, Sellack 1880, Dulas 1887, and one was seen at the Moor, Hay, 1885.—*Bull. Horne.*

W. T.—1869, p. 80.—*Lloyd.*

Order ANSERES.

Family ANATIDÆ.

WHITE-FRONTED GOOSE, *Anser álbifrons* (Scopoli).
L. N. Laughing Goose.

Occasional Visitor.

Two were shot near Ballingham, 1880.
One at Weir Cliff, on the Wye. 1885. *Bull. Horne.*

W. T.—1884, p. 225.—*Southall.* 1892, p. 384.—*Ashdown.*

BEAN-GOOSE, *Anser ségetum* (J. F. Gmelin).

Occasional Visitor. *Bull. Horne.*

Museum specimen was shot at Mordiford, 1881, by *Mr. F. R. James*

PINK-FOOTED GOOSE, *Anser brachyrhýnchus* (Baillon).
Rare Visitor.
One killed at Moccas, in the winter of 1879-80.
The Museum specimen was shot at Lugg Mills, near Hereford, 1880.—*Bull. Horne.*

BERNACLE GOOSE, *Bernícla leucópsis* (Bechstein).

Rare Visitor.

Female shot at St. Weonards. *Bull.* *Horne.*
Only record.

BRENT GOOSE, *Bernícla brenta.* (Pallas).
L. N. Black Goose, Ware Goose.

Occasional Visitor.

The Museum specimen was shot at Ross. 1882.—*Bull.* *Horne.*

W. T.—1884, p. 226.—*Southall.* 1895, pp. 103, 105.—*Ashdown.*

CANADA GOOSE, *Bernícla canadénsis.*

Two flocks of twenty and five respectively were seen at Goodrich, January, 1886, one was shot and is in the possession of Mr. W. C. Blake, Ross.—*Bull.*
Saunders says "This is a domesticated species, there is no evidence that the wild American birds visit us."

EGYPTIAN GOOSE, *Chenalópex ægyptiaca.*

One shot at Hengoed near Kington.
Two by the late Mr. Philip Morris, Hereford.
Saunders says the same about this species as the preceding one

W. T.—1869, p. 80.—*Lloyd.*

WHOOPER SWAN, *Cýgnus músicus* (Bechstein).
L. N. Hooper, Wild Swan, Whistling Swan, Elk.

Rare Visitor.

One shot near Ross 1854.—*Bull.*
A flock appeared on the Wye in the winter of 1854; five were seen at Whitney, one was shot, and is in the Hereford Museum.—*Pilley.*

W. T.—1869, p. 77.—*Ley.*

BEWICK'S SWAN, *Cýgnus bèwicki* (Yarrell).

Rare Visitor.

*One was shot near Ross 1854.—*Horne.*

W. T.—1869, p. 77.—*Ley.* 1892, p. 384.—*Ashdown.*

MUTE SWAN, *Cýgnus ólor* (J. F. Gmelin).
L. N. Tame Swan.

Occasional Visitor.—*B.*

* This appears to be the same specimen as that of the preceding species recorded by *Bull.*

COMMON SHELD-DUCK, *Tadórna cornúta* (S. G. Gmelin).
L. N. Shield or Sheld-Drake, Burrow Duck, Shel Goose, Bar Goose.

Occasional Visitor.
A male was shot on the Wye, 1877 —*Horne.*
The Museum specimens were shot, one at Moccas, 1879, and one at Whitney, 1882.—*Bull.*

W. T.—1884, p. 226.—*Southall.* 1892, p. 384.—*Ashdown.*

RUDDY SHELD-DUCK, *Tadórna casárca* (Linnæus).

Rare Visitor.

One shot at Holme Lacy, 1892.

W. T.—1892, p. 384.—*Ashdown*

Only record.

MALLARD, *Ánas bóscas* (Linnæus).
L. N. Common Wild Duck.

Resident.—*B.*

W. T.—1869, p. 160.—1873, p. 82.—1884, p. 226.—1898. p. 26.

GADWALL, *Ánas strépera* (Linnæus)
L. N. Rodge, Grey Duck.

Rare Visitor.

A specimen in the Museum probably a County one, but no history with it.—*Horne.*

Only record. Doubtful.

SHOVELER, *Spátula clypeáta* (Linnæus).
L. N. Broad-bill.

Rare Visitor.
One shot at the Mynde, 1858.
One at Leominster a few years since. *Bull.* *Horne.*

W. T.—1892, p. 384.—*Ashdown.*

PINTAIL, *Dáfila acúta* (Linnæus).
L. N. Cracker, Winter Duck.

Rare Visitor.
Three killed at Whitney, 1878, and two at the same place, 1880.—*Bull.*

W. T.—1894, p. 258.—*Ashdown.*

TEAL, *Nettion crécca* (Linnæus).

Resident, common in winter—*B.*

W. T.—1869, p. 160; 1884, p. 226.

GARGANEY, *Querquédula círcia* (Linnæus).
L. N. Summer Duck, Summer Teal, Pied Wigeon.

Rare Visitor.
One killed on the Wye between Moccas and Canon Bridge, 1882. —*Bull.*

W. T.—1892, p. 385.—*Ashdown.*

WIGEON, *Maréca penélope* (Linnæus).
L. N. Whewer, Whim.

Common Winter Visitor.

W. T.—1869, p. 160 ; 1884, p. 226 ; 1894, p. 259.

COMMON POCHARD, *Fuligula ferina* (Linnæus).
L. N. Dunbird, Red-headed Wigeon, Red-headed or eye'd Poker, Duncur.

Winter Visitor.

W. T.—1869, pp. 77, 80; 1884, p. 226 ; 1892, p. 385.

TUFTED DUCK, *Fuligula cristáta* (Leach).

Winter Visitor.

The Museum specimen came from Ross.
Two were obtained in the winter of 1879-80, one from the Lugg, near Moreton, and one from the Wye at Whitney.—*Bull. Horne.*

W. T.—1869, p. 77.—*Ley.* p. 80.—*Lloyd.* 1884, p. 226.—*Southall.* 1894, p. 258 ; 1895, p. 104.—*Ashdown.*

SCAUP-DUCK, *Fuligula marila* (Linnæus).
L. N.—Spoon-bill Duck.

Rare Winter Visitor.

Seen in the flesh at Baker's, 1855.—*Bull. Horne.*

W. T.—1892, p. 385 ; 1894, p. 258.—*Ashdown.*

GOLDEN-EYE, *Clángula glaúcion* (Linnæus).
L. N. Brown-headed Duck, Grey-headed Duck, Pied Wigeon, Golden-eyed Wigeon, Duck or Teal, Morillon, Rattlewings.

Winter Visitor.

Frequently taken in hard seasons.
Museum specimens shot at Fawley and Weobley.—*Bull. Horne.*

W. T.—1884, p. 226.—*Southall.* 1892, p. 385.—1895, p. 104.—*Ashdown.*

COMMMON SCOTER, *Œdémia nígra* (Linnæus).
L. N. Black Duck, Black Diver.

Rare Winter Visitor.

It sometimes visits the upper reaches of the Wye in Herefordshire. —*Bull.*

W. T.—1892, p. 385.—1894, p. 258.—*Ashdown.*

GOOSANDER, *Mérgus mergánser* (Linnæus).
L. N. Dun Diver, Sparling Fowl, Jacksaw, Saw-bill.

Winter Visitor to the Wye.
A pair seen near Sellack, in the winter of 1854-5.
Seen at Baker's, in Hereford, 1855.
A dead one found in the Wye near Ross, 1880.
One shot near Dinedor, 1889.—*Bull. Horne.*

W. T.—1869, p. 77.—*Ley.* 1884, p. 226.—*Southall.*

RED-BREASTED MERGANSER, *Mérgus serrátor* (Linnæus).
L. N. Red-breasted Goosander.

Rare Winter Visitor.

One shot on the Wye at Fawley, 1890.

W. T.—1892, p. 385.—*Ashdown.*

Only record.

SMEW, *Mérgus albéllus* (Linnæus).
L. N. Smee, Red-headed Smew (for young), White Nun, Lough Diver, White-headed Goosander, White Merganser.

The Museum specimen probably shot in the county.—*Horne.*
A female killed on the Weir near Ross ; this is the only authentic record.

W. T. –1895, p. 104.—*Ashdown.*

Order COLUMBÆ.

Family COLUMBIDÆ.

RING-DOVE or WOOD-PIGEON, *Colúmba palúmbus* (Linnæus).
L. N.—Ring Pigeon, Cushat, Cushie Doo, Queest or Quist.

Common Resident—*B.*

W. T.—1869, p. 160 ; 1873, p. 82 ; 1884, p. 225 ; 1896, pp. 147, 149 ; 1898, p. 26.

STOCK-DOVE, *Colúmba œnas* (Linnæus).
L. N. Stock Pigeon, Wood Pigeon, Wood Dove.

A common Resident—*B.*
W. T.—1869, p. 160; 1873, p. 82; 1884, p. 225; 1896, p. 148.

ROCK-DOVE, *Colúmba lívia* (J. F. Gmelin).
L. N. Wild Pigeon, Rock Pigeon, Wild Dove, Doo, Rockier.

Rare.

Stated by *Lloyd* to occur at Stanner Rock, Kington, but *Pilley* says he has seen the Doves at Stanner with Mr. Lloyd, and that they are Stock-Doves.
An occasional Visitor to the County.—*Southall.*

W. T.—1869, p. 80.—*Lloyd.* 1884, p. 225.—*Southall.*
Very doubtful.

TURTLE-DOVE, *Túrtur commúnis* (Selby).
L. N. Turtle, Common Turtle, Ring-necked Turtle, Wrekin Dove.

A common Resident from May to October—*B.*

W. T.—1869, p. 160; 1873, p. 82; 1884, p. 225; 1898, p. 26.

Order PTEROCLETES.

Family PTEROCLIDÆ.

PALLAS'S SAND-GROUSE, *Syrrháptes paradóxus* (Pallas).

Rare Visitor.

Mr. B. Saunders, of Kingsland, states that some years ago, probably 1888, some Sand-Grouse flew low down over his head while playing tennis. They were travelling northward.—*Williams.*

Order GALLINÆ

Family TETRAONIDÆ

BLACK GROUSE, *Tetráo tétrix* (Linnæus).
L. N. Black Cock, Black Game, Heath Cock, Heath Poult, and the female Grey Hen, Brown Hen.

Rare Resident—*B.*

Occurs at Cusop and the Black Mountains, particularly in the neighbourhood of Craswall.

It has been shot* at Stoke Edith, Hampton Court, and Shobdon.—*Bull. Horne.*

W. T.—1894, p. 259.—*Ashdown.*

* Two Blackcock were shot on Cusop Hill on September 10th, 1900.—*Rev. T. P. Powell.—T.H.*

RED GROUSE, *Lagópus scóticus* (Latham).
L. N. Red Ptarmigan, Red Game, Moor Game, Muir-fowl, Moor-bird.

A Rare Resident. Local—*B.*

Occurs on the Black Mountains and other high ground.
One was shot at Peterchurch, 1888.—*Bull. Horne.*
One was observed at Wapley Camp by *Edwards.*

W. T.—1897, p. 269.—*de Winton.*

Family PHASIANIDÆ.

PHEASANT, *Phasiánus cólchicus* (Linnæus).

A common Resident—*B.*

W. T.—1869, p. 160; 1873, p. 82; 1884, p 225; 1896, p. 148.

COMMON PARTRIDGE, *Pérdix cinérea* (Latham).
L. N. Grey Partridge.

A common Resident—*B.*

W. T.—1869, p. 160; 1873, p. 82; 1884, p. 225; 1898, p. 26.

RED-LEGGED PARTRIDGE, *Cáccabis rúfa* (Linnæus).
L. N. French Partridge, Guernsey Partridge.

An introduced species, and now a Resident—*B.*

A few have been shot in the County generally near the Gloucestershire border.
A brace were shot at Munderfield, Bromyard, Oct. 1897.—*Blathwayt.*
The Museum specimens came from Eaton Bishop and Fawley. *Bull. Horne*

W. T.—1884, p. 225.—*Southall.*

QUAIL, *Cotúrnix commúnis* (Bonnaterre).

A rare Resident from spring to October, and occasionally all the year—*B.*
A few are shot most years—*Horne.*
Very numerous in the spring of 1893—*Pilley.*

W. T.—1892, p. 382.—*Ashdown.*

Order GRALLÆ.

Suborder FULICARIÆ.

Family RALLIDÆ.

LAND-RAIL, *Crex praténsis* (Bechstein).
L. N. Corn Crake, Meadow Crake, Dakerhen.

Resident and Common from April to October—*B.*

W. T.—1869, p. 160; 1873, p. 82; 1898, p. 26.

SPOTTED CRAKE, *Porzána maruétta* (Leach).

An Occasional and Local Resident from May to October.

Mostly met with in the Lugg district.—*Bull. Horne.*
Two shot on the Wye, near Hereford, October, 1875.—*Pilley.*

WATER-RAIL, *Rallus aquáticus* (Linnæus).

L. N. Bilcock, Skiddy-cock, Runner, Brook-runner, Velvet-runner.

Resident.

W. T.—1869, pp. 80, 160.

MOOR-HEN, *Gallínula chlóropus* (Linnæus).

L. N. Water-hen, Gallinule, Moat Hen, Marsh Hen.

A common Resident—*B.*

W. T.—1869, p. 160; 1873, p. 82; 1896, pp. 147, 148.

COOT, *Fúlica átra* (Linnæus).

L. N. Bald Coot.

Resident, generally distributed, local—*B.*

Occurs on ponds at The Mynde, Berrington, Shobdon, and The Moor, near Hay, at all of which places it breeds—*Bull. Horne.*

Found a nest with 8 eggs at Rotherwas Pool, May, 1872.—*Pilley.*
The Moat, Whitbourne Court, August, 1896.—*Blathwayt.*

W. T.—1869, p. 160.—*Blight.* 1873, p. 82.—*Middleton.* 1896, p. 148.—*Williams.*

Suborder OTIDES.

Family OTIDIDÆ.

LITTLE BUSTARD, *Otis tétrax* (Linnæus).

Rare Visitor.

The Museum specimen came from the collection of the late Mr. Moss, who stated that it was shot in the neighbourhood of Dorstone.—*Bull. Horne.* The only record.

Order LIMICOLÆ.

Family ŒDICNEMIDÆ.

STONE-CURLEW, *Œdicnémus scólopax* (S. G. Gmelin).

L. N. Thick-knee, Great Plover, Norfolk Plover, Whistling Plover, Stone Plover.

Rare Visitor.

One killed at Lyde 1854—*Bull. Horne.*
And another killed at Lyde 27th November, 1894.—*Pilley.*

Subfamily GLAREOLIDÆ.

PRATINCOLE, *Gláreola pratíncola* (Linnæus).

L. N. Collard Pratincole, Austrian Pratincole.

Rare Visitor on migration during spring and autumn.

The Museum specimen was shot at Fownhope, 1834. *Bull. Horne*

Only record.

Subfamily CURSORIINÆ.

CREAM-COLOURED COURSER, *Cursórius gállicus* (J. F. Gmelin).

Rare Visitor.

The Museum specimen was shot at Backney Marsh, near Ross, 1854. *Bull. Horne.* The only record.

Family CHARADRIIDÆ.

DOTTEREL, *Endrómias morinéllus* (Linnæus).

L. N. Dottrel or Dotterel Plover, Foolish Dottrel.

Rare Visitor.

The Museum specimen was killed at Backney Marsh, Ross. A flock were seen at Letton, 1878.—*Bull.* (There is no specimen in the Museum, probably mistaken for next species).

One specimen shot about 1890, and afterwards seen and identified; it was shot on the Black Mountains, on the borders of Herefordshire and Monmouthshire.—*Watkins.*

RINGED PLOVER, *Ægialítis hiaticola* (Linnæus).

L. N. Stone-hatch or Sand-lark, Ringed or Ring Dotterel.

Rare Visitor.

The Museum specimen killed at Backney Marsh, near Ross.—*Horne.* The only record.

GOLDEN PLOVER, *Charádrius pluviális* (Linnæus).

L. N. Yellow Plover, Green Plover, Whistling Plover.

Rare as a Resident; more frequently as a Visitor—*B.*
Small flocks may occasionally be seen on the Black Mountains.—*Bull. Horne.*
Some seen on the banks of the Wye, Whitchurch, August, 1899.—*Brown.*

W. T.—1892, p. 382.—*Ashdown.* 1897, p. 269.—*de Winton.*
Note.—A pair seen Lower Lugg Meadows, Lugwardine, April, 1900.—*James.*

GREY PLOVER, *Squatárola helvética* (Linnæus).

Occasional Visitor.

Two were shot on Lugg Meadows, near Hereford, 1878.
One at Bacton and two at Old Castle, 1880.
The two Museum specimens were shot at Sugwas, 1882.—*Bull. Horne.*

LAPWING, *Vanéllus vulgáris* (Bechstein).

L. N. Pewit or Peewit, Te-wit, Teu-fit, Green Plover, Bastard Plover, Green Lapwing, Crested Lapwing.

Common Resident—*B.*

W. T.—1869, p. 160; 1873, p. 82; 1884, p. 225; 1898, p. 26.

TURNSTONE, *Strépsilas interpres* (Linnæus).

L. N. Hebridal Sandpiper.

Rare Visitor.

The Museum specimen is labelled, "Backney Marsh, 1859."—*Bull. Horne.*

Only record.

OYSTER-CATCHER, *Hæmátopus óstralegus* (Linnæus).

L. N. Pied Oyster-catcher, Shelder, Sea-Pie, Olive.

Occasional Visitor to the banks of the Wye and Lugg.—*Bull. Horne. Pilley.*

GREY PHALAROPE, *Phalaropus fulicárius* (Linnæus).

L. N. Red Phalarope.

Occasional Visitor.

One shot at Allensmore, 1847.
One at Backney Bridge, 1881.
One in the Lugg Meadows, Hereford, 1885.—*Bull. Horne.*
One at Preston-on-Wye, 1886.—*Pilley.*

W. T.—1884, p. 226.—*Southall.* 1892, p. 383.—*Ashdown.*

WOODCOCK, *Scólopax rusticula* (Linnæus).

Common Resident from October to March, and occasionally all the year round—*B.*

Has nested at Ocle Coppice, Gatley, and woods near Shobdon.—*Williams.*

W. T.—1869, p. 160; 1873, p. 82.

GREAT SNIPE, *Gallinágo major* (J. F. Gmelin).

L. N. Great, Double, or Solitary Snipe.

Rare Visitor.

Seen at Rotherwas in 1886 and 1887.—*Horne.*

COMMON SNIPE, *Gallinágo cœléstis* (Frenzel).

L. N. Whole Snipe, Snite, Heather-bleater.

Common Resident from October to March, and occasionally all the year round—*B.*

Breeds in the Golden Valley and near Kington.—*Bull. Horne.*
Also near Haywood Forest. Birds have been seen there in May.—*Pilley.*
Also in Shobdon Marshes and Coombe.—*Williams.*

W. T.—1869, p. 160; 1873, p. 82.

JACK SNIPE, *Gallinágo gallínula* (Linnæus).

L. N. Judcock, Half Snipe.

Common Resident from September to April.

W. T.—1873, p. 82.

DUNLIN, *Tringa alpina* (Linnæus).

L. N. Dunlin Sandpiper, Purre, Churr, Stint, Oxbird, Sea-Snipe, Least Snipe, Sea-Lark.

Winter Visitor to the Lugg and Wye.—*Bull. Horne.*

W. T.—1884, p. 225.—*Southall.* 1895, p. 105.—*Ashdown.*

KNOT, *Tringa canútus* (Linnæus).

Rare Visitor from August to May.

One was killed at Dewsall, 1879.
One met with at Llanwarne, 1883.—*Bull.*
One found in a field at Newcourt, 1884—*Horne.*

RUFF, *Machétes púgnax* (Linnæus).

L. N. Reeve (female).

Rare Visitor.

A pair killed at Colwall, 1890.
One taken at Garnstone, 31st August, 1894.

W. T.—1892, p. 386; 1894, p. 258.—*Ashdown.* 1896, p. 111.

COMMON SANDPIPER, *Tótanus hypoléucus* (Linnæus).

L. N. Summer-Snipe, Willy Wicket, Sand-Lark.

Common Resident from April to September—*B.*

W. T.—1873, p. 82; 1884, p. 225; 1896, p. 146.

GREEN SANDPIPER, *Tótanus óchropus* (Linnæus).

Resident.

Reported to have bred at Kington, 1886 and 1887.

One shot at Fawley, and another at Brampton Brian about twenty years ago.—*Bull. Horne.*
One shot by the late Mr. C. Hatton.
A female shot at Eaton Bishop, Nov., 1889.
A specimen seen Nov., 1898, and another on the Lugg, near Aqueduct, May, 1899.—*Pilley.*
Occurs on the Lugg and Arrow, near Kingsland, where there is good reason to believe it nests.—*Williams.*

W. T.—1892, p. 383; 1894, p. 258; 1895, p. 105.—*Ashdown.*

COMMON REDSHANK, *Tótanus cálidris* (Linnæus).
L. N. Redshank, Sandpiper, Teuke, Pool Snipe, Sand Cock, Red-legged Horseman, Red-legged Sandpiper.

Rare Visitor.

The Museum specimen was shot on the Wye at Ruckhall, 1830.—*Bull. Horne.*
One at Monkland, 1879.—*Pilley.*

W. T.—1873, p. 82.—*Middleton.*

SPOTTED REDSHANK, *Tótanus fúscus* (Linnæus).
L. N. Spotted Snipe, Dusky Sand-piper, Black-headed Snipe, Courand Snipe.

Rare.

One reported to have been killed at Monkland, 1881.—*Bull.*
Only record.

GREENSHANK, *Tótanus canéscens* (J. F. Gmelin).
L. N. Cinerous Godwit, Green-legged Horseman.

Occasional Visitor.

Has occurred at Castleton, 1879; Aymestrey, 1880; Caplar, 1880; Weir End, Ross, 1886.—*Bull. Horne.*

BAR-TAILED GODWIT, *Limósa lappónica* (Linnæus).
L. N. Common Godwit, Grey Godwit, Red Godwit, Godwit Snipe, Red-breasted Snipe.

Rare Visitor.

One shot at Mordiford, 1839.
Museum Specimen shot at Carey Island, 1879. *Bull. Horne.*

BLACK-TAILED GODWIT, *Limósa bélgica* (J. F. Gmelin).
L. N. Red-Godwit Snipe, Jadreka Snipe, Red-Godwit, Yarwhelp Yarwhip, Shrieker.

Rare Visitor.

Museum specimen shot on the Lugg, 1876. *Bull.*
Only record.

COMMON CURLEW, *Numénius arquáta* (Linnæus).
L. N. Whaup.

Local Resident during the breeding season—*B.*

It visits the Black Mountains and the neighbourhood of Kington.—*Bull. Horne. Pilley.*
Also Wapley Camp.—*Edwards.*
A pair seen and heard at Lewson, Whitchurch, about 1885.—*Brown.*
A pair nested at Shobdon, and another pair at Aymestrey, 1899—*Williams.*

W. T.—1892, p. 382; 1895, p. 154.—*Ashdown.*

WHIMBREL, *Numénius phæopus* (Linnæus).
L. N. Whimbrel-Curlew, Curlew-Jack, Curlew-knot, Half-Curlew, Jack-Curlew, Stone-Curlew, Tang-whaup, May-bird.

Rare Visitor.

One shot at Holme Lacy, 1880.
Museum specimen shot on the Lugg, 1881.—*Bull. Horne.*

Order GAVIÆ.

Family LARIDÆ.

Subfamily STERNINÆ.

BLACK TERN, *Hydrochelidon nigra* (Linnæus).
L. N. Blue Darr, Car-Swallow.

Rare Visitor.

A specimen shot on Mynde Pool, 1859.—*Bull. Horne.*
Only record.

SANDWICH TERN, *Stérna cantíaca* (J. F. Gmelin).

Rare Visitor.

A specimen picked up at Ross, 1886.—*Bull. Horne.*

W. T.—1884, p. 226.—*Southall.*

COMMON TERN, *Stérna fluviátilis* (Naumann).
L. N. Sea-Swallow, Tarney or Pictarney, Tarrock, Pirr, Gull teazer, etc.

Occasional Visitor.

Observed 1889, *Horne.*
One shot near Hereford, November, 1893.—*Pilley.*
One shot at Preston on-Wye, September, 1896.—*Moore.*

W. T.—1869, p. 80.—*Lloyd*; p. 160.—*Blight*; 1884, p. 226,—*Southall*; 1892, p. 383,—*Ashdown.*

LITTLE TERN, *Sterna minuta* (Linnæus).
L. N. Lesser Tern, Lesser Sea Swallow.

Rare Visitor.
One shot at Marden, 1869.—*Bull. Horne.*
One killed by telegraph wires, near Hereford, 1876. *Pilley.*
W. T.—1869, p. 80.—*Lloyd*; 1884, p. 226.—*Southall.*

SOOTY TERN, *Sterna fuliginosa* (J. F. Gmelin).

Rare Visitor.

One killed at Marston, near Pembridge, 1885.—*Bull.*
Only record.

BLACK-HEADED GULL, *Larus ridibundus* (Linnæus).
L. N. Brown-headed Gull, Red-legged Gull, Laughing Gull. Pewit Gull, Black-cap, Sea Crow, Hooded Mew.

Occasional Visitor.
One killed in county, 1876.—*Bull.*
One shot in county, 1889.—*Horne.*
Occasionally forwarded.—*Ashdown.*
W. T.—1869, p. 160.—*Blight.* 1884, p. 226.—*Southall.* 1892, p. 383; 1894, p. 258.—*Ashdown.*

COMMON GULL, *Larus canus* (Linnæus).
L. N. Winter Mew, Sea Mew, Sea Mall or Maw, Sea Gull, Sea Cob, Cob.

Frequent Visitor, especially in the Wye Valley, during spring and autumn.—*Bull. Horne.*
W. T.—1884, p. 226.—*Southall.* 1892, p. 383.—*Ashdown.*

LESSER BLACK-BACKED GULL, *Larus fuscus* (Linnæus)
L. N. Yellow-legged Gull.
Occasional Visitor.
One shot on the Lugg at Sutton, 1879.—*Horne.*
A pair visited the Wye between Rotherwas and Holme Lacy for the last three years (1888).—*Bull.*
One shot at Dinedor, 1892.
W. T.—1892, p. 383; 1894, p. 259.—*Ashdown.* 1897, p. 269 *de Winton.*

GREAT BLACK-BACKED GULL, *Larus marinus* (Linnæus).
Rare Visitor.
* One shot on the Lugg, at Sutton, 1879. Rarely visits Herefordshire, but has been seen here on many occasions.—*Bull.*
W. T.—1884, p. 226.—*Southall.*
Only record.

* NOTE.—This was probably the preceding species.

KITTIWAKE GULL, *Rissa tridactyla* (Linnæus).
L. N. Tarrock, Annet.

Occasional Visitor.

One picked up at Eardisley, 1866.

One shot at Venwood, December, 1887.—*Bull. Horne.*

Several picked up dead, 1879.—*Pilley.*

W. T.—1869, p. 80.—*Lloyd.* 1884, p. 226.—*Southall.* 1892, p. 383, *Ashdown*

Family STERCORARIIDÆ.

POMATORHINE SKUA, *Stercorarius pomatorhinus* (Temminck).

Rare Visitor.

Museum specimen was killed at Foxley, 8th August, 1882. *Bull. Horne.*

W. T.—1884, p. 226.—*Southall.*

Only record.

ARCTIC OR RICHARDSON'S SKUA, ‡ *Stercorarius crepidatus*, (J. F. Gmelin)
L. N. Arctic Gull, Black-toed Gull.

Rare Visitor.

One shot at Staunton Park, September, 1869.—*Bull. Horne.*

One shot at Street Court.—*Williams.*

Order ALCÆ.

Family ALCIDÆ.

Subfamily FRATERCULINÆ.

PUFFIN, *Fratercula arctica* (Linnæus).
L. N. Sea-Parrot, Coulterneb, Tammy Norie.

Rare Visitor.

Museum specimen killed with a whip on the road between Woolhope and Hereford, June, 1876.—*Bull. Horne.*

W. T.—1892, p. 384.—*Ashdown.*

‡ An immature specimen was captured near Hereford, and taken *alive* to Mr. James B. Pilley on 28th September, 1900.

Order PYGOPODES

Family COLYMBIDÆ.

GREAT NORTHERN DIVER, *Colymbus glaciális* (Linnæus).
L. N. Greatest Speckled Diver, Great Doucker, Immer, Immer Diver.

Rare Visitor.

A female shot on the Wye, near Ross, 1867.—*Bull. Horne.*
One taken at Peterchurch, 1880.—*Pilley.*
Two Museum specimens, one found near Clifford, one shot at Holme Lacy.

BLACK-THROATED DIVER, *Colymbus árcticus* (Linnæus).
L. N. Lumme, Northern Doucker, Speckled Loon.

Rare Visitor.

One caught at Kinnersley, 1891.

W. T.—1892, p. 384.—*Ashdown.*
Only record.

RED-THROATED DIVER, *Colymbus septéntrionális* (Linnæus).
L. N. Rain Goose, Cobble, Sprat-borer, Spratoon, Speckled Diver.

Occasional Visitor.

Frequents the Wye, particularly in the neighbourhood of Ross.
The three Museum specimens were taken, one in the winter of 1894-5, and the other two were shot on the Weir Cliff, Ross, in the winter of 1879-80.—*Bull. Horne.*

W. T.—1869, p. 77.—*Ley.* 1884, p. 226,—*Southall.*

Family PODICIPEDIDÆ.

GREAT CRESTED GREBE, *Podícipes cristátus* (Linnæus).
L. N. Cargoose, Loon, Greater Loon, Tippet Grebe, Gaunt, Mulrooken.

Occasional Visitor.

The Museum specimen was shot near Ross, 1852.
Two fine specimens were shot at Shobdon, 1880.
And a young bird was killed on the Wye at Wilton, Dec., 1881.—*Bull. Horne.*

W. T.—1884, p. 226.—*Southall.* 1892, p. 384.—*Ashdown.*

RED-NECKED GREBE, *Podícipes griseígena* (Boddaert).

Rare Visitor.

A specimen was shot on the Wye, 1881.—*Horne.*

W. T.—1884, p. 226.—*Southall.* 1895, p. 104.—*Ashdown.*

SLAVONIAN or HORNED GREBE, *Podícipes aurítus* (Linnæus).
L. N. Dusky Grebe.

Rare Visitor.

The Museum specimen is labelled " Hereford, 1849."

W. T.—1895, p. 104.—*Ashdown.* 1896, p. 111.

BLACK-NECKED or EARED GREBE, *Podícipes nigricóllis* (C. L. Brehm).

Rare Visitor.

The Museum specimen was shot on the Wye, near Stretton Sugwas, 1879.—*Bull.*
Only record.

LITTLE GREBE, *Podícipes fluviátilis* (Tunstall).
L. N. Dabchick or Dobchick, Didapper, Small Ducker, Blackchin Grebe.

Common Resident—*B.*

W. T.—1869, p. 160; 1873, p. 82; 1895, p. 104.

Order TURBINARES.

Family PROCELLARIIDÆ.

STORM-PETREL, *Procellária pelágica* (Linnæus).
L. N. Mother Carey's Chicken, Devil's Bird, Witches.

Occasional Visitor.

One shot at Shobdon, 1867.
One killed at Foy, 1877.—*Bull. Horne.*

W. T.—1869, p. 80.—*Lloyd.* 1884, p. 226.—*Southall.*

LEACH'S FORK-TAILED PETREL, *Oceanódroma leucorrhóa* (Vieillot).

Rare Visitor.

The Museum specimen was picked up at Dewsall in the winter of 1880.—*Bull. Horne.*

W. T.—1884, p. 226.—*Southall.*

Family PUFFINIDÆ.

MANX SHEARWATER, *Puffinus anglórum* (Temminck).
L. N. Shearwater Petrel, Manx Puffin, Cuckle, Skidden, Crew.

Occasional Visitor.
One taken at Peterstow and one at Woolhope.—*Bull. Horne.*
One caught at Dewsall, September, 1882; and one at Yatton Court, Kingsland, 1883.—*Pilley.*

The Museum specimen (a female) was found in Whitecross Road, Hereford, August, 1889.

W. T.—1869 p. 77.—*Ley.* 1884, p. 226.—*Southall.* 1892, p. 383.—*Ashdown*

FULMAR, *Fúlmarus glaciális* (Linnæus).
L. N. Fulmar Petrel, Northern Fulmar.

Rare Visitor.

The Museum specimen was caught alive, at Pontrilas, October 1889.

W. T.—1884, p, 226.—*Southall.* 1892, p. 384.—*Ashdown.*

ADDENDUM.

PHAETHON AETHEREUS, a Tropic-bird (a species of *Pelicanidæ)* is said to have been found dead in Herefordshire more than forty years ago (*J. H. Gurney*, Tr. Norfolk Soc., v., p. 659.—*Saunders.*

ERRATA.

Page 200, line 7 from the bottom, for Bramblin read Brambling.

Page 221, line 15, for Endromias read Eudromias.

HEREFORDSHIRE BIRDS.

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HEREFORDSHIRE BIRDS.

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TO THE

TRANSACTIONS OF THE WOOLHOPE CLUB

FOR THE YEARS 1898 AND 1899.

Field Meetings

AND DATES OF ANNUAL MEETINGS, 1898, 1899.

1898.

February 22nd.—Annual Spring Meeting.
May 27th.—Presteign, for Stapleton, Kinsham, and Aymestrey.
June 30th.—Llanigon, *vid* Llanthony and Capel-y-ffin.
July 28th.—Ladies' Day, Gloucester Cathedral, Tewkesbury Abbey, and Malvern Priory.
August 30th.—The Southern end of the Malvern Range.
December 22nd.—Annual Winter Meeting.

1899.

April 13th.—Annual Spring Meeting.
May 25th.—Much Marcle, Putley, "The Wonder" Landslip, Stoke Edith Park, Tarrington.
June 27th.—Symonds Yat, The Caves, and The Doward Hills.
July 27th.—Ladies' Day, Hay, Cusop, and The Black Mountains.
August 29th.—Elan Valley—The Birmingham Water Supply Works.
December 15th.—Annual Winter Meeting.

List of Meetings.

1898, 1899.

(*Arranged Alphabetically.*)

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TWO NEW HIERACIUM FORMS.

By the Rev. Augustin Ley. M.A.

Hieracium cæsium Fr., var. coracinum, nov. var. Original root-leaves rounded, later elliptic and elliptic-lanceolate; these latter acute or acuminate, with pointed teeth, the blade *shortly decurrent*, with 2–4 larger ascending teeth at base; all bright *yellow-green*, lighter beneath, firm in texture. Stem 6–15 in., leafless or with one nearly linear leaf, slightly tomentose, with short white soft hair, branched only at summit. Heads 4–8, on short spreading and ascending peduncles. Bud oval, its phyllaries bending over so that their tips touch at a very acute angle, not tucked in as in ordinary *H. murorum* L. pt. Peduncles with rather dense white tomentum and a few setæ. Phyllaries densely clothed with long white black-based hairs and very few setæ, subobtuse; the shorter outer ones very few. Ligules rather broad, full yellow, their tips naked or almost so, in bud. Style rather dark.

Differing from typical *H. cæsium* Fr. (which grows in the same locality) in the light yellow-green of its leaves, with blade decurrent and deeply toothed at its base; in the compact corymb of subumbellate heads, and in the very hairy phyllaries.

Loc. Craig Gledsiau, Brecon Beacons (sandstone), scattered over the cliff, alt. 1500–1800 ft., but not abundant. First observed in 1895, and cultivated since that date.

In cultivation the peduncles lengthen, and the leaves develop more of their characteristic toothing.

Hieracium sciaphilum Uechtr., var. pulchrius, nov. var. Stem about 1 ft., *bearing 2–3 leaves, stout, erect*, shaggy at base, with long white hairs. Root-leaves *obovate, coarsely toothed* with shallow teeth, *obtuse;* petioles and back of the midrib shaggy like the base of the stem. Stem-leaves elliptic or the uppermost ovate, toothed as those of the root, somewhat acute. Corymb *subumbellate;* peduncles straight, floccose but not hairy, beset, as are the dark phyllaries, with numerous setæ. Ligules naked-tipped, style not quite pure yellow. Pappus tinged with reddish brown.

Differing conspicuously from the type in the shorter, stouter, less leafy stem; obovate, coarsely toothed leaves; subumbellate heads with brownish pappus; and darker phyllaries with longer setæ. Growing with the type, but quite distinct, and showing no intermediate forms. In cultivation, during a series of years, it has preserved its distinctness.

This plant seems to be quite intermediate between typical *H. sciaphilum* Uechtr. and *H. murorum* L. pt. var. *pulcherrimum* (differing, however, from both in the colour of the pappus): hence the varietal name seemed appropriate, as at once marking the

handsome appearance of the plant, and suggesting a passage to *H. pulcherrimum*.

Hab. Mountain cliffs on sandstone and limestone.

Loc. Breconshire: Craig Du and Craig Gledsiau (sandstone), abundantly; Summit Crag, Brecon Beacons; Craig Cille (limestone). Carmarthenshire: Cliffs of Llyn-y-fan-fechan (sandstone). All these cliffs have a northern aspect. First observed in 1895.

[*Reprinted from the* 'JOURNAL OF BOTANY' *for January*, 1899.]

Reprinted from the 'JOURNAL OF BOTANY' *for January*, 1900.

SOME WELSH HAWKWEEDS.

BY REV. AUGUSTIN LEY, M.A.

THE following descriptions of *Hieracium* forms appertain to plants which I have been able to study for some years, and are published on my own sole responsibility. I have personally had no opportunity of submitting either the plants or the descriptions to continental authorities; and, although I have naturally brought them before one or two of the leading students of this genus in England, and have received suggestions of much value from their kind criticism, corrections or alterations, if found necessary, must entail responsibility on no one but the author of this paper.

1. HIERACIUM MURORUM L. ex parte, var. LUCIDULUM, nov. var. Very near to *H. murorum* var. *pellucidum* Laestad., but differing constantly from it in the following particulars:—Stem shorter (about 1 ft.); root-leaves of a fuller, less yellow-green, shining, often purple in exposure, veins less impressed on the upper and far less prominent on the under surface, shortly elliptic or roundly ovate, often deeply cordate and toothed at base, and (except at base) almost entire; spreading horizontally. Heads smaller, on shorter, more spreading peduncles, often forming a somewhat umbellate head; ligules shorter, style darkened. Fresh pappus pure white. Stem with a single leaf, which is ovate-acute, rather long-stalked, often placed low on the stem, or 0.

Mountain rocks and banks, not in the lowlands; common in South Wales. June.

Localities.—Herefordshire: Red Daren and Olchon Daren, in the Hatterel Hills. Monmouthshire: Daren-r-Esgob, Black Mountain. Breconshire: Common on all the mountain rocks, both on the limestone and sandstone; river-side rocks, Glyn Taf-fechan. Carmarthenshire: Cliffs of Llyn-y-fan-fechan; river-side rocks near Llangadoc. Carnarvonshire: Nant Francon. Westmoreland: Ambleside, 1870, *Rev. E. F. Linton*!

Often growing in company with var. *pellucidum* Laestad., but keeping quite distinct from it in the characters noted above. Cultivated along with it for six or seven years, it has retained its characters perfectly. I have endeavoured to indicate its relation to var. *pellucidum* Laestad. in the choice of a varietal name.

Sent out by me through the London Bot. Exchange Club in 1896, from Llangadoc, as var. *pellucidum* Laestad.

Specimens of this plant in Mr. Hanbury's herbarium from several of the above localities have been named var. *pellucidum*

Laestad. by Dr. Elfstrand; but, after watching the two for a series of years, I feel sure that they are distinct.

2. H. MURORUM L. ex parte, var. SANGUINEUM, nov. var. Foliage light green, the older root-leaves becoming blood-red underneath. *Stem-leaf 0*, or reduced to a narrow bract. Root-leaves oval or elliptic or long-elliptic, *nearly smooth on both surfaces*, the base emarginate with one or two backward teeth (later leaves on vigorous plants sometimes with conspicuous forward teeth), the two sides of the blade often unequal at base, the margins bearing small teeth which are often reduced to points, the tip similar, or *shortly acuminate in the inner leaves*.

Stem 12–15 in., nearly smooth, *conspicuously* furrowed when dry, branched from above the middle, the main branches straight. Primary flower short-stalked, soon overtopped by the secondaries with curved pedicels. Peduncle and phyllaries setose, the *latter bearing abundant* black-based *greyish hair* and loose tomentum, especially on the conspicuous white margins; tip incurved in bud. Anthode *semiglobose on opening*. Ligules, at least occasionally, ciliate at tip. Style not quite pure yellow.

Standing well away from the type, and from other common varieties of *H. murorum*, in the broad, semiglobose anthode, and the very hairy phyllaries; but agreeing with the type in the incurved tips of the phyllaries in bud, and in the curved pedicels.

The smooth, light-green leaves, with the teeth often obsolete, and the acuminate point are conspicuous features. I have never seen a stem-leaf.

Bot. Exch. Club Reports for 1893 (as *H. cinerascens* Jord.), p. 418, and 1897 (as *H. murorum* var. *caliginosum* Dahl. ?), p. 555: where see opinions.

Localities.—Yorkshire: Limestone pavements at Malham Cove, 1888; Smearsett and Moughton Scar, near Settle, 1891; Ingleborough, 1891; all *F. J. Hanbury*! Breconshire: abundant on shaded and exposed limestone rocks at the head of Dyffryn Crawnon, alt. 1450–1500 ft., 1892 and subsequently; central cliff of the Brecon Beacons, on sandstone.

Under cultivation it has retained its characters unchanged for seven years.

3. **H. vagense**, sp. nov. *H. britannicum* F. J. Hanb. var. *vagense* F. J. Hanb. in Journ. Bot. 1892, 367. As this plant seems acknowledged to be misplaced under *H. britannicum* (see Bot. Exchange Club Report, 1896, p. 523), it seems better to write a short description, giving it rank as a separate species. Its place in our list appears to be near to *H. cæsium* Fr., and perhaps next to *H. cambricum* F. J. Hanb.

Stem *slender, drooping*, 1 ft. to 18 in., *light glaucous green*, as is also the foliage, with a single leaf or 0, branching from the middle or at top, with few large heads of flower.

Root-leaves long, narrowly oval or elliptic, *narrowed at base into long petiole*, ascending, upper surface smooth, under strigose with long stiff white hairs, acuminate, the margins bearing *many long acuminate*

very unequal teeth, which are often *continued down the petiole nearly to its base*. Stem-leaf similar, or narrower and linear. *Midrib and main veins of all the leaves pellucid*.

Stem with sparse white hairs, tomentose above, branches long, ascending. Peduncles and pedicels bearing setæ which are light-coloured in the living plant. Phyllaries light green, with many setæ and black-based hairs. Bud ovate then oblong, thick; anthode ovate after flowering. Phyllaries at first loosely incurved, *erect in bud*, tips nearly naked. Heads of flower *large, handsome*, flat on opening, ligules long. Style yellow. Latter half of June.

Very similar in general appearance to *H. cambricum* F. J. Hanb., but larger in all its parts, more hairy and glandular, less intensely glaucous, and with the leaf-teeth strikingly fringing the petiole.

Growing and increasing by seed readily in garden soil. In cultivation this plant retains all its characteristics, and does not change, except to assume a somewhat larger size, and exaggerate the peculiar toothing of the leaves.

On river-side rocks in the valley of the Wye, between Builth and Three Cocks Junction, chiefly near Errwood, in Breconshire and Radnorshire.

First noticed in 1883: cultivated by me since that date.

4. H. VULGATUM Fr. var. MUTABILE, nov. var. Stem 1–2 ft., erect, with 1–4 leaves (usually 2), bearing long stiff white hair on the lower half, slender setæ and tomentum on the upper, the hair lessening upwards, the setæ and tomentum downwards.

Root-leaves several, *spreading horizontally*, long-stalked, elliptic, flat, rather obtuse, narrowed into petiole, greyish green on both sides, with very small shallow teeth. Petiole and both sides of leaf strigose, like base of stem, with stiff white hairs. Stem-leaves similar to the root-leaves, but with less hair, more deeply toothed, and less narrowed into petiole; *1–4, or reduced to 1 or 2 small bracts*, the lowest usually *placed low on the stem*, decreasing in size upwards.

Panicle usually branched, with long ascending branches, the branches 1–3-flowered. Peduncles clothed with sparse white tomentum and black-headed setæ. Phyllaries *without micro-glands*, bearing setæ but scarcely tomentum except at base, acute, some of the *outer ones loose with ascending points*, incurved in bud, with white tips. Buds thick, shortly cylindrical; heads of flower rather small. Style nearly pure yellow.

Best placed as a var. under *H. vulgatum* Fr., this plant nevertheless presents an extraordinary range of variation, which naturally led me, on first studying the wild plant, to suspect a mixture of several species. Further study led me to attribute all the forms to a single species, a conclusion which cultivation has abundantly confirmed. Very small forms with a single stem-leaf from dry mountain banks have become in ordinary garden soil in two years large branching plants 4 ft. high, bearing five stem-leaves and numerous branches. Other forms, simulating *H. murorum* L., when similarly treated, quickly become indistinguishable from these: the plant therefore in this respect presenting a marked

contrast to most of the forms in this genus. The hair, under cultivation, becomes less, and the toothing of the stem-leaves exaggerated.

In comparison with *H. sciaphilum* Uechtr., the leafy-stemmed forms of this plant have shorter, more elliptic leaves, those of the root usually arranged in a conspicuous flat rosette, the hair stiffer, the anthode thicker, the hair and floccum of the phyllaries less in quantity, the style nearly pure yellow.

Mountain banks, hedge-banks, railway and colliery *débris*, &c., in mountain districts; common, at least in South Wales.

Localities.—Breconshire: Abundant on the upper part of the Towy and its tributaries (first noticed in 1890); hedge-bank, Llanwrtyd; bank near Abergwesyn (passed by Dr. Lindeberg as *H. rigidum* Hartm. var. *latifolium*); gravel of stream, Cellwen; colliery *débris*, Ystrad-gynlais. Carmarthenshire: Hedge-banks, Nantymwyn; dry mountain banks on the Upper Towy; hedge-bank near Llandebie. Glamorganshire: Bank, Pont-nedd-fechan. Cardiganshire: Mountain banks on the Upper Towy; Cwm Twrch.

Sent to the London Botanical Exchange Club from hedge-banks at Nantymwyn as *H. murorum* L. ex parte, var. *ciliatum* (see *Report*, 1896, p. 523); and from dry mountain banks in the same neighbourhood, without a name (see *Report*, 1897, p. 556).

5. H. VULGATUM Fr. var. AMPLIFOLIUM, nov. var. Tall, stem 2–3 ft., *erect*, sometimes branched from near base; flowers few, rather large; foliage *soft*, *light green*.

Root-leaves long-stalked, *large*, oblong or oblong-obovate, *rounded and very obtuse*, with very shallow teeth often reduced to mere points, thin, strigose on both sides, with rather stiff white hairs. Stem-leaves 4–5, large, the upper gradually more shortly stalked and smaller, hairy beneath, nearly smooth above, with *large triangular teeth*, acute.

Stem bearing long white hair and setæ, which are rather numerous under and on the base of the phyllaries. Bud shortly oval, then oblong; anthode after flowering ovate. Phyllaries with many black and few white hairs, light green with darker centre, floccose at tip. Heads of flower flat on opening; ligules *very full yellow*; styles *slightly darkened*.

Near var. *glaucovirens* Dahl., but differing from it in the tall erect habit, closer heads with shorter peduncles, oblong very obtuse root-leaves, soft light and bright green foliage, and darkened style.

From *H. sciaphilum* Uechtr. it is distinguished by its obtuse oblong root-leaves, larger and less numerous stem-leaves, which bear larger triangular teeth, and white-haired peduncles, and by the less numerous and less black setæ of peduncles and phyllaries.

Hilly banks, on limestone and sandstone; also on mountain rocks.

Localities.—Herefordshire: Great Doward Hill; bank at Walford; Red Daren, Hatterel Hills. West Gloucestershire: Symonds Yat. Monmouthshire: Wyndcliff, *Mr. W. A. Shoolbred*! Breconshire: Bwlch-y-fingel, Black Mountain.

Congress of Archæological Societies in Union with the Society of Antiquaries. July 11th, 1900.

Notes on the Systematic Study

OF

OUR ENGLISH PLACE-NAMES.

By J. HORACE ROUND, M.A.

I HAD the honour, some years ago, of reading in this room before the Society of Antiquaries, a paper on the Settlement of the Saxons in Essex and Sussex, in which I dwelt on the great value of the study of Place-names for our early history, and urged "the practical impossibility of accomplishing any scientific work in this department of research until the place-names of England have been classified and traced to their origin."* I ventured then to express the hope that we might see "this urgent work undertaken, county by county, on much the same lines as those adopted by the Government in France. It seems to me," I added, "to be eminently a subject for discussion at the Annual Congress of Archæological Societies." Consequently, when Mr. Nevill suggested that the time had now come for the Congress to take up some fresh work, I brought forward this subject, and it received at once the Committee's approval. Since then the British Museum has rendered a great service to antiquaries by the publication of an index to the place-names contained in

* This paper has since been printed in my *Commune of London and Other Studies* (Archibald Constable and Co.).

its rolls and charters, for which it is claimed that one of its "chief points of interest and value lies in the evolution of modern place-names from the early forms found in the oldest documents." Here, then, we have the first step that has been taken in this country towards such an undertaking as I hope to see carried out.

There are two grounds on which the present time is peculiarly suitable for putting it in hand. The first is the great increase, of late, in the available material, owing to the publication of records by Government, by societies, and even by individuals; the other is the change that, in this generation, is passing over the face of the country. I am confirmed by the Deputy Keeper of the Records in the belief that the new edition of the Ordnance Survey omits ancient place-names that were still to be found in its predecessor. Railways alone have done much in shifting the balance of population, in reducing the importance of old villages, and causing new ones to spring up; and agricultural depression is affecting the map as surely as the conversion of arable into pasture in the agricultural revolution of the 16th Century; the great towns, again, are rapidly absorbing and effacing villages of which the names may be found even in Domesday Book. As an expert on this subject observed to me last week, antiquaries two generations hence may be seeking the origin of a district's name, which was really given by a speculative builder who called it after one of his daughters. Some changes in nomenclature are due to a subtler cause; the too ingenious antiquary has much, I fear, to answer for. In Worcestershire, Ab (or Hab) Lench kept the name it possessed in Domesday down to the other day, but has now become Abbot's Lench, having never, to my knowledge, had anything to do with an Abbot. In Northamptonshire, the "Holewelle" of Domesday remained undisturbed till, promoted to an ecclesiastical district, it became Holy Well. In Essex, our Society, last year, visited Stow Maries, which is known to have derived its name from the family of Marice or Morice, and discovered it beginning

to blossom out into Stowe St. Mary, the change, which began on the Church bills, having already reached the sign posts. As ecclesiastically-minded ladies would say, the new names are much "nicer," but they breathe the spirit, I venture to think, of Church restoration at its worst.

Now these examples have a real moral, a lesson that we need to bear in mind. The influence on our place-names of folk-etymology has been far greater, probably, than is supposed. If such changes as these I have glanced at are possible even at the present day, what could not be effected when all spelling was uncertain, and when maps were as yet unknown? for folk-etymology has been always with us, and the too ingenious antiquary is no modern phenomenon. Even Henry of Huntingdon could hardly mention a place without proceeding to explain the meaning of its name; and Robert of Gloucester explained that Colchester derived its name from King Coel. Colchester proved itself worthy of the tale, and showed not only his statue and his sword but even his "kitchen" and his "pump." It is now proposing to place his Arms on its new Town Hall, having, I observe, obtained them for the purpose from "Heralds' College, London."

It is on account of the influence of this folk-etymology that I dispute the claim of the philologist to explain place-names by his laws. His laws fail from the same cause as the laws of political economy; they ignore the human element. I have observed that if you tell a philologist what a place-name originally was, and what it is now, he will produce a law with a long name which accounts for the change to perfection, but if he is not supplied with that preliminary information, his laws are by no means a sure guide to the modern forms of an ancient name. Let me cite, from a single county, two instances as a test. The name of Chaddesley Corbett, Worcestershire, suggests that there must have been some other Chaddesley in the county from which it had to be distinguished. And research will show that in the 12th Century there actually was such a place, which appears as "Chaddesleia." But this latter

place has now become "Chaceley," while the other remains "Chaddesley." So, again, the "Biselege" of Domesday has become "Bisley," in Gloucestershire, while in Worcestershire, some ten miles off, it has become "Bushley," a fact which, even now, proves confusing to students. It is obvious that no philological "law" can account for name-developments so different as these.

Cognate to the process of folk-etymology is that marked tendency of our people to introduce the syllable "ing" into place-names which did not contain it. In the Paper to which I have alluded I dwelt on the enormous importance attached by such scholars as Kemble, Stubbs, Green, and Canon Taylor, to the existence of *ing* in place-names as evidence of clan-settlement, and I pointed out that, even apart from other possible criticisms, the scientific study of our place-names would prove that in many cases the *ing* was a mere corruption. A curious instance came before me only the other day. The City of Hereford appears in Domesday as "Hereford port," but a Worcestershire Hereford, by the addition of "tun," becomes Herefordtun, and in Domesday "Herferthun," and finally by a process of corruption "Harvington." Nothing at first sight could be less likely than the true derivation of the name, and Kemble accepted its present form as proof that the place was the home of the Harvings, or as he termed them the Horfingas. By a no less strange corruption the "Widemondefort" of Domesday, the "Withermundeford" of charters, became our Essex Wormingford. The name, of course, was claimed by Kemble as evidence of its settlement by a Worming clan, but we have got beyond the clan now; we have discovered the totem, and we run him for all he's worth. The Wormings, therefore, are claimed as totemists, sons of the Worm, and as you must never eat your totem, we discover that this interesting clan cannot have lived on a diet of worms. You may think that I am jesting, but Mr. Grant Allen, under the auspices of the Society for Promoting Christian Knowledge, included Wormingford among the place-names leading to "the almost

irresistible inference that at some earlier period the Anglo-Saxons had been totemists."*

I have tried to bring home to you, by actual instances, the strange theories, historical and other, to which students have been led by the change and corruption in place-names; and in the Paper to which I have referred I have shown how, largely through the influence of Kemble, their erroneous derivation has affected our views on our early history. In doing this, it has been my object to plead for their systematic treatment in the belief that such treatment will not only save us from much error but will enable students to arrive at conclusions of great importance. They can hardly be expected at present to work out for themselves the history of every name with which they are called upon to deal. So brilliant a scholar as Professor Maitland has observed, for instance, in his great work on *Domesday Book and Beyond*, that Amport, Hants, derives its suffix from having been at some early date a port or market town. Now it can be shown that this place was in Domesday simply Anne, and derived its suffix "port" from the Norman family of de Port, which then held it, and which was itself named from Port-en-Bessin. There are many other interesting cases of English names incorporating those of foreign families or individuals. If our place-names had received scientific treatment as in France, scholars would have ready to their hands the whole material in a trustworthy form instead of being driven, as now, to guesswork, or to virtually prohibitive toil.

The mere collection of local names on a scale as exhaustive as possible, will prove that some of the oldest are now among the least known. Manors of great antiquity have often vanished from the map, while the names of others may only be preserved by a farm, by a wood, or by a lane. The ancient names of our Hundreds, often now obsolete, call for special attention, representing as they sometimes do, the meeting place of primitive settlers. And, to turn to a later time, the coming

* *Anglo-Saxon Britain*, *p.* 81.

of alien lords is recalled by the names of the castles they erected at "Montacute" and at "Pleshy," at "Richmond" and at "Belvoir."

As to the method of the treatment to be adopted, I do not propose to deal with it in detail, but rather to elicit from this Congress an expression of opinion that the work ought to be taken in hand. Should it be pleased to refer the subject to a Special Committee, the whole matter could be carefully considered and a scheme of work drawn up for uniform adoption throughout the country. For that such work should be uniform, I need scarcely say, is essential.

I referred at the outset to the lines adopted by the Government in France as a guide to ourselves in the matter. French scholars are justly proud of the *Dictionnaire Topographique de la France comprenant les noms de lieu anciens et modernes*. This great undertaking is printed at the national expense, and describes itself as "published by order of the Minister of Public Instruction and under the direction of the Historical Works Commission." But the system is strictly a local one in practice, inasmuch as it is carried out department by department. Moreover, the assistance of a local society, if one exists, is secured, and the volume produced under its auspices by some qualified Scholar. In this series an introduction to the volume deals with the geography, geology, history, and ancient divisions, ecclesiastical and administrative divisions, and so forth of the department. But the body of the work consists of its place-names in alphabetical order. Hamlets, manors, fiefs, farms, streams, hills, and similar objects are included, but not mere field-names.* The essential feature, however, is that the date and the authority for each form of the name cited is given, as is done with all words in our New English Dictionary. Alphabetical lists are given, for reference, of all the sources of information employed,

* Genuinely ancient field-names are often of great interest, but the modern ones, of little or no value, now swamp them.

printed and manuscript, and formidable lists they are. A "table des formes anciennes," that is, the Latinised forms, for cross reference, completes the volume.

We should, I think, certainly retain the above essential feature in any scheme we may adopt, but should add, when well established, those peculiar local pronunciations which are now rapidly being lost. And I would make the further suggestion that certain selected sources of information* should be systematically read for the purpose by volunteer helpers, as has been done to supply the material for the New English Dictionary. Those who are willing so to assist should inform their local society, and might perhaps enlist others. We are so rich in mediæval records that we should not only illustrate the origin and history of existing names, but bring, I believe, to light many that are now forgotten. Lastly, I desire to make it clear that the scheme I suggest will not comprise philological speculation. It aims only at collecting the evidence in a trustworthy and scientific form, a process which, in many cases, will suffice to guide us to the origin of a name.

My own work has lain so largely among records of the 12th and 11th centuries that the need of the work I am advocating is continually brought home to me. The Deputy Keeper of the Records, to whom I spoke lately on the subject, told me that he thought the idea excellent, and I think we might fairly reckon on the approval of the Public Record Office, which is doing so much itself, by its noble series of Calendars, to illustrate our local history and identify our ancient place-names. In the striking words of Professor Maitland: "The map of England is the most wonderful of all palimpsests, could we but decipher it," and it is because I agree with him that much of our history that is still dark is written in the names that our remote forefathers gave to their English homes that I ask you, as a Congress, to express the

* Some printed works are not trustworthy for the purpose.

opinion that the scientific treatment of our place-names on a uniform system throughout the country is a task that ought to be taken in hand, and that is likely to prove of high value for the knowledge of our early history.

July 22nd, 1908.

ELAN VALLEY AND BIRMINGHAM WATERWORKS.

1908 J.T.S.

*** FROM SIGMA.

On May 20th, 1897, the Mayor of Birmingham laid the foundation-stone of this stupendous undertaking—at the Caban Coch dam below the junction of Elan little mountain stream of 12 miles long on the NE., and Clearwen a similar little stream, on S.E. range of those beautifully varied surrounding Welsh Hills; and on August 20th, 1899, the Corporation of Hereford, by the invitation of the Woolhope Club, ably guided by our clever, indefatigable and ever-to-be-regretted secretary, Mr H. Cecil Moore, so recently passed from amongst us, joined by many visitors, visited those works practically to learn the enormous extent of the operations, the beauties of vale and river surroundings of the locality as well as all their journey there, with something by imagination of what was to be the future outcome of it, after three million and a half of the estimated expenditure had been applied in effecting this water supply.

Very great engineering skill, and well-trained surveyors with their thousands of well-conducted well paid working men, were to take years in doing it. Eleven years have now passed, and when the river Wye was bank full on Saturday last it occurred to me that splendid rainfull of the summer would show us what the "outcome of it all" really meant. Taking the 9.20 train from Hereford to Rhayader, and a hired trap from thence, could of course readily show us—I have written readily, but the traveller reaching Three Cocks Junction and then Builth Road gets very impatient in losing an hour at each place. waiting for Brecon and Cardiff trains, but the idle hour will not be wasted if he can borrow Vols. 1896 and 1898 of "Woolhope Transactions" and learn every particular of dear Cecil Moore's labours in statistics of the geology, rainfall, water shed, business arrangements, materials and their composition, that the increasing work of the wooden hut temporary large village of Elan working community, with Mr Alfred Watkins's valuable photographs and lasting records of what was being done. Failing to get the volumes mentioned, everybody can find them in the Free Library at Hereford—all too long a story to venture even an abstract of in the present letter; and in the huge volumes of the *Hereford Times* at the Free Library may also be found in the dates mentioned admirable accounts of these extraordinary works.

A holiday out could scarcely be more pleasurably and instructively enjoyed than this excursion Hereford to Elan Valley—the Midland passing through a lovely country in redenhill and Lady Lift, will only give st view of the Wye river at Whitney xtensive view of Wye Valley, bounded uth by Merbridge and the lofty ridge can discern the steam jet of the Golden ilway engine meeting him at Hay, and he right after crossing the Wye is th eam with its widenings and narrowings oded pictures, prettily situated Cabalva le, and Fair Rosamond's ruined Castle to give his mind a romantic turn on rings him to Hay and Glasbury, where shining river is a continuous object of d the veriest Paradise for the angler long to stay and fish.

Three Cocks Junction, if the volumes hope Transactions" are not to hand, n be done but stroll into the refresh- and study the newspaper Hereford ay have supplied him with, or walk gate leading into a meadow a few yards Builth line, and there see a pretty little nd Lunfy river coming from Talgarth re stream for spawning salmon in the a confounded little stream for supply- dering Vaga" with pike from the the way nearly from Three Cocks, past oughrood, and Abereddw to Builth, s right or his left, will the Wye shallows streams over beds of rock and gravel g of hill valley with wood and larch present charming glimpses, and keep ishes floating over meum and teum ish those foaming runs. If the train stop at Abereddw and let us see the fall—rocks and bold outcrop of the stem, joy of the geologist, what a treat ve been. Past Builth the Wye and the easily distinguished, and Rhayader, ain does move on, is soon eached.

am from Hereford Station secures a et the excursionists for a drive up the y, and no sooner does he pass the Elan l than "Oh!" exclaims all the party, Coch Dam meets his view—wate n 120 feet of rugged stone masonry length, dashed into foam immediately top water, looking like a huge veil of the entire structure. Well may the p for the party to see the view, and n on the river. Then again just above arty will see almost the only busy at the screens and outfall pipes, water supply starts for Birmingham, lamps all about it, doubtless showing our there, but gone are almost all llage of Elan Valley in 1899, gone t a few still taking off slate and huts, men sending off the old material by weekly trains on rusty rails—of a very small bit of railway left.

On our right a little farther on a huge cutting into the mass of steep hill rock shows where much of those enormous blocks of rock that built the dam came from, and then we reach another surprise, a lovely lake towards Claerwen, the valley, the chapel, the houses, the fields all gone, and turning north you almost laugh to see a fine stone bridge, with a splendid wide road across it, standing in flood with its seven arches, and know it is built on the submerged dam, made there to provide our Wye river with its fair supply and not grab all for Birmingham. At one end of it the handsome tower with screens and engineering arrangements for sending off the water through one mile of tunnel, a 34-mile journey to millions of thankful souls.

Another three miles drive may make you think of a Scotch lake of natural not artificial construction, but to those who remember Nantgwylt Mansions and Mr Lewis Lloyd's lovely fields and walks around it his vision tells him all is gone—all is under water, some 40 feet at least, and he looks upon miles of clear water, instead of a valley of meadow, gorse, and fern. Continuing his charming drive, with lake on his left, and a mountain of rock only a bird can traverse, on his right, another surprise awaits him, another dam, Pen-y-Gareg Dam, 525 ft. long and 48 ft. high, seemingly larger and higher than Caban Coch Dam, because you are driving below it instead of as at Caban Coch above it. Water falling and foaming over its entire breadth, conducted down the outsides into a very little rocky Elan stream at the foot of it. It is more picturesque than Caban Coch. An arched gallery is running inside and all across the dam, and the walk to the top of the tower in the centre or on either side of the hill shows another lovely lake as far as the eye can reach. Here on ferny banks will the traveller rest and look well around, first on the mass of falling water, then back at the mountain of rock he has passed beneath in his drive up the valley, and delight in a wondrous panorama of hill and valley scenery. Gone are the railway lines and sleepers, gone are the toilers' many huts and quarters of 1896-1899, and there only in its loneliness of this scene, and shut up, is the once very pretty wood and iron built house where hospitable Stillingfleet, C.E., from Hereford, lived with his family as local engineer, delighting his Hereford visitors with the ever-welcome afternoon tea and buttered toast!

Here on this lovely spot lingered the writer, wishing he could take that house, and find in the mountain air a resuscitation of former years and strength to utilise that nice little mountain stream that steals its rocky way down to Elan in forming a fish hatchery to stock the lake with trout, grayling, perch, dace, and roach, each helping to feed the other, and in time beating the boating fishermen on the Veruyw, which lake, beautiful as it is, as a single lake, has but plain surroundings, which cannot compare with this, now romantic, district of lakes at Elan, with their marvel of geological formations. Notices are affixed, "Apply to Mr John Jones, Rhayader, for regulations and fishing tickets," but I can hardly imagine the small brown trout of the Elan or Claerwen streams with their sparse food supply will for many years to come afford much of a supply of sporting fish in this large water area.

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INSTITUTION OF CIVIL ENGINEERS.

BIRMINGHAM WATER WORKS.

A paper by Mr. Ernest L. Mansergh and Mr. Walter L. Mansergh, which dealt exhaustively with "The Works for the Supply of Water to the City of Birmingham from Mid Wales," was read before the Institution of Civil Engineers.

The city of Birmingham they said, stood on high ground, the elevation above Ordnance Datum varying between 300ft. and 600ft. The Parliamentary district of supply embraced an area of 83,221 acres and showed somewhat greater variations of elevation than the borough. According to the 1891 census it had a population of 648,000, and the demand for water was then approaching 15 million gallons a day. The local sources from which the city and the surrounding districts were supplied before the Welsh water came into use afforded about 20 million gallons a day. In 1890 the late Mr. James Mansergh was consulted by the Water Committee on the question of an additional supply to the district, and the recommendation made to the committee was that they should secure the control of the watershed of the Rivers Elan and Claerwen in Radnorshire, which was at a suitable elevation to enable the water to be delivered into a service-reservoir near Birmingham at such a level that it could be supplied to a very large portion of the district by gravitation, and was of sufficient area to meet the requirements of the city and district for two or three generations. The drainage-area of the rivers Elan and Claerwen above the Caban Côch dam was 45,562 acres, or 71·19 square miles, and the level of the river-bed at that dam was 700ft. above O.D.

The Reservoirs and Dams.

Three reservoirs had been constructed—viz., the Caban Côch, the Pen-y-gareg, and the Craig Gôch. The dams for these reservoirs were respectively 122ft., 123ft., and 120ft. in height above the river-bed, were 610ft., 528ft., and 513ft. long, and provided storage for 7,815, 1,330, and 2,000 million gallons. The construction of three other reservoirs was contemplated—viz., the Dol-y-mynach, the Ciloerwynt, and the Pant-y-beddau. The dam for the Dol-y-mynach reservoir had already been built to a height of 31ft. above the river-bed; it would eventually be 101ft. high, 940ft. long, and would provide storage for 1,680 million gallons. The other two reservoirs would be 108ft. and 98ft. high respectively, would be 1,053ft. and 720ft. long, and would provide storage for 3,150 and 1,940 million gallons. The dams were essentially masonry and not concrete structures.

The three dams built for the first instalment were all of considerably greater height above river-bed level than any existing in this country previously, and for their design the following broad principles were laid down for their profiles:—(1) That the lines of stress, with the reservoir either overflowing or empty, should fall within the middle fourth of the length of the base throughout; (2) that the vertical component of the pressure on the foundations should nowhere exceed 10 tons per sq. ft.; (3) that the factor of safety against overturning (reservoir overflowing) should nowhere be less than three.

An interesting feature of the scheme was the submerged dam constructed across the Caban Côch reservoir at a place called Caregddu, about 1¼ mile higher up the River Elan than the Caban Côch dam itself. This dam was for the purpose of holding up the water to the required level to charge the upper end of the aqueduct without involving the loss of storage for compensation purposes in the Caban reservoir. It was found that, in order to give the most economical cross section and the best line, the fall required in the 74 miles of aqueduct between [illegible] and the Frankley reservoir was

15/83 Sep. 15th

Craig Coch Dam

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The Reservoirs and Dams.

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An interesting feature of the scheme was the submerged dam constructed across the Caban Côch reservoir at a place called Caregddu, about 1¼ mile higher up the River Elan than the Caban Côch dam itself. This dam was for the purpose of holding up the water to the required level to charge the upper end of the aqueduct without involving the loss of storage for compensation purposes in the Caban reservoir. It was found that, in order to give the most economical cross section and the best line, the fall required in the 74 miles of aqueduct between the Elan valley and the Frankley reservoir was approximately 170ft. Top water-level of Frankley reservoir had to be at about 600ft. above O.D., and therefore the invert of the aqueduct at the Elan end was necessarily about 770 O.D., or 70ft. above the bed of the river at the Caban Côch dam.

In plan the Craig Gôch dam was an arc of a circle of 740ft. radius, and it carried a public road-bridge. The roadway, which was narrowed to the smallest feasible limit, was 9ft. 6in. between the parapets; and the bridge consisted of 13 openings of 30ft. span, forming an overflow having a net length of 390ft. The drainage-area above the dam was 13,700 acres, and provision was made in the culvert for carrying off water during construction at the rate of 30cu. ft. per minute per acre. To discharge this a circular culvert 17ft. 6in. in diameter was required, working under a few feet of head. The culvert was constructed on the left bank of the river, and its invert level was 937·4 O.D., or about 17ft. above the bed of the river.

The middle of the dam for the Pen-y-gareg reservoir was occupied by a valve-tower, immediately above a culvert which pierced the base of the dam, the invert being 123ft. below the crest. The first operation in the construction of this dam was the excavation of a temporary cut on the left bank of the river for the passage of the water, whilst the excavation was got out in the river-bed and right bank and the dam and culvert were built up to 850 O.D. on the western side of the valley. The culvert was 18ft. in diameter, straight in plan, with its invert-level at 822 O.D., and provided for the discharge of flood-water from a drainage-area of about 16,000 acres. Water was drawn from the Pen-y-gareg reservoir into the Caban Côch reservoir through a vertical standpipe in the valve-tower 24in. in diameter, having branches communicating with the reservoir at five different levels.

The dam of the Caban Côch reservoir was situated about seven furlongs below the confluence of the rivers Elan and Claerwen, and when the reservoir was full top water tailed out at about 4½ miles up the Elan Valley, at the toe of the Pen-y-gareg dam, and 2½ miles up the Claerwen Valley, at a point where the partially-built Dol-y-mynach dam was situated. At this point the flood-water from the whole watershed of 45,562 acres had to be dealt with. In view of the large area, it was assumed that provision should be made for a discharge of 15 cu. ft. a minute per acre, representing a volume approaching 700,000 cu. ft. per minute. During construction flood-water was carried off by two culverts, 16ft. in diameter, one on each side of the river, with their inverts at 700ft. above O.D.

Originally it was not intended that the Dol-y-mynach dam should form part of the first instalment of the works. In view, however, of the fact that the top water of the Caban reservoir would back up in the Claerwen Valley to above the site of this dam, and that, in any case, some sort of weir would have had to be constructed to divert the dry-weather flow of the Claerwen through the Dol-y-mynach tunnel to above Caregddu, it was decided that the foundations should be taken out, and the building of the dam carried up to 8ft. above the top water-level of the Caban reservoir. The drainage-area above this dam was 23,524 acres, and the culvert to pass the flood-water was 19ft. in diameter, the same as at Caregddu, its invert-level being 800 O.D. There was a tunnel with its inlet end situated in Dol-y-mynach reservoir about 225ft. above the dam, and its outlet in the Caban Côch reservoir about 250ft. above the Caregddu dam and on the opposite side of the valley to the Foel valve-tower, which was a little over 1¼ mile in length. It had a discharging capacity of 50 million gallons a day.

The Aqueduct and Siphons.

The total length of the aqueduct, from the Foel valve-tower in Caban Côch reservoir to Frankley service-reservoir, was 73 miles 658 yards. It consisted of two main classes of work:—(*a*) Conduit—either in tunnel or cut and cover—designed to carry the full quantity of water available from the drainage-area. Of this conduit there was a total of 36 miles 1,248 yards. (*b*) Inverted siphons of cast-iron or steel, of which two pipes out of six had already been laid. The length of siphon was 36 miles 1,170 yards. Class (*a*) embraced "tunnel" of an aggregate length of 12 miles 1,556 yards, and "cut and cover" of an aggregate length of 23 miles 1,452 yards. There were in all 15 separate tunnels, nine over 500 yards in length and six not exceeding 500 yards each, on the whole line; the longest was the Dolau tunnel between Dolau and Bleddfa, 4 miles 464 yards in length, and the shortest was the tunnel at Hagley, close to the Severn siphon-outlet, 183 yards in length. There were 11 siphons, with an aggregate length of nearly 36¾ miles. The shortest, across the Lugg Valley, in Radnorshire, was 552 yards long, and the longest, across the valley of the Severn and its tributaries, was 17 miles 234 yards. The shallowest siphon was that across the Dulas Valley, in Radnorshire, where the pressure barely exceeded 25lb. per sq. in., as against a *maximum* of nearly ten times as much at the lowest point of the Severn siphon. The portion of the aqueduct which, in relation to its length, involved the largest expenditure and some of the heaviest work was that between 725ft. west and 1,100ft. east of the centre of the River Severn.

The Frankley service-reservoir, at the termination of the aqueduct, was situated on high ground about six miles south-west of the centre of Birmingham. Its top water-level was at 603 O.D. and its capacity was just over 200 million gallons. It was semi-circular in plan, the radius to the toe of the curved wall being 780ft., and it was divided into two quadrants by a central division wall.

General.

In addition to the waterworks, a considerable number of subsidiary and ancillary works had to be carried out. On the watershed, in addition to 36 miles of temporary railway, about 17 miles of permanent public highways had to be constructed, with numerous bridges, culverts, and fence-walls, wire and other fences, and also a large quantity of pitching and beaching of the sides of the reservoirs. In round figures the quantities of the principal kinds of work which had to be done in the construction of the reservoirs, filters, aqueduct, &c., carried out by administration, the total cost of which amounted to £1,810,000, were:—Excavation, 1,300,000 cu. yds.; cyclopean masonry and concrete in dams, &c., 380,000 cu. yds.; brickwork, 20,000 cu. yds.; masonry facing, including rubble work, 140,000 cu. yds.; pitching and beaching on slopes, &c., 425,000 cu. yds.; pitching and ballast, railways and highways, 76,000 cu. yds.; and fencing, mainly post and wire, 32 miles. The whole of the remainder of the aqueduct, the Frankley works, and mains into the city and district, were carried out by contract at a cost of nearly £3,000,000.

15/83 Sep. 15th

Craig Coch Dam

on the opposite side of the valley to the Foel valve-tower, which was a little over 1¼ mile in length. It had a discharging

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service-reservoir,
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Of this conduit
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cu. yds.; and fencing, mainly post and wire, 32 miles. The whole of the remainder of the aqueduct, the Frankley works, and mains into the city and district, were carried out by contract at a cost of nearly £3,000,000.

5-/83

Sep. 15

Craig Coch Dam

tivity APRIL 3, 1912.

on the opposite side of the valley to the Foel valve-
tower, which was ...
had a discharging ...
day.

THE A...

The total lengt... valve-tower in C... service-reservoir, ... of two main clas... in tunnel or cut a... quantity of wate... Of this conduit ... yards. (b) Inver... which two pipes ... The length of sip... (a) embraced "... 12 miles 1,556 ya... gate length of 23 ... 15 separate tunn... six not exceedin... the longest wa... and Bleddfa, 4 ... shortest was ... Severn siphon-... were 11 siphon... 36½ miles. Th... Radnorshire, ... across the vall... was 17 miles 2... that across th... the pressure ... against a *maxi*... lowest point ... the aqueduct ... the largest e... work was th... of the centre...

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railway so far as its progress ...
6 km. from Brussels. As a first step towards these
works, the Railway Administration is inviting
tenders for the construction of a large goods shed
with a building for offices at the Petite Ile at a cost

3

Pen y garreg 15/5/

5/83

Sep. 15th

Craig Coch Dam