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PROCEEDINGS

OF THE

HOLMESDALE NATURAL HISTORY CLUB

FOR THE YEARS 1893, 1894, and 1895.

TOGETHER WITH

RULES and LIST OF MEMBERS.

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LONDON:

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

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PROCEEDINGS

OF THE

HOLMESDALE NATURAL HISTORY CLUB.

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EVENING MEETING, held at Redhill, 20th of January, 1893.

Mr. N. E. Brown, of Kew, gave an address on

CARNIVOROUS PLANTS AND THE MANNER IN WHICH THEY ENTRAP  
THEIR PREY.

Mr. Brown illustrated his lecture with a fine series of  
diagrams.

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EVENING MEETING, held at Reigate, 17th of February, 1893.

The company of young people was specially invited.

Mr. Joseph Cheal, of Crawley, gave a lecture on

THE MONARCHS OF THE FOREST.

Mr. Cheal illustrated his lecture with specimen branches of  
most of the trees described; and he also showed a number of  
lantern pictures illustrative of his subject.

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EVENING MEETING, held at Redhill, 17th of March, 1893.

Mr. C. E. Salmon exhibited two photographs of the Barn Owl, taken from life.

Mr. A. H. Fardon exhibited a specimen of the *Convolvulus Hawk-Moth* caught in a garden at Reigate.

Miss A. L. Ashby sent for exhibition a series of watercolour sketches of the flowers of South Australia, drawn by her when in the Colony last year.

Mr. H. Martin Sells gave an address on

BARBADOES AND DEMERARA,

illustrated by a large assortment of curiosities and natural products.

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EVENING MEETING, held at Reigate, 21st of April, 1893.

Mr. E. S. Salmon presented the following records of fresh Surrey localities for plants:—

*Corydalis claviculata*. Hankley Common. E. S. & C. E. Salmon.

*Cardamine Amara*. By stream, Holmwood Common. C. E. Salmon.

*Silene dichotoma*. Pym's sand-pit, Reigate. C. E. Salmon.

*Vicia Sepium*, var. *ochroleuca* (fide Ar. Bennett). Near Haxted Mill, near Edenbridge. E. S. Salmon.

*Lathyrus Nissolia*. Near Dwelly Farm, near Edenbridge. E. S. Salmon.

*Potentilla argentea*. By footpaths near Elstead, towards Hankley Common. E. S. & C. E. Salmon.

*Alchemilla vulgaris*. Roadside between Boxhill and Holmwood. B. B. Gough & C. E. Salmon.

- Epilobium roseum*. By stream, Nutfield Marsh. C. E. Salmon.
- Anthriscus vulgaris*. Abundant in several places about Elstead. E. S. & C. E. Salmon.
- Ceanothe Phellandrium*. Near Dwelly Farm, near Edenbridge. E. S. Salmon.
- Scleranthus annuus*, var. *biennis*. Hankley Common, in sandy places. E. S. & C. E. Salmon.
- Marrubium vulgare*. Near Gomshall Station; lane leading from Little Bookham to Bookham Station, S.W.Ry. C. E. Salmon.
- Chenopodium Bonus-Henricus*. Roadside near Betchworth Church. C. E. Salmon.
- Polygonum Convolvulus*, var. *pseudo-dumetorum*. Near Wire Mill. E. S. & C. E. Salmon.
- Rumex Hydrolapathum*. By the Tillingbourne, at Shere. C. E. Salmon.
- Iris foetidissima*. In wood, by side of a lane leading from back of Ranmore Common towards Bookham. C. E. Salmon.
- Zannichellia palustris*, "v. *brachystemon*." Pond on Holmwood Common. C. E. Salmon.
- Carex curta*. Wire Mill-pond; bogs on Hankley Common. E. S. & C. E. Salmon.
- Carex axillaris*. Blindley Heath, near Godstone. E. S. Salmon.
- Carex arenaria*. Sandy hedge-bank, in lane between Elstead and Hankley Common. E. S. & C. E. Salmon.
- Carex levigata*. Plentiful at "Bellagio," near Lingfield. E. S. Salmon.

Mr. Frederick T. G. Hobday, M.R.C.V.S., London, gave an address on

BACILLI AND MICRO-PARASITES.

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## ANNUAL MEETING,

held at Redhill, 20th of October, 1893.

The Annual Report and Balance Sheet were read and adopted.

## ANNUAL REPORT.

It is pleasant to be able to report that 17 new members or subscribers have joined the Club during the year, though we regret the loss of 11 through resignation, removal, or death. The present membership is 76.

During the winter months 4 meetings were held at Reigate, and 3 at Redhill. The attendance varied from 16 to 84, the average being about 40. Several lectures of great value and ability were delivered, some of which secured a large attendance and excited fresh interest in the Club.

The following were the papers or addresses which occupied the Club at its winter meetings:—

1892.

- October. The Descent of Birds, by Mr. H. M. Wallis.  
 November. A Month in the Canaries, by Miss Martin.  
 „ Short Botanical Rambles, by Mr. C. E. Salmon.  
 December. A Week in Teesdale, by Messrs. E. S. Salmon & A. J. Crosfield.  
 „ Report of Excursions, by Messrs. W. H. Tyndall & C. E. Salmon.

1893.

- January. Carnivorous Plants, and the manner in which they entrap their prey, by Mr. N. E. Brown.  
 February. The Monarchs of the Forest, by Mr. Jos. Cheal.  
 March. Barbadoes and Demerara, by Mr. H. Martin Sells.  
 April. Bacilli and Micro-Parasites, by Mr. F. T. G. Hobday, M.R.C.V.S. (Lond.).

A volume of Proceedings for the years 1890, 1891, and 1892 has been issued and distributed to members of the Club, and to many other Natural History Societies. The ordinary funds of the Club not being sufficient to meet the cost of the printing, it has been met by handsome donations of £20 and £5 respectively from Mr. Tyndall and Dr. Bossey.

Many of the summer excursions have been very well attended, the exceptionally fine summer having been unusually favorable. On two occasions the Club was very kindly and handsomely entertained, namely, by W. J. Evelyn, Esq., at West Hoathly, and by Mrs. Flower at Tangley.

The following were the Club Excursions :—

*Whole Day.*

- May 13.—Purley, Chelsham, and Worms Heath.  
June 10.—Balcombe, Rockhurst, and West Hoathly.  
July 8.—Tangley, King John's Palace, and Black Heath.  
Aug. 12.—Ranmore Common and Gomshall.  
Sept. 9.—Great Bookham Common and ponds, and East Horsley.  
Oct. 7.—Shere and the Silent Pool.

*Afternoon.*

- April 29.—Buckland and Reigate Heath.  
May 27.—Headley and Walton.  
June 24.—Chipstead and Upper Gatton.  
July 22.—Farthing Down and Coulsdon Common.  
Aug. 26.—Holmwood Common.  
Sept. 23.—Nutfield, Bletchingley, and Godstone Station.

The Club has been enriched by the following donations :—

The Flora of W. Surrey, by Mr. S. T. Dunn, presented by the Author.

Contributions towards a Flora of Caithness, No. 2, a reprint, by Mr. Arthur Bennett, F.L.S., presented by him.

Part of a Flora of North Yorkshire, by J. Gilbert Baker, F.L.S., presented by the Yorkshire Naturalists' Union.

Annual Report and Transactions of North Staffordshire Naturalists' Field Club and Archæological Society, 1892, presented by the Society.

Report of the British Association for 1892, presented by the Association.

Transactions and Journal of Proceedings of the Dumfriesshire and Galloway Natural History and Antiquarian Society, 1891-2, presented by the Society.

Report and Proceedings of the Belfast Natural History and Philosophical Society, 1891-92, presented by the Society.

Epsom College Natural History Society, Report for the year ending Christmas 1892, presented by the Society.

Tunbridge Wells Natural History and Philosophical Society, Annual Report for the year ending September 30, 1892, presented by the Society.

Address read before the Entomological Society, London, 18th January, 1893, by Mr. F. DuCane Godman.

Field Club, January 1893.

Rochester Naturalist, January 1893, April 1893, and July 1893.

Paper on Potamogetons by Mr. Arthur Bennett, F.L.S., presented by him.

Records of Scottish Plants for 1892, by Mr. Arthur Bennett, F.L.S., presented by him.

The Yorkshire Carboniferous Flora, by Mr. Robert Kidston, presented by the Yorkshire Naturalists' Union.

Proceedings of the Bath Natural History and Antiquarian Field Club, 1893, presented by the Club.

The South-Eastern Naturalist, Vol. I., Part iii.

Report of the Marlborough College Natural History Society for the year ending Christmas 1892, presented by the Society.

Proceedings of the Warwickshire Naturalists' and Archæologists' Field Club, 1891, presented by the Club.

Proceedings and Transactions of the Croydon Microscopical and Natural History Club, February 10, 1892, to January 11, 1893, presented by the Club.

Cardiff Naturalists' Society, Report and Transactions, 1891-92, presented by the Society.

Cardiff Naturalists' Society, Report and Transactions, 1892-93, presented by the Society.

To Mr. Jno. Linnell the Club is indebted for new cabinets in the Museum, as well as for paper for mounting specimens of dried plants; and Messrs. E. S. and C. E. Salmon and Mr. Linnell have devoted a great deal of time and labour to the arranging and mounting of the Power herbarium, and to the care of the Club herbarium generally.

The following Officers were elected for the coming year:—

*President.* Mr. W. H. Tyndall.

*Treasurer.* Mr. J. I. Cudworth.

*Secretary.* Mr. A. J. Crosfield.

*Curator.* Mr. Jno. Linnell.

*Committee.* Messrs. J. Bonnor, T. Cooper, J. B. Crosfield, F. H. Ellwood, J. Knight, E. S. Salmon, C. E. Salmon, and the Rev. W. M. Paull.

Mr. N. E. Brown, of Kew, lectured on

BRITISH CARNIVOROUS PLANTS.

## THE HOLMESDALE NATURAL HISTORY CLUB.

## ABSTRACT OF ACCOUNTS.

*Receipts.*

(October 1892 to October 1893.)

	£	s.	d.
Balance, October 1892.....	9	1	10
Subscriptions .....	24	15	0
Donations .....	25	0	0
Sale of Proceedings .....	9	0	0

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£59 5 10
*Expenses.*

(October 1892 to October 1893.)

	£	s.	d.
Rent, Gas and Cleaning .....	18	9	3
Printing .....	2	9	5
„ Proceedings .....	25	9	3
Sundries, <i>per</i> Secretary .....	1	19	3
Collector—Commission .....	1	0	9
„ Postage, &c. ....		5	11
Balance, October 1893.....	9	12	0

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£59 5 10
*Proceedings.*

EVENING MEETING, held at Reigate, 17th of November, 1893.

Dr. Bossey exhibited a large specimen of Selenite, which he presented to the Club. He read a short account of the recent discovery of large quantities of this mineral in some parts of America.

Mrs. G. Abbott of Tunbridge Wells, in the absence through illness of her husband, Dr. Abbott, read a paper by him entitled

FLINT AS FOUND IN CHALK.

Numerous specimens of the different varieties mentioned were exhibited.

MEETING, held at Reigate, 15th of December, 1893.

Mr. Jno. Linnell remarked that the Club had not hitherto recorded the occurrence in our neighbourhood of Dipterous insects. As a contribution to such a record, he exhibited the following species:—

*Sargus infuscatus*, from Redstone, Redhill.

*Chloromgia formosa*,                   "                   "

*Beris vallata*, from Reigate Heath.

*Actina tribialis*, from Redstone.

*Neoitamus cyanurus*,                   ,,

*Empis livida*, from Tilgate.

Mr. S. T. Dunn, of Chilworth, read a paper on

THE DISTRIBUTION OF SOME PLANTS IN SOUTH-WEST SURREY,  
from which the following is extracted:—

In the following paper an attempt is made to make clear to inexperienced botanists the main facts relating in general to the distribution of plants over small areas, the S.W. quarter of Surrey being used to supply whatever examples are necessary.

S.W. Surrey is divided into three more or less parallel bands running E. and W., namely, the North Downs, composed of Chalk, to the north, the Wealden Clay to the south, and between

these the Greensand. The division of the two northern bands is obvious from the slope of the Downs; the southern formations are divided by the south slopes of the range of which Leith Hill and Hindhead form the most conspicuous points. The difference of the Chalk flora from the rest is very marked; the chief plants confined to it are:—*Viola hirta* (Hairy Violet), *Hypericum hirsutum* (Hairy St. John's Wort), *Hippocrepis comosa* (Horse-shoe Vetch), *Gentiana Amarella* (Autumnal Gentian), *Daphne Laureola* (Spurge-laurel), *Phyteuma orbiculare* (Rampion), and the various Orchises.

The Greensand is characterized chiefly by heath and bog plants, such as *Ornithopus perpusillus* (Bird's-foot), *Teesdalia nudicaulis*, *Senecio sylvaticus* (Wood Groundsel), *Filago minima* (Least Cudweed), in its dry parts; *Comarum palustre* (Marsh Cinquefoil), *Viola palustris* (Marsh Violet), *Utricularia minor* (Lesser Bladderwort), and Bog Asphodel, in its wetter situations.

The remaining formation, the Wealden Clay, has only a few rare flowers peculiar to it, such as *Cardamine bulbifera* (Coralwort) and *Ænanthe Phellandrium*.

Before leaving the subject of the geological distribution of plants, let us glance at the real relation between them and the soil. The difference between soils lies in variation of chemical composition, and fineness or coarseness of texture; and it is the preference for soil of particular composition and a particular texture which determines whether a plant will thrive best on one or other of the formations present. If a dry shallow soil of very fine grains is most advantageous, or if lime is necessary, the plant will be found most plentifully on the chalk; if a coarse-grained, loose soil is preferable, the plant will flourish best on the sand; while those needing a damp and fine-grained or stiff soil will not be able to get a footing except on the clay.

We have now seen how two of the chief regulators of distribution are plant surroundings and variation of soil, and the only other important factor which shows itself in small areas is the arrangement of river valleys. This is considered of so great importance in most counties that it is used to afford a scientific division of the land for purposes of reference in the

compiling of local floras; and even where there is really little difference in the vegetation of each river-basin, the system is nevertheless adopted as supplying a convenient natural division of a district. There is no doubt that seeds and roots get carried down and distributed by streams in a way that tends to make riverside vegetation more or less uniform and permanent throughout. In S.W. Surrey this is shown along the Wey Valley. A remarkable instance of the spread of a plant by the agency of water is presented by *Impatiens fulva* (Balsam), which was planted in ponds at the head of the Tillingbourne Valley, and has spread down this stream to its junction with the Wey near Shalford, and from this point down the Wey nearly as far as the Thames, while, apart from this line, it occurs nowhere else in the country. This plant is adapted in a remarkable degree for this kind of distribution, for its small seed-pods are provided with highly elastic ribs which are the means of ejecting the seeds to some distance. As the Balsam usually overhangs the water, most of them fall on its surface, on which they float and get carried to new localities.

The paper was illustrated by diagrams showing the distribution of certain typical species.

Mr. A. J. Crosfield mentioned that he had found *Setaria viridis* in a field in which gravel is quarried between Burford Bridge and Dorking.

Mr. C. E. Salmon read a paper on

PLANTS FOUND NEAR TIGHNABRUACH, ARGYLLSHIRE.

Mr. Salmon exhibited beautiful specimens of most of the plants named in his paper.

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EVENING MEETING, held at Reigate, 19th of January, 1894.

Miss Martin read a paper entitled

NATURAL HISTORY WANDERINGS IN ALGIERS.

Mr. Tyndall read

METEOROLOGICAL NOTES AT REDHILL, 1893,  
and also presented his Notes for 1892.

*Meteorology, Redhill, 1892.*

BAROMETER.

Dealing with the monthly average, during the months of January and February the average pressure was below 30 inches. From March to July, both months inclusive, the average stood above 30 inches. August and October were under 30 inches. September, November, and December above 30 inches. It is to be borne in mind that my house stands, by Ordnance Survey, at an elevation of just 300 feet above the level of the sea, and consequently the barometer would stand about three-tenths of an inch lower with me than at the sea-shore.

On 192 days the pressure reached to or was over 30 inches ; on 164 days under 30 inches, but on no day during the year did it fall below 29 inches. This result has not occurred for several years.

THERMOMETER.

On 49 days the temperature rose to 70° and over, but under 80°, and on 102 days it fell to the freezing-point 32°, or below it. On six days only did the temperature fail during some part of the day to rise above 32°, namely on 9th and 10th January, on 16th February, and on the 2nd, 3rd, and 5th March.

January, February, and March were cold. The mean temperature of March was only 35·70, more than 6 degrees below the average of the month. April was also cool, the average temperature being 45·26, about 2 degrees below the general average of 50 years ; but many days in the earlier part of the month were fine, cloudless, and genial. May and June were genial months. July was cool. August and September about the average temperature, but without any decidedly hot weather in August. Great difficulty and loss was incurred in getting in the harvest. October was a wet and cold month. November about an average, and December cold.

The average temperature of the year was 46·86.

**RAIN.**

**RAIN** or **SNOW** fell on 171 days, to a total amount of 27·31 inches. Some heavy falls occurred during the year, especially on 28th June, when 2·20 inches was measured. On 27th and 28th August was a continuous fall measuring 1·51 inches. On 25th May ·96 of an inch fell, and 18th August ·86 inch. On 27th and 28th October a continuous fall of 1·07 inches, and on 30th October a fall of ·90 inch.

**SNOW.**

**SNOW** fell on 5 days in January; on 3 days in February; on 7 days in March, and one day in April, the last fall being equal to half an inch of rain. Snow fell also on the 5th and 31st December, in all on 17 days.

**THUNDERSTORMS** occurred on 25th May about 8 A.M., and again on the same day about 10 P.M., continuing until 6 A.M. the next morning. Thunder was heard on the 27th of the same month, in the early morning.

A particularly heavy thunderstorm occurred on the 28th June, commencing about 7 P.M., and lasting for several hours. This was the heaviest thunderstorm I have seen at Redhill since my residence here, commencing in March 1866. The lightning was almost incessant from 7 P.M. to 10 P.M., and then continued with less frequency until nearly midnight. Heavy rain accompanied the electric storm, but the rain did not begin to fall heavily until two hours after the electric discharges commenced. It was on this occasion that 2·20 inches of rain were collected.

Other thunderstorms occurred. One on the 18th August, and another on the morning of the 20th of September, neither being very violent, and the one in September being of short duration only.

An **AURORA** was observed on the evening of the 25th April, but the display was feeble and of short continuance.

METEOROLOGY.—OXFORD ROAD, REDHILL (1892).

Month.	BAROMETER.				THERMOMETER.						RAIN.		
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.		Total of No. of Days '01 fell.		
									Max.	Min.			
January ..	30·62	26	29·43	7	51·0	29, 30	18·5	16	40·05	29·53	34·79	10	
February .	30·53	13	29·16	18	51·0	25	12·0	18	43·31	31·40	37·35	16	
March . . .	30·55	31	29·38	13	57·0	26	19·0	8, 12	42·97	23·44	35·70	12	
April . . . .	30·49	1	29·52	16	70·5	4	22·0	14	56·21	34·32	45·26	8	
May . . . . .	30·40	12	29·75	3	82·0	31	24·5	6	60·22	42·07	53·60	9	
June . . . . .	30·45	8	29·66	23	82·0	10, 28	37·0	14	67·55	45·78	56·66	15	
July . . . . .	30·38	24	29·78	7	78·0	3	43·0	26	67·78	49·10	58·44	13	
August ..	30·31	11	29·08	18	79·0	23	39·0	10	70·68	49·37	60·02	18	
September.	30·38	5	29·55	30	71·0	20	33·0	17	63·67	47·77	55·72	13	
October ..	30·30	19	29·40	7	58·5	29	26·0	23	51·32	38·34	44·83	25	
November .	30·49	28	29·72	3	57·5	14	28·5	1, 7	49·57	38·62	44·09	20	
December .	30·39	16	29·53	11	53·0	15	18·0	26	40·82	30·58	35·70	12	
Year.	30·62		29·08		82·0		12·0					27·31	171

*Meteorology, Oxford Road, Redhill, 1893.*

## BAROMETER.

The observations are made at 8 A.M.

The maximum of the year was 30·70 inches on 30th December. The minimum was 28·85 inches on the 21st February, but the lowest actually noticed was 28·73 inches at 6 P.M. on 20th December. This last is the lowest reading I have recorded in 27 years.

On 228 days the pressure was over 30 inches; on 137 days it fell below 30 inches. The pressure was in excess for a considerable portion of the year, chiefly in the spring months.

The extreme range was 1·97 inches. The average pressure 30·04 inches.

## THERMOMETER.

The temperature reached 80° and upwards in the shade on 22 days, and 70° and upwards but less than 80° on 64 days. The summer was therefore decidedly warm.

The minimum temperature was 8° on the 3rd January. It fell below freezing-point at some part of the twenty-four hours on 71 days. For seven days in January the temperature did not rise above the freezing-point at any time of the day.

## RAIN.

The total fall in the year was 23·76 inches on 145 days. The only years embraced in my record in which less rain had fallen are:

1870, when 23·73 inches fell on 130 days.

1884, „ 23·03 „ „ 168 days.

In the month of April the quantity of rain measured was only ·04 of an inch, and that fell on the 16th. This amount, with the exception of February 1891, when no fall at all was recorded in that month, was the least fall I have recorded in any one month during 27 years.

The longest period of drought was from 17th March to 14th May, 59 days; in which period only the small quantity of rain

0·4 fell on the 16th April. The next longest period without any rain was 13 days, from 7th June to 19th.

In January the fall of rain was slightly over the average. In February (the month last year deserved the name sometimes given to it, "February fill dyke") the amount which fell was 3·87 inches, the average for that month being only 2·17 inches. In July the fall slightly exceeded the average. August was dry. October retained its character of being the wettest month of the year.

SNOW fell on five days in January, on one day in February, and one day in November. The total fall of snow was slight.

THUNDER was heard on the undermentioned dates :—

March	1,	at 5.20 P.M.,	with rain	·51	inch.
May	17,	at 3·43 P.M.,	„	·51	„
„	29,	„	„	·16	„
June	19,	at 4.10 P.M.			
Oct.	1,	at 12.45 P.M.	3 very heavy peals.		
„	9,	at 6 & 8.30 P.M.,	with heavy rain.		

#### WIND.

Gales occurred on the undermentioned dates : on January 28th ; February 9th, 12th, and 14th ; November 18th and 19th, when the gales were heavy ; December 10th, 11th, and 12th, also heavy gales.

In the middle of the rainy weather of February, on the 19th, there occurred a remarkably fine, warm, balmy day, preceded and followed by a day of rain. The temperature on that day rose to 54° in the shade.

Many days in March, especially from the 17th to the 25th, were absolutely cloudless. On the 24th the thermometer rose to 59·5 in the shade. Again, from the 28th to 31st of March the days were cloudless.

But little fog was observed during the year.

METEOROLOGY, OXFORD ROAD, REDHILL (1893).

Month.	BAROMETER.				THERMOMETER.						RAIN.		
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.		Total of No. of Days Month. '01 fell.	INCHES.	
									Max.	Min.			
January ..	30.43	19	29.54	29	51.0	31	8.0	3	38.82	30.51	34.67	2.43	15
February .	30.41	5	28.85	21	54.0	19	22.0	5	46.18	34.25	40.21	3.87	24
March . . .	30.47	25	29.74	13, 16	62.0	29, 30	23.0	18	54.31	33.92	44.11	0.81	6
April . . .	30.54	8	30.00	1	82.0	26	27.0	14	64.17	38.72	51.43	0.04	1
May . . . .	30.46	6	29.70	18	78.0	15	35.0	31	67.16	45.47	56.31	0.86	7
June . . . .	30.45	6, 7	29.44	23	86.5	19	39.0	1, 2	72.57	49.55	61.06	0.85	8
July . . . .	30.37	28	29.63	12	84.5	8	45.0	27	72.43	52.78	62.60	2.94	17
August . .	30.35	25	29.77	21	86.5	16, 18	41.0	28	73.66	54.24	63.95	0.69	11
September.	30.37	12	29.44	29	74.0	14	36.0	24	64.23	46.05	55.14	1.47	13
October . .	30.46	23, 24	29.30	4	65.0	16	25.5	31	57.50	42.84	50.17	3.89	16
November .	30.36	29	29.08	18	55.5	17	28.0	22	46.88	37.08	41.98	2.87	14
December .	30.70	30	29.12	20	54.5	13	19.0	2	44.71	33.40	39.06	3.04	13
Year.	30.70		28.85		86.5		8.0					23.76	145

EVENING MEETING, held at Reigate, 16th of February, 1894.

Mr. C. E. Salmon presented a record of the rainfall taken at Margery, Reigate Hill, 757 feet above sea-level, by Mr. W. F. Taylor, for the months of April to December, 1893.

The monthly totals are :

April .....	·07
May .....	·92
June .....	·76
July .....	2·80
August .....	·64
September .....	1·67
October .....	4·09
November .....	2·64
December .....	3·10

Mr. H. M. Wallis, of Reading, gave an address on

NATURAL HISTORY NOTES IN SWITZERLAND.

Mr. Wallis exhibited a large number of Swiss butterflies ; and Mr. A. J. Crosfield showed some specimens of Swiss plants.

EVENING MEETING, held at Redhill, 16th of March, 1894.

A Locust, imported in hay, from Canada, was presented by Dr. Bossey.

Specimens of Lead Ore from Teesdale, on the Durlam side of the Dale, by Mr. E. Horne.

Mr. B. B. Gough read his

REPORT OF EXCURSIONS FOR 1893.

The following took part in an exhibition of objects under the microscope:—

Miss Crosfield, Mr. Brown (Royal Vet. College), Dr. Bossey, Mr. Tyndall, Mr. Poulter, Mr. A. H. Fardon, Mr. Sheffield, Mr. B. B. Gough, Mr. A. B. Gough, and Mr. Blake.

Mr Arthur Blake, M.R.C.V.S., F.R.M.S., after a few introductory remarks by the President, then read his paper :

AN EVENING WITH THE MICROSCOPE.

Mr. C. E. Salmon presented the following list of newly recorded localities for plants in Surrey:—

- Thalictrum flavum*. By the Wey, near Shalford. E. S. & C. E. Salmon.
- Ranunculus Lenormandi*. Stream in one of the valleys of Hurtwood Common, near Ewhurst Mill. E. S. & C. E. S.
- Cardamine impatiens*. Roadside between Shamley Green and Cranleigh. E. S. & C. E. S.
- Cardamine amara*. By stream, north of Westcott, near Dorking. E. S. S.
- Alyssum incanum*. Waste ground near Burford Bridge, with *Melilotus alba*. C. E. S.—Sand-pit on hills south of Gomshall where *Stachys annua* has been found. E. S. S.
- Polygala calcarea*. "Sheep Leas," near West Horsley. E. S. & C. E. S.
- Geranium pyrenaicum*. Near the Grand Stand, Epsom. G. F. Gibbs.
- Impatiens fulva*. By the stream opposite the "Black Horse," Gomshall. E. S. & C. E. S.
- Ribes nigrum*. By the Tillingbourne between Chilworth and Shalford. E. S. & C. E. S.
- Gnaphalium sylvaticum*. Abundant in meadows near Peaslake. E. S. & C. E. S.
- Petasites fragrans*. Roadside near Ockley Church. E. S. & C. E. S.
- Cnicus pratensis*. Meadows near Farnboro' Station. E. S. & C. E. S.
- Serratula tinctoria*. Footpath between Great and Little Bookham Churches. C. E. S.
- Atropa Belladonna*. Under trees near the "Sheep Leas," West Horsley. E. S. & C. E. S.

- Mentha rubra*, *M. piperita*. Roadside, Dawes Green. C. E. S.  
*Stachys annua*. Sand-pit on hills south of Gomshall. C. E. S.  
*Lamium maculatum*. Hedgebank in a lane near Muggswell,  
 some distance from houses. E. S. S.  
*Polygonum dumetorum*. Lane on hill south of Gomshall,  
 between Gomshall and Abinger Hatch. C. E. S.  
*Rumex Hydrolapathum*. By the Tillingbourne, between  
 Chilworth and Shalford. E. S. & C. E. S.  
*Thesium linophyllum*. "Sheep Leas," near West Horsley.  
 E. S. & C. E. S.  
*Iris foetidissima*. Gatton Park, near Gatton Tower. C. E. S.  
*Carex curta*. Lower Lake, Military College, Blackwater.  
 C. E. S.  
*Zannichellia palustris*. Fetcham Mill Pond. C. E. S.  
*Chara contraria*. Fetcham Mill Pond. C. E. S.  
*Chara vulgaris*. Fetcham Mill Pond. C. E. S.—Near Haxted  
 Mill, near Edenbridge. E. S. S.  
*Chara fragilis*. Near Haxted Mill, near Edenbridge. E. S. S.  
*Chara fragilis*, var. *Hedwigii*. Near Haxted Mill, near Eden-  
 bridge. E. S. S.  
*Nitella opaca*. Pond near Ranmore Common Church. E. S.  
 & C. E. S.—Well near the railway at Buckland. E. S. S.
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EVENING MEETING, held at Reigate, 20th of April, 1894.

Mr. A. Dowsett, of Reading, gave his

DEMONSTRATION ON BIRDS,

using by way of illustration specimens from his own collection. Various species of Cuckoo were chiefly taken, their habits discussed, and the theories accounting for their parasitic habits mentioned.

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ANNUAL MEETING,  
held at Reigate, 19th of October, 1894.

The Annual Report and Balance Sheet were read and adopted.

ANNUAL REPORT.

We are glad to be able to report an increase in the membership of the Club during the past twelve months. 15 members or subscribers have joined the Club; 7 have left through resignation or removal from Reigate, and 3 through death, making the present membership 81. It is with sorrow that we record the decease of two gentlemen who have been members of the Club almost from its commencement—Henry Webb, Esq., of Redstone Hill; and Robert C. Baxter, Esq., who served the Club as treasurer from 1871 to 1884.

The attendance at the Evening Meetings during the winter session was very good. On two occasions, once at Reigate and once at Redhill, over 80 persons were present. The average attendance at all the meetings was 46. The quality of the papers read or addresses given was quite equal to that of former years. The Club met 4 times at Reigate, and 3 times at Redhill, where the majority of our members now reside.

The following subjects occupied the evening meetings:—

1893.

October. British Carnivorous Plants, by Mr. N. E. Brown.

November. Flint as found in Chalk, by Dr. G. Abbott.

December. The Distribution of some Plants found in S.W. Surrey, by Mr. S. T. Dunn.

„ Plants found near Tighnabraich, Argyllshire, by Mr. C. E. Salmon.

1894.

January. Natural History Wanderings in Algiers, by Miss Martin.

„ Meteorological Notes at Redhill, 1893, by Mr. W. H. Tyndall.

1894.

- February. Natural History Notes in Switzerland, by Mr. H. M. Wallis.
- March. An Evening with the Microscope, by Mr. Arthur Blake, M.R.C.V.S., F.R.M.S.
- „ Report of Excursions, 1893, by Mr. B. B. Gough.
- April. Bird Demonstration, by Mr. A. Dowsett.

The Museum of the Club has been enriched by a handsome present from Mr. W. H. Heaton, of a number of large cases of stuffed birds and several beautifully-arranged specimens of nests and eggs obtained in this neighbourhood.

The following Societies have kindly sent us their publications :—

- The British Association for the Advancement of Science.
- Bath Natural History and Antiquarian Field Club.
- Cardiff Naturalists' Society.
- Croydon Microscopical and Natural History Club.
- Dumfriesshire and Galloway Natural History and Antiquarian Society.
- Epsom College Natural History Club.
- Hampshire Field Club.
- Marlborough College Natural History Society.
- North Staffordshire Naturalists' Field Club and Archæological Society.
- Penzance Natural History and Antiquarian Society.
- Rochester Naturalists' Club.
- South London Entomological and Natural History Society.
- West Kent Natural History, Microscopical, and Photographic Society.

Mr. Arthur Bennett, F.L.S., has kindly sent reprints of several Botanical articles.

The exhibits at the Evening Meetings have perhaps not been so numerous as during some former years; but many of the addresses given were illustrated by specimens or diagrams.

The usual number of excursions were planned for the summer months, but three of them fell through owing to unfavourable weather.

The following were carried out:—

*Whole Day Excursions.*

May 19.—From Shalford, by the banks of the Wey, to Godalming and Hurtmoor.

June 16.—Norbury Park and Ranmore Common.

July 14.—Leith Hill.

*Afternoon Excursions.*

April 28.—Outwood.

June 2.—Fay Gate and Holmbush Beacon.

June 20.—Boating on the River Wey.

July 28.—Chilworth.

Aug. 11.—Ashdown Forest.

Aug. 25.—Betchworth and Headley Lane.

Few excursions of recent years have been more productive botanically than the one from Shalford to Godalming, under the leadership of Mr. S. T. Dunn, who was able to point out quite a number of scarce species or varieties of plants.

On the occasion of the excursion to Outwood the Club was kindly entertained at tea by Mrs. Alexander.

In the Ashdown Forest excursion members of the Tunbridge Wells Natural History Society met our Club.

The following Officers were elected for the ensuing year:—

*President.* Mr. W. H. Tyndall.

*Vice-President.* Dr. F. Bossey.

*Treasurer.* Mr. J. I. Cudworth.

*Secretary.* Mr. A. J. Crosfield.

*Curator.* Mr. J. Linnell.

*Committee.* Messrs. A. Blake, J. Bonnor, T. Cooper, J. B. Crosfield, F. H. Ellwood, J. Knight, C. E. Salmon, the Rev. W. M. Paull.

THE HOLMESDALE NATURAL HISTORY CLUB.

ABSTRACT OF ACCOUNTS.

*Receipts.*

(October 1893 to October 1894.)

	£	s.	d.
Balance, October 1893.....	9	12	0
Subscriptions .....	29	0	0
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	£38	12	0
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*Expenses.*

(October 1893 to October 1894.)

	£	s.	d.
Rent of Museum, Gas and Cleaning ..	17	4	7
„ Redhill Hall .....	1	1	0
Printing, &c.....	3	19	8
Sundries, <i>per</i> Secretary .....	14	11	
Collector—Commission .....	1	3	0
„ Stamps, &c. ....	8	0	
Balance, October 1894.....	14	0	10
	<hr/>		
	£38	12	0
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*Proceedings.*

Mr. N. E. Brown, of Kew, lectured on  
 OUR BRITISH WILD FLOWERS. WHERE DID THEY COME FROM?  
 HOW DID THEY GET HERE? WHEN DID THEY COME?

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EVENING MEETING, held at Redhill, 16th of November, 1894.

Mr. H. M. Wallis, of Reading, gave an address on  
 NATURAL HISTORY OBSERVATIONS IN THE PYRENEES.

Mr. Wallis exhibited a number of Butterflies taken in the  
 Pyrenees, including the scarce Swallowtail, the Apollo, and  
 many other species.

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EVENING MEETING, held at Reigate, 21st of December, 1894.

Mr. Jno. Linnell exhibited specimens of the following British  
 Diptera caught by him:—

*Bibio pomonæ*, F. From Reigate district.  
*Melanostoma mellinum*, L. Redstone, Redhill.  
*Syrphus ribesii*, L. " "  
*Myopa buccata*, L. " "  
*Myopa testacea*, L. Redhill.  
*Pollenia rudis*, F. Redstone, Redhill.  
*Platystoma seminationis*, F. Reigate.  
*Syritta pipiens*, L. Gomshall.

Mr. A. J. Crosfield exhibited specimens of plants collected  
 on the excursion to Godalming on May 19th.

Mr. W. Carter, M.A., of Tunbridge Wells, lectured on

DUST.

A REPORT OF EXCURSIONS FOR 1894,  
edited by Mr. B. B. Gough, was read.

The excursion on May 19th to Shalford and Godalming, under the leadership of Mr. S. T. Dunn, was one of the most productive that the Club has taken during recent years.

On Shalford Common, the biennial Knawel, *Sceleranthus annuus*, L., var. *biennis*, Reut., was found: also *Montia fontana*, L., a. *minor*, Gmel., *Trifolium filiforme*, L., *Trifolium subterraneum*, L., *Carex ovalis*, Good., var. *bracteata*, Syme, and one plant of *Claytonia perfoliata*, Don. The ponds were white with Water Crowfoots. *Ranunculus peltatus*, Schrank, var. *floribundus* (Bab.) was the most abundant species.

The walk was continued along the banks of the River Wey. In the river *Ranunculus fluitans*, Lam., and *Potamogeton densus*, Linn., were observed.

The alarm note of the Yellow Wagtail called attention to a pair of these graceful summer visitants, which kept flitting restlessly to and fro and perching on the willow-bushes and telegraph-wires. The grating song of the Sedge Warbler proceeded from a small alder copse.

In a rough belt of land between the Wey and the Canal the leaves of Meadow Rue, *Thalictrum flavum*, L., were seen.

In a meadow, where the greensand cropped out through the alluvial deposit, a few plants of *Vicia lathyroides*, L., were met with. It is an interesting find, which few of us had seen in Surrey previously. *Saxifraga granulata*, L., was rather plentiful. The two forms of *Ranunculus acris*, L., b. *tomophyllus*, Jord., and c. *vulgatus*, Jord., were recognized. In a small bog *Stellaria palustris*, Ehrh., was found. It is scarce in Surrey. *Medicago maculata*, Sibth., was gathered by the Wey. *Enanthe peucedanifolia*, Poll., was growing sparingly in one of the large water meadows near Godalming.

The party went through the outskirts of Godalming, and up the Hurtmoor valley. In swampy ground *Equisetum maximum*, Lam., and *E. palustre*, L., flourished. On a sandy bank *Carex muricata*, L., var. *pseudo-divulsa*, Syme, was gathered. On

some rubbish heaps at Godalming *Anthriscus vulgaris*, Pers., and *Lepidium Smithii*, Hook., grew. *Trifolium medium*, L., was gathered at Hurtmoor, and *Geranium lucidum*, L., which is common round Godalming, though unknown round Reigate. *Ranunculus peltatus*, var. *penicillatus*, was found in a still stream.

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EVENING MEETING, held at Redhill, 18th of January, 1895.

Mr. Sydney Webb, of Dover, read a paper on

DRAGONS.

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EVENING MEETING, held at Reigate, 15th of February, 1895.

Mr. Arthur F. Griffith, of Brighton, gave an address on

VARIATIONS IN THE PLUMAGE OF BIRDS.

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EVENING MEETING, held at Redhill, 15th of March, 1895.

Mr. W. H. Tyndall read a paper entitled

A VISIT TO THE ENGLISH HIGHLANDS ;

in which he described the physical features and scenery of the Cheviots ; the Pennine range, including Crossfell, Micklefell, Ingleboro', and the Derbyshire hills ; the Cumberland Mountains ; Bardon Hill in Leicestershire ; the Malvern Hills ; the Cotteswolds ; the Mendip Hills ; Exmoor ; and Dartmoor.

Mr. C. E. Salmon read a paper on

BOTANICAL RAMBLES.

On the occasion of a ramble round Guildford he recorded the

following plants :—*Dianthus plumarius*, *Dipsacus pilosus*, *Alysum incanum*, *Filago apiculata*, *Silene dichotoma*, *Hypochaeris glabra*, *Papaver hybridum*, *Fumaria Vaillantii*, and *F. densiflora*.

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EVENING MEETING, held at Reigate, 19th of April, 1895.

Mr. John Linnell exhibited the following Diptera :—

1. *Rhyphus fenestralis*, Scop. From Redhill, 1864.
  2. *Hematopota pluvialis*, L. Between Redhill and Tilburstow Hill, 1862.
  3. *Theriopectes solstitialis*, Mg. Redstone House.
  4. *Tabanus autumnalis*, L. Redhill, 1862.
  5. *Chrysops cæcutiens*, L. Redstone, 1875.
  6. *Leptis scolopacea*, L. Sand-cutting, Reigate tunnel, 1863.
- All captured by him.

Mr. A. W. Brown, of Christ Church, Oxford, gave an address entitled

AN ACCOUNT OF THE THEORY OF EVOLUTION.

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### ANNUAL MEETING,

held at Redhill, 18th of October, 1895.

The Annual Report and Balance Sheet were read and confirmed.

#### ANNUAL REPORT.

During the year 11 members have joined the Club, and 4 have resigned, leaving the present membership 88.

The quality of the addresses given at the Evening Meetings has on the whole been well maintained. The attendance has averaged 32. The three meetings held at Redhill averaged an attendance of 40, whilst the 4 at Reigate averaged only 29.

The attendance fell as low as 11 at the December meeting, when an exceptionally interesting paper on Dust was read by Mr. W. Carter, M.A., of Tunbridge Wells. A very able address on Variations in the Plumage of Birds was given to an audience of but 14 people by Mr. Arthur F. Griffith, of Brighton. It is long since the Club has had a greater treat than the lecture on the Theory of Evolution, by Mr. A. W. Brown, of Christchurch, Oxford. We have also been privileged again to welcome amongst us our honorary members, Mr. Sydney Webb, of Dover, and Mr. N. E. Brown, of Kew, and our friend, Mr. H. M. Wallis, of Reading.

The following is the tabulated list of subjects and speakers :—

1894.

- October. Our British Wild Flowers. Where did they come from? How did they get here? When did they come? By Mr. N. E. Brown.
- November. Natural History Observations in the Pyrenees, by Mr. H. M. Wallis.
- December. Dust, by Mr. W. Carter, M.A.
- „ Report of Excursions for 1894, by Mr. B. B. Gough.

1895.

- January. Dragons, by Mr. S. Webb.
- February. Variations in the Plumage of Birds, by Mr. A. F. Griffith.
- March. A Visit to the English Highlands, by Mr. W. H. Tyndall.
- „ Botanical Rambles, by Mr. C. E. Salmon.
- April. An Account of the Theory of Evolution, by Mr. A. W. Brown.

We are indebted to the following Societies for copies of their publications :—

- The Cardiff Naturalists' Society.  
The British Association.

The Dumfriesshire and Galloway Nat. Hist. and Antiquarian Society.

The Belfast Nat. Hist. and Philosophical Society.

The West Kent Natural History Society.

The Brighton and Sussex Natural History Society.

The Croydon Microscopical and Nat. Hist. Club.

The Bath Nat. Hist. and Antiquarian Field Club.

The Burton-on-Trent Nat. Hist. and Archæological Society.

The South London Entomological and Nat. Hist. Society.

The Marlborough College Nat. Hist. Society.

Mr. Arthur Bennett, F.L.S., has kindly sent reprints of Botanical articles.

The following are the Excursions which the Club took during the unusually fine summer :—

*Whole Day.*

May 11.—Felday and Holmbury Hill.

June 8.—Gomshall, Newlands Corner and Chilworth.

July 13.—Balcombe and West Hoathly.

Aug. 10.—Witley Common and Haslemere.

Sept. 7.—Leith Hill.

Oct. 5.—Ashdown Forest.

*Afternoons.*

April 27.—Reigate Park and Reigate Heath.

May 25.—Bury Hill.

June 22.—Reigate and Buckland Hills.

July 27.—Croham Hurst and Sanderstead.

Aug. 24.—Albury Heath and Chilworth.

Sept. 21.—Godstone and Nutfield.

THE HOLMESDALE NATURAL HISTORY CLUB.

ABSTRACT OF ACCOUNTS.

*Receipts.*

(October 1894 to October 1895.)

	£	s.	d.
Balance, October 1894.....	14	0	10
Subscriptions .....	28	15	0
Sale of Proceedings .....	2	0	
	<hr/>		
	£42	17	10
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*Expenses.*

(October 1894 to October 1895.)

	£	s.	d.
Rent of Museum, Gas and Cleaning ..	17	4	3
„ Redhill Hall .....	1	1	0
Printing, Stationery, &c.....	2	5	11
Sundries, <i>per</i> Secretary .....	1	5	4
Collector—Commission.....	1	5	9
„ Postages, &c. ....		5	8
Balance .....	19	9	11
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	£42	17	10
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*Proceedings.*

The following Officers were elected :—

*President.* Mr. W. H. Tyndall.

*Treasurer.* Mr. J. I. Cudworth.

*Secretary.* Mr. A. J. Crosfield.

*Curator.* Mr. Jno. Linnell.

*Committee.* Messrs. A. Blake, J. Bonner, T. Cooper, J. B. Crosfield, F. H. Ellwood, A. G. Northover, C. E. Salmon, and the Rev. W. M. Paull.

Mr. N. E. Brown, of Kew, lectured on

THE GIANT TREES OF CALIFORNIA.

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EVENING MEETING, held at Reigate, 15th of November, 1895.

Mr. Leonard J. Day read a paper on

NATURAL HISTORY OBSERVATIONS MADE DURING 8 YEARS'  
RESIDENCE IN THE COAST PROVINCES OF CHINA.

Mr. Day exhibited specimens of a leach and wire-worm from China; also of *Lycopodium* and of Chinese silk.

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EVENING MEETING, held at Redhill, 13th of December, 1895.

The Rev. W. M. Paull lectured on

A VISIT TO TUNIS AND ALGERIA.

The lecture was illustrated by a fine series of lantern slides as well as by articles of native manufacture.

Mr. Tyndall's Meteorological tables for 1894 are appended.

METEOROLOGY.—OXFORD ROAD, REDHILL (1894).

Month.	BAROMETER.				THERMOMETER.				RAIN.		
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.	Total fall.	No. of Days
January . . . .	30·50	3	29·33	31	50·0	11, 12, 16, 27	8·5	6	37·30	INCHES, 4·57	23
February ..	30·52	19	29·56	12	54·5	7	21·0	20	41·36	1·95	16
March . . . . .	30·47	23	29·23	13	60·0	27, 30, 31	24·0	2	43·10	1·38	9
April . . . . .	30·20	5	29·49	16	68·5	8	31·0	21	50·38	1·92	13
May . . . . .	30·32	1	29·65	29	68·5	15, 16	32·5	20	49·85	1·64	14
June . . . . .	30·43	30	29·80	2	77·0	30	45·0	11	58·40	2·68	12
July . . . . .	30·36	1	29·38	12	81·0	1, 6	46·0	13	61·96	5·06	20
August . . . .	30·28	30	29·68	14	72·0	13	45·0	19, 29	59·64	2·55	17
September ..	30·45	30	29·72	25	68·0	1, 19	35·5	27	53·93	2·09	14
October . . . .	30·51	1	29·29	25	63·0	11	30·0	16	49·92	4·29	21
November ..	30·48	30	29·24	12	61·0	1	30·5	21	44·71	4·88	18
December ..	30·61	27	29·40	30	53·0	14	25·5	30	41·00	2·46	16
Year.	30·61		29·23		81·0		8·5			35·47	193



# R U L E S .



## NAME

I.—The Association shall be styled "THE HOLMESDALE NATURAL HISTORY CLUB."

## OBJECTS.

II.—The investigation of the Natural History of Reigate and its vicinity, and the mutual improvement of the members in the study of Nature.

## CONSTITUTION.

III.—The Club shall consist of Members, Subscribers, Corresponding Members, and Honorary Members.

## MEMBERS.

IV.—Members shall be elected by ballot or show of hands at any Ordinary Meeting. The candidate to be recommended by one or more Members at any Ordinary Meeting, and the election to take place at the Meeting next ensuing.

## SUBSCRIBERS.

V.—Subscribers shall be elected in the same manner as Members, and shall have all the privileges of Members, except of holding any office in the Club, or of voting upon any matter connected therewith, or of having any right or ownership in the property of the Club.

## CORRESPONDING MEMBERS.

VI.—It shall be competent for the Club to elect as Corresponding Members any gentlemen distinguished for their attainments in Natural History, either as collectors or authors, or to whom the Club may be indebted for contributions of papers or specimens; such Corresponding Members to have similar privileges to Subscribers without payment, and to be elected by the Club upon the nomination of the Committee.

## HONORARY MEMBERS.

VII.—Honorary Members shall be elected by the Club upon the nomination of the Committee; and shall be exempted from the payment of subscriptions, and shall have the privileges of Subscribers.

## OFFICERS.

VIII.—The Club shall, at the Annual General Meeting, elect from among themselves a President, Treasurer, Secretary, Curator, and nine Members to form a Committee of Management, three of whom to form a quorum.

## VICE-PRESIDENTS.

IX.—The President shall nominate annually two Vice-Presidents from the members of the Committee.

## ANNUAL GENERAL MEETING.

X.—This shall be held previous to the Evening Meeting on the third Friday in October, when the Committee shall present a Report detailing the general state, proceedings, and pecuniary condition of the Club, and proceed to the election of Officers.

## SPECIAL MEETINGS.

XI.—The Committee shall have the power to call a Special General Meeting at any time; and they shall do so within four weeks after receiving requisition to that effect, signed by at least five Members. The notice calling the Meeting shall state the objects for which the Meeting is called, and no other business shall be transacted.

## ORDINARY MEETINGS.

XII.—These shall be held on the third Friday in every month, from October to April, inclusive, or more frequently at the option of the Committee.

## SUBSCRIPTIONS.

XIII.—Each Member shall pay to the Treasurer Ten Shillings on his election, and the same sum at the Annual General Meeting each year; but may compound for such Annual Subscription by payment of Five Pounds. Each Subscriber shall pay to the Treasurer Five Shillings on his election, and the same sum at the Annual General Meeting each year. That it shall be optional with the Committee to strike out the name of any Member or Subscriber who shall be in arrear with his Subscription for twelve months or more.

## NEW RULES.

XIV.—Any five members, wishing to propose a New Rule, or the omission or alteration of any existing Rule, must send notice to the Secretary, who shall within a month call a Special General Meeting to consider the change proposed.

## LIBRARY AND COLLECTIONS.

XV.—The Club shall form, as opportunity may offer, a Library of Reference, consisting of works bearing on the subject of Natural History; and obtain collections of the natural objects of the neighbourhood. The Library, Collections, and Funds to be the property of the Members for the time being, and shall be vested in Trustees for the use of the Members. Contributions of Life Members shall also be invested in the names of such Trustees in such manner as the Committee may direct, the interest arising therefrom to be handed to the Treasurer for the general purposes of the Club.

## ELECTION OF TRUSTEES.

XVI.—The Trustees shall consist of the President for the time being, and three other Members to be elected by the Club.

## LIST OF MEMBERS AND SUBSCRIBERS.

*Names marked \* are Honorary Members.*

- ADENEY, Miss ; Bushey, Reigate.  
BEEBY, W. H. ; Vaila, Burwood Park Road, Walton-on-Thames.  
\*BENNETT, ARTHUR, F.L.S. ; High Street, Croydon.  
BLAKE, ARTHUR, M.R.C.V.S. ; Dean House, Redhill.  
BONNOR, JAMES ; Linkfield Lane, Redhill.  
BOSSEY, FRANCIS, M.D. ; Mayfield, Redhill.  
BRASS, Rev. HENRY, M.A. ; Redhill.  
\*BROWN, N. E. ; Herbarium, Kew.  
BUNDOCK, T., B.A. ; Buckland House, Station Road, Redhill.  
CAMPION, Miss ANNIE ; Mayfield, Redhill.  
COCHRANE, W., B.A. ; Upland Villa, Redhill.  
CONOLLY, W. ; Buckhurst, Redhill.  
COOPER, THOMAS ; Brighton Road, Redhill.  
CREWDSON, Miss ; The Barons, Reigate.  
CROSFIELD, JAMES B. ; Undercroft, Reigate.  
CROSFIELD, HERBERT ; do.  
CROSFIELD, Miss ; do.  
CROSFIELD, ALBERT J. ; Carr End, Reigate.  
CROSFIELD, Mrs. A. J. ; do.  
CUDWORTH, JAMES I. ; Woodcote, Reigate.  
CUDWORTH, Mrs. J. I. ; do.  
DUNN, S. T. ; St. John Baptist Vicarage, Bath.  
ELLWOOD, F. H. ; Station Road, Redhill.  
\*EVELYN, W. J. ; Wotton House, Dorking.  
FARDON, Miss ; Taisboro, Reigate.  
GEDGE, EDWARD, Jr. ; Grove Hill Road, Redhill.  
GIBBS, GEORGE F. ; Blackboro' Road, Reigate.  
GILFORD, WILLIAM ; Beech Grove, Redhill.  
GOUGH, ALFRED B. ; Sandcroft, Redhill.  
GOUGH, BERNARD B. ; do.  
GURNEY, HENRY ; Nutwood, Reigate.  
HARDING, Miss LILLY ; Mount Sandford, Reigate.  
\*HEATON, WILLIAM H. ; 21 Fairfield Road, Croydon.  
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HOOPER, T. R. ; Redhill.  
HORNE, EDWARD, J.P. ; Park House, Reigate.  
HORNE, Miss ; Warwick Road, Redhill.  
JOHNSTON, WALTER ; Oak Bank, Bridge Road, Redhill.  
JOHNSTON, Miss ANNIE J. ; do.  
JOHNSTON, Miss ALICE ; do.  
LEES, JOHN ; Reigate.

- LEMON, F. E. ; Hillcrest, Redhill.  
 LINNELL, JOHN ; Redstone Wood, Redhill.  
 LUBBOCK, Sir JOHN, Bt., M.P. ; 15 Lombard Street, London, E.C.  
 LURY, SAMUEL H. ; North View, Redhill.  
 MARTIN, Miss ; Lynton, Bridge Road, Redhill.  
 MEW, JOHN ; Gloucester Road, Redhill.  
 MOTT, FRANK ; 11 Ladbroke Crescent, Redhill.  
 NEWMAN, THOMAS P. ; Hazelhurst, Haslemere.  
 NORTHOVER, ARTHUR G. ; Holmleigh, Bridge Road, Redhill.  
 ORAM, Miss F. ; Portnals, Woodlands Road, Redhill.  
 PADWICK, THOMAS ; Station Road, Redhill.  
 PACE, P. C. ; Gatton Point, Redhill.  
 PAULL, Rev. W. MAJOR ; Park Road, Redhill.  
 PAWLE, FREDERICK C. ; Northcote, Reigate.  
 PECK, Miss M. ; Testerton, Redhill.  
 PHILLIPS, T. BACON ; Woodlands Road, Redhill.  
 PIERCE, A. N. ; Melrose, London Road, Redhill.  
 PIERCE, Miss A. E. ; do.  
 POULTER, DANIEL P. ; Gloucester Road, Redhill.  
 POWELL, Mrs. ; Ivanhoe, Reigate.  
 RICHARDS, Mrs. ; 5 Park Road, Redhill.  
 SALMON, SAMUEL ; Clevelands, Reigate.  
 SALMON, Mrs. ; do.  
 SALMON, Miss I. E. ; do.  
 SALMON, ERNEST S. ; do.  
 SALMON, CHARLES E. ; do.  
 SARGANT, Miss ; Quarry Hill, Reigate.  
 SELLS, H. MARTIN ; Lodore, Campden Road, Croydon.  
 SHAPLAND, EDGAR ; Winslade, Bridge Road, Redhill.  
 SHAPLAND, Miss ALICE ; do. do.  
 SHARP, J. B. ; Hill Brow, Reigate.  
 SILLITOE, F. S., Jr. ; Redhill.  
 SPRULES, G. H. ; Mansfield, Reigate.  
 STAMM, Miss IDA ; Messina, Redhill.  
 SUTTON, Miss ; Redhill Common, Redhill.  
 THOMPSON, Mrs. ; The Stream, Buckland.  
 THOMPSON, Miss T. ; do.  
 THOMPSON, Miss MAY ; Clairville, Reigate.  
 THOMPSON, Miss GERTRUDE ; do.  
 TINDALL, Mrs. S. H. ; Hillside Villa, Redhill.  
 TROWER, ARTHUR ; London Road, Redhill.  
 TROWER, Miss ; Wiggie, Redhill.  
 TURNBULL, Miss ; Summerhill House, Redhill.  
 TYNDALL, WILLIAM H. ; Morlands, Redhill.  
 WALTERS, JOHN, M.B., J P. ; Church Street, Reigate.  
 WEBB, SYDNEY ; Maidstone House, Dover.  
 WHITTARD, Mrs. ; The Elms, Redhill.







247.

PROCEEDINGS

OF THE

HOLMESDALE NATURAL HISTORY CLUB

FOR THE YEARS 1896, 1897, and 1898.

TOGETHER WITH

RULES and LIST OF MEMBERS.



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LONDON:

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

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PROCEEDINGS  
OF THE  
HOLMESDALE NATURAL HISTORY CLUB.

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MEETING, held at Reigate, 17th of January, 1896.

Mr. C. E. Salmon exhibited a fine series of plants, dried and beautifully mounted.

Mr. A. W. Brown, of Christchurch, Oxford, gave an address on

LIFE IN THE DEEP SEA.

After shortly tracing the history of our knowledge of the Deep-sea Fauna, the Lecturer stated that the lecture would deal with four points, viz. :—(1) The physical conditions of life at great depths in the ocean; (2) General characters of deep-sea life; (3) The characters of the more interesting members of the deep-sea fauna; (4) The origin of the deep-sea fauna.

(1) The physical conditions at great depths of the sea, as they affect animal life, may be summed up as follows. First, the pressure is enormously increased, at a depth of 2500 fathoms amounting to  $2\frac{1}{2}$  tons to the square inch. Secondly, there is an absence of movement in the water, all waves being on the surface. Then the temperature is very low, probably close upon freezing-point, though certainty as to this cannot be reached at present. Light probably does not penetrate below

400 fathoms to any marked extent, and, in consequence, plant-life is absent. Lastly, the character of the sea-bottom also affects animal life.

(2) The colour of deep-sea animals is generally uniform, blue and green colours being almost absent, and red the prevalent tone. In addition to this character the eye is either very large or very small and almost functionless. Many animals have phosphorescent organs, developed either as ocelli down the body or as glandular organs on the head. The bones and shells of deep-sea forms are conspicuous for their lack of carbonate of lime. Deep-sea animals probably derive their food from the surface.

(3) This section of the lecture discussed the special characters of deep-sea fish and other forms. The large size of the jaws and head of certain eels was called attention to, and the relation between deep-sea and fossil echinoderms discussed. Shrimps, sea-spiders, crustacea, and the remarkable forms *Cephalodiscus* and *Rhabdopleura* were briefly described.

(4) The various suggestions as to the origin of the deep-sea fauna were considered. Agassiz believed that the deep-sea forms had been specially created. Wyville Thomson had suggested a more or less ancient population of the deep sea. The most satisfactory answer to the question seemed to be that of migration, possibly when the cooling of the poles in Mesozoic times compelled the animals of the Arctic seas to migrate. As soon as cold water carried oxygen down to the depths, a deep-sea fauna became possible. However, the question must at present remain wrapped in great obscurity.

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MEETING, held at Redhill, 21st of February, 1896.

Dr. Bossey exhibited some flints obtained from the excavations for the Fort on Reigate Hill. Some of them were pear-shaped, others more elongated. Their cores were filled in

part with chalk and in part with red clay. The chalk contained numerous foraminifera, and the clay contained spicules of sponges.

The Rev. Hy. Brass, M.A., read a paper on

THE GEOLOGY OF THE ISLE OF PORTLAND.

The paper was illustrated by a large collection of fossils and fragments of rock.

Mr. W. H. Tyndall read his

REPORT OF THE METEOROLOGY OF REDHILL for 1895.

THE BAROMETER.

In the month of January the pressure was low, only three times reaching to 30 inches, and those times the last three days of the month. On the 14th the pressure fell to 28·99 inches, and this was the lowest recorded in the year. The average of the month was 29·70 inches, being the lowest monthly average in the year.

In September the pressure was never under 30 inches, the minimum being 30·01 inches, and the average of the month 30·22. The maximum during the year was 30·57 inches, on the 2nd of May. In the twelve months the pressure was 30 inches and above, 176 times; 29 inches and upwards; and once under 29 inches.

TEMPERATURE.

The year ushered in cold. On 23 nights in January the temperature fell below freezing and on ten days it did not rise above the freezing-point. The average of the month was 32°·19, being 3°·75 below the average of 16 years. February was remarkable for its extreme severity. On 23 days the temperature fell below freezing, and on the other five days of the month the maximum reached only just above the freezing-point. The coldest night was the 6th, when the glass fell to 4°·5 (or 27°·5 below the freezing-point). The next night it was half a degree

higher. On 12 days it did not rise above  $32^{\circ}$  at any time during the day, and on the 6th, 7th, and 8th the maximum of the day was  $22^{\circ}\cdot 5$ ,  $20^{\circ}\cdot 0$ , and  $26^{\circ}\cdot 0$ . The average temperature of the month was  $27^{\circ}\cdot 45$ , the lowest average of any month of February recorded by me since 1867, being  $9\cdot 95$  degrees lower than the average temperature of that month as observed at Redhill in 16 years.

From April to September the temperature was above the average; in September  $3^{\circ}\cdot 89$  beyond the average. An unusually hot time occurred towards the end of the month, when the thermometer rose on the 30th to  $80^{\circ}\cdot 5$  in the shade. October was cool, and towards the end of the month very cold for the time of year. From the 22nd to the 30th it fell below freezing each night, and on the 27th sank to  $23^{\circ}$  or 9 degrees below freezing-point. November was wet and warm, the average of the month being  $3^{\circ}\cdot 20$  above the general average of 16 years. December was also slightly warmer than the average. On the coldest night the temperature fell to  $23^{\circ}$ , on the 21st.

#### THE RAINFALL.

In January it was slightly under the average. In February the deposit was only  $\cdot 28$ , being  $1\cdot 82$  inches below the average of 29 years. March and April were about the average. The fall in May and June very slight—only  $\cdot 55$  and  $\cdot 38$  respectively. July was a wet month, the rainfall being nearly double the average. August was beyond the average. September the fall was very slight, only  $\cdot 49$ , not  $\frac{1}{5}$  of what might have been expected. October did not keep up its character of being the wettest month in the year, the fall being only  $3\cdot 32$ , but yielded the palm to November, when the fall was  $5\cdot 47$  inches, a trifle more than the fall in July. December yielded about the average.

Some heavy falls of rain occurred in the months of July and November.

In July	1·46 inches	on the	2nd,
	1·88	„	22nd,
	·90 inch	„	27th ;

and in Nov.	·71	inch	on the	8th,
	·54	„	„	10th,
	·70	„	„	15th,
	·63	„	„	28th.

Besides those mentioned the falls of half an inch and upwards were

In April	·65	on the	25th,
Dec.	·58	„	16th.

The total fall of the year was 28·23 inches on 159 days. The average yearly fall has been 30·64 on an average of 176 days.

The most rainy year was 1877, when the total fall was 39·07 inches, and the least rainy 1884, when only 23·03 inches fell.

Very little snow fell during the year, at no time was the ground covered at even depth with so much as one inch. Yet in January snow fell slightly on 14 days, and in February on 6 days. In March a little fell on 4 days. A very little in October, but not enough to measure; and one day in December snow and rain mingled, and on another day in the same month there was a slight fall but not sufficient to measure.

Lightning was seen and thunder heard on the 23rd of January at about 10.30 A.M., attended by a strong gale which lasted the whole day. On the 10th of August was a thunder-shower from 9 to 10 P.M., again on the 21st, coming on about 7 A.M., and again coming on about 12 hours later with rain and hail. Upon the whole there has been but little electrical disturbance during the year.

Gales occurred from the 26th to the 28th of March, doing little damage in this district, but in some parts of the Midland counties it reached a hurricane, blowing down numbers of trees, chiefly elms. They were lying about the lanes and fields in Warwickshire in hundreds. A heavy gale at night occurred on the 3rd of October; again a very heavy gale from the S.W. on the 10th of November; and gales from the N.E. on the 23rd and 24th.

The year has, for the most part, been favourable in this

METEOROLOGY.—OXFORD ROAD, REDHILL (1895).

Month.	BAROMETER.				THERMOMETER.				RAIN.		
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.	Total fall.	No. of days.
January . . . . .	30.48	30	28.99	14	50.0	20	18.0	26	32.19	2.47	21
February . . . . .	30.46	17	29.57	11	42.0	23, 28	4.5	6	27.45	.28	7
March . . . . .	30.43	15	29.01	28	60.5	22	24.5	3	41.14	1.89	18
April . . . . .	30.26	30	29.40	23	62.5	20, 30	32.0	1, 12	47.20	1.97	14
May . . . . .	30.57	2	29.62	18	80.5	30	28.0	4	54.40	.55	5
June . . . . .	30.47	24, 25	29.50	2	77.5	23, 26	37.0	15	59.80	.38	8
July . . . . .	30.30	6, 8	29.60	Several days.	78.0	13	47.0	5, 6	62.85	5.44	16
August . . . . .	30.50	28	29.50	4, 6	78.0	22	42.0	31	60.70	3.07	18
September . . . . .	30.37	21	30.01	6	80.0	27	40.0	20, 22	60.17	.49	4
October . . . . .	30.52	18	29.15	9	72.0	1	23.0	27	45.20	3.32	15
November . . . . .	30.39	1	29.32	12	60.5	16	29.5	17	46.20	5.47	17
December . . . . .	30.36	28	29.23	16	55.0	5	23.0	21	39.60	2.90	16
Year . . . . .	30.57		28.99		80.5		4.5			28.2	159

district for the gardens. Small fruits, as currants and gooseberries, were for the most part abundant. Strawberries suffered from the drought in June. Apples were abundant. Pears and plums scarce, although in some districts in the West of England plums were most abundant.

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MEETING, held at Reigate, 20th of March, 1896.

Mr. Poulter exhibited geological specimens from Franz Josef Land containing foraminifera.

Mr. C. E. Salmon exhibited several species of Rubi collected by him at Hindhead.

Mr. C. E. Salmon presented a list of new localities for plants in Surrey:—

*Sagina ciliata*, Fr. Shalford Common. C. E. S.

*Hypericum Androsæmum*, L. Near Goudhurst Pond, near Cowden. C. E. S.

*Callitriche hamulata*, Kuetz. Shalford Common. C. E. S.

*Serratula tinctoria*, L. Roadside near Churt, Bellagio. C. E. S.

*Myosotis sylvatica*, Hoffm. Between Holmbury Hill and Farley Heath. C. E. S.

*Polygonum Bistorta*, L. Roadside between Gomshall and Felday. C. E. S.

Miss Crosfield read a paper on

#### THE TREMADOC SLATES.

In presenting a paper to this Society upon one small division of geological science, it seems necessary to offer some introductory remarks, in order to endeavour to make the subject interesting to those whose studies have been chiefly in other branches of Natural Science. In doing so, I run the risk of being tedious to the geologists present, and am open to the criticism of dealing with matters outside my subject.

The Tremadoc Slates—as their name indicates—are so called from the town of Tremadoc in North Wales, where they are well exposed, and where they were first observed in 1846 by Prof. Sedgwick to be distinct lithologically from the beds above and below them. Ten years later Mr. J. W. Salter determined, after examination of the fossils from the Slates in this district, that they must rank as a sub-formation.

Before describing in detail the three areas in Wales, and the one in Shropshire, where we find these rocks, we will consider first their position in the stratigraphical succession. For this purpose I must direct your attention to the Geological Record. From it we see that the Tremadoc Slates occur low down in the Primary or oldest division. English geologists, or, rather, I should say the Geological Survey, class the beds with the Cambrian or lowest system; foreign geologists, on the other hand, place them at the base of the Ordovician; the reason for this we shall consider later on, when dealing with the fauna of the formation.

The geologist has four main guides to help him in forming a chronological classification of the rocks of the earth's crust:—

- (1) by their visible superposition;
- (2) „ distinctive lithological character;
- (3) „ containing fragments of rocks derived from other formations, the actual place of which is known;
- (4) by their distinctive fossils.

We will consider briefly the relative value of these guides in determining the age of the Primary rocks of Wales.

(1) The law of superposition (that is to say, that the strata which lie on the top are younger than those they rest upon). This law is not applicable among the Welsh hills, where the strata are almost invariably bent and contorted, where masses of rock may have been brought up from below and pushed on to the top of rocks younger than themselves.

(2) The lithological character of a rock is helpful in distinguishing one series from another, but alone it can give no definite evidence of the age of a series; nevertheless an

experienced field-geologist has been often led to form a correct opinion as to the age of a deposit from its lithological resemblance to a series of known age in another district.

(3) In conglomerates, coarse grits, and sandstones, pebbles and fragments from older beds of known age are often recognizable, and they tell us that the rock in which they occur is newer than the one from which they have been derived. Conglomeratic rocks are often unfossiliferous, so that any evidence as to their age is of great value.

(4) The fossils contained in a rock are the most useful, and in fact the indispensable guide for determining the age of a series. William Smith, the father of English geology, was the first to point out that strata could be identified in distant localities by the organic remains, and that different strata were characterized by fossils more or less peculiar to them. This was in 1794; but it was many years before his views were accepted, and it is only comparatively recently that the method of describing rocks by their contained faunas has been commenced. There is little doubt but that all rocks will in the future be so described, and ultimately the systems themselves will be determined by the possession of a characteristic fauna. It is with the older forms of life that we have to do to-night.

It has been found that the Lower Palæozoic rocks contain three distinct faunas,

- (1st) or Cambrian, or Primordial Fauna,
- (2nd) or Ordovician Fauna,
- (3rd) or Silurian Fauna.

Although we thus speak of distinct faunas, we must carefully bear in mind that there is no break in the succession of life, but one fauna gradually merges into the next.

(1st.) In the Cambrian or Primordial Fauna (first distinguished by the great geologist Barrande) trilobites preponderate, mollusca are rare. These early crustaceans exhibit a looseness of structure and a less high organization than those of a later period. They are characterized by having many body-segments and few tail-segments, and are often eyeless. They are the

representatives of a deep-sea fauna which must have been preceded by another richer fauna of which we have no knowledge.

(2nd.) In the Ordovician Fauna trilobites continue to abound. Brachiopods are very abundant and preponderate over the true molluscs. Graptolites are very numerous and exhibit a great variety of forms.

The trilobites of the 2nd Fauna are much more compact than those of the 1st; the pleura are more closely appressed. The head, body, and tail are nearly equal in size. The eyes large, well developed, and faceted.

(3rd.) In the Silurian Fauna trilobites no longer preponderate and the forms that occur are specialized. Echinoids, molluscs, and brachiopods are abundant. The graptolites consist of but few genera, but the species are numerous. At the end of the series fish appear.

With the risk of going outside my subject, I must complete these introductory remarks by referring to the subdivisions of the 1st and 2nd Faunas. They are described by their characteristic trilobites.

#### CAMBRIAN.

<i>Fauna.</i>	<i>Formation.</i>
Olenellus fauna.	Harlech and Caerfai.
Paradoxides „	Solva and Menevian.
Olenus „	Lingula Flags.
Ceratopyge „	Tremadoc Slates.

#### ORDOVICIAN.

Phyllograptus fauna.	Arenig.
Placoparia „	Llanvirn.
Asaphus „	Llandeilo.
Trinucleus „	Bala.

We will now consider in detail the lithological character and the palæontological contents of the Tremadoc Slates of the four chief districts where they are exposed.

We find these beds in North Wales, near Tremadoc and

Barmouth. In South Wales at St. David's, at Shineton not far from Shrewsbury, at Malvern, and, lastly, near Carmarthen.

The true position of the Tremadoc Slates between the Lingula Flags below and the Arenig beds above, was first determined in North Wales, so we will take this district first.

The beds crop out round the northern part of the Merioneth, or Harlech anticline, where they are found always to rest conformably on the Lingula Flags below them, the zone of the graptolite *Dictyograptus socialis* being considered a passage-bed between the two series. The upper limit to the beds is difficult to determine owing to the unfossiliferous character of those which rest upon them.

On the S. side of the anticline the beds are found near Dolgelly and on the flanks of Cader Idris. The beds are divided into—Lower Tremadoc, with a thickness of about 500 ft.; Upper Tremadoc, also with a thickness of about 500 ft.

The cliffs of Ogof-ddu near Criccieth and the promontory of Craig-ddu exhibit a complete section from the Lingula Flags to the Upper Tremadoc, but there are no fossils here. Further east, however, at Penmorpha, Borthwood, and Portmadoc, and on the south side of the estuary at Aber ei Sudhrath and Cae Iago, fossils are plentiful. From these beds Mr. D. Homfray, Mr. Asb, Mr. Salter, and Mr. Gibbs obtained their rich collections of about 42 species.

The Lower Tremadoc Slates are thin-bedded, fine-grained, and earthy, generally grey or bluish in colour, and often stained with iron; sometimes the slates are striped by harder bands, showing alternations during the deposition of the sediment.

The Upper Tremadoc Slates are more sandy in character and greyer in colour, except when ferruginous, often with felspathic lines,—a ribbon-slate in fact.

The most important fossils of the *Lower Tremadoc* are the following:—Niobe Homfrayi, Psilocephalus inflatus and innotatus, Orthoceras sericeum, Ogygia scutatrix, Dikellocephalus furca?, Conocoryphe depressa.

*Upper Tremadoc Fossils*:—Asaphellus Homfrayi, Asaphus

*affinis*, *Cheirurus Frederici*, *Dikellocephalus furca*, *Ampyx prenuntius*, *Ogygia scutatrix*, *Neseuretus ramseyensis*, *Angelina Sedgwickii*, ? *Olenus impar*.

We note in passing that we have representatives of the 1st and 2nd Faunas occurring together. This, we shall find, is still more marked in other regions.

The next district to be described is the important one of St. David's, Pembrokeshire. Little was known about the rocks of the St. David's Promontory until in 1866 Messrs. Salter and Hicks drew up a list of the fossils which had up to that time been found. Six years later Dr. Hicks gave to the Geological Society a full account of the Tremadoc rocks, in which he had carefully worked both on the mainland and in Ramsey Island, and he compared these beds with those already known in North Wales.

The slates may be seen in the N.E. of Ramsey Island, at the N. end of Whitesand Bay, extending inland in a N.E. direction, and in Tremanhir five miles east of St. David's. At each place they rest conformably on the Lingula Flags, as we have already seen is the case in North Wales.

In Ramsey Island the lower part consists of grey earthy flags of a hard texture, this merges into rock of a bluish-grey colour, which is sometimes thick-bedded and tough. Above them are dark iron-stained slates of Arenig age. The total thickness is about 1000 feet.

At Whitesand Bay the rocks are very similar.

At Tremanhir the exposures of the rock are few, as the surface of the country is thickly covered with drift, but the rock in the few quarries that there are resembles the beds in Ramsey Island, with the exception that the middle part is more sandy and less cleaved. The Upper Lingula Flags of the district consist of hard siliceous sandstones, a shallow-water or littoral formation; these, as we have seen, are followed by the tough mudstones of a deeper sea of the Tremadoc period, and these again by the fine black muds deposited in the deep Arenig ocean. Dr. Hicks says: "This intermediate condition" (under which the Tremadoc rocks were deposited) "must have been

particularly favourable to the existence of life, and was doubtless one of the causes of the appearance at this time of such a varied and important group of organisms."

Dr. Hicks has divided the series into two divisions :

*Lower Tremadoc*, 200 ft. of dark earthy slates and flaggy sandstones, with *Neseuretus*, *Niobe*.

*Upper Tremadoc*, 800 ft. of iron-stained slates and flags, with *Asaphus Homfrayi* and *Angelina Sedgwickii*.

These divisions are not the equivalents of the Lower and Upper Tremadoc of Salter and Belt in North Wales, but only of their Lower Tremadoc division; and Dr. Hicks thinks that "it is not unlikely that the lower portion of the Tremadoc Slates at St. David's was deposited contemporaneously with the black beds of the Lingula Flags of N. Wales, as in both cases they are the first indications of a change taking place in the sea-bottom, after the long period of the shallow sea, in which so many thousand feet of Lingula Flags and sandstones were deposited."

The following are the most important fossils which have been found:—

*Neseuretus*, 5 species.

*Niobe menapiensis*, Hicks.

„ *solvensis*, Hicks.

*Dendrocrinus cambrensis*.

*Palasterina ramseyensis*, Hicks.

*Ctenodonta*, 2 species.

*Modiolopsis*.

*Orthis Carausii*, Salter.

„ *menapiæ*, Hicks.

*Asaphellus Homfrayi* and *Ogygia scutatrix* were also found by Dr. Hicks at St. David's, but he found them associated with graptolites of Arenig age. We have seen that in N. Wales they are recorded from the Upper Tremadoc beds. This has led Dr. Hicks to the view that his Lower Arenig beds of S. Wales are represented by the Upper Tremadoc of N. Wales. If this view were correct, and it is supported by one or two

other facts, the Upper Tremadoc of N. Wales would in the future have to be classed with the Arenig beds.

The Tremadoc Slates in Shropshire are known as the Shington Shales. These beds had always been considered to be of Bala age until the year 1874, when Dr. Callaway communicated a paper to the Geological Society entitled "On a Tremadoc Area near the Wrekin in South Shropshire, with a description of a new fauna." In 1877, after Dr. Callaway had collected further fossil evidence, the Tremadoc Slates age of the beds was acknowledged. The shales strike N.E. S.W., and are found on both sides of the Longmynd and on the E. and S. sides of the Wrekin.

Their greatest length is about 8 miles in each district, and their greatest width about 2 miles.

The shales are nowhere found resting normally on the Lingula Flags as in N. and S. Wales, but they either rest unconformably on, or are faulted against, far older beds. Near the Wrekin and Little Caradoc they rest on the Hollybush or Comley sandstone, which is of early Cambrian age and contains the *Olenellus* and *Paradoxides* faunas. On the W. side of the Longmynd they are faulted against a volcanic series, and here they are succeeded by the Stiper Stones, a massive quartzite of Arenig age; in other parts, Bala, Llandoverly, Permian beds, and even the Coal-measures, rest on them.

The shales are of a dark blue colour, which weather to olive or yellow; sometimes the shales are covered with a film of iron-oxide. They are micaceous, thin-bedded, soft, and rather fissile. At the top of the series the shales are slightly more arenaceous and thicker-bedded.

The chief fossils which have been found in this locality are

Conocoryphe monile, Salter.		Asaphellus Homfrayi, Salter.
Olenus Salteri, Call.		Platypeltis Croftii, Call.
Olenus triarthrus, Call.		Conophrys salopiensis, Call.
Agnostus dux, Call.		Lichopyge cuspidata, Call.
Lingulella Nicholsoni, Call.		Macrocytella Mariæ, Call.
Obolella.		Dendrograptus.
Theca.		

The last area of Tremadoc Slates to be described was discovered in 1894 by Miss E. G. Skeat and the writer of this paper, and lies to the S. of the town of Carmarthen in South Wales. The beds strike nearly due E. and W., they dip due S. under the O. R. S., which in this part of Wales overlaps the beds immediately underneath it, and rests unconformably on the older Silurian rocks.

Only a few exposures of the slates have been found, for the country here, as at Tremanhir and St. David's, is covered in places with a thick coating of drift.

The shales are fine-grained and finely bedded, of a blue-grey colour. They weather a rich yellow or brown, and are often iridescent, from being covered with a film of iron-oxide; with the shales are occasional bands of micaceous sandstone.

The fauna up to the present obtained from these beds is small, and nearly all are new species, so that the difficulty of correlating these beds with those of other areas is great.

The following is a complete list of the fossils at present obtained:—

- Parabolinella, n. sp., cf. rugosa, Brögger.
- Peltura punctata, n. sp.
- Ogygia marginata, n. sp.
- Erinnys sp.
- Orthoceras sp.
- Orthis sp.
- Modiolopsis sp.

Let us now consider the place of these beds in the stratigraphical succession, and also their relative age with regard to each other.

We will note first their position in the stratigraphical succession. Among the trilobites recorded from each of the districts, we have representations of two types:—

- (1) Those trilobites which have many body-rings and a small tail, which are characteristic of the Primordial Fauna (Cambrian);
- (2) Those trilobites which are compact in form, whose hinder segments have become fused together, and which have

the head, body, and tail of nearly equal size—typical of the Ordovician or 2nd fauna; and this mingling of two faunas is a striking feature of the Tremadoc Slates.

Of the first type we have :—

- (1) *In N. Wales.* Conocoryphe, Olenus, Angelina, ? Neseuretus, Dikellocephalus.
- (2) *At St. David's.* Neseuretus, 5 spp., Dikellocephalus.
- (3) *At Shinetun.* Conocoryphe (a Euloma), Olenus Salteri (Parabolinella Salteri), Olenus triarthrus, and Conophrys salopiensis.
- (4) *At Carmarthen.* Peltura punctata, Parabolinella sp., and Erinnyss sp.

Of the second type we have :

- (1) *In N. Wales.* Ogygia scutatrix, Asaphus affinis, Asaphellus Homfrayi, Niobe Homfrayi, Psilocephalus 2 spp., and Cheirurus.
- (2) *At St. David's.* Niobe 2 spp., and Niobe Homfrayi.
- (3) *At Shinetun.* Asaphus Croftii and Asaphellus Homfrayi.
- (4) *At Carmarthen.* Ogygia marginata.

Thus we see that the genera of the 1st and 2nd faunas in the Tremadoc rocks are nearly equally represented.

But besides these 7 genera of Trilobites belonging to the 2nd fauna, we have 2 genera of Graptolites, the earliest representatives of a family which attains such importance in the Arenig and succeeding formations. Here also the first Cephalopods (which hold such an important place in Scandinavia at a rather later period) are found.

These facts point clearly to the conclusion that the Tremadoc Slates are *Passage Beds* from the Cambrian into the Ordovician. This view is confirmed also from the following evidence, that of the 33 genera and 89 species of the Tremadoc Slates, 9 genera and 10 species have come up from the Lingula Flags (3 of these pass into the Arenig), and 11 genera and 18 species pass from the Tremadoc up to the Arenig.

This gives 13 genera and 61 species *peculiar* to the Tremadoc Slates. As I stated earlier on, the Geological Survey class the Tremadoc Slates with the Cambrian, but the Continental geologists place them with the Ordovician. From the figures I have just given, and the fact that such important families as the Lamellibranchs, Graptolites, and Cephalopods appear first at this stage, the evidence seems to me to support the foreign classification.

A careful zonal examination of the strata may, however, possibly show that errors have been made by collectors, and that the fauna is not so mixed as at present appears to be the case. Thus some of the beds containing primitive forms may be relegated to the Lingula Flags, while those with a larger proportion of later forms may fall into their place, at the base of the Ordovician.

We will now consider for a few moments the relative age of the deposits in N. and S. Wales, and in Shropshire.

The zone of the graptolite *Dictyograptus socialis* has been taken as the upper limit of the Lingula Flags or the base of the Tremadoc. We find this zone in N. Wales and also in Shropshire and at Malvern; thus some portion at any rate of the oldest beds are found in these two districts. The fauna of the Shineton Shales, with its various Olenidæ, alone is sufficient to suggest, apart from the *Dictyograptus*, that this was the case in Shropshire. At Carmarthen this graptolite zone has not been found, but lithologically the beds are very similar indeed to those at Shineton: and the presence of *Erinnys*, a Lingula-Flag form, together with two or three genera of the Olenidæ, strengthen the opinion that these beds are probably of about the same horizon as the Shineton Shales.

In attempting to arrange chronologically these deposits, our great difficulty is that few fossils are common even to two areas. N. and S. Wales have only two trilobites (out of a total of 11) in common—*Niobe Homfrayi* and *Asaphellus Homfrayi*; and only one in common with Shineton, *Asaphellus Homfrayi*; and not one with Carmarthen. Not one Olenid is found at St. David's.

I would suggest the following arrangement of the strata:—

- Lr. T. { at the *base* Shineton Shales, and Carmarthen Shales  
and upper part Malvern Bk. Shales,  
and the lower part of the N. Wales beds.
- Up. T. { The greater part of the St. David's beds, and the  
*upper* part of the N. Wales Tremadoc Beds.

I have drawn freely, while preparing this paper, from the writings of Dr. Callaway, Dr. Hicks, Mr. Marr, and Prof. Lapworth, and from Mem. Geol. Survey, vol. iii.

Mr. C. E. Salmon read a

REPORT OF THREE OF THE CLUB EXCURSIONS during 1895.

May 11.—Felday and Holmbury Hill. Members and friends to the number of 33 had a most enjoyable ramble from the station at Gomshall.

A fine bright morning with scarce a cloud in sight had no doubt attracted so many. Felday was first reached by a pretty lane, where, by the roadside, in a damp spot near a stream, *Polygonum Bistorta*, L., occurred sparingly. From Felday, across the open heather and through belts of fir-trees, and then, at the brink of the hills, the wonderful panorama of the plains opens out before us. This is Holmbury Hill, and its 800 or so feet afford extensive views on all sides. Amongst the heather the pretty little *Polygala depressa*, Wend., was plentiful.

Here the party became divided, some returning by way of Peslick to Gomshall again, but others pushed on to Chilworth. These were at first forced to proceed more or less in a bee-line for St. Martha's Chapel, which stood out conspicuously on the opposite range of hills, through a dense tangle of brushwood, there being no suitable path in view, but, luckily, soon struck a track which led in the right direction to Farley Green. On the way a little patch of *Myosotis sylvatica*, Hoffm., attracted attention: it is certainly an uncommon plant, at any rate, in Surrey, and was distinctly the find of the day.

Then over the wilds of Blackheath to Chilworth finished a most delightful walk, which was accompanied throughout by the most glorious spring weather imaginable—cloudless and brilliant from sunrise to sunset.

June 22.—Betchworth and Buckland Hill. Meeting at Betchworth Station, the party proceeded by footpaths towards Buckland, and, crossing the railway and passing Hill Farm (where *Galium tricorne*, Stokes, grew plentifully), the steep hillside was ascended. This *Galium* had also been previously gathered near Betchworth Station. Through the Yew-trees and by Walton Heath brought the party to the Beech wood on Reigate Hill, and by Wray Lane back to Reigate. The ancient Pilgrim's Way was followed for some distance.

18 members were present.

Aug. 10.—Hindhead. 18 members started from Reigate, but only a very small portion alighted at Milford, where our conductor, the Rev. E. S. Marshall, met us. The rain was responsible for this. Those who did venture were rewarded by a splendid walk over very rich botanical ground.

We first visited Mr. Marshall's own garden at Milford Vicarage, where he grows an interesting collection of hybrid Willows and Willow-herbs and other scarce British plants. Through the Allotment grounds, where *Galinsoga parviflora*, Cav., is well naturalized, and *Polygonum Convolvulus* v. *sub-alatum*, V. Hall, trailed abundantly, and the vast tract of heather and pine wood, known as Witley Common, was reached. This is one of the best localities for *Rubi*, not only in Surrey, but in England, so Mr. Marshall told us.

By lane to Brook brought us to another rich botanical locality. Here a field was simply crowded with *Epilobium Lamyi*, F. Schultz, a plant rare in many parts of England; but certainly abundant in several places in S.W. Surrey. Not far away a little clump of *Anaphalis margaritacea*, Benth. & Hook. fil., was discovered; of course it could have no claim to be considered a native here.

By the roadside, at no great distance away, *Epilobium lanceolatum*, Seb. & Maur., was still in flower, though sparingly; it was evidently rather late for both these Epilobia, as the seed was quite ripe in most cases, and it is generally quite plentiful, too, in this locality. *Epipactis media*, Fr.—a single plant was all we could find, though usually it is here in fair quantity—also grew near this same spot. Just halting to gather a specimen of *Rosa sepium*, Thuill., from a wayside bush (most scarce in Surrey, by the bye), and we are off to the summit of Hindhead, which towers up before us.

By lanes to Boundless Copse, and then a short sharp scramble up the hillside and the summit is gained. But now the day is almost at an end, and, after a short rest, Haslemere Station is reached and train taken home.

The *Rubi* gathered during the day, by Mr. Marshall's help, included *R. foliosus*, Weihe, *R. echinatus*, Lindl., *R. pulcherrimus*, Neum., *R. viridis*, Kalt., *R. Marshalli*, Focke & Rogers, *R. corylifolius*, Sm., v. *sublustris* (Lees), *R. Babingtonii*, Bell-Salt., *R. imbricatus*, Hort., *R. Sprengelii*, Weihe, *R. holerythros*, Focke, *R. mutabilis*, Genev., *R. pyramidalis*, Kalt., and *R. pubescens*, Weihe, v. *subinermis*, Rogers.

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MEETING, held at Redhill, 17th of April, 1896.

A series of lantern-slides illustrating the geological strata of Kent and Sussex were exhibited. They were lent for the occasion by the Tunbridge Wells Nat. Hist. Soc., and were prepared through the energy of Dr. Geo. Abbott, of Tunbridge Wells.

The Rev. Hy. Brass, M.A., lectured in explanation of the slides, and exhibited a diagram of the strata from Chatham to Beachy Head.

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## ANNUAL MEETING,

held at Reigate, 16th of October, 1896.

The Annual Report and Balance Sheet were read and adopted.

## ANNUAL REPORT.

Only 9 members have joined the Club during the past year, whereas 20 have resigned. One member has died. Mr. W. H. Heaton has just been elected an honorary member as a mark of respect for his services to the Club and of gratitude for his handsome gift of stuffed birds. The number of members is now 76.

A small volume of Proceedings has been issued for the years 1893, 1894, and 1895. The Committee did not see its way to entail so heavy an expense as on former occasions, so the volume is more strictly confined to local records than some former volumes of Proceedings have been. It has been sent to a number of Scientific Societies, many of which send us their Proceedings in exchange.

For the first time the Club has been able to send a delegate to the meetings of representatives of Scientific Societies held in connection with the British Association meeting at Liverpool.

The attendances at the evening meetings varied from 10, on a soaking wet night at Reigate, to 100 at a lantern-lecture at Redhill. The average was about 45. It will be seen that 3 evenings were devoted to Geology, 1 to Biology, 1 to Botany. At the other 2 meetings the speakers dealt with foreign travel, including some natural history observations.

The following is a list of the papers or addresses:—

1895.

- October 18. The Giant Trees of California, by Mr. N. E. Brown.  
November 15. Natural History Observations in the Coast Provinces of China, by Mr. Leonard J. Day.

## THE HOLMESDALE NATURAL HISTORY CLUB.

## ABSTRACT OF ACCOUNTS.

*Receipts.*

(October 1895 to October 1896.)

	£	s.	d.
Balance, October 1895 .....	19	9	11
Subscriptions .....	23	5	0

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 £42 14 11
 

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*Expenses.*

(October 1895 to October 1896.)

	£	s.	d.
Rent, Gas, and Cleaning .....	19	14	8
Printing, Stationery, &c. ....	4	2	3
Printing Proceedings .....	8	7	0
Collector—Commission .....	1	0	6
"    Postage .....		3	6
Balance .....	9	7	0

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 £42 14 11
 

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*Proceedings.*

1895.  
 December 13. A visit to Tunis and Algeria, by the Rev. W. Major Paull.
1896.  
 January 17. Life in the Deep Sea, by Mr. A. W. Brown.  
 February 21. Geology of the Isle of Portland, by the Rev. Hy. Brass, M.A.  
 „ Report of Meteorology, 1895, by Mr. W. H. Tyndall.  
 March 20. Tremadoc Slates in Great Britain, by Miss Crosfield.  
 „ Report of Club Excursions, 1895, by Mr. C. E. Salmon.  
 April 17. Geological Strata of Kent and Sussex, by the Rev. Hy. Brass, M.A.

The following Societies have sent their publications to the Club :—

The British Association ; Belfast Nat. Hist. & Philosophical Soc. ; Bath Nat. Hist. & Antiquarian Field Club ; Cardiff Naturalists' Soc. ; Croydon Microscopical & Nat. Hist. Club ; Dumfriesshire & Galloway Nat. Hist. & Antiquarian Soc. ; Nat. Hist. Soc. of Glasgow ; Marlborough College Nat. Hist. Soc. ; Rochester Naturalists' Club ; South London Entomological & Nat. Hist. Soc. ; Warwickshire Naturalists' & Archæologists' Field Club ; Penzance Nat. Hist. & Antiquarian Soc.

During the summer months the excursions were well supported. Over 50 ladies and gentlemen took part in the excursion to Ranmore Common on Aug. 22, when the party was kindly entertained by Lord Ashcombe, at Denbies.

The following were the Excursions :—

*Whole Day.*

- May 2.—Holmwood and Brockham.  
 June 6.—Sanderstead and Addington.  
 July 4.—Hogsback and Compton.

- Aug. 8.—Ashdown Forest.  
 Sept. 5.—Leith Hill and Ockley.  
 Oct. 3.—Godstone, Brewer Street, and Merstham.

*Afternoon.*

- April 18.—Betchworth and Reigate Heath.  
 May 16.—Westcot.  
 June 20.—Boxhill and Betchworth.  
 July 18.—Merstham and Chaldon.  
 Aug. 22.—Ranmore Common.  
 Sept. 19.—Chipstead.

The following Officers were elected for the ensuing year:—

- President.* Mr. W. H. Tyndall.  
*Secretary.* Mr. A. J. Crosfield.  
*Treasurer.* Miss Crosfield.  
*Curator.* Mr. John Linnell.  
*Committee.* Messrs. J. Bonnor, T. Cooper, J. B. Crosfield,  
 F. H. Ellwood, A. G. Northover, E. S. Salmon,  
 C. E. Salmon, A. Trower.

Mr. N. E. Brown, of Kew, lectured on

## LEAVES AND THEIR DOINGS.

Leaves are almost the most abundant product of nature, and without them we could not exist. To the plant they are the organs of life, by means of which it obtains its solid food.

Leaves need light, and strive in various ways to obtain it. They also protect themselves against the evil effects of an excess of light. Hence we find many modifications of the form and position of leaves. The leaves of a daisy, for instance, radiate from the centre at a slight angle, and the inner leaves are smaller than the outer, in order not to overshadow them. The angle at which they grow serves to direct the rain downwards to their roots.

The leaves of trees are mostly at the ends of twigs, and the

blades are turned towards the light. Their position serves to scatter the rain towards the spreading roots.

A primrose when growing in the shade has larger leaves than when grown in an open place. Many leaves are lobed and cut so as to allow the light to shine through to the lower leaves. Ivy is an example of this. The leaf of *Monstera*, a climber of tropical America, has holes through it for a like purpose.

Almost every leaf is pretty constantly in motion, but the motion is very slow. It is only during daylight that leaves can feed. *Mimosa pudica* folds itself up to sleep. *Coronilla*-leaves stand upright to prevent excessive radiation.

In the springtime the green colouring-matter of the young leaves is not so fully protected as it is later on, and consequently the young leaves droop so as to keep in heat and check radiation.

Leaves consist of veins, cellular tissue, and epidermis or skin. In the lower skin are air-openings or stomata. The cells contain green colouring-matter or chlorophyll, which is injured by too strong a light. The pale glaucous bloom on Acacias and many other tropical plants is due to a waxy exudation which protects the chlorophyll from the light.

*Eucalyptus* when young has large, horizontal, opposite, glaucous leaves and a square stem; when older it has a round stem, and alternate, drooping leaves, free from glaucous powder.

The red tint of many young leaves in the tropics serves to protect the chlorophyll. Autumnal tints are probably due to most of the chlorophyll grains being dissolved out of the protoplasm and carried away.

Mr. Brown exhibited several diagrams and leaves in illustration of his lecture.

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MEETING, held at Redhill, 20th of November, 1896.

Mr. Francis M. Duncan read a paper on

HYMENOPTERA, OR ANTS, BEES, AND WASPS.

Mr. Duncan remarked that proof of the early cultivation of bees was to be found in the book of Job, the Vedas, the Egyptian

sculptures and papyri, and the poems of Homer. Hymenoptera might generally be called four-winged flies. In some instances wings were not present, as in the worker ant and some of the female gall-flies. Females of nearly all the species possessed organs for the conveyance of the eggs to the spot where development was to take place. Those organs often constituted formidable offensive weapons; they were known as the ovipositors or stings. Those insects in which the ovipositor was converted into a sting, had the base of the organ put into communication with a gland secreting an acrid fluid, which contained much formic acid. The injection of this fluid into the puncture produced by the sting, made the effect of being stung so exceedingly painful. It must not be concluded that the sting was used solely as a weapon of defence, as a large number of the Hymenoptera had to supply their young with animal food, consisting generally of the larvæ of other insects or spiders. The victims were rendered helpless by the female, who stung them before depositing them with her egg in the nest. The sting did not kill but paralysed the victim. Thus fresh food was secured to the larvæ. The larvæ of Hymenoptera, with the exception of the Saw-flies, were soft, fleshy, legless grubs. Those of the Saw-fly closely resembled the caterpillar of the Lepidoptera, but a second glance showed they widely differed; the true caterpillar having only five pairs of feet, while the larvæ of the Saw-fly had seven or eight pairs of sucker-feet, as, for instance, the Turnip Saw-fly, and larvæ of the Twig Saw-fly, commonly known as black "palmers or niggers." The fly appeared in early summer; it was of a bright orange colour, with black head, tinged with deep red at the base, with four transparent wings, having an orange tinge towards the base. It was only to be seen on the wing during hours of bright sunshine. The female laid her eggs in slits at the edge of the turnip leaves, and the eggs hatched in about five days. The grub, which was at first nearly white, soon became green with a black head, and then quite black with a pale stripe and with a white head, and lastly assumed a slate-grey colour with a grey head. It had 22 feet, and took about

three weeks to attain full growth. The pupal stage took place in the soil, and lasted about 23 days, when the perfect insect emerged. There were several broods within the year. The way to get rid of this pest was by sweeping the leaves with boughs of light leafage, and drenching with liquid manure.

The lecturer proceeded to describe the Gooseberry Saw-fly. The head and thorax were, he said, black, marked with yellow, with orange abdomen, and iridescent wings. It was to be seen hovering about currant and gooseberry bushes in early spring. The female laid her eggs in slits cut in the underside of the leaves. The larvæ were a bluish-green with black spots on the segments, and yellow markings on the head and tail. They formed a yellow-brown cocoon at a depth of two or more inches beneath the surface of the earth. The perfect insect appeared in about three weeks; in the late brood, the larvæ remained in cocoons throughout the winter. The remedy for getting rid of this pest was by removing the earth during the autumn and winter, by burning a few inches of the surface soil, by working gas-lime well into the soil beneath the bushes in early spring, or by dusting the leafage with soot, lime, or tobacco powder.

Gall-flies were remarkable for the curious swelling produced by them on trees. The oak apple, "apple of Sodom," and gall-nuts, from which ink was made, were all the work of these minute creatures.

The Ichneumon-flies were useful as preying upon other insects, some destroying plant-lice, and others the cabbage-white butterfly.

The second group—Ants—lived in communities. There were three distinct castes: male, female, and worker. Sometimes there was a fourth caste, called soldier ants. One species formed roads and harvested grain; others were migratory, and made raids, captured slaves, and had definite burying-grounds.

Of the Hive Bee there were three adult forms: the male, or drone; the perfect female, or queen; and the worker, or undeveloped female. Cultivation of bees was recorded in the

earliest history of the civilized world. Mr. Duncan took as his illustration of the Solitary Bee, the Rose-leaf-cutting Bee, which burrowed in the ground or in decaying wood, forming a tunnel in which to place its cells, which were constructed from rose-leaves. The leaves were twisted by the bee into little funnel-shaped cones, in which a cake of honey and pollen was deposited, together with an egg. The Solitary Wasp (*Philanthus apivorus*) preyed upon bees as food for its young. It dug galleries in sandy soil to a considerable depth. It would seize a bee as large as itself and sting it, and, though the bee made a brave fight, it was overcome by the poison of the sting, and was carried off by the wasp and deposited in a cell as food for its young.

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MEETING, held at Reigate, 18th of December, 1896.

Dr. Bossey exhibited a Jumping Bean. He explained its motion as due to the presence of the larva of a winged insect.

Mr. C. E. Salmon exhibited some beautiful photographs of birds' eggs taken *in situ*. These included the eggs of the Great Plover, Kentish Plover, Little Tern, Redshank, &c.

Mr. H. M. Wallis, of Reading, described a visit paid by him to

#### NORTHERN ITALY AND THE TYROL.

On Lago Varese he explored a lagoon or marsh which in the winter time is frequented by Widgeon, Pintail, and Cormorant. Here he found the Little Bittern nesting. The nests consisted of 3 or 4 reeds flattened down; most of them contained a single white egg. He observed the Little Bittern's wonderful powers of mimicry. It drew itself up into the semblance of a reed, and allowed itself to be captured without relaxing its position. The Dutch reed-cutters call it the "wood-ape," because it mimics a stake of wood.

The other birds frequenting Lago Varese are the White-winged Black Tern, Common Tern, Reed Warbler, Great Reed Warbler, Grasshopper Warbler, and Smaller Grey Shrike.

In several places are remains of pile-dwellings. Bones have been met with of the Beaver, Badger, Red-deer, Roe-deer, Boar, Wolf, Polecat, Ox, and Horse; also thousands of arrow-heads of chert and obsidian.

In the higher pine-forests of the Tyrol, Mr. Wallis found that Bonelli's Warbler takes the place of the Chiffchaff. He met with the Italian House-Sparrow 40 miles beyond the boundary of Italy.

Mr. Wallis exhibited eggs of the Little Bittern and other species.

Miss Crosfield reported on the Meeting of Delegates of the Corresponding Societies of the British Association at Liverpool, as follows:—

I was sent this year as your Delegate to the meetings of the Corresponding Societies of the British Association.

As this is the first time that the Holmesdale Nat. Hist. Club has sent a Delegate, it is perhaps advisable to explain the duties and privileges of our Club in connection with the British Association. In 1884 the British Association invited those Scientific Societies which published 'Proceedings' to correspond with it and to send Delegates annually to confer together.

The objects of the British Association are stated to be "To give a stronger impulse and a more systematic direction to scientific enquiry,—to promote the intercourse of those who cultivate Science in different parts of the British Empire, with one another and with foreign philosophers,—to obtain a more general attention to the objects of Science, and a removal of any disadvantages of a public kind which impede its progress."

It is obvious that this step was one eminently in keeping with the declared objects of the British Association.

I do not know what year our Club became a Corresponding Society, but probably from the first, in 1884.

My duty as Delegate was to attend two meetings of the Corresponding Societies.

The first meeting was presided over by Dr. Garson, who was supported by Sir Douglas Galton, and by Mr. Holmes (of the Essex Field Club), Secretary of the Corresponding Societies' Committee.

A paper was read by Dr. G. Abbott, of Tunbridge Wells (Gen. Sec. of the S. Eastern Union of Scientific Societies), entitled "District Unions of Natural History Societies."

In this paper Dr. Abbott calls attention to the need of improvement in our Local Societies. He points to the too frequent decay of Clubs, and to the small results achieved by them. The work done is often weak, irregular and desultory, and too often begins and ends with lectures, that are mere stale résumés of what others have done, and yet there is an army of 50,000 members in the Clubs; from these the results ought to be very different. Dr. Abbott considers that the chief cause of failure is want of organization. To remedy the lack of organization he suggests a scheme, to which I shall refer later.

The paper was followed by a Discussion, and Delegates from the Yorkshire Naturalists' Union (with its 2500 associates), the Leicester Literary and Philosophical Society (Mr. Montague Brown), the Dublin Naturalists' Field Club (Prof. Johnson), and others, described the methods of work and the organization of their Clubs.

Finally a Committee was formed to consider Dr. Abbott's proposals, and to report to the next Delegates' meeting. At the second Conference of Delegates this Committee reported, and presented certain resolutions, which the meeting adopted.

Professor Flinders Petrie then read a paper, "On a Federal Staff for Local Museums," which, as it is short, I may perhaps be allowed to read.

The paper was followed by a Discussion, but no definite resolution was proposed. The suggestions made in Prof. Flinders Petrie's paper may not seem to affect our Club, as I fear our small Museum can only find a place in the 4th Class, if indeed we can find a place among the 30 Museums of the 4th Class. Nevertheless, it is my duty to bring this paper before us; and perhaps I may be allowed to suggest that we endeavour

to improve the collections we have, so that when such a circulating federated staff as Mr. Flinders Petrie suggests is started, we may be in a position to claim and profit by the occasional services of specialists.

The Delegates' meeting concluded with remarks from representatives of Sections C & H, who desired help from the Corresponding Societies in their work.

Our duty as a Corresponding Society of the Brit. Assoc. is to consider the proposals in Dr. Abbott's paper, either now or at some future meeting, and report our opinion on them to the Corresponding Societies' Committee.

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MEETING, held at Reigate, 15th of January, 1897.

Mr. Ernest A. Salmon read a paper on

MOSSES.

The paper was illustrated by over 50 beautifully executed diagrams, as well as by specimens shown under the microscope and a large number of mounted specimens.

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MEETING, held at Redhill, 26th of February, 1897.

Mrs. F. E. Lemon read a paper on

BIRDS.

The paper was illustrated by a beautiful series of lantern-slides.

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MEETING, held at Reigate, 19th of March, 1897.

Mr. A. W. Brackett, of Tunbridge Wells, read a paper entitled

GLIMPSES OF THE INCONCEIVABLE, OR PHENOMENA OUTSIDE OUR  
APPEHENSION.

MEETING, held at Reigate, 9th of April, 1897.

Mr. E. Gower exhibited a fossil vertebra from a field at Badingham, in Suffolk, and other specimens.

Mr. C. E. Salmon presented a further list of localities for plants in Surrey, as follows:—

- Ranunculus intermedius*, Knaf. Large pond on Holmwood Common. C. E. Salmon.
- R. fluitans*, var. *Bachii* (Wirtg.). Leatherhead. (Confirmed by H. & J. Groves.) E. S. Salmon.
- Barbarea intermedia*, Boreau. Roadside S. of Brockham Field, Reigate Hill. C. E. S.
- B. præcox*, R. Br. A few plants in Pym's sand-pit, Reigate. E. S. S.
- Sagina ciliata*, Fr. St. Martha's Hill, Chilworth, 1894. A. J. Crosfield.
- Trifolium agrarium*, L., and *Lathyrus Aphaca*, L. Roadside casuals between Normandy and Wanborough Station. E. S. & C. E. S.
- Lathyrus sylvestris*, L. Railway-bank between Reigate and Redhill. C. E. S.
- Lotus tenuis*, Waldst. & Kit. Roadside near Wanborough Station. E. S. & C. E. S.
- Prunus Avium*, L. Various places about Reigate Hill. E. S. & C. E. S.—About Buckland. C. E. S.
- P. insititia*, Huds. About Buckland. C. E. S.
- Pyrus Malus*, L., var. *mitis*, Wallr. Holmwood Common and between it and Brockham. C. E. S.
- Rubus Lindleianus*, Lees. Reigate Heath. Smithwood Common. E. S. S.
- R. pulcherrimus*, Neum. Reigate Heath. E. S. S.—“A very strong form,” W. M. R.
- R. villicaulis*, Koehl., var. *calvatus*, Blox. Reigate Heath. E. S. S.
- R. leucostachys*, Schleich. Walton Heath, near Reigate. C. E. S.

- R. infestus*, Weihe. Reigate Heath. E. S. & C. E. S.
- R. Gelertii*, Frider. Margery, Reigate Hill. C. E. S.—“This is the only *R. Gelertii* that I have seen from England,” Mr. Gelert.
- R. corylifolius* × *rusticanus*. Reigate. E. S. S.—“Probably this,” W. M. R.
- (All the above *Rubi* were kindly named by the Rev. W. Moyle Rogers.)
- Geranium lucidum*, L. Brockham Bridge. E. S. S.
- Epilobium Lamyi*, F. Schultz. Between Normandy and Wanborough Station. (*Fide* E. S. Marshall.) E. S. & C. E. S.
- Myriophyllum alterniflorum*, DC. Pond near Kingswood Church. C. E. S.
- Smyrniolum Olusatrum*, L. Still plentiful on Cockshot Hill. C. E. S.—(‘Surrey Fl.’, Brewer.)
- Anthriscus vulgaris*, Bernh. Plentiful on hedgebanks near Dorking towards Milton Heath. C. E. S.
- Galium tricornis*, Stokes. Field foot of Boxhill, near water-mill. C. E. S.
- G. Mollugo*, L., var. *insubricum* (Gaud.). Brockham. E. S. S.
- Tragopodon pratense*, L. Railway-bank between Reigate and Redhill. C. E. S.
- Euphrasia Kernerii*, Wettst. Reigate Hill. (*Fide* F. Townsend.) E. S. S.
- Mentha sativa*, L. Great Bookham Common. Nutfield Marsh Green. E. S. S.
- Hydrocharis Morsus-ranae*, L. Pond, High Trees, Reigate, abundant. E. S. & C. E. S.
- Allium vineale*, L., var. *compactum* (Thuill.), and probably var. *bulbiferum*, Syme. Betchworth. (*Fide* W. H. Beeby.) E. S. S.
- Epipactis violacea*, Boreau. Copses, Reigate Hill. (*Fide* W. H. Beeby.) C. E. S.
- Carex pallescens*, L. Margery Wood, Reigate Hill. C. E. S.
- C. divulsa*, Good. Clifton Lane, near Reigate Heath. (*Fide* W. H. Beeby.) E. S. & C. E. S.

*Apera Spica-venti*, Beauv. Abundant, fruit farm, Normandy. Rev. E. S. Marshall.

*Agropyron caninum*, Beauv. Near Brockham. E. S. S.

*Chara fragilis*, var. *Hedwigii*, Kuetz. Mere Pond, Walton-on-the-Hill. (*Fide* H. & J. Groves.) C. E. S.

Reports by Mr. C. E. Salmon of the Excursions on May 2 and July 4, 1896, were read.

#### REPORT OF EXCURSIONS for 1896.

May 2, 1896.—Whole day to the Holmwood, from Dorking Station. Conductor, C. E. Salmon.

Up Coldharbour Lane, where *Luzula Forsteri*, DC., was in plenty on the hedgebanks. Then footpaths to Holmwood Common. Here *Ranunculus intermedius* (Knaf.) bordered the edges of a large pond. After a halt for lunch, footpaths and lanes led the party towards Brockham and Betchworth Station. On the way *Pyrus Malus*, L., var. *mitis*, Wallr., was observed in one or two places; also *Ruscus aculeatus*, L., abundant in many spots on the Holmwood. Nearing Brockham, *Barbarea intermedia*, Boreau, grew by the roadside.

July 4, 1896.—14 members enjoyed a delightful day in the Wanborough district.

The Rev. E. S. Marshall, F.L.S., kindly conducted. From Ash Station by lanes and paths through Ash Green to Wanborough Wood. On the way our conductor pointed out *Rubus cognatus* (N. E. Br.) and *R. ericetorum*, Lefv., in abundance. In the Wood itself *R. viridis*, Kalt., and *R. Radula agg.* occurred; also a small quantity of *Calamagrostis epigeios*, Roth. Between the Wood and Wanborough Station *Lotus tenuis*, Waldst. & Kit., grew sparingly. On Normandy Common Mr. Marshall directed attention to *Rubus suberectus*, Anders., and *R. Marshalli*, Focke & Rogers; whilst in a fruit-farm at Normandy *Apera Spica-venti*, Beauv., was in great beauty and abundance. The last plants gathered were by the

roadside between Normandy and Wanborough Station—*Epilobium Lamyi*, F. Schultz, *Lathyrus Aphaca*, L., and *Trifolium agrarium*, L., the two latter of course only casuals.

Miss E. Sargent lectured on

#### THE CELL AND THE NUCLEUS.

Miss Sargent stated that both animal and vegetable bodies are of cellular structure. Growth takes place both by division of cells and by increase in the size of cells. An examination of the root of a young bean proved that growth was most rapid at the tip. Near the apex of the root the cells were in the most active state of cell-division.

Most of the contents of the cells are transparent. Both the nucleus and protoplasm are transparent. Hence to see what is passing, it is needful to use coloured chemicals.

No nucleus can be seen in the living cell when about to divide, but it has been proved that the nucleus itself divides and controls division.

When the structure is at rest, it is more difficult to examine than when division is going on. As the cell increases in size the cloudy fluid disappears; the nuclear membrane disappears, and the coil of ribbon broadens and changes into lengths, shorter, thicker, and straighter. Fibres form in bundles from the protoplasm, the rods being regular in number, in *Lilium Mastagon* 24 to each cell, the number of spindle-fibres being the same. The fibres pull the rods apart till they bend and lie out. Two nuclei are formed connected with the spindle-fibres, which are thickened in the middle; the thickened fibre forms the new cell-wall. All this takes place in the middle of thick protoplasm.

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## ANNUAL MEETING,

held at Redhill, 15th of October, 1897.

The Annual Report and Balance Sheet were read and adopted.

## ANNUAL REPORT.

During the year 12 members have joined the Club, and 5 have resigned. The number of members is now 83.

The character of the papers read at the evening meetings has been well maintained. Their standard of interest has been quite equal to that of former years. The attendance at the evening meetings has varied from 20 to 60, the average being 29. A lantern-lecture on Birds by Mrs. Lemon attracted the largest audience.

The following is a list of the papers or addresses :—

1896.

- October 16. Leaves and their doings, by Mr. N. E. Brown.  
 November 20. Ants, Bees, and Wasps, by Mr. F. M. Duncan.  
 December 18. North Italy and the Tyrol, by Mr. H. M. Wallis.

1897.

- January 15. Mosses, by Mr. E. S. Salmon.  
 February 26. Birds, by Mrs. F. E. Lemon.  
 March 19. Glimpses of the Inconceivable, by Mr. A. Brackett.  
 April 9. The Cell and the Nucleus, by Miss E. Sargent.

The lectures were illustrated with diagrams and specimens.

The following Societies have sent their publications to the Club:—

The British Association; Belfast Nat. Hist. and Philosophical Soc.; Burton-on-Trent Nat. Hist. and Archæological Soc.; Hastings and St. Leonards Nat. Hist. Soc.; North

## THE HOLMESDALE NATURAL HISTORY CLUB.

## ABSTRACT OF ACCOUNTS.

*Receipts.*

(October 1896 to October 1897.)

	£	s.	d.
Balance, October 1896 .....	9	7	0
Subscriptions .....	24	10	0

*Expenses.*

(October 1896 to October 1897.)

	£	s.	d.
Rent, Cleaning, &c.....	19	11	11
Printing .....	2	11	10
Postage, &c.....	1	5	3
Collector's Comm. and Postages.....	1	1	6
Subscription to S.E. Union.....	5	0	0
Balance.....	9	1	6

£33 17 0
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£33 17 0
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Staffordshire Naturalists' Field Club; Yorkshire Naturalists' Union; South London Entomological and Nat. Hist. Soc.; Bath Nat. Hist. and Antiquarian Field Club; Cardiff Naturalists' Soc.; City of London College Science Soc.; Croydon Microscopical and Nat. Hist. Club; Dumfriesshire and Galloway Nat. Hist. and Antiquarian Soc.; Nat. Hist. Soc. of Glasgow; Marlborough College Nat. Hist. Soc.; South-Eastern Union of Scientific Societies.

Mr. Arthur Bennett, F.L.S., has kindly sent reprints of botanical articles.

Mr. E. S. Salmon presented a 'Key to the Genera and Species of British Mosses.'

Mr. C. Attersoll Smith presented a collection of Foreign Ferns and Selaginellæ.

The usual number of Excursions were planned for the summer months. On June 26 the Club joined a large party of geologists belonging to the London Geologists' Association in a visit to the new railway-cuttings at Redhill and Merstham.

On July 24 the Club was hospitably entertained by Abraham Dixon, Esq., of Checkley Court, near Mickleham, who showed his hothouses containing the *Victoria Regia* in bloom, and other objects of interest.

The following is a list of the Excursions:—

*Whole Day.*

May 3.—Gravetye.

June 12.—Boating on the Wey.

July 10.—Milford, Crooksbury Common, and Waverley Abbey.

Aug. 7.—Tilgate Forest.

Sept. 4.—Chilworth to Gomshall.

Oct. 2.—Guildford to Gomshall.

*Afternoon.*

Apr. 24.—Betchworth to Reigate Heath.

May 22.—Westcot.

June 26.—Redhill to Merstham.

July 24.—Mickleham.

Aug. 21.—Felday and Holmbury Hill.

Sept. 18.—Upper Gatton.

The following Officers were elected :—

*President.* Mr. W. H. Tyndall,

*Secretary.* Mr. A. J. Crosfield.

*Treasurer.* Miss Crosfield.

*Curator.* Mr. John Linnell.

*Committee.* Messrs. J. Bonnor, T. Cooper, J. B. Crosfield,  
F. H. Ellwood, E. S. Salmon, C. E. Salmon,  
A. Trower, and Miss E. Sargent.

Dr. Bossey exhibited some fine specimens of Iron Pyrites from Reigate Hill ; also a flint filled with drift-clay.

Miss Horne exhibited a specimen of Turkey Oak.

Mr. Poulter exhibited a rose-leaf cut by a bee.

Mr. Tyndall exhibited specimens of wood.

Mr. N. E. Brown lectured on

THE NATURALIST DETECTIVE AND HIS EXPLOITS IN THE NORTH.

He referred to the discovery by Agassiz and others that Switzerland had once been covered by ice to the thickness of 1000 feet. The British Islands, most of Europe, and large parts of N. America were similarly covered with ice. At that time only an arctic flora could survive.

In the forest-beds of the Mundesley Cliffs, near Cromer, below the boulder-clay, stumps occur of Yew, Hazel, Birch, Scotch Fir, and Spruce, not *in situ*, but having drifted.

Above the forest-beds are clays with lignite. In these clays *Salix polaris* and an arctic moss have been found, and also *Betula nana*.

Above these clays is boulder-clay containing no fossil remains.

Above the boulder-clay are freshwater clays containing *Betula nana*, *Salix polaris*, *S. reticulata*, *S. herbacea*, and *Dryas octopetala*. All these are arctic species, and no plants other than arctic have been found. The same plants occur in the clays under the bogs in Denmark.

In the Danish bogs is a bottom layer containing *Populus tremula*. The next layer contains *Pinus sylvestris*. Then comes *Quercus sessiliflora*, then *Quercus pedunculata*; and in the uppermost layer of the bogs *Alnus glutinosus*.

On the solid ground above the bogs Beech is the prevailing tree.

The calcareous tuff-deposits of Denmark contain numerous prints of shrubs and trees.

In the lower deposits *Dryas octopetala* occurs with *Hippophaë rhamnoides*.

In higher deposits occur shrubs, *Pinus sylvestris*, Water-lilies, &c. Higher still is Oak but no Firs, and higher is Alder, but no Beech or Hornbeam, which are now common in Denmark.

Spruce Fir is found fossilized in no stratum above the boulder-clay in England or Denmark. It has most likely entered Norway from the east by way of Finland.

The occurrence of layers in the bogs points to the alternation of wet and dry periods. During the wet periods bog formed; during the dry periods trees could grow.

These observations tend to show the immensity of time that has elapsed.

In Norway the lower bogs have but one layer of peat; the next have two layers; and those at still higher elevation have three layers. Most probably the lower were below sea-level when the upper ones were formed, and the land has risen more recently.

The Scotch Fir is not now wild in Denmark, and does not thrive in most parts of Denmark when planted, nor do arctic

plants now grow in Denmark. The Beech has probably been dominant there from 2000 to 10,000 years.

The relics of man's work found in the bogs shows that the iron age coincides with the surface of the bogs; the bronze age goes down to the layers of oak; the flint age to the bottom of the bogs.

In Norway flints have been found within a foot or two of the surface of the bogs.

Mr. Brown stated that the most probable explanation of the cause of the alternations is found in the precession of the equinoxes, each period occupying 21,000 years.

The following notes were presented by Mr. W. H. Tyndall:—

METEOROLOGY, OXFORD ROAD, REDHILL, for the year 1896.

#### JANUARY.

The *Barometer* during the month ranged high. For 29 days it reached 30 inches and upwards; the maximum being 30·86 inches on the 30th, the minimum 29·40 inches on the 14th. The average of the month 30·34 inches. A sudden fall occurred from the 13th, when it stood at 30 inches, to the 14th, when it fell to 29·40 inches. This was the only violent fluctuation observed during the month.

*Thermometer*.—The temperature was above the average by about 4 degrees. The maximum reached 50°·5 on the 15th and 17th; and the minimum fell to 28° on the 19th and 29th. The average temperature observed for this month was 39°·87. At no time did frost continue throughout the day, nor was the variation in temperature great day by day or night by night. The month was unusually mild; but on ten nights the temperature fell to freezing-point and under.

*Rain*.—But little rain fell during the month, only ·98 of an inch during 11 days; the average fall for January being 2·85 inches, observed over a period of 30 years. On nine continuous days, from the 3rd to the 11th, no rain fell.

No snow of measurable quantity fell during the month. In a meteorological point of view the month passed very quietly.

## FEBRUARY.

There were greater fluctuations in the barometer this month than in January; but the average height was 30·31 inches, differing but little from January. On 25 days the barometer read 30 inches and upwards, and on 4 days only did it fall under 30 inches. The maximum was 30·69 inches on the 3rd; the minimum 29·76 inches on the 20th.

The month was warm. The average height of the thermometer was 39°·35; the average for this month over a period of 30 years being only 37°·51. The maximum temperature 54°, was reached on the 12th and 28th; the minimum, 20°·5, on the 25th. On eleven nights the temperature fell to freezing-point and under.

Rain fell on nine days to the extent of only ·39 of an inch; the average fall for the month of February, as observed at Redhill, being 2·04 inches.

## MARCH.

The height of the barometer this month averaged 29·86 inches. The maximum being 30·31 inches on the 10th; the minimum 28·96 inches on the 4th. On 13 days only did the barometer attain a height of 30 inches. On one day it fell below 29 inches. A very heavy gale was raging on the night of the 2nd and morning of the 3rd, and it was in connection with this stormy weather the barometer fell to 28·96 inches on the 4th.

Thunder was heard about 4 P.M. on the 3rd, accompanied by a very sharp but short shower of hail and rain. Lightning was again seen in the evening of the 4th.

*Thermometer.*—The maximum temperature reached 61° on the 22nd. The minimum fell to 31° on the 3rd and 14th. On five nights the temperature fell below freezing. The average temperature of the month was 44°·80, four degrees above the general average of the month of March.

This month was unusually wet, 3·70 inches of rain fell on 25 days; the average fall for March being under 2 inches. March is ordinarily one of the driest months in the year, but in

1896 it forfeited its character for dryness; but in the early days of the month it maintained its character for being stormy.

#### APRIL.

*April.*—The barometer rose to 30·52 inches on the 21st, and fell to 29·80 inches on the 29th, giving an average for the month of 30·19 inches. On 25 days it attained to 30 inches and upwards.

The temperature reached a maximum of 67° on the 27th, and fell to 31° on the night of the 21st. On two nights only it fell below the freezing-point. The general average temperature for the month of April, as observed at Redhill, is 46°·10. April, 1896, consequently was warm.

Rain fell on 10 days to the extent of only ·88 of an inch. The average fall for the month of April is 1·93 inches. No rain fell for 11 days from 17th to 27th. Lightning was seen about 8.30 P.M. on the 30th.

#### MAY.

The barometer this month never fell below 30 inches; the maximum being 30·50 inches on the 25th, the minimum 30·00 inches on the 20th. The extreme range was half an inch only.

The temperature reached 76°·5 on the 18th, and fell at night to 31° on the first day of the month. Temperature reached 70 and upwards on five days. The average temperature of the month was 53°; the general average for the month of May is 52°·56. This month was warm and enjoyable.

Rain fell on three days only, to the extent of only ·26 of an inch. The average total fall for the month of May is 1·81 inches. No rain fell for 19 days from the 1st to the 19th, and again for 9 days, from the 23rd to the 1st of June.

Thunder was heard at about 1 P.M. on the 20th, on which day ·09 of an inch of rain was measured.

#### JUNE.

The barometer reached 30 inches and upwards on 18 days; the maximum being 30·33 inches on the 20th; the minimum 29·56 inches on the 9th. The average of the month was 30·01 inches.

Temperature reached  $80^{\circ}$  on one day, the 15th, and  $70^{\circ}$  and upwards on 21 other days. The average temperature of this month was  $61^{\circ}90$ ; the average for June being  $58^{\circ}95$ .

Rain fell on ten days to the extent of 2.58 inches, a little in excess of the general average for that month. A heavy fall of 1.04 inches occurred on the 10th, followed by a period of 13 days in which time once only rain fell, viz. on the 17th, to a depth of .19 of an inch. A fall of .45 of an inch occurred on the 9th, making the continuous fall on the 9th and 10th nearly an inch and a half. .46 of an inch fell on the 24th. When the rain did come this month it fell heavily.

#### JULY.

The barometer reached a maximum of 30.33 inches, as in June, and fell to a minimum of 29.84. The maximum was on the 11th, the minimum on the 26th. The average of the month was 30.07 inches. For 24 days it stood at 30 inches and upwards. No violent fluctuations occurred during the month.

The temperature reached  $81^{\circ}5$  on the 7th and 21st, and this was the maximum of the year. It fell to  $42^{\circ}5$  on the night of the 28th. The average for the month was  $62^{\circ}42$ , a little over the general average for the month of July. On 18 days the temperature reached  $70^{\circ}$  and upwards, and on 4 days more it rose to  $80^{\circ}$  and above.

Rain fell on 10 days to the extent of 1.51 inches, less than the average for July by an inch and a quarter. The maximum fall was only .45 of an inch, and occurred on the 26th. No rain fell from the 4th to the 14th, nor from the 17th to the 23rd.

#### AUGUST.

The barometer for this month and the preceding two months was very steady. The maximum this month was also 30.33 inches, and occurred on the 11th. The minimum, 29.93 inches, was on the 27th. The average of the month was 30.09 inches. Precisely as in July, the barometer rose to 30 inches and upwards on 24 days, and below 30 inches on 7 days.

The temperature reached a maximum of only  $73^{\circ}$ , and that was attained on the 12th, 13th, and 23rd. It fell to a minimum of  $44^{\circ}\cdot5$  on the nights of the 16th and 26th. On four days the temperature rose to  $70^{\circ}$  and upwards. The average of the month was  $58^{\circ}\cdot46$ , nearly two degrees below the average for August.

Rain fell on 17 days to the amount of 2·64 inches, a little under the average fall for August. The heaviest fall was ·40 of an inch, and occurred on the 21st.

Thunder was heard on the 7th, about 4 P.M., and again on the 8th, about noon, and on the 26th at 3 P.M.; but no violent storm occurred at Redhill. In fact, this district is not often disturbed by violent thunderstorms.

#### SEPTEMBER.

During this month were several rapid fluctuations in the barometer, especially from the morning of the 24th, at 8 o'clock, when it stood at 29·95 inches, to the morning of the 25th, at the same hour, when it had fallen to 28·91 inches, more than one inch. The maximum occurred on the 30th, when it reached 30·40 inches, the stormy weather being over. The minimum, 28·91 inches on the 25th, as above stated.

On 24 days the barometer fell below 30 inches, and on one day more, below 29 inches.

The temperature rose to  $70^{\circ}$  on one day only, the 8th. It fell to  $36^{\circ}$  on two nights, the 20th and 30th. The average of the month was  $55^{\circ}\cdot87$ , somewhat below the general average for the month of September.

*Rain.*—In this month the rain was excessive. The total fall was 7·72 inches, an amount greater in any one month than has been observed at Redhill during 31 years. Rain fell on 26 days. Several heavy falls occurred; on the 8th of the month 1·79 inches, and on the 9th ·17 of an inch, making a continuous fall of nearly 2 inches. On the 24th, ·84 of an inch fell, and on the following day ·19 of an inch was recorded. This was practically a continuous fall of 1·03 inches. On the 4th of the

month  $\cdot 98$  of an inch was recorded ; and in the period from the 10th to the 13th  $2\cdot 08$  inches were measured.

During 31 years there have been 12 monthly falls of 5 inches and upwards, 3 monthly falls of 6 inches and over, and 3 monthly falls of 7 inches and above. All these heavy falls have occurred in months from July to January.

Hail fell about 2.30 P.M. on the 20th. A strong gale occurred on the 22nd, and continued in the night and up to the morning of the 23rd.

#### OCTOBER.

Is often a stormy month with rapid fluctuations of the barometer. In this month the maximum reached  $30\cdot 50$  inches on the 1st, and fell to the minimum of  $29\cdot 30$  on the 19th ; the range being an inch and two-tenths. The barometer reached 30 inches on 25 days. The average of the month was  $29\cdot 78$  inches, the lowest monthly average of the year.

The maximum temperature was  $62^{\circ}\cdot 5$ , reached on the 3rd. The lowest temperature was  $27^{\circ}$ ; which happened on the night of the 27th. On six nights the temperature fell below the freezing-point. The average for the month was  $45^{\circ}\cdot 37$ , below the general average for October nearly  $2^{\circ}$ .

Rain fell on 22 days to the extent of  $4\cdot 47$  inches, exceeding the general average of the month by nearly one inch.

On the observation of 30 years, the month of October has proved the wettest month of the year.

A maximum fall of  $1\cdot 03$  inches occurred on the 6th. Other heavy falls were :  $\cdot 65$  of an inch on the 12th, and  $\cdot 43$  of an inch on the 13th. More than an inch for those two days.

A thunder-shower with hail occurred about noon on the 25th. Lightning was seen the same evening about 8 P.M. It rained each day from the 2nd to the 9th, and again each day from the 12th to the 20th of the month.

#### NOVEMBER.

The barometer this month averaged  $30\cdot 14$  inches ; it attained the maximum,  $30\cdot 61$  inches, on the 23rd, and was lowest,

29.40 inches, on the 15th. For twenty days it reached 30 inches and upwards.

The temperature attained a maximum of  $50^{\circ}$  on the 20th. It fell lowest, to  $25^{\circ}5$ , on the night of the sixth. On ten nights it fell below the freezing-point. The average temperature of the month was  $39^{\circ}50$ , considerably below the general average of November, namely  $42^{\circ}79$ .

Rain fell on 11 days to the amount of 1.76 inches. Very considerably less than the average for the month, namely 3.18 inches.

Much mist visited the district towards the close of the month. The absence of sunshine kept down the temperature. Hence, chiefly, the deficiency in warmth during the month.

#### DECEMBER.

In this month were considerable fluctuations in the barometer. The maximum was 30.35 inches on the 27th and 29th. It fell to 28.78 inches on the 6th. On 13 days the barometer reached 30 inches. On 17 days it fell below 30, and on one day more it fell to 28.78 inches.

Temperature reached a maximum of  $50^{\circ}$  on the 3rd and 28th, and fell to  $24^{\circ}$  on the 16th. The average for the month was  $38^{\circ}65$ .

On twelve nights the temperature fell below the freezing-point, and one day, the 18th, it did not at any time of the day rise above it. And on the 17th, the maximum of the day was only  $32^{\circ}5$ .

Rain or Snow fell to the amount of 4.11 inches on 22 days, chiefly rain; the snow measured only .09 of an inch. A heavy fall of rain occurred on the 4th, .75 of an inch being measured; and on the following day .30 of an inch was measured, making together more than one inch, practically a continuous fall. A fall of .48 of an inch occurred on the 2nd, and .46 of an inch on the 13th.

#### SUMMARY.

The total rainfall of the year has been 31 inches, exceeding

the average for 31 years by  $\cdot 05$  of an inch. The days on which rain has fallen, more or less, were 176, the average number of days in a year being 177.

On 57 nights the temperature fell below freezing; on 49 days it reached  $70^{\circ}$ , but under  $80^{\circ}$ ; and on 5 days it reached  $80^{\circ}$  and upwards.

The station is just 300 feet, by Ordnance Survey, above the level of the sea.

Observations were taken at 8 A.M.

The Thermometers have a northern aspect, near the wall of the house, but not touching the wall, and they are sheltered from the early morning sun and late evening sun of summer.

The Barometer reached 30 inches and over on 233 days.

reached 29 inches and over on 130 „

and on 3 days was under 29 in. 3 „

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366 leap year.

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MEETING, held at Reigate, 19th of November, 1897.

The following reprints were presented:—

“Geology of the Neighbourhood of Carmarthen,” from the Quarterly Journal of the Geological Society, by Miss Crosfield and Miss Skeat, presented by Miss Crosfield.

“Records of Scottish Plants and Notes on *Carex*,” by Mr. Arthur Bennett, F.L.S., presented by Mr. A. Bennett.

The Rev. Robert A. Bullen exhibited Neolithic implements, including a hammer and chopper, from Pakefield; also models of Trilobites from the Utica Slates of New York State. He stated that two hundred millions were to be found in those beds. They measured about half an inch long, and a quarter of an inch broad.

METEOROLOGY.—OXFORD ROAD, REDHILL (1896).

Month.	BAROMETER.				THERMOMETER.					RAIN.	
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.	Total fall. INCHES.	No. of days.
January.....	30.86	30	29.40	14	50.5	15, 17	28.0	19, 29	39.87	.98	11
February ..	30.69	3	29.76	20	54.0	12, 28	20.5	25	39.35	.39	9
March .....	30.31	10	28.96	4	61.0	22	31.0	14	44.80	3.70	25
April .....	30.52	21	29.80	29	67.0	27	31.0	21	47.94	.88	10
May .....	30.50	25	30.00	20	76.5	18	31.0	1	53.00	.26	3
June .....	30.33	20	29.56	9	80.0	15	42.0	26	61.90	2.58	10
July .....	30.33	11	29.84	26	81.5	7, 21	42.5	28	62.42	1.51	10
August .....	30.33	11	29.93	27	73.0	12, 13, 23	44.5	16, 26	58.46	2.64	17
September ..	30.40	30	28.91	25	70.0	8	36.0	20, 30	55.87	7.72	26
October .....	30.50	1	29.30	19	62.5	3	27.0	27	45.37	4.47	22
November ..	30.61	23	29.40	15	50.0	20	25.5	6	39.50	1.76	11
December ..	30.35	27, 29	28.78	6	50.0	3, 28	24.0	16	38.65	4.11	22
Year.....	30.86		28.78		81.5		20.5		48.93	31.00	176.

Mr. Henry M. Wallis, of Reading, lectured on

THE EVOLUTION OF THE HUMAN EAR.

He described with great care the result of some years' observations on the ears of young infants, from which he found that the hairs on the human ear have a strong tendency to meet in a tuft on the inturned tip on the margin of the helix. This tends to confirm the idea that the human ear was formerly erect as in many beasts, and that the hairs served to protect the upright ear from the weather by shooting off the rain from it. He also called attention to the intrinsic muscles which still exist and enable some persons to wag their ears. In Apes there is no sign of an ear-tip, nor are their ears hairy.

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MEETING, held at Redhill, 17th of December, 1897.

Mrs. Whittard exhibited a specimen of *Aphrolite aculeata*, from Bournemouth.

Mrs. E. Frith exhibited specimens of a fungus, *Geaster fornicatus*, from Hertfordshire.

Mr. A. W. Brown exhibited specimens of a new species of Arthropod, of the genus *Peripatus*, from Durban, S. Africa.

Mr. A. W. Brown, B.A., F.L.S., of Oxford, gave an address on

RECENT RESEARCHES IN THE LIFE-HISTORY OF EELS.

The life-history of the Eel has been a mystery since the days of Aristotle, although many attempts to explain it have been made. The facts leading to a correct understanding of the subject have been accumulating for the last 20 years, but the finishing-touches have been put only within the last 5 years by the Roman naturalist, G. B. Grassi.

The Eel is a fish modified for life in the mud. It is more or less degenerate too, having no pelvic fins, very small scales

in the integument, and other peculiar characteristics. In habit Eels are very carnivorous.

It is curious to note that prior to Grassi's work no one had ever seen an Eel less than  $2\frac{1}{2}$  inches in length. It was many years too before any trace of sex could be discovered. Now it seems satisfactorily proved that the broad-nosed variety of Eels are females, and the sharp-nosed males. Some eggs thought to be Eel's eggs had been found by an Italian naturalist, but no definite proof existed that they were Eel's.

For many years a great deal of interest had centred in the annual migrations of Eels. The adults going down to the sea in the autumn, the young, or elvers, coming up from the sea in the spring.

For some years a peculiar little fish called *Leptocephalus* had been known. It resembled a transparent ribbon of jelly, and was thought to be an Eel which had become modified by being carried out to sea.

The essential fact in Grassi's discovery lay in his proof that *Leptocephalus* was the larva of the Eel, a normal stage in its life-history.

Following out this clue, Grassi found that Eels matured sexually and bred at great depths in the sea, and hence explained their migrations. Those Eels which come up from the depths were found to have developed a bridal habit of silver and grey colour.

The evidence for the connection between *Leptocephalus* and the Eel was based on experimental as well as anatomical evidence. The change from *Leptocephalus* to the young Eel is accompanied by a diminution in size, and by the time the Eels reach the mouths of rivers, they have assumed all the characters of the ordinary Eel.

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MEETING, held at Reigate, 21st of January, 1898.

Dr. Bossey exhibited a Fungus growing on the back of a chrysanthemum-leaf from France.

The Rev. R. Ashington Bullen, B.A., read a paper entitled

RANDOM NATURAL HISTORY NOTES AND OBSERVATIONS IN THE  
WESTERN HEMISPHERE.

The random observations in the following paper were made between Sept. 9 and Oct. 16, 1897, in a journey to Canada in the 'Parisian' to County Bagot, Quebec, down the St. Lawrence to Montreal, to Toronto, Niagara, Buffalo, Albany, New York, up to Newhaven and Boston, and back from N.Y. by the 'Etruria.' Sea temperature varied from 58° F. on the Irish Coast to 33° in the Gulf of St. Lawrence, where the Baffin's Bay current flows down between the Gulf-Stream and the N. American coast.

Among the birds noticed were *Larus marinus* (Great black-backed gull), *Procellaria pelagica* (Stormy petrel), *Sterna fluviatilis* (Common tern), *Fulmarus glacialis* (Fulmar petrel), *Larus atricilla* (larger than its English cousin *L. ridibundus*, which latter is not pelagic in its habits), *Colymbus glacialis* (Great northern diver), *Podilymbus podiceps* (Pied-bill grebe). The last-named was frequently run over asleep by the 'Parisian,' woke up in alarm, and settled down to rest again a few yards away.

*Balaena musculus* (Rorqual) occurred in the Gulf of St. Lawrence. Its "baleen," though much shorter than that of the Greenland whale, is now sought for because of the scarcity of the latter (£3000 a ton). Schools of Porpoises also occurred in the same Gulf, and *Delphinus delphis* (ordinary Dolphin) 500 miles off the coast of Ireland. The 'Etruria' was steaming 20 knots an hour, but the dolphins easily kept up, and even passed ahead. Luminous medusæ occurred at night in the Gulf between 8 and 10 P.M.; temperature of water, 33°.

The colour of the waters of the St. Lawrence changed perceptibly to a pale green as we ascended. The banks and hills were beautified by the lakes and reds and scarlets of maple and sumach. Of Insecta, black crickets occur in the fields in millions. Their sound is very irritating, but they are good

food for fowls. A green cricket (not so common as the black) resembles our *Gryllus viridissimus*, and may be the same. The Arabs from Africa, who go over to trade with the "habitants," eat them. I found a yellow spider on *Senecio Jacobæa* protectively coloured. It eats the whole fly, wings and all, and returns a small black pellet (probably the chitin of the fly) not larger than a small pin's head. A brown spider, domestic in habit, acted in a quite opposite manner, merely killing the fly and taking a minimum of juice from it. This spider slew 20 to 30 flies a day, and is a great boon to the housewife.

*Acris gryllus*, one of the arboreal frogs anatomically, frequents the ditches and chirps like a cricket.

Of Lepidoptera I saw in abundance *Pieris rapæ*, introduced at Quebec years since in ballast (*teste* Dr. William Brodie of Toronto). *Vanessa antiopa* (Camberwell Beauty). Two broods (Dr. Brodie): A. The first a dwarfed variety, from eggs laid by hibernated specimens in June. B. The second, appearing about September from the eggs of (A), are large and fine.

*Colias philodyce*, a beautiful blended yellow and green, was common in September in Quebec province.

*Thecla nippon* is a Japanese butterfly also. Dr. Brodie informed me quite a number on West Coast U.S.A. are closely related to Japanese lepidoptera.

The larva of *Feniseca tarquinius* feeds on aphides, and is a farmer's friend.

In Ontario there are 2 Vanessidæ, 6 Pieridæ, 5 Limenitidæ, 2 Satyridæ, 6 Theclidæ, 7 Papilionidæ, 7 Coliadæ, 5 Argynnidæ, 1 *Melitæa*, 7 Graptidæ, 7 Lycænidæ, 1 *Catacephalus*, 1 *Feniseca*, 4 Thanaidæ, 2 Parnassiidæ, 3 Physioidæ, 3 Pyrameidæ, 1 *Junonia*, 2 Neonymphidæ, 2 Cœnonymphidæ, 3 Erebiadæ, 3 Chionobidæ, 5 Chrysophanidæ, 10 Pamphilidæ, 3 Eudamidæ (Dr. Brodie).

*Danaïs Archippus* ascends into the air when autumn commences, and in two days has been reported from Florida, 1500 miles off.

Canada and U.S.A. seem to be the meeting-ground of forms from Europe on the east, and Asia on the west.

The Canadian "Crow" (*Corvus corone*, Linn.), rather more slender than our rook, has a quicker caw, and when several are calling together, their sound resembles a dog's bark. P. H. Gosse ('Canadian Naturalist,' p. 167) says: "This is one of the few species which are common to America and Europe."

Twice I saw the Musquash, *Fiber zibethicus* (Cuvier). About 4 million skins are cured every year.

*Sciuropterus volucella*, the Grey flying squirrel, I saw at Dr. Brodie's in Toronto. It is very gentle. The same gentleman is one of the few that has the secret of handling live rattlesnakes.

I heard the Skunk (*Mephitis varians*, Gray) at night whisking and snuffing round the hen-roosts.

Of Aves, *Ectopistes migratorius* (Linn.) (the Canadian passenger pigeon), Dr. Brodie, Mr. G. Ogilvie, Mr. J. Downs and others assured me is almost extinct.

The Toronto Biological Society are endeavouring to promote the study of living birds in the woods, to be identified by means of the T. B. S. type-collection, and thus to prevent the unnecessary destruction of bird-life.

*Ampelis cedrorum*, Baird, the Cedar-bird, has a horny-red secretion or flake on one of its secondary feathers.

The Black woodpecker is 18 inches long, has a red head; the contents of the stomach, when examined, are mainly black and red ants.

The Canadian cuckoo sometimes makes a nest. From its irregular habits in egg-laying, Dr. Brodie has found in its nest fledged and unfledged young and fertile unhatched eggs.

*Uria Brunnichii*, Sabine (Brunnich's guillemot), sometimes comes up the St. Lawrence to Toronto Bay, unwisely, for it invariably starves to death.

*Passer domesticus*, Linn. (imported), has driven the small Canadian birds from near houses into the quiet of the woods.

*Mollusca*.—Varieties of *Helix* are scarce; but the water-fauna is rich.

*Limnæa stagnalis*, Linn., occurs both as a stunted and also a very large form. *Physa* and *Unio* occur in great variety. Kew,

'Dispersal of Shells' *passim*, and Cooke, 'Cambridge Natural History,' iii. p. 282-3, should be consulted as to distribution of forms; but it is as well to mention that *L. stagnalis* (= *L. jugularis* of Canadians), *L. peregra* (Müll.), *L. truncatula* (Müll.), and *L. palustris* (Müll.), occur in the whole of Europe, N. Asia to Amurland, Turkestan, Afghanistan, N. Persia, Kashmir, Greenland, N. America (from the Atlantic to the Pacific), and from North Canada and British Columbia as far south as Texas.

*Botany*.—In Canada and Michigan golden-rod, ragwort, purple \* marguerites, dandelion, burdock, and teasel were abundant, the last three in fruit.

A. Plants indigenous to N. America and England:—Rosebay willowherb (*Epilobium angustifolium*), marsh marigold, sundew, ragwort, white water-lily, yellow water-lily, raspberry, *Geranium dissectum*, herb-robert, *Potentilla anserina* (silverweed), common wood-sorrel, *Osmunda regalis*, dogwood, enchanter's nightshade, water knot-weed (*Polygonum amphibium*), harebell, marsh hedge-nettle.

B. Plants introduced into N. America:—Dandelion, chicory, the goosefoots (except *Ch. glaucum*, which is indigenous), collins and cream (*Epilobium rigidum*), watercress, bindweed, pasque-flower, yellow melilot, yellow toad-flax, oxeye daisy, our three common buttercups (*R. acris*, *R. repens*, and *R. bulbosus*), musk-mallow, bladder campion, ground-ivy, bell-flower, yellow flag, spurrey, soapwort, night-flowering catch-fly, stinking iris, small periwinkle, bittersweet, tansy, common mugwort, red clover, viper's bugloss, henbane, hound's tongue.

The Canadian raspberry resembles ours; but the Canadian blackberry is a lowly, erect shrub with all stem and no branches, about 6 inches high, sparse fruit, and no thorns.

Of seaweeds in the St. Lawrence Gulf occurred *Fucus vesiculosus* (bladder-wrack) and *Laminaria saccharina*. Off New York a specimen of *Sargassum vulgare* occurred.

*Sisyrinchium angustifolium*, Bermudan blue grass, fairly

\* Especially in Michigan.

common in Canada, also grows in Ireland; and *S. californicum*, a yellow-flowered species, has been lately discovered in Co. Wexford, Ireland.

The Crustacean *Limulus polyphemus* (Ranzani) occurred in numbers, dead, at Lighthouse Point Rocks 8 miles from New-haven, and is a link with Old Red Sandstone times, being related to the Stylonuri. *L. polyphemus* belongs to the "sword-tails," *Xiphosuri*. His eye is composed somewhat like an insect's, of a number of facets, as was the case with the extinct order of Trilobites. His segments number 18, the typical Crustacean of the present day numbering 21. His 10 larger limbs are generally on the same plan; there is no differentiation into claws and legs. His mouth is just behind the two small fore-claws, so that each of the ten large claws can convey food to it. The gill-plates are arranged behind the claws, and the whole animal is covered with an ample carapace. The tail (pygidium) is useful, enabling it to turn over if it accidentally falls on its back, and acting as a lever when it wants to burrow in the sand. It cannot swim, and crawls along the bottom in from 2 to 6 fathoms of water.

My best thanks are due to Mr. D. Boyle, Dr. W. Brodie, of Toronto, Prof. Beecher, of Yale, and Prof. Whitfield, of New York, for much help in seeing a great deal in a little time; and also to Mr. A. Smith Woodward, F.L.S., British Museum (Geology), and Mr. Lancelot Watson, Aurora, Illinois, for kind introductions.

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MEETING, held at Reigate, 18th of February, 1898.

An exhibition of Microscopes took place. Many objects of interest were shown.

Mr. C. E. Salmon read a paper entitled

BOTANICAL RAMBLES IN ROSS-SHIRE.

A little village amongst the hills of Ross-shire, delightfully

free from railways, is Kinlochewe: nestling in a valley, hemmed in on all sides but one by mountains of no mean height, and for the most part unfrequented by the restless tourist who reckons to "do" Scotland comfortably in his three weeks' holiday.

The one open side looks down to Loch Maree, into which a winding river runs, after meandering picturesquely through the village.

I say village, but this consisted only of an inn, a blacksmith's, a general store, and a shoemaker's, and one or two other small cottages, with of course the Manse and Church close by.

The botany of the country round this picturesque village had not been very systematically worked, so we had the pleasure of adding several new plants to the County List of Ross-shire; these were chiefly in the Hawkweed and Bramble families.

The most fruitful botanizing grounds appeared to be upon the summits or close thereto of the mountains called Slioch (3217 feet high) and Ben Eay (3309 feet). Unfortunately, this latter mountain forms part of an extensive Deer Forest, and it was only by having a keeper to accompany us (who kept a strict look-out for fear of disturbing the deer) that we were allowed permission to botanize at all upon this mountain.

Slioch, happily, is given over to sheep-grazing.

These Deer Forests proved a great source of annoyance subsequently, for three or four most interesting and "likely-looking" mountains had to be left unexplored, as the owners (though we pointed out how much they would be assisting Science, with a capital S, if they granted it) most decidedly refused to allow us permission to botanize upon them at this season (August), for the deer, once disturbed, are very chary of returning to the same feeding-grounds again.

On Slioch we first made the acquaintance of the two mountain Willow-herbs (*Epilobium anagallidifolium*, Lam., and *E. alsinæfolium*, Vill.), growing by a rocky stream with *Oxyria digyna*, Hill; higher up, *Gnaphalium supinum*, L., a pretty little alpine Cudweed, was plentiful; higher still, amongst the crevices of the rocks, grew *Luzula spicata*, DC., and *Carex*

*rigida*, Good., and some plants of *Hieracium graniticolum*, W. R. L., were gathered; almost at the top *Potentilla Sibbaldi*, Hall fil., was sparingly seen, in fruit only, and the very summit yielded *Arenaria sedoides*, Froel., a peculiar little plant forming great moss-like patches amongst the short wiry turf.

Other interesting plants of Slioch were *Hieracium lingulatum*, Backh., *H. atratum*, Fr., *H. senescens*, Backh., *H. Leyi*, F. J. Hanb., *H. anglicum*, Fr., v. *longibracteatum*, F. J. Hanb., *H. Sommerfeltii*, Lindeb., *Loiseleuria procumbens*, Desv., *Cornus suecica*, L. (the little dwarf Dogwood), *Poa Balfourii*, Parn., and the aquatic *Isoetes lacustris*, L.

The much rarer *Isoetes echinospora*, Dur., in which the spores are acutely tubercled, turned up also in two or three lochs near Kinlochewe, associated with plenty of the odoriferous *Chara fragilis*, Desv.

Ben Eay gave us *Hieracium rubicundum*, F. J. Hanb., and its variety *Boswelli* (Linton), and *H. argenteum*, Fr., also the *Loiseleuria* and *Luzula spicata*, DC., again, and the rather insignificant looking *Arabis petraea*, Lam., or Rock-cress.

Here, too, grew the Alpine Bearberry (*Arctostaphylos alpina*, Spreng.), which at that time was in ripe, black fruit, very tasteless compared to the Crowberry fruit (*Empetrum*), which was very plentiful; the other Bearberry (*Arctostaphylos Uva-ursi*, Spreng.) also grew lower down the mountain.

*Juncus trifidus*, L., was another rather uncommon plant to be found on Ben Eay, and quite an abundance of a little Eyebright, *Euphrasia Scotica*, Wetts., which had not previously been recorded in Great Britain except from three other Scotch counties.

The beautiful, almost transparent, little Bog Orchis (*Malaxis paludosa*, Sw.) occurred in two places near Kinlochewe; it is an epiphyte, always amongst Sphagnum, a most delicate plant. An interesting point in connection with this plant, is that small bulbils fringe the tip of its leaves, which fall off eventually and form new plants.

We had plenty of opportunity here to study the Sundews; every marshy spot almost abounded with *Drosera rotundifolia*,

Linn., or *D. anglica*, Huds. In two places where these plants grew together, it was interesting to find the hybrid between them, *D. obovata*, Mert. & Koch.

With these three, a plant grew which has puzzled us very much; it much resembles *D. intermedia*, Hayne, but we cannot decide yet if it should not really go, for several reasons, under the same hybrid too. If so, it only shows very strongly the well-known fact, that hybrids between two plants may vary to a very considerable extent.

In one or two lochs round Kinlochewe the peculiar Bladderworts (*Utricularia neglecta*, Lehm., and *U. intermedia*, Hayne) were growing; these are plants that entrap minute animals in the small bladders or pitchers attached to the leaves. Some of these lochs also had a very interesting plant, *Subularia aquatica*, L., growing in them; it belongs to Cruciferae, but is unique amongst the plants of this Order (at least as far as British representatives are concerned) in its habit of growing totally submerged, flowers and all, in the shallow margins of lakes.

Another interesting aquatic is the Water Lobelia (*Lobelia Dortmanna*, L.), though this seemingly is not quite so much at home in the water as the *Subularia*, as this Lobelia sends up its stalk above the surface of the lake to bear the flowers and fruit; one or two lochs had their margins quite covered with the swaying flower-stalks and pale blossoms of this plant.

In dark rocky glens, in places always moist and cool even on the hottest day, the Filmy Fern (*Hymenophyllum unilaterale*, Bory) could generally be found, and a spot like this suits too *Circeæ alpina*, L. (but this was much scarcer) and the Roseroot (*Sedum roseum*, Scop.).

*Pyrola minor*, Sw., and *P. secunda*, L., the Winter-greens, were also gathered in rather damp spots near rushing burns, but only in fruit.

On the moors close at hand the delicate lilac-flowered Pale Butterwort (*Pinguicula lusitanica*, L.) grew plentifully, and *Alchemilla alpina*, L., and *Galium boreale*, L., were of very frequent occurrence.

I have also brought down specimens to exhibit of the true *Ranunculus reptans*, L., which we gathered by Loch Leven on our way home from Kinlochewe. It was plentiful, and is really a very graceful little plant, arching over and rooting again perhaps half a dozen times or more.

I have also, for comparison, brought down some specimens of a plant which sometimes gets mistaken for the real *reptans*; but, as will be seen, it is a very coarse-looking plant beside the delicate thread-like growth of the true *reptans*, and besides, the hooked style of the latter further distinguishes it. This coarser plant is but a form of *Ranunculus Flammula*, L., called *pseudo-reptans*, Syme; but a specialist to whom we submitted the plants, gave his opinion that they were a step still nearer true *reptans*, and named them "a form between *R. reptans* and *R. flammula* v. *pseudo-reptans*," and this kind of hair-splitting is certainly very puzzling!

A REPORT OF EXCURSIONS, 1897,  
was presented.

*April 24.*—Betchworth, Rice Bridge, and Reigate Heath.

67 species of plants were found in flower on this excursion, including *Barbarea intermedia*, Bor., which was plentiful in a field beyond Betchworth towards Leigh; it is uncommon in Surrey.

Sedge-Warbler was heard and Swallow seen during the walk.

*June 12.*—Boating on the Wey.

23 members and friends enjoyed a cloudless day on the river between Guildford and Godalming. The banks were gorgeous with flowers, and the beautiful, damp, low-lying meadows afforded much delight to the botanists of the party. Sedges were abundant; *Carex paniculata*, L., *C. remota*, L., *C. acutiformis*, Ehrh., and others, were observed. *Stellaria palustris*, Retz., occurred in some profusion near Godalming, and *Vinca major*, L., on the bank towards Guildford.

June 26.—Redhill and Merstham. Conductor, Miss Crosfield.

About 35 members collected on the grass outside Redhill Station, where the Rev. Henry Brass gave a short lecture on the general geological structure of the district. He mentioned that the strata found in the area were—the Chalk, Upper Greensand, Gault, Lower Greensand (with its sub-divisions), and the Weald Clay; that at some period these beds had been upheaved into an anticlinal fold, and that subsequently they had been denuded by the sea and subaerial agents, the harder beds standing out as escarpments and the softer being worn away into valleys. Geological maps and sections illustrated the remarks.

The party was then joined by about 35 members of the Geologists' Association, under the guidance of G. J. Hinde, Ph.D., F.R.S., and W. Whitaker, B.A., F.R.S. The whole company first visited the Fullers' Earth pits close to the station. The subject of the position of the Fullers' Earth in the Lower Greensand was raised. Mr. Whitaker stated that the series was so distinct that, whatever its exact position might be, it deserved recognition in the mapping of the district. Specimens of "heavy spar" were collected, and casts of *Trigonia* and an echinoderm were found. The bed of Fullers' Earth in this pit is about 14 feet thick.

The party proceeded by a footpath northward, passing a small cutting in which the Fullers' Earth is brought up again to the surface by faults.

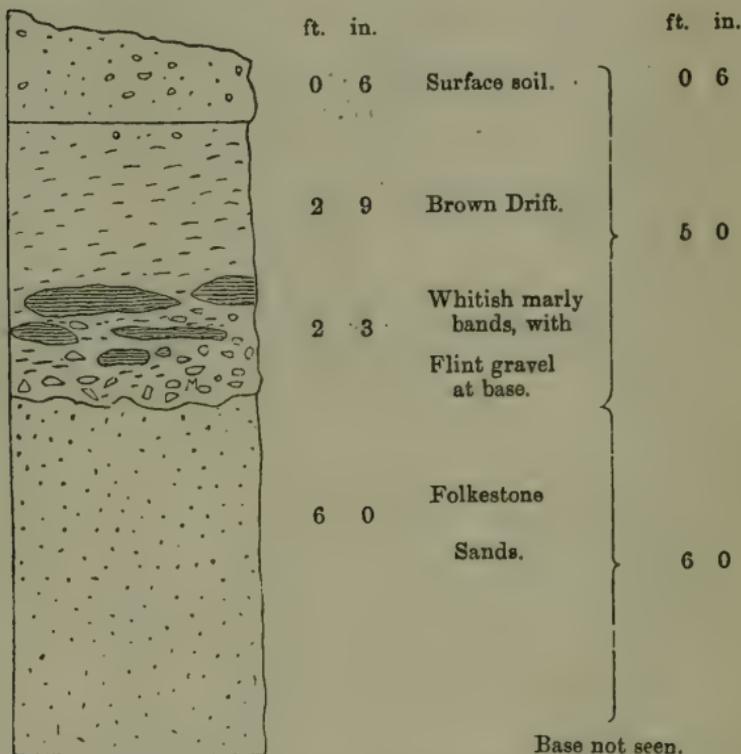
At Frenches sand-pit, which was the next point of geological interest, brown brick-earth is seen lying on Folkestone sand. Fragments of bone and a small shell (*Pupa*) were found.

The following (p. 66) is a detailed section of the bed as it appeared three months later, soon after the discovery of the upper molar of a mammoth by one of Mr. R. Trower's workmen.

From here the party walked to Battlebridge, where the Drift was found resting on Gault. Search was made for fossils in the Gault and the following species were found—*Ammonites interruptus* and *Belemnites minimus*.

The next pit to be visited was at the junction of Battlebridge

Road with Nutfield Lane. Here the Folkestone Sand is seen, and resting on it is a doubtful bed, which is either the base of the Gault or the top of the Folkestone Sand. It contained phosphatic nodules.



Section in Frenches Pit, 20° S. of E.

October 7, 1898.—M. C. C.

The party now climbed on to the new railway and examined the deep cutting in the Gault and Upper Greensand. The Gault contains here Foraminifera and Entomostraca, which are visible with a lens. In the Upper Greensand some harder layers of a siliceous character were noticed. Examination shows that the bands consist largely of sponge-spicules.

From here the Members rapidly melted away, few remaining to examine the tunnels by means of which the Greensand beds are worked, or to visit the fine chalk-pit a little farther north.

July 10.—Milford, Crooksbury Common, Waverley Abbey, to Farnham.

On this excursion we had the benefit of being conducted by the Rev. E. S. Marshall, F.L.S., who pointed out several rare and critical plants. Only 4 members availed themselves of his guidance.

Mr. Marshall led us first over Royal Common, where we gathered *Rubus hemistemon* (P. J. Muell.) and *R. rhombifolius*, Weihe, and then on, through delightful country, past Elstead to Charles Hill. Here *R. mollissimus*, Rogers, was found. Over sandy fields and through sandy fir-woods, where *Epilobium Lamyi*, F. Schultz, was growing, led us pleasantly to Crooksbury Common.

On the way to Waverley Abbey, *Teesdalia* was noted by the roadside. A visit was made to the ruins, but not very much remains of the once extensive Cistercian Abbey (the earliest in England) which was founded by Bishop Gifford in 1128.

A rare Surrey plant, *Geranium rotundifolium*, L., grows by the roadside near Farnham, and we were very pleased to end a most enjoyable excursion by gathering specimens of it, though it was somewhat past its prime. It might be hastily confounded with *G. molle*, L.; but if carefully examined, the carpels of the former are found to be quite hairy, whereas those of *G. molle* are glabrous and wrinkled as well: this distinction was very evident, as the plants were well in fruit.

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MEETING, held at Redhill, 18th of March, 1898.

The following paper by Miss E. Sargent was read by Miss Thomas:—

#### PHOTOMICROGRAPHY AS AN AID TO RESEARCH.

[When this paper was read, the photomicrographic instrument used by the Author was exhibited, and its working demonstrated to the Club.]

Ever since the invention of photography, those who use the

microscope have tried to employ photographs as a means of recording their observations. The advantages of doing so would clearly be very great. The question for the worker in science was, and still is, whether those advantages are worth the time and trouble necessary to obtain results good enough to be useful.

Twenty years ago this question was by common consent answered in the negative. Very beautiful photomicrographs were produced in those days, but they represented an expenditure of time and labour quite out of proportion to their scientific value. But since that date photography has been revolutionized by the general adoption of the dry-plate process. Great strides have also been made in the manufacture of microscopic lenses, and in the art of preparing and staining objects for microscopic observation. Apochromatic lenses have been constructed by the firm of Carl Zeiss in Jena, and by other opticians on their model. The microtome is generally used in botanical as well as in zoological laboratories. Photomicrography is now a comparatively simple art, and the whole question of its use to the professional biologist is again open.

In Bacteriology, indeed, photomicrographs are generally used. A few zoologists and botanists have photographed their preparations, generally for class demonstration by means of the lantern. But the method is not yet naturalized in the biological laboratory.

The advantages of the method are briefly these:—(1) the absence of personal bias in the picture produced by the camera; (2) the easy multiplication of prints; (3) the great ease with which photographs of two preparations can be compared with each other. These points are worth considering separately.

Everyone who has worked with the microscope knows how difficult it is to keep an unprejudiced mind. It is possible to be perfectly honest in intention and yet to consistently misrepresent the facts, first to oneself and then to others. For this reason it is often of the greatest service to get an unbiassed opinion on a preparation—a “fresh eye” as is sometimes said. And for similar reasons the photograph of a familiar section is

often most valuable. The features of the section are all there but in an unfamiliar aspect. One is compelled to follow out every detail as if for the first time.

When a successful negative has been taken, an unlimited number of prints can be made from it. These prints are very convenient to send to other scientific workers, and they are of much more value as evidence than original drawings. A photograph may of course be touched up so as to conceal the truth, but it cannot be unconsciously falsified.

The comparison of sections with each other is a difficult matter in which photography is of great service. The usual method is to put them one by one under the microscope. The details of that section which is actually being examined are compared with the details left in the observer's mind from examination of the last section. The process is very much simplified if we have photographs of both sections side by side. The larger features can be compared as well in the photographs as in the preparations. The observation of finer detail must be checked by reference to the original, but this reference is made much easier when we have the photograph as a ground-plan\*.

I have purposely refrained from discussing the merits of photography as a method of illustrating original memoirs. In some cases I am convinced it will do excellent service in this field. In many others its want of flexibility is a hopeless barrier. When the author of a theory draws figures to illustrate his meaning, he of course lays stress on those features which have determined his views. Thus his drawing is a more or less partial statement of facts, and for that reason illustrates his paper better than a merely mechanical reproduction of detail. A certain amount of selection is possible with the camera, but only within very narrow limits.

Turning now to the process itself, the question for the

\* Only very rough measurements can be made from photomicrographs, because the shrinkage of the paper on which they are printed is different in different directions, so that a certain amount of distortion takes place in the print. This is particularly apparent in platinotype prints; less so in those on albumenized paper.

biologist is one of degree. Are the difficulties so great as to be prohibitive to him? Clearly, no general answer is possible. Each worker will balance advantages against drawbacks in his own particular case and will come to his own conclusion. I am trying the experiment myself in a small botanical laboratory. The work I am doing is anatomical, and I have been attempting to keep a record of results by means of a series of photographs. My experience is that it is easy to take a fairly good photograph of a suitable section even with rough apparatus, but that with the best instruments it is difficult to get uniformly good results. Many of the difficulties however disappear as one gains experience. It is necessary to adopt a uniform method of staining which will photograph precisely. A brilliant artificial light must be used. The plates and the developer must be capable of giving density, for when a very thin section is illuminated by artificial light it is difficult to secure sufficient contrast. The plates must be backed to avoid halation. I have learnt to prefer the long-tube microscope to one provided with the short foreign tube because the field is larger, often a very important matter.

Such knowledge is gained by many failures. But when photography has once gained a footing in biological laboratories, there seems no reason why it should not be learnt as regularly as the art of microtoming. I believe that as a means of providing graphic records of scientific evidence, it will prove a very great aid to research.

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SPECIAL GENERAL MEETING, held at Reigate, 21st of October,  
1898.

The following resolutions were carried:—

“That Rule V. be amended by the omission of the words ‘of holding’ down to ‘therewith or.’”

“That Rule XII. be amended by the insertion of ‘fourth’ in place of ‘third’ before Friday.”

## ANNUAL MEETING,

held at Reigate, 21st of October, 1898.

The Annual Report and Balance Sheet were read and adopted.

## ANNUAL REPORT.

During the past year 9 members joined the Club, whilst we have lost 12 through resignation or death, making the present membership 80.

Through the death of Mr. James Bonnor, on Jan. 19, 1898, the Club has lost one of its most loyal members. To his active exertions the success of many of the summer excursions was due, and he was the means of introducing a large number of gentlemen and ladies to membership in the Club.

The meetings of the Club during the winter session were of an interesting character. A pleasant evening with the microscope gave an enjoyable opportunity for social intercourse. In a paper on Photomicrography, Miss E. Sargent gave the Club the benefit of some of her original research. Mr. N. E. Brown of Kew, Mr. H. M. Wallis of Reading, and Mr. A. W. Brown of Oxford, placed before the Club in their usual interesting and lucid manner facts that were little known to most of our members.

The following is a list of the subjects dealt with at the evening meetings:—

1897.

- October. The Naturalist Detective and his Exploits in the North, by Mr. N. E. Brown.
- November. The Evolution of the Human Ear, by Mr. H. M. Wallis.
- December. Recent Researches in the Life-history of Eels, by Mr. A. W. Brown.

1898.

- January. Random Natural History Notes and Observations in the Western Hemisphere, by the Rev. R. A. Bullen.
- February. Exhibition of Microscopes.
- „ Botanizing in Ross-shire, by Mr. C. E. Salmon.
- March. Photomicrography, by Miss E. Sargant.

The Club is indebted to the following Societies for copies of their publications:—

The British Association; Belfast Nat. Hist. and Philosophical Society; Burton-on-Trent Nat. Hist. and Archæological Society; City of London College Science Society; Croydon Microscopical and Nat. Hist. Club; Nat. Hist. Soc. of Glasgow; North Staffordshire Field Club; Penzance Nat. Hist. and Antiquarian Society; South-Eastern Union of Scientific Societies; Warwickshire Field Club.

Miss Young kindly presented some foreign shells.

The usual programme of excursions was varied on one occasion by an open-air lecture on Bees, which was planned by Mr. A. Trower.

The following were the excursions:—

*Whole Day.*

- May 7.—Dry Hill and Forest Row.
- June 11.—Bewbush and Ifield.
- July 9.—Hedge Court and Copthorne.
- Aug. 6.—Ashdown Forest.
- Sept. 3.—Witley Common.
- Oct. 1.—Holmbury Hill.

*Afternoon.*

- April 23.—Godstone, Tilburstow, and Nutfield.
- May 21.—Worth.
- June 25.—Wiggie, for lecture on Bees.
- July 23.—Betchworth Hill.
- Aug. 20.—Guildford and Chilworth.
- Sept. 17.—Merstham and Alderstead.

## THE HOLMESDALE NATURAL HISTORY CLUB.

## ABSTRACT OF ACCOUNTS.

*Receipts.*

(October 1897 to October 1898.)

	£	s.	d.
Balance, October 1897.....	9	1	6
Subscriptions .....	34	15	0
Sale of Brewer's 'Flora'.....	3	10	11
Sale of Proceedings .....	1	0	0

*Expenses.*

(October 1897 to October 1898.)

	£	s.	d.
Rent, Gas, Fire, &c. ....	17	7	6
Caretaker for Museum .....	1	0	0
Printing, Postage, and Stationery ....	5	0	0
Collector's Commission .....	1	12	0
Expenses of Lectures .....	11	8	8
Subscription to S.E. Union.....	10	2	2
Balance in hand .....	21	7	1

£47	8	5
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£47	8	5
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The following Officers were elected :—

*President.* Mr. Frederick Hughes.

*Secretary.* Mr. Albert J. Crosfield.

*Treasurer.* Miss Ethel Sargant.

*Curator.* Mr. John Linnell.

*Committee.* Messrs. T. R. Chapman, T. Cooper, J. B. Crosfield, W. Cochrane, B.A., the Rev. G. Currie Martin, Messrs. D. P. Poulter, C. E. Salmon, A. Trower, and W. H. Tyndall.

The Rev. R. Ashington Bullen presented some valuable Fossils collected in North Kent.

Dr. Bossey exhibited roots of the Common Pea and Everlasting Pea, and called attention to the tubers upon them, which have the property of restoring nitrogen to the soil.

Mr. A. J. Crosfield called attention to the same feature in another leguminous plant, *Tetragonolobus purpureus*.

Miss Ethel Sargant gave an address on

#### SEEDLINGS OF ARUM MACULATUM.

The address was illustrated with diagrams and specimens.

Mr. Albert J. Crosfield described the

#### BIRDS AND PLANTS OF TANGIER, MOROCCO.

The month of April was specially favourable for seeing birds, as many were passing on migration. All through the month *Bee-eaters* were passing over in flocks varying in numbers from 3 or 4 to 70. They floated along against the east or north wind, uttering their plaintive whistle as they flew.

Seven *White Storks* were seen passing over the town on April 3rd; probably the stream of migration was then almost at an end. Storks were seen in pairs in the fields; and on April 11th about a dozen pairs were nesting on the thatched

roofs of a village about an hour's ride from Tangier. Some of the nests contained perfectly fresh eggs.

*Blackcaps*, *Nightingales*, and *Sardinian Warblers* had taken up their summer quarters in the gardens around the town by the 3rd of April; and *Martins*, *Swallows*, and *Swifts* were abundant. *Nightingales* were extremely abundant in all the country round.

On April 5th, 4 or 5 *Pied Wheatears* were seen on the hill to the west of Tangier. *Redstarts* were seen on the 6th.

On the 7th a *Hoopoe* rose from amongst the palm-scrub on a hill to the south of the town. Two more were seen on the 8th, and 6 together on the 17th.

*Stonechats* and *Wheatears* were met with on the 7th. A *Cuckoo* passed over; and *White Wagtails* were seen on the shore.

On the 8th several *Hen Harriers* were hawking along the hillside near the Jews' River. Some were in grey, some in brown plumage. Two *Woodchat Shrikes* appeared. From this date onwards *Woodchats* became abundant. They are conspicuous birds and love to perch on the topmost point of the aloe hedges. This habit is taken advantage of by the Moorish and Spanish boys, who set snares for them and catch them.

On April 9th about a hundred *Black Kites* were circling over the hill on the west side of Tangier.

On the 11th a *Sandpiper* was seen by the river.

On the 12th a *Pied Flycatcher* made its appearance in the Hotel garden, and *Whinchat* on the hills.

A pair of *Sand Martins* were flying over the river on the 15th; and a *Golden Oriole* was seen flying over the hillside on the 17th.

On April 25th, *Spotted Flycatcher*, *Turtle Dove*, and *Nightjar* were met with. The two last-named were on the cistus-covered hills.

*Rufous Warblers* made their appearance on April 30th, and were seen almost every day after that date. They loved to flit from point to point of the aloe hedges. When clinging to the

aloe leaves they would often spread out their tails like a fan, showing conspicuously the white fringe. When on the ground they had much the manner of Nightingales.

Three *Norfolk Plovers* rose from the foot of a stony hill near the Atlantic sea-board on May 6th.

Other species met with at Tangier were:—*House Sparrow* in great abundance; *Serin Finch* (a pair were generally twittering in the tree-tops in the Hotel garden); *Ultramarine Tit*; *Thrush*; *Blackbird*; *Robin*; *Linnet*; *Goldfinch*; *Calandra Lark*, one pair; *Wood Lark*; *Crested Lark*, very abundant in the corn-fields; *Corn Bunting*; *Raven*; *Buzzard*; *Algerian Chaffinch*; *Grey Shrike*; *Ortolan Bunting*, in a small flock feeding on sandy ground; and two kinds of small Warbler, probably the *Melodious Warbler* and the *Western Olivaceous Warbler*.

Mr. Crosfield exhibited about 60 specimens of plants from the neighbourhood of Tangier.

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MEETING, held at Redhill, 25th of November, 1898.

The President nominated Dr. Bossey and Mr. W. H. Tyndall as Vice-Presidents for the year.

The Secretary read parts of a letter from Mr. W. A. Brewer offering to present to the Club a collection of fossils and a collection of British plants. The Secretary was asked to convey the thanks of the Club to Mr. Brewer.

Mr. C. E. Salmon presented a reprint from the 'Journal of Botany' of "Notes from Cantire."

Mr. C. E. Salmon mentioned that a *Potamogeton* in the Power collection belonging to the Club has been identified by Mr. Arthur Bennett, F.L.S., as *P. rutilus*, Wolfg., a species new to Great Britain. It is not certain whether it was gathered in Warwickshire or Staffordshire.

Mr. A. J. Crosfield mentioned that he had, on the 18th inst., seen three Crossbills flying over the Great Doods estate, whistling as they flew.

Mr. Henry M. Wallis, of Reading, lectured on

#### THE MIGRATION OF BIRDS.

Round our lighthouses on the East Coast, on foggy nights in autumn, vast flocks of birds fly to and fro all night long. The species include Larks, Short-eared Owls, Woodcocks, and Ducks, and many others. Amongst these migrat flocks stragglers occasionally occur, such as a species of Nightingale whose summer home is in N.E. Siberia and whose winter resort is Burmah.

Some species which are residents with us are migrants in Scandinavia and Germany. Amongst these are the Robin, Rook, and Goldcrest.

In the Arctic Regions no species are residents, whilst in the Tropics almost all species are.

The island of Heligoland, off the mouth of the Elbe, lies in the stream of European migration. Dr. Gätke made observations there, with the result that 398 species have been recorded as occurring on the island, which in area is not so large as Hyde Park. This number includes some E. Asian and one or two American species. The total number recorded as having occurred in Great Britain is 426.

An example of the most limited migration is the Alpine Accentor, which spends the summer on the mountains, and the winter at their base.

The most extreme migrants known are the Knot and Sanderling, which breed in the Arctic Regions to the north of Smith's Sound, and travel as far as New Zealand. They also pass the whole length of the American Continent. Possibly a yet longer sea passage is made by the Golden-winged Cuckoo, which passes between Tahiti and New Zealand.

It seems probable that the migration of today is based upon emigration at earlier periods of the earth's history.

The various species of Willow Wren winter in Central

Africa, but on their passage northward in the spring they spread out like a fan, some going eastward to Siberia, others turning westward over Europe.

The Rose-coloured Pastor and some other birds winter in India and spread westward in summer, so that eastward and westward bound species will sometimes meet in the spring and autumn as they fly in opposite directions, and a stray bird becoming confused may join the wrong train of migrants. Hence an eastern species, like the Nightingale already referred to, has been met with far away from its usual summer quarters.

The Arctic regions are favourable summer resorts for birds from the abundance of mosquito larvæ for them to feed upon, and the absence of such enemies as snakes and monkeys. It seems likely that bird-life may have originated at one of the poles. The presence of Penguins in the southern hemisphere, which have such limited powers of locomotion, suggests the South Pole as the original scene of bird-life, in the days when damp warmth prevailed. A relic of habits acquired in the Polar regions may be traced in Ducks and other species which are night feeders.

Elaborate speculations on the dispersal and subsequent return and further dispersal of species, as the Arctic Regions have varied in temperature, were made by the late Mr. Henry Seebohm.

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MEETING, held at Reigate, 9th of December, 1898.

Mr. F. Curtis lectured on

A VOYAGE IN POLAR SEAS.

The lecture was illustrated by a splendid series of lantern-slides.

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## APPENDIX.

## SONGS OF BIRDS.

Paper by Mr. J. B. CROSFIELD read on the Excursion to Dry Hill, 7th May, 1898.

As the conductor is expected to provide a short paper or address intended in some measure to illustrate some of the objects of investigation of the excursion, I have thought that a few remarks on the songs of the birds likely to be heard in the course of our walk may have some interest, and so far as I am aware it is a subject that has not been touched upon on any previous occasion. I select it because the month of May is the one in which the variety and volume of song to be heard reach their maximum; the migrants have now practically all arrived, and except the Missel Thrush no species has as yet diminished the flow of song. I am afraid, however, that we are already too late for this one species. I have often heard people express a wish that they knew what the different birds are that they hear singing, and a regret at being unable to distinguish them. To learn this is, I imagine, mainly a question of a little patient and close observation. Although the songs of some few species resemble one another somewhat, yet it will be found that each has its own characteristics, and a song, when once identified and known, will not readily be forgotten. The differences are rather such as exist between different musical instruments than between different tunes. I will give first a list of the birds whose songs we may expect to hear in the course of our walk, arranged roughly in their order of merit as songsters; though of course this is a point on which there is room for difference of opinion. I divide them into three classes, the third class including those birds whose song consists merely of the same series of notes again and again repeated, almost or quite without variation. Such a song seems of a lower type of development than those in the other two classes, which have attained to a greater or less degree of variety in the arrangement of their notes or phrases.

<i>1st class.</i>	<i>2nd class.</i>	<i>3rd class.</i>
Nightingale.	Linnet.	Willow-Wren.
Blackcap.	Tree-Pipit.	Chaffinch.
Blackbird.	Swallow.	Wood-Wren.
Skylark.	Whitethroat.	Yellowhammer.
Garden-Warbler.	Robin.	Lesser Whitethroat.
Thrush.	Wren.	Chiffchaff.
	Sedge-Warbler.	Great Tit.
	Hedge-Sparrow.	
	Greenfinch.	

I need hardly say that to judge fairly as to a bird's song, as well as to learn to know it, one ought to hear it at tolerably close quarters, and to listen to it for some little time, so as to hear all the varieties of note; and with a few of the species, notably the Nightingale, these are not quickly exhausted; even after listening for a long time, one is perhaps surprised to hear some new note, not previously sung. The songs of the Thrush, Blackbird, and Skylark are probably the best known to most people, and some will prefer one, some another. The Skylark has not so much variety as the others, but its song is certainly extremely sweet, and its continuity gives it an advantage over them; while the Thrush has great variety and many rich, clear, and strong notes, it has also some distinctly harsh, which tend to lower the general average of its song; the Blackbird has probably the richest notes of the three, with more of finish and real quality about them. The Blackcap is a species not nearly so well and generally known as it deserves to be; when well settled into song its melody is delightful; many of the notes are extremely clear and sweet, and the whole song is very rapidly uttered, often with great variety of note; the rapidity and sudden changes give a certain wildness to it, which has a great charm. The Garden-Warbler has a song very similar, but rather less varied and without any of the loud clear notes of the Blackcap; it is, however, extremely sweet and mellow, and perhaps the quality is even superior. As regards the 2nd class, the song of the Linnet, which heads the list, is very

decidedly inferior to that of any of the species included in the 1st class ; it is pretty well known, as the bird is often kept in cages. The Tree-Pipit has a pleasing and rather varied song ; some of the notes are decidedly sweet and approach to those of the Canary. The Swallow's soft twittering song is generally well known, and affords delight to most people, though it can hardly be called very musical. The Whitethroat's song bears a family resemblance to that of the Blackcap, to which species the bird is very nearly related ; some notes are very similar, but there are many harsh or rather poor notes, and the song is uttered in a rather jerky or spasmodic manner. The Robin's song is of course very well known, rather plaintive, and somewhat feeble ; it is, however, distinctly sweet, and if more connected and continuous would rank higher. The Wren has a strong, cheerful song very rapidly uttered, but without much variety. The Sedge-Warbler, on the other hand, has plenty of variety, but many harsh babbling and grating notes. This species often sings in the night. The Hedge-Sparrow's song, though rather sweet, has no variety ; it is sung very rapidly ; at a little distance, when only the more pronounced notes are heard, they sound much like the loud chirp of the Cole-Tit. The Greenfinch has a good deal of variety of voice and has several different series of trilling notes, but does not often use more than one or two of these sets connectedly ; when it employs several of the series they form what may be called a song ; they are, however, not very musical ; if they possessed a little more quality the bird would make a fine songster. In class 3 the Willow-Wren's song, from its softness of tone, is one that it is always delightful to listen to ; it consists merely of a series of about ten notes in a descending scale. The Chaffinch's song must be well known to almost every one, and is incessantly uttered. It may have been this species that Tennyson had in his mind when he wrote :

“ Then as a little helpless innocent bird,  
That has but one plain passage of few notes,  
Will sing the simple passage o'er and o'er  
For all an April morning, till the ear  
Wearies to hear it.”

The Wood-Wren's song is much less soft and pleasing than the Willow-Wren's, and the notes run in an ascending scale. The Yellowhammer's notes perhaps hardly deserve the name of song, and the same applies to the loud cheerful double or treble chirp of the Chiffchaff. The Lesser Whitethroat's somewhat tinkling trill can also scarcely be called a song, though it occasionally introduces a few other notes that remind you of its relative the Whitethroat, and that perhaps hold out hopes of something better. Should we be fortunate enough to hear today all the species whose songs I have briefly described, I need hardly say that the notes themselves will at once speak far better than any description can do.

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METEOROLOGY, OXFORD ROAD, REDHILL, for the year 1897.

Lat.  $51^{\circ} 14'$ , long.  $11' W$ . Elevation above Sea Level,  
300 feet by Ordnance Survey.

**JANUARY.**

*Barometer.*—Maximum,  $30\cdot55$  inches on 2nd; minimum,  $29\cdot38$  inches on 30th; average,  $29\cdot91$  inches; mean,  $29\cdot965$  inches.

A rapid fall occurred from  $29\cdot98$  inches on the morning of the 21st to  $29\cdot41$  inches on the morning of the 22nd, but it was not accompanied by any greatly marked disturbance in the weather.

*Thermometer.*—Maximum,  $47^{\circ}\cdot5$  on 7th and 10th; minimum,  $22^{\circ}$  on 23rd; average,  $35^{\circ}\cdot19$ , being one degree lower than the general average for the month.

The temperature fell to freezing-point and under on 18 nights; and on one day did not rise above the freezing-point, the maximum being  $31^{\circ}$  only, on the 23rd.

*Rain or Snow* fell on 22 days to the amount of  $2\cdot26$  inches. Snow or sleet fell on 11 days out of the 22, but to no great depth. The fall of rain for the month is slightly under the average for January.

Average rainfall for the month of January,  $2\cdot83$  inches.

Average temperature,  $36^{\circ}\cdot11$ .

## FEBRUARY.

*Barometer*.—Maximum, 30·64 inches on 16th; minimum, 29·23 inches on 2nd; average, 30·15 inches.

Reached 30 inches and upwards on 21 days, being continuous from the 8th to the end of the month.

*Thermometer*.—Maximum, 55° on the 26th; minimum, 27° on the 16th; average, 42°·85.

On four nights fell to 32° and under.

Average temperature for the month of February for 17 years, 1880 to 1896, 37°·51. Consequently February, 1897, has been unusually warm; more than 5 degrees above the average.

*Rain* fell on 13 days to the amount of 2·84 inches, chiefly during the first half of the month. The average fall for the month of February is 2·04 inches. The only heavy falls were ·52 of an inch on the 2nd, and ·47 of an inch on the 5th.

Many pleasant genial days occurred during the last half of the month. The fruit trees showed a good amount of blossom; the warm month had advanced them early, and they had to contend with cold winds in March and April.

## MARCH.

*Barometer*.—Maximum, 30·14 inches on the 8th and 20th; minimum, 28·90 inches on 3rd; average, 29·78 inches; range, 1·24 inches.

Reached 30 inches on 9 days. Fell below but reached 29 inches on 21 days. Fell below 29 inches on 1 day. The average of the month was very low.

*Thermometer*.—Maximum, 60°·5 on the 23rd; minimum, 27° on 8th and 29th; average, 43°·80, being 3°·31 above the average of the last 17 years; range, 33°·5.

On nine nights temperature fell to 32° and under. From the 17th to the 27th the nights were warm.

*Rain* fell on 22 days to the depth of 4·65 inches. This is a very unusual amount for the month of March. The average fall for this month over a period of 30 years being only 1·99 inches, the excess in the month is 2·66 inches.

Heavy falls of rain—·63 of an inch on 1st; ·78 of an inch on 2nd; ·50 of an inch on 17th.

Although the month of March failed to retain its character for dryness, it maintained its character for being boisterous and for rapid changes of storm and sunshine.

*Snow.*—Very little fell. On the 6th, snow and rain combined measured  $\cdot 16$  of an inch.

A very sharp but short shower of hail and rain occurred about 7.30 P.M. on the 28th.

#### APRIL.

*Barometer.*—Maximum, 30.25 inches on 16th; minimum, 29.04 inches on the 1st; average, 29.89 inches.

At the beginning of the month the barometer was unsteady, but as the month advanced the variations were less marked. The extreme range was 1.21 inches.

*Thermometer.*—Maximum, 67°·5 on the 27th; minimum, 26° on 10th; average, 45°·58; on four nights temperature fell to 32° and under.

Average temperature of April, 1880 to 1896 (17 years), 46°·10. The past month has been a little cooler than the average. Nevertheless there were some warm days towards the close of the month.

*Rain* fell on 16 days to the extent of 1.71 inches, the average fall for April at Redhill being 1.90 inches, slightly above the fall of last month. No heavy fall occurred; the maximum being  $\cdot 31$  of an inch on the 15th. Total fall of rain from 1st of January 11.46 inches on 73 days. This is considerably more than the average for the four months, such average being 8.78 inches. Last March was the cause of the increase, that month yielding 4.65 inches of rain in place of an average of 1.99 inches.

#### MAY.

*Barometer.*—Maximum, 30.44 inches on 15th; minimum, 29.46 inches on 28th; average, 30.07 inches; the range,  $\cdot 98$  of an inch, showing no great fluctuations. On 18 days it reached 30 inches and upwards; on 13 days it fell below 30 inches.

*Thermometer.*—Maximum, 73° on 18th; minimum, 31° on night of the 12th; average, 52°·16.

On 12th and 13th it fell to the freezing-point. The minimum of the day temperature was 49°. For the most part the day temperature of the month was without great fluctuations; 70° was reached or exceeded on 3 days,

*Rain* fell on 12 days to the depth of 1·45 inches, the average of this district for month of May being 1·81 inches. The month on the whole was drier than the average, the bulk of the fall occurring from the 28th to 31st, the fall in that period being ·98 of an inch. The difference between the average temperature of the day and the average temperature of the night was 17·34 degrees.

Lightning was seen and thunder heard in the early morning of the 17th, again between 7 and 8 P.M. on the 30th, and in the early morning of 1st June. The thunder-shower of the 30th was very heavy, the rain falling in torrents for about 20 minutes and yielding ·45 of an inch.

#### JUNE.

*Barometer.*—Maximum, 30·39 inches on 12th; minimum, 29·65 inches on 18th; average, 30·09 inches.

Considerable fluctuation occurred on several days; from the 8th to the 9th it fell ·36 of an inch, and rose from the 9th to the 11th ·64 of an inch; from the 15th to the 16th it fell ·40 of an inch. Thunderstorms, unless accompanied by strong wind, do not affect the barometer greatly. On 23 days the barometer rose to 30 inches and upwards; on 7 days it fell to below 30 inches.

*Thermometer.*—Maximum, 84° on 24th; minimum, 44° on 9th, 16th, and 18th; average, 60°·81.

Reached over 80° on one day only. On 15 days it reached 70° and upwards. The average temperature for June, as recorded at this place, is 58°·95. This month consequently has been somewhat warmer than the average.

*Rain.*—The total fall in the month was 2·36 inches on 11 days. The average fall for June is 2·14 inches. The excess

in the month has arisen from a heavy fall,  $\cdot 67$  of an inch during a thunderstorm on the 6th.

Some rain with a very sharp but short fall of hail about 10.15 A.M. on the 27th. Thunderstorm between 1.50 P.M. and 3 P.M. on the 6th, but not heavy. Much distant thunder from 3 to 4.30 P.M. on the 24th, but no rain.

### JULY.

*Barometer.*—Maximum, 30.44 inches on 11th; minimum, 29.70 inches on 20th; average, 30.10 inches.

Attained 30 inches and over on 24 days. No great fluctuations at any time in the month.

*Thermometer.*—Maximum,  $80^{\circ}$  on 17th; minimum,  $42^{\circ}\cdot 5$  on 7th; average,  $63^{\circ}\cdot 12$

Attained  $70^{\circ}$  and upwards on 22 days.

The night temperature has varied but little. For 28 nights it did not fall below  $50^{\circ}$ . The average temperature of the month has been  $1^{\circ}\cdot 74$  in excess of the average for 17 years—1880 to 1896.

*Rain* fell to the extent of 1.10 inches on 4 days. This is below the average fall for July by 1.71 inches. There were 13 consecutive days without rain—from 6th to 18th;  $\cdot 52$  of an inch fell on the 19th, and  $\cdot 41$  of an inch on the 21st, in each case during thunderstorms. The total fall from 1st January is 16.37 inches, being rather more than an inch above the average of several years. The excess arises from the unusually heavy fall of 4.65 inches in March.

*Thunder.*—Two thunderstorms occurred in the month, on the 19th and 21st, not violent at Redhill, but in places not far distant very severe.

### AUGUST.

*Barometer.*—Maximum, 30.27 inches on 3rd; minimum, 29.65 inches on 21st; average, 29.23 inches.

Reached 30 inches and upwards on 12 days. The range was not great, only  $\cdot 62$  of an inch, but the general feature was a low barometer.

*Thermometer.*—Maximum,  $83^{\circ}5$  on 5th; minimum,  $46^{\circ}$  on the 12th, 25th, and 31st; average,  $61^{\circ}83$ . This average is about  $1^{\circ}50$  higher than the average at Redhill for the month of August.

On the 4th of the month the maximum reached  $82^{\circ}5$ . This day and the 5th were the only days the temperature reached  $80^{\circ}$  and upwards. On 13 days it reached  $70^{\circ}$ , and on 16 days  $60^{\circ}$  and upwards. The night temperature varied from  $46^{\circ}$  to  $61^{\circ}$ . The day temperature from  $64^{\circ}5$  to  $83^{\circ}5$ .

*Rain* fell on 18 days to the amount of 3.36 inches. This was above the average by three-quarters of an inch. The heaviest falls were,—on the 8th, .59 of an inch, 25th, .46, and 30th, .42 of an inch. The total fall since the beginning of the year is 19.73 inches on 118 days, in excess of the average by about 1.25 inches. Rained on 8 consecutive days from 24th to 31st.

Thunder was heard in showery weather on the 8th, accompanied with heavy rain. A thunderstorm with vivid lightning occurred in the early morning of the 19th. Thunder was also heard in the afternoon of the 31st.

#### SEPTEMBER.

*Barometer.*—Maximum, 30.53 inches on the 13th; minimum, 29.60 inches on the 2nd; average, 30.06 inches.

Reached 30 inches and upwards on 18 days. No violent fluctuations occurred in the month. The greatest difference between any two days was from 30.20 inches on the 16th to 29.87 inches on the 17th.

*Thermometer.*—Maximum,  $69^{\circ}9$  on the 2nd and 29th; minimum,  $39^{\circ}$  on the 18th; average,  $55^{\circ}18$ .

The average temperature of the month, as recorded at Redhill, is  $56^{\circ}26$ . Consequently the past month was below the average temperature by a little over one degree.

The day temperature varied but little, the maximum being  $69^{\circ}$  and the minimum  $54^{\circ}$ . The night temperature also was without much variation, the maximum being  $56^{\circ}$ , the minimum  $39^{\circ}$ .

*Rain* fell on 15 days to the extent of 2.67 inches. Three

heavy falls occurred—·41 of an inch on the 1st, ·46 on the 5th, and ·95 on the 29th. This last downfall was accompanied by a thunderstorm, lasting from about 7.30 to 10 o'clock P.M. Lightning was very vivid, but thunder was not loud. Average rainfall in September at this station is 2·86 inches. The fall in the last month has been close to the average. The amount of rain from the 1st January has been 22·40 inches on 133 days.

The average for the last 17 years for those 9 months has been 21·35 inches. Rain consequently has been about 1 inch in excess in 1897.

*Wind.*—A strong gale occurred on the night of the 1st and morning of the 2nd; in other respects the atmosphere has been little disturbed in September.

#### OCTOBER.

*Barometer.*—Maximum, 30·59 inches on the 21st; minimum, 29·60 inches on the 15th; average, 30·23 inches.

On 27 days 30 inches and upwards were recorded; on four days only less than 30 inches.

*Thermometer.*—Maximum, 63°·5 on the 19th; minimum, 32° on the nights of 6th and 7th; average, 49°·91.

Throughout the month the day temperature has varied but little, the maximum of the day having been 63°·5, as above stated: the minimum of the day temperature, 52°·2 on the 7th and 12th. Nor has the night temperature varied much; on 10 occasions only has the temperature fallen below 40°, and on 6 nights it did not fall below 50°. The average temperature of October, as recorded at Redhill during the last 17 years, is 47·20, consequently October 1897 has been warm above the average.

*Rain* fell on 7 days only to the small extent of ·53 of an inch. This is the least rainfall for October recorded at this station during 30 years. The next least is ·96 of an inch in October 1879. The record shows that October is on the average the wettest month in the year; the average for October being 3·55 inches. In 1880, 7·48 inches fell in October, and in 1891, 7·11 inches.

Wind has for the most part been from the North and North-east, occasionally blowing strongly. On two or three occasions it veered somewhat to the South-east and South, producing warm and genial weather.

#### NOVEMBER.

*Barometer.*—Maximum, 30·74 inches on the 21st; minimum, 29·40 inches on the 29th; average, 30·23 inches.

During the first half of the month the barometer varied but little, the extreme range for that period was ·67 of an inch. Towards the close of the month there was considerable oscillation resulting from the stormy weather on the 28th and 29th of the month. On the whole the barometer stood high, being 30 inches and upwards on 25 days, and on 5 days only, 29 inches and upwards.

*Thermometer.*—Maximum, 58°·5 on the 18th and 20th; minimum, 27° on the night of the 25th; average, 44°·82; two degrees above the average for November generally. The average of the day temperature was 50°·63, of the night temperature 39°·02. At an elevation of 4 feet from the ground the temperature fell to freezing-point on 3 days only.

*Rain* fell to the depth of 1·20 inches on 12 days; the average fall for the month of November being 3·18 inches. This month, like the preceding month of October, was unusually dry. Only one heavy fall occurred, on the 27th, when ·51 of an inch was measured. The total fall from the beginning of the year is 24·21 inches, nearly 4 inches below the average fall for that period.

*Wind.*—A very heavy and destructive gale from N.W. occurred on the 28th and 29th. Much fog prevailed from the 19th to the 22nd, chiefly in the night, and in the morning until mid-day.

#### DECEMBER.

*Barometer.*—Maximum, 30·63 inches on the 22nd; minimum, 29·32 inches on the 30th; average, 30 inches.

Some rapid falls occurred, viz.: from 30·17 inches on the 7th to 29·44 inches on the 9th; from 30 inches on the 28th to

29·32 inches on the 30th. During the fog which prevailed from the 18th to the 20th, the barometer remained steady at 30·36 inches.

*Thermometer.*—Maximum, 52°·5 on the 7th, 17th, and 29th; minimum, 20° on the 3rd; average, 40°·11; range, 32°·5.

On 12 nights the temperature fell to 32° and under, and on one day, the 20th, it did not rise above 32°, the freezing-point. The average temperature for December, for 18 years from 1880 to 1897, is 37°·89. The month has consequently been warmer than the average.

*Rain* fell on 17 days to the depth of 3·83 inches. The average fall in December over a period of 31 years (1867 to 1897) is 2·91 inches. The fall this month has been nearly an inch in excess of the average. Two heavy falls occurred. One on the 7th to the extent of ·90 of an inch, and another on the 29th to ·75 of an inch. Practically the fall continued to the 30th, resulting in a continuous fall of ·87 of an inch. It was accompanied by a heavy gale during the whole of the period.

*Lightning, Thunder, and Hail.*—A storm occurred between 3 and 4 o'clock on the morning of the 15th inst., with several very bright flashes of lightning followed by heavy peals of thunder, and accompanied by strong wind. A sharp shower of hail fell. From the unusual noise made by the hail on the windows and slates the hailstones must have been large and heavy.

With regard to a record of the rainfall for the year, the fall has been 2·52 inches below the average of 31 years; the average being 30·56 inches, the actual fall in 1897 being only 28·04 inches. The deficiency took place chiefly in July, the fall being 1·10 inches in place of 2·81 inches, and in October, the fall being only ·53 of an inch in place of 3·45 inches, and in November, the fall being only 1·28 inches in place of 3·12 inches; this leaves a deficiency of 6·47 inches in those three months. But the rainfall in March was unusually heavy, being 4·65 inches in place of 2·08 inches; and in December the rainfall was also in excess, being 3·83 inches in place of 2·91 inches. The result is, a deficiency in the year of 2·52 inches.

METEOROLOGY.—OXFORD ROAD, REDHILL (1897).

Month.	BAROMETRER.				THERMOMETER.					RAIN.	
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.	Total fall. INCHES	No. of days.
January . . . . .	30.55	2	29.38	30	47.5	7, 10	22.0	23	35.19	2.26	22
February . . . . .	30.64	16	29.23	2	55.0	26	27.0	16	42.85	2.84	13
March . . . . .	30.14	8, 20	28.90	3	60.5	23	27.0	8, 29	43.80	4.65	22
April . . . . .	30.25	16	29.04	1	67.5	27	26.0	10	45.58	1.71	16
May . . . . .	30.44	15	29.46	28	73.0	18	31.0	12	52.16	1.45	12
June . . . . .	30.39	12	29.65	18	84.0	24	44.0	16, 18	60.81	2.36	11
July . . . . .	30.44	11	29.70	20	80.0	17	42.5	7	63.12	1.10	4
August . . . . .	30.27	3	29.65	21	83.5	5	46.0	12, 25, 31	61.83	3.36	18
September . . . . .	30.53	13	29.60	2	69.0	2, 29	39.0	18	55.18	2.67	15
October . . . . .	30.59	21	29.60	15	63.5	19	32.0	6, 7	49.91	.53	7
November . . . . .	30.74	21	29.40	29	58.50	18, 20	27.0	25	44.82	1.28	12
December . . . . .	30.63	22	29.32	30	52.5	7, 17, 29	20.0	3	40.11	3.83	17
Year . . . . .	30.74		28.90		84.0		20.0			23.04	169

The fall in October last is the least amount recorded for October in 31 years. That month is usually the wettest in the year.

Observations were taken at 8 A.M.

The Thermometers have a northern aspect near the wall of the house, but not touching the wall, and they are sheltered from the early morning sun and late evening sun of summer. They are hung four feet above the ground.

WILLIAM HENRY TYNDALL,

February, 1898.

F.R.Met.S.

PLANT RECORDS IN SURREY, 1898.

- Bunias orientalis*, L. Alien. Field at top of Reigate Hill, near Margery Wood. (*Fide* A. Bennett & S. T. Dunn.) C. E. Salmon.
- Alyssum incanum*, L. Field near Bowlhead Green, Thursley. E. S. Marshall & C. E. S.
- Hypericum perforatum*, L., var. *angustifolium*, Gaud. By quarry near Brook. E. S. M. & C. E. S.
- Rubus plicatus*, W. & N. Reigate Heath. (*Fide* W. M. Rogers.) C. E. S.
- R. hystrix*, W. & N.: form. Reigate Heath. (*Fide* W. M. Rogers.) C. E. S.
- Pyrus Malus*, L., var. *mitis*, Wallr. Shaw, top of Reigate Hill. C. E. S.
- Artemisia vulgaris*, L., var. *coarctata*, Forcell. Field near Bowlhead Green, Thursley. (*Fide* A. Bennett.) E. S. M. & C. E. S.
- Anchusa sempervirens*, L. Still at the foot of Colley Hill, Reigate. C. E. S.
- Datura Stramonium*, L. Field near Half Moon Inn, Witley Common, with one plant of *Amaranthus retroflexus*, L. E. S. M. & C. E. S.

- Mentha piperita*, L., var. *officinalis* (Hull). Stream, Wotton, 1890. (*Fide* W. R. Linton.) A. J. Crosfield.
- M. sativa*, L., var. *subglabra*, Baker. Banks of Mole at Brockham, 1886. (*Fide* W. R. Linton.) A. J. C.
- M. arvensis*, L., var. *agrestis* (Sole). Reigate, 1886. (*Fide* W. R. Linton.) A. J. C.
- M. gentilis*, L. Dawes Green, 1897. (*Fide* W. R. Linton.) C. E. S.
- Convallaria majalis*, L. Still plentiful in locality in Brewer's 'Flora,' near Kingswood Church. C. E. S.
- Juncus diffusus*, Hoppe. Near Hammer Pond, Witley Common. E. S. Marshall.
- Potamogeton obtusifolius*, M. & K. Pond on Witley Common, near Half Moon Inn. E. S. Marshall & C. E. S.
- Nitella opaca*, Ag. Pond at Mogador, Walton Heath. (*Fide* H. & J. Groves.) C. E. S.
- 

REPORT OF DELEGATES sent to the Third Annual Congress of the SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES, held at Croydon in June, 1898. By Miss ETHEL SARGANT.

THE Conference was held at the Town Hall, Croydon, where the President's Address was delivered at 8 P.M. on Thursday, June 2nd. On Friday, June 3rd, there were two General Meetings for the reading and discussion of papers on Natural History and kindred subjects. On Saturday morning there was a Delegates' Meeting for the transaction of business, followed by a General Meeting, at which all the papers treated of the formation and maintenance of local Natural History Societies. The discussions which followed these papers were animated and suggestive; it is to be regretted that they had to be cut short for want of time.

A very full Report of the Proceedings at the Conference has been published, and a copy sent to our Society. It is unnecessary to repeat what you will find there at full length,

but I may perhaps be allowed to comment on the proceedings from the point of view of our Society.

The papers read on Friday were for the most part models of what such papers should be. They were clear, short, and well illustrated. Two of them were on subjects which lie outside the scope of our Society, namely, that read by Mr. Dawson, of Uckfield, on "Ancient and Modern Dene-Holes and their Makers," and that most interesting and suggestive paper by Mr. Lovett, of Croydon, on "The Folk-Lore of Amulets and Charms." The most lively discussions which took place on Friday arose from these papers, which certainly aroused more general interest than the others. I cannot help thinking that we should draw many members into this Club if we included the subjects of Anthropology and Archæology. There is a large field for work in recording the ancient customs and local forms of speech which vanish so quickly. Anyone interested in the work can do it after a very short training, provided that he works under an expert who will test, classify, and record results. The subject is therefore peculiarly suited to a local Society, where we may hope to find two or three members to specialise in the branch, and to act as advisers and referees to those who from time to time communicate observations. The results thus obtained are of double value, for they can be forwarded at once to the Ethnographical Survey of the United Kingdom, a Report of which I have received from the British Association to lay before you, and on the other hand they provide material for papers and discussions at our own meetings which are of general interest and can be appreciated by all the members. Many scientific subjects are interesting only to specialists.

The papers and discussions on Saturday morning were full of value. Our Club has anticipated the recommendation of Dr. Hobson (p. 88 of Report) to form small sub-committees on the different subjects included in our Proceedings, but each sub-committee will find many practical hints in his paper. I was particularly interested in his advice that the Club should keep a register of all plants, animals, fossils, and the like found in

the neighbourhood, and that it should be the business of each sub-committee to keep the register of its subject posted up to date. This would render the collective knowledge of the Club available, and might lead to some of our members specialising on the less-known groups. Some very useful, if humble work might be done in supplying scientific men working in London with material for their research. It would be of great assistance to many if they could find out at once, by applying to the Secretaries of Local Societies, where to look for the plants or fossils of which they were in search, and the Secretary might, by giving his information with discretion, save rare species from extinction.

If we could establish friendly relations with some of the scientific men in London, they might perhaps respond to Mr. Pankhurst's appeal (p. 92 in the Report) and suggest subjects for our investigation. On the one hand, they have training, laboratories, and books, but, on the other, we have all the life of the fields and hedgerows at our gate, and there seems no reason why both parties might not benefit from an exchange of good offices.

In conclusion, I wish to say that the thanks of our Club are due to the Mayor and Corporation of Croydon for their very hospitable reception of our Delegates.

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# RULES.

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## NAME.

I.—The Association shall be styled "THE HOLMESDALE NATURAL HISTORY CLUB."

## OBJECTS.

II.—The investigation of the Natural History of Reigate and its vicinity, and the mutual improvement of the members in the study of Nature.

## CONSTITUTION.

III.—The Club shall consist of Members, Subscribers, Corresponding Members, and Honorary Members.

## MEMBERS.

IV.—Members shall be elected by ballot or show of hands at any Ordinary Meeting. The candidate to be recommended by one or more Members at any Ordinary Meeting, and the election to take place at the Meeting next ensuing.

## SUBSCRIBERS.

V.—Subscribers shall be elected in the same manner as Members, and shall have all the privileges of Members except of having any right or ownership in the property of the Club.

## CORRESPONDING MEMBERS.

VI.—It shall be competent for the Club to elect as Corresponding Members any gentlemen distinguished for their attainments in Natural History, either as collectors or authors, or to whom the Club may be indebted for contributions of papers or specimens; such Corresponding Members to have similar privileges to Subscribers without payment, and to be elected by the Club upon the nomination of the Committee.

## HONORARY MEMBERS.

VII.—Honorary Members shall be elected by the Club upon the nomination of the Committee; and shall be exempted from the payment of subscriptions, and shall have the privileges of Subscribers.

## OFFICERS.

VIII.—The Club shall, at the Annual General Meeting, elect from among themselves a President, Treasurer, Secretary, Curator, and nine Members to form a Committee of Management, three of whom to form a quorum.

## VICE-PRESIDENTS.

IX.—The President shall nominate annually two Vice-Presidents from the members of the Committee.

## ANNUAL GENERAL MEETING.

X.—This shall be held previous to the Evening Meeting on the fourth Friday in October, when the Committee shall present a Report detailing the general state, proceedings, and pecuniary condition of the Club, and proceed to the election of Officers.

## SPECIAL MEETINGS.

XI.—The Committee shall have the power to call a Special General Meeting at any time; and they shall do so within four weeks after receiving requisition to that effect, signed by at least five Members. The notice calling the Meeting shall state the objects for which the Meeting is called, and no other business shall be transacted.

## ORDINARY MEETINGS.

XII.—These shall be held on the fourth Friday in every month, from October to April, inclusive, or more frequently at the option of the Committee.

## SUBSCRIPTIONS.

XIII.—Each Member shall pay to the Treasurer Ten Shillings on his election, and the same sum at the Annual General Meeting each year; but may compound for such Annual Subscription by payment of Five Pounds. Each Subscriber shall pay to the Treasurer Five Shillings on his election, and the same sum at the Annual General Meeting each year. That it shall be optional with the Committee to strike out the name of any Member or Subscriber who shall be in arrear with his Subscription for twelve months or more.

## NEW RULES.

XIV.—Any five Members, wishing to propose a New Rule, or the omission or alteration of any existing Rule, must send notice to the Secretary, who shall within a month call a Special General Meeting to consider the change proposed.

## LIBRARY AND COLLECTIONS.

XV.—The Club shall form, as opportunity may offer, a Library of Reference, consisting of works bearing on the subject of Natural History; and obtain collections of the natural objects of the neighbourhood. The Library, Collections, and Funds to be the property of the Members for the time being, and shall be vested in Trustees for the use of the Members. Contributions of Life Members shall also be invested in the names of such Trustees in such manner as the Committee may direct, the interest arising therefrom to be handed to the Treasurer for the general purposes of the Club.

## ELECTION OF TRUSTEES.

XVI.—The Trustees shall consist of the President for the time being, and three other Members to be elected by the Club.

## LIST OF MEMBERS AND SUBSCRIBERS.

*Names marked \* are Honorary Members.*

- ADENEY, Miss ; Cranford, Reigate.  
ASHBY, J. STERRY ; Brendon, Redhill.  
ASHBY, J. WILLIAM ; Wyresdale, Redhill.  
BAKER, Rev. E. J. ; Nutley Lane, Reigate.  
BAXTER, Miss E. S. ; Englewood, Reigate.  
BEEBY, W. H. ; Hildasey, Thames Ditton.  
\*BENNETT, ARTHUR, F.L.S. ; 143 High Street, Croydon.  
BONNOR, Miss F. ; Linkfield Lane, Redhill.  
BOSSEY, FRANCIS, M.D. ; Mayfield, Redhill.  
BRASS, Rev. HENRY, M.A. ; Redhill.  
\*BROWN, N. E. ; Herbarium, Kew.  
BULLEN, Rev. R. ASHINGTON, B.A., F.L.S. ; Little Stukeley, Hunts.  
BUNDOCK, T., B.A. ; Elmside, Redhill.  
CAMPION, Miss ANNIE ; Mayfield, Redhill.  
CHAPMAN, T. A. ; Betula, Reigate.  
COCHRANE, W., B.A. ; Upland Villa, Redhill.  
CONOLLY, W. ; Buckhurst, Redhill.  
COOPER, THOMAS ; Brighton Road, Redhill.  
CROSFIELD, JAMES B. ; Undercroft, Reigate.  
CROSFIELD, Miss ; do.  
CROSFIELD, ALBERT J. ; Carr End, Reigate.  
CROSFIELD, Mrs. A. J. ; do.  
CUDWORTH, JAMES I. ; Woodcote, Reigate.  
CUDWORTH, Mrs. J. I. ; do.  
DRUCE, FRANCIS ; Merstham, Redhill.  
DUNCAN, FRANCIS M. ; Lincoln Villa, Redhill.  
DUNNING, A. H. ; Tynedale, Reigate.  
DUNNING, Mrs. ; do.  
\*EVELYN, W. J. ; Wotton House, Dorking.  
GIBBS, GEORGE F. ; Uplands, Chart Road, Reigate.  
GILFORD, WILLIAM ; Beech Grove, Redhill.  
GOUGH, ALFRED B. ; Sandcroft, Redhill.  
GOUGH, BERNARD B. ; do.  
GOWER, EDMUND ; Rawcliff House, Preston, Brighton.  
GURNEY, HENRY ; Nutwood, Reigate.  
HARDING, Miss LILLY ; Mount Sandford, Reigate.  
HEINTZ, ARTHUR F. ; St. Agnes, Fengates Road, Redhill.  
HEINTZ, Mrs. ; do. do.  
HOOPER, T. R. ; Redhill.  
HORNE, Miss ; Warwick Road, Redhill.

- HUGHES, FREDERICK ; Fairleigh, Reigate.  
 JOHNSTON, WALTER ; Oak Bank, Bridge Road, Redhill.  
 JOHNSTON, Miss ANNIE J. ; do.  
 JOHNSTON, Miss ALICE ; do.  
 KLEIN, SIDNEY T., F.L.S. ; Hatherlow, Reigate.  
 LEES, JOHN, J.P. ; Reigate.  
 LEMON, F. E. ; Hillcrest, Redhill.  
 LINNELL, JOHN ; Redstone Wood, Redhill.  
 LUBBOCK, Sir JOHN, Bt., M.P. ; 15 Lombard Street, London, E.C.  
 LURY, SAMUEL H. ; Meadvale, Redhill.  
 MARRIAGE, Miss B. J. ; Wilton Cottage, Yorke Road, Reigate.  
 MARTIN, Miss ; Lynton, Bridge Road, Redhill.  
 MARTIN, Rev. G. CURRIE, M.A. ; Clifton, Reigate.  
 MARTIN, HOWARD ; Chudleigh, Reigate.  
 MARTIN, Miss MARGARET ; do.  
 MARTIN, SAMUEL ; do.  
 MORRISON, Miss MABEL ; The Oaks, Reigate.  
 MOTT, FRANK ; Shaw's Corner, Redhill.  
 PACE, P. C. ; Gatton Point, Redhill.  
 PAWLE, FREDERICK C., J.P. ; Northcote, Reigate.  
 PHILLIPS, T. BACON ; Woodlands Road, Redhill.  
 POULTER, DANIEL P. ; Gloucester Road, Redhill.  
 POWELL, Mrs. ; Ivanhoe, Reigate.  
 POWELL, LESLIE ; do.  
 POWELL, KENNETH ; do.  
 PRIDEAUX, R. M. ; 105 Reigate Hill, Reigate.  
 ROBERTS, Miss M. ; 27 Pearfield Rd., Perry Vale, Forest Hill, S.E.  
 ROGERS, F. J. ; 71 Eastcheap, London, E.C.  
 SALMON, SAMUEL ; Clevelands, Reigate.  
 SALMON, Mrs. ; do.  
 SALMON, Miss I. E. ; do.  
 SALMON, ERNEST S. ; do.  
 SALMON, CHARLES E. ; do.  
 SARGANT, Miss ETHEL ; Quarry Hill, Reigate.  
 SHAPLAND, EDGAR ; Winslade, Bridge Road, Redhill.  
 SHARP, J. B. ; Hill Brow, Reigate.  
 SPRULES, G. H. ; Mansfield, Reigate.  
 SUTTON, Miss ; Redhill Common, Redhill.  
 TAYLOR, GEORGE R. ; Margery, Reigate.  
 TAYLOR, WILL F. ; do.  
 TAYLOR, Miss M. C. ; do.  
 TROWER, ARTHUR ; Redhill.  
 TROWER, Miss ; Wiggie, Redhill.  
 TYNDALL, WILLIAM H. ; Morlands, Redhill.  
 WALTERS, JOHN, M.B., J.P. ; Church Street, Reigate.  
 \*WEBB, SYDNEY ; Maidstone House, Dover.  
 WEST, RICHARD E. ; Firth Dene, Reigate.  
 WHITTARD, Mrs. ; The Elms, Redhill.

14 SEP. 1901







PROCEEDINGS  
OF THE  
HOLMESDALE NATURAL HISTORY CLUB

FOR THE YEARS 1899, 1900 and 1901.

TOGETHER WITH  
RULES and LIST OF MEMBERS.



LONDON:

PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

1902.



REDHILL LAWN TENNIS AND CROQUET CLUB.

*Sir!*

PRESIDENT: J. COLMAN, ESQ., MA., D.L., J.P.  
HON. SECRETARY:  
C. E. SALMON,  
PILGRIMS WAY,  
REIGATE.

HON. TREASURER:  
J. POWELL,  
IVANHOE,  
REIGATE.

Feb. 11. 1908.

My dear Britten,

With pleasure I send enclosed: sorry  
have not one to spare of later years.

I should not think we are dead, we  
Liberarian, why, we are just trying to  
raise money to build a brand new Museum!

in the Country.

Full Details Later on.

I have seen the photo of the Sussex  
Debris Lucania — it must have been a

lovely spike.

I did not mean to suggest

that the photo would be useful as to identity of  
the plant, but I think very few botanists  
have seen such a thing —

However, I expect

it is an expensive job, representing photos.

PROCEEDINGS  
OF THE  
HOLMESDALE NATURAL HISTORY CLUB

FOR THE YEARS 1899, 1900 and 1901.

TOGETHER WITH  
RULES and LIST OF MEMBERS.



LONDON:

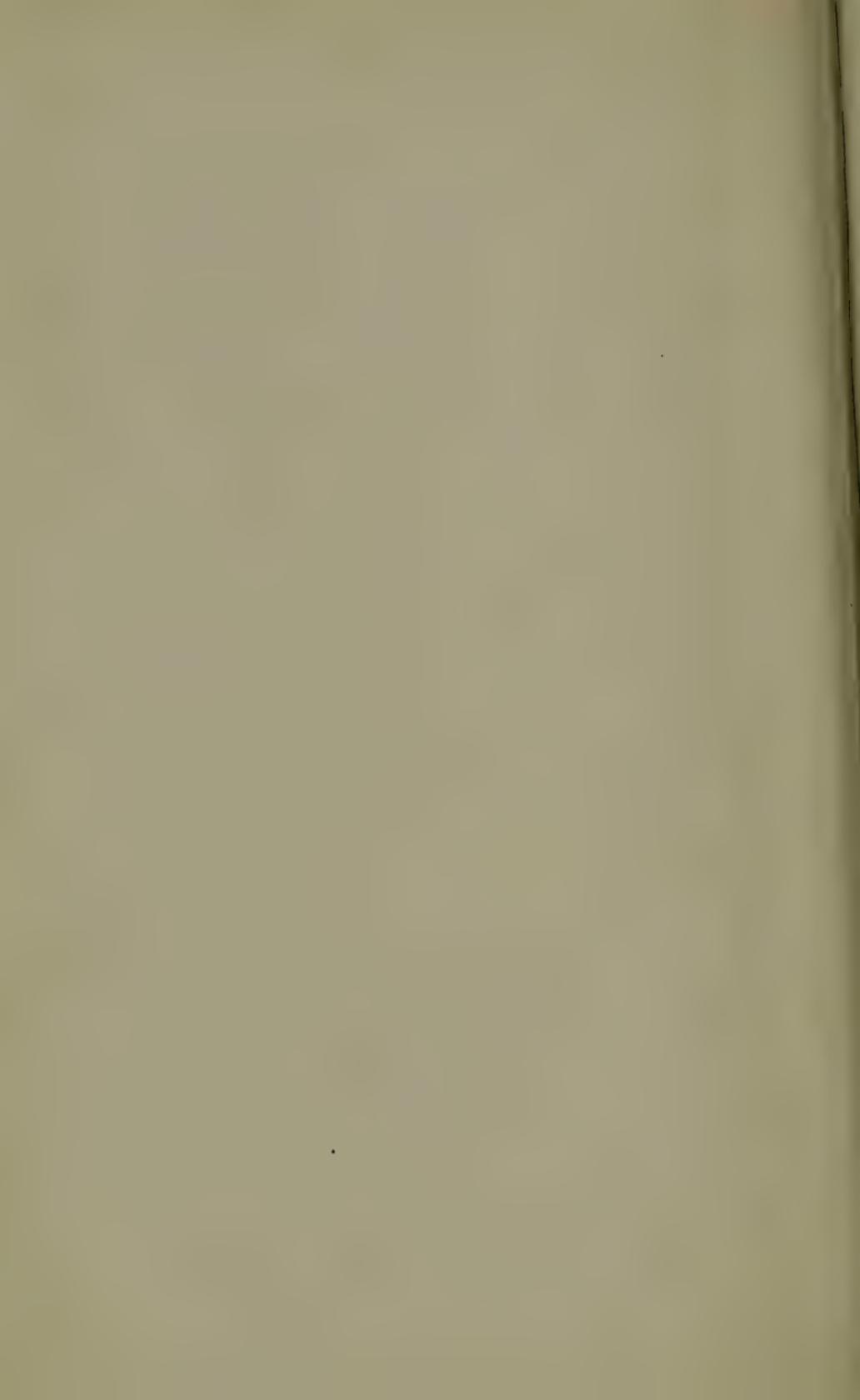
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1902.



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# PROCEEDINGS

OF THE

## HOLMESDALE NATURAL HISTORY CLUB.

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MEETING, held at Redhill, 27th of January, 1899.

Mr. I. H. Burkill, F.L.S., of Kew, gave an address on

CROSS AND SELF-FERTILISATION.

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MEETING, held at Reigate, 24th of February, 1899.

Mr. Richard Kearton, F.Z.S., lectured on

WILD LIFE AT HOME, HOW TO STUDY AND PHOTOGRAPH IT.

The lecture was illustrated by fine photographs taken from life by Mr. Cherry Kearton.

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MEETING, held at Redhill, 24th of March, 1899.

Mr. Arthur Trower exhibited two Mammoth teeth from the Pleistocene deposit at Frenches, Redhill.

The Rev. R. Ashington Bullen, F.L.S., F.G.S., gave an address on

A HOLOCENE DEPOSIT AT REIGATE.

My attention was called to a section somewhere near the old

Butts at Reigate by the remarks of the President of the Malacological Society, Lieut.-Colonel H. H. Godwin-Austen, F.R.S., 10th June, 1898. In alluding to my Dover specimens he said that it would be interesting to find out the time when *Helix pomatia* first made its appearance in England. He had found it associated with a horn of roe-deer near the Rifle Butts at Reigate, and the occurrence of roe-deer in this part of England certainly went back far into the past.

Commencing with our largest snail, *H. pomatia*, Linn., commonly called the "Roman" or "apple" snail, both of which designations are probably erroneous, its specific name "pomatia" is probably not derived from "pomum" an apple, but from  $\pi\acute{\omega}\mu\alpha$  an operculum or cover, three splendid specimens of which are before you, one of them (from Reigate) with a sinistral whorl. The  $\pi\acute{\omega}\mu\alpha$  or epiphragm is the cover by which the snail seals itself up in its winter burrow. The material is exuded all round the mantle like liquid plaster of Paris, and hardens into a firm cover just exactly as such a liquid would do. It is evident that to do this the aperture of the snail must be horizontal, and the writer of the article "Helicidæ" in the 'English Encyclopædia,'\* quoting M. Gaspard and Professor Bell, gives an elaborate account of the whole process which is too long for quotation.

The other title "Roman snail" is also probably erroneous. Various accounts of the introduction of the snail into Britain have been given. It has been attributed to the Romans, who were very partial to it as an article of diet, fattening it, according to Pliny, on new wine boiled down and meal, in regular "snaileries" or "Cochlearia." Varro (who must have been a good hand at the long-bow) credits them with growing so large that they held 10 quarts!

Among the reasons that make for the *H. pomatia* being indigenous, is the fact that it is found in a much more rigorous climate than England, viz., Sweden, whither the Romans did not penetrate. It is also a remarkable fact that although the

\* Eng. Encyc. vol. ix. p. 64, art. "Helicidæ."

shells of *H. aspersa*, the common garden snail, are found in great abundance in Roman rubbish-pits at Chesterford and other places round Cambridge\*, and other shells are found in Roman débris in Northamptonshire †, *H. pomatia* does not occur in any Roman deposit so far as I can find out. It would be strange if the Romans introduced a snail which they never used.

I found specimens at the depths of 1 foot 9 inches, 2 feet, 2 feet 3 inches, fragments at 2 feet 9 inches, 2 feet 6 inches, and a young *pomatia* at a depth of 3 feet 6 inches. As I found a neolith (an early type of Neolithic scraper) at a depth of 2 feet 6 inches, and what is probably a core at a depth of 8 feet, I take it that the upper part, 2 feet 6 inches, is most likely the only part of the deposit formed since Roman times.

It is an idea of mine that the deepest part (the 8-foot section) of the deposit (just above Mr. Taylor's water-boring) marks a section across the bed of an old trough which held back the water and was the old marshy ground in which such forms as *Arion ater*, *Helicigona arbustorum*, *Vallonia pulchella*, *Pupa muscorum*, *Cochlicopa lubrica*, all of which except *H. arbustorum* occur in such abundance through the section, and as far as my observations in Kent, Cambridgeshire, and Surrey are concerned, do occur most abundantly in the moister places. It is necessary, however, to point out that so far no freshwater shells have occurred.

The Reigate deposit has been most baffling, as well as encouraging, for beyond the one certain neolith and the possible core, time data have been quite absent. In searching for further evidence of time, your Society can do most valuable work.

*H. aspersa*, Müll., has been found in pre-Roman burial mounds in Wiltshire in 1868 ‡, by Mr. J. W. Flower, F.G.S., on the banks of the Mersey in kitchen-middens of Neolithic

\* Mrs. McKenny Hughes, Geol. Mag. 1888, p. 205 sqq.

† Kew: Dispersal of Shells, p. 241.

‡ Kennard, Proceedings of Malacological Society, vol. ii. p. 106.

age\*, by Mr. W. J. Lewis Abbott, F.G.S., at the Hastings kitchen-midden, and by myself at Dover †.

It is curious that of so common a snail only two specimens have been secured from the Horseshoe deposit, and those only in the upper part of the section, one at 9 in. and one at  $10\frac{1}{2}$  from the surface. This is the variety that used to be imported to America in barrels ‡; it formed the staple of the glass-blowers' feast in Newcastle §, and has been much praised as a remedy for consumption. It is fed on by thrushes and black-birds, which break the shell in halves on a stone, and also by field-voles and mice, which, it is said, gnaw a hole in the side of the shell to extract the animal. The mucus of *H. aspersa* and *H. pomatia* make one of the strongest cements known.

For some reason it occurs in almost incredible numbers near the sea, for instance at Dover it was the commonest snail last year (1898); and in July 1898, at St. Enodock near Padstow, Cornwall, the churchyard wall was packed with thousands of the dark variety.

It will be noticed that *Helicella cantiana* occurs but sparingly and within the upper two feet of the Horseshoe deposit.

It is supposed that the Kent snail is a post-Roman importation into England, but Sir Joseph Prestwich in his paper on the Rubble-drift records it for Baggy Point, North Devon (which is a Pleistocene deposit), on the authority of Dr. Gwyn Jeffreys. As no specimens are now forthcoming this record is rejected, and it shows how careful observers should be to produce their specimens, "which are chiefls that canna' ding." It seems almost incredible that Dr. Gwyn Jeffreys should have made a mistake in so well-marked a snail.

*Helicella cantiana*, Mont., is exceedingly common along the North Downs. Mr. Lionel Adams says that it is only found near paths, and in this he is very likely right, but he says that he has never known birds eat it. That statement I cannot

\* Kennard, Proceedings of Malacological Society, vol. ii. p. 106.

† Bullen, Proc. Malac. Soc. vol. iii. pt. 3, p. 104.

‡ Kew: *op. cit.* p. 203.

§ Eng. Encycl. ix. p. 69.

corroborate, because last summer near the Butts, on the path at the angle, day after day I found fresh *H. cantiana* shells broken in the way that thrushes and blackbirds break them, on a convenient stone.

*Helicigona arbustorum*, Linn. Specimens were exhibited from several localities :

- (a) From a very abundant deposit at Harlton, Cambridge, of Neolithic age according to Rev. Osmond Fisher, F.G.S.
- (b) From Dover, where it is undoubtedly Pleistocene.
- (c) From Redhill osier-bed, near Station, and from Lewes, Sussex.
- (d) From Reigate Horseshoe, at depths of 2 ft. 6 in. to 3 ft. 9 in.

There are also the yellowish variety from Brigg, and dwarf specimens from Shoreham (in Kent), of Mr. Abraham Hale's collection.

This snail has an extensive range in geological time. It has been found abundantly by Mrs. McK. Hughes in the Pleistocene gravels of Barnwell and Grantchester, both near Cambridge, and is represented in her splendid collection of Pleistocene mollusca in the Woodwardian Museum at Cambridge. From the Barnwell gravels have been identified *Corbicula (Cyrena) fluminalis*—the nearest point of occurrence now is Sicily, the rivers of Asia Minor, Syria, and the Nile—also Mammoth and Rhinoceros. The occurrence of mammoth etc. stamps the Barnwell gravels as Pleistocene. The Grantchester gravels are as certainly Pleistocene because of the occurrence of *Succinea oblonga*, *Eulota fruticum*, *Bos primigenius*, *Elephas primigenius*, fossil horse, cave bear, cave hyæna, and cave lion. These with badger, rhinoceros, hippopotamus, reindeer, Irish elk, and *Bison priscus* occur at Barnwell, which is richer in species even than Barrington.

I have mentioned at length these Pleistocene (Barnwell etc.) gravels in connection with *H. arbustorum* because the deposit at Frenches containing mammoth remains is undoubtedly Pleistocene, and of course is older than the Horseshoe deposit.

*Helicigona arbustorum* (with *Cl. Rolphii*, *Buliminus montanus*;

*Helicodonta obvoluta*) seems to have had a much more extensive range in Pleistocene time than it has today, being now a very local shell but fairly abundant in places where it occurs.

Even in Cambridgeshire, at Harlton, the Rev. O. Fisher found a living specimen 33 years ago, and has found none since, though it is abundant in the fossil state, and not uncommon at Coe Fen, Cambridge.

This snail is said to occur high up mountain-sides under granite boulders, but it is certainly most abundant near water, where it can hide under willow-stems and near decaying wood. As, however, boggy places are common enough even on the summits of hills, and moreover elevations attract rain and mists, it may only be an apparent contradiction for this snail to choose seemingly the most arid and the most humid conditions.

It seems to be extinct at the Horseshoe, and its occurrence at the depths mentioned,  $2\frac{1}{2}$  to  $3\frac{3}{4}$  feet, points to a time when the foot of Reigate Hill was probably boggy or marshy, a conclusion borne out by the immense number of *Arion ater* granules, and shells of *Carychium minimum* which occur at the lower part of the deposit and are only found where moisture is abundant. Favourable conditions for the existence of these molluscs may have been ended centuries or even thousands of years ago, either by natural causes or by Neolithic man, who was a tiller of the soil and whose tools are abundant enough on the top of Reigate Hill and the North Downs between Margery Grove and the Walton Road past the Yew wood, and on the Lower Greensand ridge.

In *Pomatias reflexus*, Olivi, which occurs all through the Horseshoe deposit, we have our solitary British example of a genus which is well represented in the West Indies and on the Continent of Europe. It is a great pity that the "law of priority" has displaced the perfectly appropriate name *Cyclostoma elegans*, which was most distinctive, for *Pomatias* has a circular mouth, and its shape, sculpture, and colour are most elegant, whether it be of the pale buff, or brown, or grey-blue variety.

But *Pomatias* is also distinctive, for it is one of our two

operculated terrestrial molluscs\*,  $\pi\omega\mu\alpha$  as we remember being the Greek for cover or operculum.

*P. reflexus* has an extensive range in geological time and occurs in all deposits from Pleistocene up to Recent. I was fortunate enough (or rather Mrs. Bullen) to find one specimen in the Pleistocene at Portland Bill in 1894 †.

*Cæcilianella acicula*, Müll., is one of our most interesting snails. The shell looks like a fragile piece of Venetian glass. The animal, as its name implies, is blind, being subterranean in habit. Its needle-like shape with rounded apex enables it to descend into the earth along worm-burrows and along the line of roots. It is carnivorous and probably hunts for its food by smell alone, which, as in *H. pomatia*, *H. aspersa* and other molluscs, is very acute. Where it abounds there appear to exist no underground fungi or other vegetation, and like *Glandina* (a carnivorous form) there is the same notch or truncature at the base of the shell ‡.

*C. Rolphii*, Gray, which is a very rare and local form now, but seems to have been plentiful in Pleistocene times, occurs in the Reigate deposit. It occurred in a very circumscribed spot in my old parish in Kent (Shoreham) about 450 feet above the sea. I have not been fortunate enough to discover it living at Reigate, though there look to be likely spots in Gatton woods where it might be found among the beech trees. With *H. obvoluta*, *H. arbustorum*, and *Buliminus montanus* it seems to be dying out.

*Buliminus montanus*, Drap., is the important find in the Horseshoe deposit. It used to be known as the "Glory of Wilts," *Bulimus Lackhamensis*. It has been recorded from Southern and Western counties, and is especially plentiful in Birdlip Woods, Gloucestershire. It dates back to Pleistocene times, occurring in the Barnwell and Grantchester gravels. It now frequents the trunks of beech, sycamore and ash.

*B. obscurus*, Müll., a much smaller and an allied form, is

\* The other is *Acme lineata*.

† Geol. Mag. 1894, p. 432.

‡ L. E. Adams, British L. & F. W. Shells, p. 111.

very plentiful on beech trunks in my old parish at Shoreham, Kent, it also occurs on the bare hill-side above the Horseshoe.

It has a queer habit of covering itself with a gummy exudation to which dust and dirt adhere. Sometimes minute lichens take root on it and cover it completely, so that on a tree-trunk it looks like a somewhat dirty bud or small knob of bark. It is clean and smooth in the crevices of rocks in Derbyshire, and also on Reigate Hill.

The address was illustrated by a fine series of specimens of fossil and recent land shells.

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MEETING, held at Reigate, 27th of April, 1899.

Mr. C. E. Salmon exhibited specimens of *Claytonia perfoliata* from a plantation to the west of Reigate Heath.

Mr. Wilfred Mark Webb lectured on

COLOUR IN NATURE.

The lecture was illustrated by lantern views.

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ANNUAL MEETING,

held at Redhill, 27th of October, 1899.

The Annual Report and Balance Sheet were read and adopted as follows :—

ANNUAL REPORT.

Thirteen new members have joined the Club during the past year, 8 have resigned, and 3 have died. The membership now numbers 82.

A volume of printed Proceedings has been issued for the

years 1896, 1897, and 1898, and Mr. Linnell has brought out Part 3 of the Catalogue of Coleoptera found in our neighbourhood.

The Club is greatly indebted to Miss E. Sargant for giving a course of 12 Botanical lectures during the winter months. The audiences varied from 10 to 20; and the proceeds amounting to £15 10s. were presented to the Club.

Special sections have been formed for the study of Botany, Ornithology, and Geology.

In February, Mr. Richard Kearton, F.Z.S., gave his lantern-lecture at the Public Hall, Reigate, on Wild Life at Home. The admirable photographs were greatly admired by an audience of about 150 people. At the other evening meetings the attendance averaged 24.

The following is a list of the speakers and subjects:—

1898.

- October. Seedlings of *Arum maculatum*, by Miss E. Sargant. Birds and Plants of Tangier, Morocco, by Mr. A. J. Crosfield.
- November. The Migration of Birds, by Mr. H. M. Wallis.
- December. A Voyage in Polar Seas, by Mr. F. Curtis.

1899.

- January. Cross and Self Fertilisation, by Mr. I. H. Burkill.
- February. Wild Life at Home: How to Study and Photograph it, by Mr. R. Kearton, F.Z.S.
- March. A Holocene Deposit at Reigate, by the Rev. Ashington Bullen, B.A., F.L.S.
- April. Colour in Nature, by Mr. Wilfred M. Webb.

The following Societies have sent their publications:—

The British Association; The Bath Nat. Hist. & Antiquarian Field Club; Belfast Nat. Hist. & Philosophical Soc.; Burton-on-Trent Nat. Hist. & Archæological Soc.; Cardiff Naturalists'

## THE HOLMESDALE NATURAL HISTORY CLUB.

## ABSTRACT OF ACCOUNTS, Oct. 1898—Oct. 1899.

<i>Receipts.</i>		<i>Expenses.</i>	
	£ s. d.		£ s. d.
Balance, from October 1898 .....	21 7 1	Rent of Museum, Reigate .....	15 0 0
Subscriptions, 1898-99 .....	4 5 0	Other expenses of Museum .....	3 11 6
Lectures .....	27 7 6	Rent of Redhill Hall .....	1 2 6
Subscriptions, 1899-1900 .....	24 10 0	Stationery (ordinary) .....	2 18 3½
Sale of "Proceedings" .....	0 7 0	Collector's Commission .....	1 4 9
		Postages and Petty Cash .....	1 15 9
		Expenses of Lectures .....	12 3 3
		Printing "Proceedings" .....	21 8 0
		Balance in hand .....	18 12 6½
	<u>£77 16 7</u>		<u>£77 16 7</u>

Audited and found correct.  
 Oct. 26, 1899. W. H. TYNDALL.

Soc.; City of London College Science Soc.; Croydon Microscopical & Nat. Hist. Club; East Kent Scientific & Nat. Hist. Soc.; Nat. Hist. Soc. of Glasgow; Marlborough College Nat. Hist. Soc.; North Staffordshire Field Club; Sidcup Literary & Scientific Soc.; South Eastern Union of Scientific Socs.; South London Entomological & Nat. Hist. Soc.; Penzance Nat. Hist. & Antiquarian Soc.

Mr. A. Bennett and Mr. E. S. Salmon have kindly sent reprints of articles in various Journals.

To Mr. W. A. Brewer the Club is indebted for some specimens of British plants and fossils.

Excursions took place as under:—

*Whole Day.*

- May 13.—Bagdon Valley and Bookham.  
June 17.—Merstham and White Hill.  
Sept. 2.—Guildford, for boating on the Wey.  
„ 30.—Leith Hill.

*Afternoon.*

- April 29.—Betchworth and Headley Heath.  
June 3.—Reigate Hill, with London Geologists' Association.  
July 1.—Leatherhead.  
„ 29.—Gomshall.  
Sept. 16.—Reigate and Buckland Hills.

The following Officers were elected:—

- President.* Mr. Frederick Hughes.  
*Secretary.* Mr. Albert J. Crosfield.  
*Treasurer.* Miss Ethel Sargant.  
*Curator.* Mr. John Linnell.  
*Committee.* Messrs. T. A. Chapman, W. Cochrane, J. B. Crosfield, Rev. G. Currie Martin, Mr. D. P. Poulter, Mrs. Powell, Messrs. C. E. Salmon, A. Trower, and W. H. Tyndall.

On the recommendation of the Committee, Mr. Thomas Cooper, now of Marathon, Kew, was elected an honorary member in recognition of his services to the Club extending over many years.

Mr. C. E. Salmon presented a reprint from the *Journal of Botany* of his paper on "Somerset Plants."

Mr. John Gilbert Baker, F.R.S., of Kew, lectured on

THE PHYSICAL GEOGRAPHY AND PLANTS OF PALESTINE,  
describing the four regions into which the country is naturally divided botanically, viz., the Jordan Valley, where the vegetation is sub-tropical; the Plains, on which the plant life generally resembles that of the Mediterranean countries; the Hill district, where the vegetation assumes a more temperate character; and the Mountain region, comprising altitudes from 4,000 to 10,000 feet.

The lecture was illustrated by maps and numerous specimens.

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MEETING, held at Reigate, 24th of November, 1899.

Mr. A. K. Coomara-Swamy, F.G.S., delivered a lecture entitled

BOTANICAL SKETCHES IN CEYLON.

The lecture was illustrated with beautiful lantern-views.

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MEETING, held at Redhill, 29th of December, 1899.

Mr. Francis M. Duncan read a paper on

NATURE'S NIGHT LIGHTS.

The paper was illustrated with diagrams.

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MEETING, held at Reigate, 26th of January, 1900.

Mr. C. E. Salmon exhibited a specimen of *Potamogeton rutilus*, Wolfg., collected at Rye, Sussex, by Mr. Thomas Hilton, in July 1898. This is the first certain record of *P. rutilus* in Great Britain.

Miss E. Sargent gave an address on

RECENT DISCOVERIES REGARDING THE FERTILIZATION OF  
*Lilium Martagon*.

Miss E. Sargent exhibited under the microscope a section of the seed-vessel showing the process of fertilization in *L. Martagon* in demonstration of the newly-discovered facts.

[For full report see Proceedings of the Royal Society, May 4, 1899.]

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MEETING, held at Reigate, 23rd of February, 1900.

Mr. S. T. Dunn, F.L.S., of Kew, gave a lecture entitled

ART IN RELATION TO BOTANY.

It was illustrated with lantern-views.

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MEETING, held at Reigate, 23rd of March, 1900.

A glass tube containing Meteoric Stone, which fell at Agra, Aug. 7, 1822, was presented to the Club by Mr. F. H. Ellwood.

Mr. J. Linnell presented the 'Naturalists' Directory' for 1900; and Mr. C. E. Salmon a reprint from the 'Journal of Botany,' on *Potamogeton rutilus*, Wolfg.

Mr. S. T. Klein, F.L.S., F.E.S., then gave an address upon

CERTAIN MYSTERIOUS INSTINCTS OF INSECTS: A SUGGESTED  
EXPLANATION.

By a number of interesting experiments he demonstrated

how our senses appreciated colour and sound by a series of vibrations; when sympathy between two exactly similarly-vibrating objects was obtained, one would set the other vibrating, no matter what intervened between the two.

He argued, this might well be true in the animal world as well and might account for several insect phenomena at present unexplained.

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MEETING, held at Redhill, 27th of April, 1900.

The Rev. R. Ashington Bullen, F.L.S., F.G.S., gave an address on

EOLITHIC IMPLEMENTS: THEIR USE AND MEANING.

The lecture was illustrated by implements of flint, chert, quartzite, basalt, &c., illustrative of all the stone periods—Eolithic, Palæolithic, Neolithic, and modern.

The lecturer briefly alluded to the meanings of these various terms. The Palæolithic period was illustrated by implements from Abbeville and the Somme Valley, where M. Boucher de Perthes began collecting in 1832, in gravels above the level of the present river Somme. The measure of erosion since these high-level gravels (in which bones of the extinct mammalia, *Elephas primigenius*, &c., occur) is the measure of time since men of the "Old Stone Age" fabricated their implements. These postglacial gravels, as well as those of Hoxne, Broom, Freemantle (near Christchurch), &c., have yielded large numbers of these chipped stone tools. The Neolithic Age (or "New Stone" Age) was represented by tools from Italy, Ireland, Denmark, and England, &c. The fine implements from Suffolk were especially interesting and included arrow-heads which "screw" their way through the air (thus anticipating our modern rifled ordnance), saws with secondary teeth upon the larger teeth (thus foreshowing the modern American saw with subsidiary teeth), bone needle-borers (forestalling the engineer's

bit with its cutting surfaces at two opposed angles). Round scrapers, knives, gouges, chisels, &c., were also shown and explained, as also was a bone needle-scraper from Reigate Hill. A nice set of lake-dwelling implements from Font, Switzerland, including a spindle whorl, which proved the acquaintance of Neolithic man with spinning and weaving, and a limestone net-sinker, equally demonstrating his knowledge of the piscatorial art, were exhibited. There were also a series of very fine lance, spear, and arrow-heads of the North-American Indians of Canada; chisels from U.S.A., the Fiji Islands, the Malay Peninsula, &c. The name Eolith ("Dawn" or "Early" Stone Age) was next explained and defended. For far beyond the Palæolithic Age, at levels between 300 and 400 feet higher than the highest Palæolithic deposits known, implements of a deeply ochreous stain and of a much redder character, have been found on the plateau of Kent, by Mr. B. Harrison of Friston, near Eastbourne, and elsewhere, by the lecturer and Mr. W. J. Lewis Abbott, F.G.S., by Mr. Montgomery Bell, Mr. de Barri Crawshay, in Kent, Mr. O. A. Shrubsole, F.G.S., in Berks, and by Mr. H. P. Blackmore near Salisbury, in gravel which corresponds to the præ-glacial southern drift of Prestwich, and which pre-dates the earliest remains of man hitherto known. These implements were suited to man's simple needs and were used by primitive man when England had a milder climate than prevailed during the Great Ice Age (or Glacial Epoch) high up on the now vanished hill-range which once occupied the Wealden area, probably at a height 2,000 feet or more above mean high-water mark. These weapons and tools indicated that he probably used fire (for many of the tools look like strike-a-lights), cut, scraped, and used the hides of animals, crushed their bones for the contained marrow, bored and split wood, and scraped his feet and body to keep the skin soft and supple. There were also specimens of arrow-heads (fragments) picked up on the field of Marathon, most probably used by the Persian archers of King Darius, B.C. 490.

## ANNUAL MEETING,

held at Reigate, 26th of October, 1900.

The Annual Report and Balance Sheet were read and adopted as follows:—

## ANNUAL REPORT.

During the past 12 months only 5 fresh members have joined the Club, whilst 11 have resigned and 1 has died. The membership is thus reduced to 75.

The winter session opened with a most interesting lecture on the Physical Geography and Plants of Palestine, by Mr. J. Gilbert Baker, F.R.S., of Kew.

A record of original work was presented to the Club by Miss E. Sargant, who described her researches regarding the fertilisation of *Lilium Martagon*.

At all the evening meetings a high level of interest was maintained. The attendance ranged from 27 to 13. It averaged 18.

The following is a list of the papers and addresses:—

- 1899.
- |           |   |
|-----------|---|
| October.  | The Physical Geography and Plants of Palestine, by Mr. J. Gilbert Baker, F.R.S. |
| November. | Botanical Sketches in Ceylon, by Mr. A. K. Coomara-Swamy, F.G.S.                |
| December. | Nature's Night Lights, by Mr. F. M. Duncan.                                     |
- 1900.
- |           |  |
|-----------|--|
| January.  | Recent discoveries regarding the Fertilisation of <i>Lilium Martagon</i> , by Miss E. Sargant. |
| February. | Art in relation to Botany, by Mr. S. T. Dunn, F.L.S.   |
| March.    | Certain mysterious Instincts of Insects, by Mr. S. T. Klein, F.L.S., F.E.S.                    |
| April.    | Eolithic Implements, their use and meaning, by the Rev. R. Ashington Bullen, F.G.S.            |

## THE HOLMESDALE NATURAL HISTORY CLUB.

## BALANCE SHEET, Oct. 1899—June 1900.

<i>Receipts.</i>		<i>Expenses.</i>	
	<i>£ s. d.</i>		<i>£ s. d.</i>
Balance, October 1899 .....	18 12 6½	Rent, &c. ....	18 14 8
Subscriptions to June 1900 .....	2 15 0	Stationery .....	2 4 3
Subscriptions in advance .....	10 0	Petty cash .....	1 13 2½
Sale of Brewer's 'Flora' .....	5 2 0	'Birds of Surrey' .....	12 6
Rent from Literary Institute .....	3 6 8	Subscription to S.E. Union .....	5 0
		Balance in Bank .....	6 16 1
	<u>£30 6 2½</u>		<u>£30 6 2½</u>

Proceedings.

The Club is greatly indebted to the gentlemen and lady who so kindly contributed to its instruction. The addresses were illustrated by specimens, diagrams, or lantern-slides.

The following Societies have sent their publications to the Club :—

The British Association; Associated Nat. Hist. Socs. of the South-East of England; Belfast Nat. Hist. & Philosophical Soc.; Cardiff Naturalists' Soc.; City of London College Science Soc.; Croydon Microscopical & Nat. Hist. Club; Hastings & St. Leonards Nat. Hist. Soc.; International Soc. of Preparators; Marlborough College Nat. Hist. Soc.; Nottingham Naturalists' Soc.; North Staffordshire Field Club; Rochester Naturalists' Club; South London Entomological & Nat. Hist. Soc.

Reprints of articles in Journals have been presented by Messrs. Arthur Bennett, F.L.S., and C. E. Salmon; The Naturalists' Directory for 1900, by Mr. John Linnell; a glass tube containing Meteoric Stone which fell at Agra, Aug. 7, 1822, by Mr. F. H. Ellwood.

Members and friends of the Club took part in the following Excursions :—

April 23.—Merstham, to study Geology.

May 12.—Ranmore Common.

„ 26.—Dunton Green and Shoreham, Kent.

June 9.—Gatton Park.

July 7.—Wiggie, for lecture on Bees, by Mr. W. F. Reid.

„ 21.—Lewes.

Aug. 4.—Gomshall to Dorking.

Sept. 15.—Penshurst.

„ 29.—Albury Park.

The following Officers were elected :—

*President.* Mr. Frederick Hughes.

*Secretary.* Mr. Albert J. Crosfield.

*Treasurer.* Miss Ethel Sargant.

*Curator.* Mr. John Linnell.

*Committee.* Rev. R. Ashington Bullen, Dr. T. A. Chapman,  
Mr. J. B. Crosfield, Rev. G. Currie Martin,  
Mr. D. P. Poulter, Mrs. Powell, Messrs. C. E.  
Salmon, A. Trower, and W. H. Tyndall.

The Rev. R. Ashington Bullen, F.L.S., F.G.S., exhibited a specimen of Carborundum, a compound of carbon and sand, which is hard enough to cut glass. It is very brittle.

He also exhibited the following:—

*Opisthostoma* (from Colonel Beddome's collection).—The peculiarity of this genus of land molluscs from Borneo is that the last or body-whorl is reflexed backward, so that the entrance to the shell is in an exactly opposite direction to the general trend of the whorling. The following species of *Opisthostoma* were shown:—*O. linteræ* (Sow.), *O. de Crespignyji* (H. Adams), *O. Everetti* (E. A. Smith), *O. Baritensis* (E. A. Smith), *O. Wallacei* (Ancay), *O. mirabile* (E. A. Smith), *O. pulchella* (Godwin-Austen), *O. jucundum* (E. A. Smith), *O. Busanense* (E. A. Smith), *O. otostoma* (Boettiger).

*Molubdides* or sling-bolts from Marathon (Forman Collection), probably relics of the battle between the Greeks and Persians, B.C. 490.

The sling-bolts exhibited were of lead, of an elongated elliptical form.

*Helicigona arbustorum*.—The specimens of this land-shell were from Derbyshire, at high altitudes, viz.: Buxton, Lovers' Leap, 950 feet O.D.; above Poole's Cavern, Buxton, 1200 feet O.D.; and up the Winnats Pass, Castleton, 1250 feet O.D. *Locally*, it used to occur at Redhill in the osier-bed near the Railway, which seems to have disappeared: it also is found in the Holocene deposit at the Horseshoe at the lower levels.

This species occurs in Pliocene, Pleistocene, and Holocene deposits.

*Vitrea alliaria*.—This mollusc exhales a strong sent of garlic, hence its name. This peculiarity is not confined to this species. One specimen was found in the Holocene deposit at the Horseshoe Pit, Colley Hill.

*Otoliths*.—These interesting ear-stones, or rather “ear-bones,” are contained in special chambers in a serous fluid on each side of the longitudinal median axis of the fish’s skull and beneath the floor of the brain, to which latter they are connected by a fine nerve-filament. The convex side of the otolith is always inward, and the pointed end always forward.

The following species were represented:—*Thymallus vulgaris*, Cuv. (Grayling); *Pleuronectes platessa* (Plaice); *Cantharus lineatus* (Black Sea-Bream); *Gadus morrhua* (Cod); *G. merlangus* (Whiting); *Clupea harengus*, Linn. (Herring); *Rhombus maximus*, Cuv. (Turbot); *R. vulgaris*, Cuv. (Brill); *Morrhua aeglefinus*, Cuv. (Haddock); *Morone labrax* (*Labrax lupus*, Cuv.) = Bass; *Solea vulgaris*, Cuv. (Sole); *Mullus barbatus* (Red Mullett).

Mr. F. Martin Duncan lectured on

#### HIDDEN WONDERS OF THE SEA-SHORE.

The lecture was illustrated by beautiful lantern-slides.

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MEETING, held at Redhill, 23rd of November, 1900.

The Rev. R. Ashington Bullen, F.L.S., presented his Report as Delegate to the Brighton Meeting of the South-Eastern Union of Scientific Societies\*.

Mr. N. E. Brown, F.L.S., of Kew, lectured on

#### THE ISLAND OF ST. HELENA AND ITS VEGETATION.

He stated that the island contains three Botanical Regions:—

1. OUTER; 1 mile broad, and ascends to 2272 feet; is rocky and nearly barren. Temperature 10° F. hotter than other parts. Inhabited by *Cynodon*, exotics and peculiar indigenous plants.
2. INNER;  $\frac{3}{4}$  mile broad, and varies from 400 to 2000 feet;

\* A full report of the meetings will be found in the ‘Transactions’ of the Union.

is less rocky. Temperature cooler ; with scanty vegetation, chiefly exotic.

3. CENTRAL. From 1200 to 2704 feet. Has good depth of soil covered with vegetation. Chief plants are:— Furze, Brambles, Fir-trees, Willows, Fuchsias, Scarlet Geraniums, Buddleas, Oaks, Peach, Loquat, Passion-flowers, Tobacco, Camellia, and numerous other European, S. African, American, Australian, Indian, and Japanese plants, with some indigenous species.

Total number of plants recorded as growing wild or under cultivation is as follows:—

		Native.	Endemic.
Flowering Plants.....	880	38	37
Ferns .....	25	25	12

(with 29 common tropical weeds that are doubtful natives).

The Native Flora includes 5 Endemic Genera not closely allied to any other.

Mammalia are absent on the Island, except those introduced ; birds are represented by 1 Plover (*Aegialitis Sanctæ-Helenæ*) and 8 Sea-birds.

One Lizard and two Turtles are known on the Island, and 75 species of Fish, all marine, of which 17 are peculiar to the locality.

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MEETING, held at Reigate, 28th of December, 1900.

Dr. T. A. Chapman, F.Z.S., lectured on

THE EVOLUTION OF CHRYSALIDES.

He exhibited numerous specimens and diagrams in illustration of his lecture.

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January 16, 1901.

A lecture was delivered by Mr. R. Kearton, at the Market Hall, Redhill, entitled

PICTURES FROM NATURE,

illustrated by splendid lantern-slides.

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MEETING, held at Reigate, 1st of March, 1901.

The Rev. R. Ashington Bullen, F.L.S., exhibited various bone implements from Holborn, E.C., Moorfields, E.C., and New Guinea: also otoliths of Halibut and Red Gurnard: *Gryphæa expansa* (Oxford Clay, Jordan Hill), with impression of *Trigonia gibbosa*, and a recent *Pecten opercularis* covered with spat of *Anomia ephippium* showing striations of the Pecten-shell.

Mr. J. Edmund Clark, B.A., gave a lecture on

LEAVES, THEIR FORMS AND FUNCTIONS,

illustrated with lantern-slides of his own taking.

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MEETING, held at Reigate, 29th of March, 1901.

Mr. C. E. Salmon exhibited all the known species of British Gentians (7 species and 1 variety).

Mr. F. Chapman, A.L.S., delivered his lecture on

THE RAISED BEACH AT BRIGHTON AND OTHER  
RAISED BEACHES,

illustrated by lantern-slides of various *Entomostraca*, rare minerals, and geological diagrams.

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On April 19th, 1901, a Soirée was held at the Market Hall, Redhill.

Among the Exhibits were the following:—

Mr. F. Hughes (President), Microscopic Objects.

Mr. C. E. Salmon, Botanical Specimens (Characeæ).

Miss Taylor, Quern, Fossils, Coins.

Mrs. James Powell, Rare Natural History Books, and Sea-weeds.

Miss Emily Dawson, Photographs of and Specimens from Yellowstone Park, U.S.A.

Mrs. R. Ashington Bullen, Phœnician Glass, Ancient Lamps, "Tribute" Money, &c.

Miss Alice Johnston, Aloe-Fibre Basket.

Mr. A. Trower, Molar of *Elephas primigenius* (Wiggie), Local Neoliths.

Mr. G. E. Frisby, Microscopic Objects, Foreign Aculeate Hymenoptera.

Rev. R. Ashington Bullen, F.L.S., F.G.S., Natural-History Specimens, Polished Stones, Fossils, Stone Implements from El Areesh, &c.

Dr. Bossey, Photographs.

Rev. H. Brass, F.G.S., Coins and Geological Specimens.

Mr. Richard Kerr, F.G.S., assisted by Miss Katie Kerr, gave a demonstration of Fluorescent Tessler Tubes; and Mr. S. T. Klein, F.L.S., F.R.A.S., gave an entertainment with Edison's latest Phonograph.

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### ANNUAL MEETING,

held at Reigate, 25th of October, 1901.

The Annual Report and Balance Sheet were read and adopted.

### ANNUAL REPORT.

During the past year 3 subscribers have resigned, but 2 new subscribers and 4 new members have joined the Club, bringing the total up to 78.

At the evening meetings many papers were read of much interest; the attendance varied from 106 to 9, the average being 42, the following being a list of the Lecturers and their subjects:—

1900.

October. Hidden Wonders of the Sea-shore, by Mr. F. Martin Duncan.

November. The Island of St. Helena and its Vegetation, by Mr. N. E. Brown, F.L.S.

December. The Evolution of Chrysalides, by Dr. T. A. Chapman, F.Z.S.

- 1901.
- January. Pictures from Nature, by Mr. Richard Kearton, F.Z.S.
- March. Leaves, their Forms and Functions, by Mr. J. E. Clark, B.A.
- „ The Raised Beach at Brighton and other Raised Beaches, by Mr. F. Chapman, A.L.S.
- April. In place of the usual Evening Meeting this month, a Soirée was held at the Small Hall, Redhill, which proved most successful. Many members and friends contributed to the success of the evening by exhibiting interesting Natural History and other specimens. A feature of the evening was Mr. R. Kerr's demonstration of Fluorescent Tessler Tubes, and Mr. Klein's exhibition of Edison's latest Phonograph.

The following publications have been presented to the Club by the various Societies :—

Proceedings, Bath Nat. Hist. & Antiquarian Field Club ; 48th Report, Nottingham Naturalists' Society ; Parts 23, 24, & 25, Transactions, Yorkshire Naturalists' Society ; Vol. 32, Report & Transactions, Cardiff Naturalists' Society ; Vol. 35, Report & Transactions, North Staffordshire Field Club ; Proceedings, South London Entomological & Nat. Hist. Society ; Rochester Naturalist for July 1901 ; Report, No. 49, Marlborough College Nat. Hist. Society.

Reprints of articles in Journals have been presented by Mr. A. Bennett, F.L.S., Rev. R. A. Bullen, F.L.S., F.G.S., and Mr. C. E. Salmon.

The Misses Martin, of Bell Street, Reigate, have kindly presented to the Club a collection of Wealden and other Fossils, belonging to and collected by their father, Mr. Peter Martin, M.R.C.S. (*obit.* 1863) ; also three Cases of Birds, shot at Glass Island, Hebrides, by their brother, Mr. Henry Charrington Martin.

The thanks of the Club were given for the kind gift.

## THE HOLMESDALE NATURAL HISTORY CLUB.

BALANCE SHEET, July 11th, 1900, to August 11th, 1901.

<i>Receipts.</i>		<i>Expenses.</i>	
	£ s. d.		£ s. d.
Balance, July 11, 1900 .....	6 16 1	Rent and sundries .....	16 11 11
Subscriptions .....	22 0 0	Petty Cash .....	1 15 6
Rent from Literary Institute .....	4 0 0	Stationery .....	1 3 2
Mr. Kearton's Lecture .....	6 6 0	Collector's Commission &c. ....	1 6 11
Donations to supply deficit .....	8 0 0	Subs. to S.E. Union (two years) ..	0 10 0
		Expenses of Mr. Kearton's Lecture ..	15 14 0
		Balance in Bank .....	10 0 7
	<u>£47 2 1</u>		<u>£47 2 1</u>

The Summer Excursions were fewer in number than is usual; they were fairly well attended:—

*Whole Day.*

- May 11.—Ockley.  
 June 22.—Fittleworth and Lavington.  
 Sept. 7.—Send and Newark Abbey.  
 Oct. 5.—Ardingly.

*Afternoon.*

- April 27.—Bury Hill, Dorking.  
 June 1.—Godstone.  
 Sept. 21.—Three Bridges and Worth.

The following Officers were elected for the coming year:—

<i>President.</i>	Mr. Frederick Hughes.
<i>Joint Secretaries.</i>	Messrs. G. E. Frisby and C. E. Salmon.
<i>Treasurer.</i>	Miss Ethel Sargant.
<i>Curator.</i>	Mr. John Linnell.
<i>Committee.</i>	Rev. E. J. Barker, Rev. R. A. Bullen, Dr. T. A. Chapman, Mrs. Powell, Messrs. J. B. Crosfield, S. T. Klein, C. E. Salmon, A. Trower, and W. H. Tyndall.

Mr. A. B. Harding, Fellow of the Physical Society, gave a lecture entitled

## FROM CLOUD TO GLACIER,

illustrated by the oxy-hydrogen lantern and numerous brilliant and successful experiments.

The forms of clouds were dealt with and some beautiful photographs shown on the screen. To illustrate the excessive cold produced by evaporation, an iron cylinder containing 100 gallons of liquid carbon dioxide (carbonic acid gas) was slightly opened by a valve; the liquid escaped as gas, but in becoming gas it gave up its heat and became frozen, falling into a receptacle as the snow of carbon dioxide. Plunging a thermometer into the snow, mercury froze at a temperature of

about 60° below zero. To cause greater coldness a little ether poured upon the snow caused it to part with its heat more quickly, and a spirit-thermometer showed successive readings of 90°, 97°, and finally 100° below zero, or 132° of frost. Further experiments, photographs of ice-crystals, hailstones, glaciers, etc., brought the lecture to a conclusion.

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EVENING MEETING, held at Redhill, 6th of December, 1901.

A REPORT OF TWO OF THE CLUB EXCURSIONS

held during the past summer was read.

June 22, 1901.—Fittleworth and Lavington.

Under the guidance of the Rev. E. S. Marshall, F.L.S., a very small party enjoyed a delightful day's ramble in this most picturesque part of Sussex. Starting from Fittleworth Station, over Coates Common, *Epilobium Lamyi* was seen by the roadside, and on the sandy margin of a pond near the Common *Carex hirta*, var. *hirtiformis*, was growing plentifully with the type. Delightful lanes and paths through Bignor Park (where *Carex acuta* grew luxuriantly by the pond) led to Sutton, a small village nestling at the northern base of the South Downs, where a short halt was called for lunch.

Then westwards to the fine woods (locally "Hangers") on the north slopes of the Chalk downs and the open grassy Downland. In the Hangers the wild Columbine's graceful leaves and upright stems bearing seed-vessels were seen, with here and there a late purple flower lingering upon them. The dull purple bells of Deadly Nightshade were also seen on the margins of the woods, and the Sweet Milk-vetch (*Astragalus glycyphyllos*) trailed along the ground or over low bushes, showing its somewhat dirty-looking yellowish flowers.

On past Barlavington and Woolavington Downs, keeping near the foot, the grandeur of the Chalk-range here greatly impresses one. Magnificent beech woods clothe the slopes—which in places are extremely steep—from foot to summit, following the graceful smooth curves of the Downs, and forming romantic wooded

glens and deep ravines; now and again the woods cease, and the bold curves of sweeping grassland charm and refresh the eye. Such spots as these the little Milkwort (*Polygala oxyptera*) loves, and *Lithospermum officinale* and *Rubia peregrina* were seen in some of the ravines. *Valeriana Mikanii* was also frequent in shady places, and *Lathyrus sylvestris* trailed its showy flowers over the hedge-rows.

Tea was kindly provided by Mr. Marshall at his Vicarage at Graffham, terminating a most successful day.

Sept. 7, 1901.—Send and Newark Abbey.

A bright sunny day made this excursion, attended by about a dozen members and friends, a very enjoyable one.

The walk from Worplesdon Station to the river at Send is by no means uninteresting. The way is by footpath and tangled lane, and where the former led through a rough field the party was delighted to see a decidedly scarce Surrey plant, *Lactuca virosa*, growing in some profusion; a few of the specimens were over 6 feet in height. In the same field, confined to a small area, *Gnaphalium sylvaticum* was abundant and remarkably tall in growth—some examples quite 2 feet high. *Hypericum dubium* in seed and *Erigeron acre* were also noticed here.

Obtaining boats at Send, the river was followed up to the ruins of Newark Abbey, where the party halted for lunch. An examination of the ruins showed them to be in rather a crumbling condition, but still there is much to show that the Priory once existed as a very fine and impressive Early English building.

The party afterwards rowed further towards Wisley, then turned, and disembarked at the Lock at Send.

A REPORT from the Rev. R. A. Bullen, who attended (with Miss Ethel Sargent) as Delegates to the Haslemere Conference of the SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES on June 6th to 8th, was presented and read. A record of the Proceedings will be found in the 'South-Eastern Naturalist.'

Miss Ethel Sargant then reported, as Delegate to the Club, upon the BRITISH ASSOCIATION Meeting at Glasgow. The object and uses of local Natural History Clubs was brought before the Meeting, and suggestions offered whereby the work done could be easily brought to one centre for the purpose of reference. She suggested that Anthropology, Folk-lore, Old Customs and Superstitions &c., might well come within the scope of the Holmesdale Natural History Club.

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## APPENDIX.

## EXCURSIONS, 1898.

*June 4.*—Bewbush and Ifield.

Nine members left Redhill by an early train to Faygate. Footpaths and a pleasant walk through a wood led the party to Bewbush Mill-pond; on the way *Carex pallescens* was gathered, and in the wood *Luzula Forsteri* and *Carex vesicaria* were seen.

Nearer the pond, in open meadows, *Orchis morio* was abundant, and in the swampy margin of the pond itself a tuft of *Carex axillaris* was discovered. Sedge-Warblers were common here and two of their nests found; also one of the Black-headed Bunting.

On the railway embankment close by, a Tree-Pipit had its nest.

After a short halt near the pond, the party took footpaths towards Ifield, but had not proceeded far before a Snipe's nest was found with four eggs, the bird being flushed at close quarters. The eggs were extremely handsome, and were placed in a tuft of thick grass.

Nearer Ifield, *Ophioglossum vulgatum* occurred in a meadow.

Boats were obtained at the mill, and most of the party explored the further end of the pond (which is the prettiest portion) by punt.

The Waterlilies were in abundance and *Ænanthe phellandrium* grew in one portion.

Train was taken back to Redhill from Three Bridges, to which Station the members walked *via* Crawley, where a halt was made for tea.

*Sept. 3.*—Witley Common.

Only four members met the conductor, Rev. E. S. Marshall, upon Milford platform.

A delightful day was spent; Thursley Common was first visited and *Potamogeton obtusifolius* obtained from a pond; close

by, in a sandy field, *Datura stramonium* and *Amaranthus retroflexus* grew.

Near one of the Hammer Ponds was seen a fine clump of the hybrid Rush, *Juncus diffusus*, with it were the parents, *glaucus* and *effusus*; near here Mr. Marshall pointed out two fine bushes of *Rosa sepium*.

Then across open heathy land, producing *Euphrasia nemorosa*, towards Cosford; *Epipactis media*, Bab., was seen in some abundance, near here, under fir-trees, but its flowers were mostly over.

Delightful lanes and field-footpaths led back to Witley Station, by way of Bowhead Green and Brook; *Artemisia vulgaris* var. *coarctata*, *Alyssum incanum*, *Hypericum perforatum* var. *angustifolium*, and *Epilobium lanceolatum* were gathered on the way.

#### EXCURSIONS, 1899.

##### Sept. 2.—Boating on the Wey.

Nine members spent a most enjoyable day on the water below Guildford, Sutton Lock being reached. *Sagittaria* and *Impatiens biflora* (*fulva*) were abundant, the latter often forming fine patches of colour. *Mimulus Langsdorffii* was seen in one spot on the river-bank, and *Polygonum minus* found in a dyke near Sutton Lock.

##### Sept. 30.—Leith Hill.

A party of six only assembled at Gomshall Station for the last excursion of the season; others were probably deterred by the threatening appearance of the sky; but with the exception of two or three smart showers the day proved fair with a good amount of pleasant sunshine. On leaving the station two or three plants were found in a field which had the appearance of being hybrids between *Carduus nutans* and *C. crispus*; the flowers drooped like those of *C. nutans* and the involucre were precisely similar, but the flowers were nearer the size of *C. crispus*; this was confirmed later by Mr. Beeby. On a bank by the roadside soon after passing Abinger Hammer abundance

of Soapwort was found to be in flower, this being a well-known locality; this plant appears to be *S. officinalis* var. *puberula*, having a very slight pubescence on the calyx and the uppermost joint of the flower-stalk. *Mentha piperita* \* and *M. rubra* were found in the stream that flows down the Wotton Valley, a little way below Friday Street. At the edge of a pond between Abinger Hammer and Friday Street, *Impatiens fulva* was found growing, the flowers, however, being over; more of the same species was also observed at another pond nearer to Wotton; this is a species that appears to be extending in the district at present. Many large patches of *Epilobium angustifolium* were seen, but almost wholly in seed †. No birds of special interest were observed; on the lake at Bury Hill were many Wild Ducks, Coots, and Moorhens, and a single Sand-Martin was seen, probably nearly the last lingerer of its species, flying about a pond with Swallows, near Wotton. Fungi were much less plentiful than usual at this date, as a consequence of the long drought; but the rain of the last week had evidently had the effect of causing some to show themselves. *Boletus edulis* was especially abundant in one or two places and some very large specimens were observed.

#### EXCURSIONS, 1900.

June 9.—Gatton Park.

Nineteen members and friends were present. Permission had been obtained to examine the lake etc., and many sedges were found at the margin of the water; the most interesting was *Carex axillaris*, as this is apparently a new station in the district. *Potamogeton Friesii* was plentiful in the lake, but none could be found producing fruit.

Sept. 5.—Tonbridge to Penshurst.

Only a very small party arrived at Tonbridge, for this walk along river-banks and by lanes to Penshurst. Near the river,

\* Vars. *officinalis* and *vulgaris*.

† *Euphrasia Rostkoviana*, Hayne, was found also in abundance between Friday Street and Leith Hill summit, and by a stream above Friday Street, *Mimulus Langsdorffii*.

close to Tonbridge, *Sparganium simplex* and *Mentha rivalis* were gathered in a pool; by the river, *Epilobium roseum* was not uncommon.

Leigh, a picturesque, though mainly modern, village, was reached for tea.

Pleasant lanes and footpaths were found leading to Penshurst Station, by way of Moorden Farm. *Agrimonia odorata* and *Chenopodium polyspermum* var. *cymosum*, Moq., were gathered on the way.

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PLANT RECORDS IN SURREY, 1899.

(All by C. E. S., unless otherwise stated.)

*Fumaria officinalis*, L., var. *media*, Continho. Cultivated ground, Betchworth.

*Sisymbrium Columnæ*, Jacq. (Fide S. T. Dunn.) Sand-pit, Wiggie, Redhill. Alien.

*S. officinale*, var., *leiocarpum*, DC. (Confirmed by W. H. Beeby.) Roadside near Chilworth Station. Ripley-road, 3 miles from Guildford. S. T. Dunn.

*Brassica sinapioides*, Roth. By the Wey, below Stoke Lock, Guildford.

*Camelina eu-sativa* of Syme. Hills between Chilworth and Gomshall, 1886. A. J. Crosfield.

*Erophila brachycarpa*, Jord. Reigate Heath.

*Cardamine amara*. Abundant by backwater near Unstead Farm, Bramley.

*Rapistrum rugosum*, All. } Near Fort, Merrow Downs, Guild-  
*R. orientale*, DC. } ford. S. T. Dunn & C. E. S.

*Viola silvestris*, f. *leucantha*, G. Beck. (Confirmed by W. H. Beeby.) Margery Wood, Reigate Hill. Miss A. S. Taylor.

*V. ericetorum*, Schrad. Reigate Heath.

*Saponaria officinalis*. Large patch, amongst bracken on heath S. of Shere, S. of railway (with double flowers).

*Silene cucubalus*, var. *puberula*, Syme. Colley Hill, Reigate. (Confirmed by W. H. Beeby.)

- Stellaria media*, var. *major*, Koch. Marsh, Wiggie, Redbill.  
(Confirmed by W. R. Linton.)
- Spargula vulgaris* (Bœnn.). Field near Gomshall. Field near  
Tonbridge Church. Field between St. Martha's Hill  
and Shalford.
- S. sativa* (Bœnn.). Field near Reigate Heath.
- Claytonia perfoliata*, Donn. Large patch in larch plantation  
by field-path between Reigate Heath and Buckland.  
T. Thompson.
- Geranium lucidum*. Plentiful by stream and roadside near  
Unstead Farm, Bramley.
- Erodium cicutarium*, var. *chærophyllum* (Cav.). Reigate  
Heath.
- Impatiens fulva*. Abundant by Wey, between Guildford and  
Newark Abbey.
- Medicago lupulina*, L., var. *Willdenowiana*, Koch. Roadside  
near Tandridge Church. Hedge-bank, Reigate Hill.
- Vicia lathyroides*. St. Martha's Hill, Chilworth. S. T. Dunn  
& C. E. S.
- Rubus Lindleyanus*, Lees ("a glandular form or hybrid."  
W. M. Rogers). Lane leading S. from Albury Heath.
- Poterium muricatum*, Spach, var. *stenolophum* (Jord.). (Con-  
firmed by W. H. Beeby.) Near Fort, Merrow Downs,  
Guildford. S. T. Dunn & C. E. S.
- Epilobium lanceolatum*. Sandy land near Albury Heath.  
(Confirmed by E. S. Marshall.)
- E. roseum*. By Wey, between Sutton and Send.
- Anthriscus vulgaris*. Plentiful near Gomshall Station.
- Carduus crispus* × *nutans*. (Confirmed by W. H. Beeby.)  
Field near Gomshall Station.
- Centaurea solstitialis*. Casual near some stacks, near Lock-  
nerholt, Chilworth.
- Mimulus Langsdorffii*. Stream, Friday Street, Leith Hill. By  
Wey Navigation, between Sutton Lock and Bower's Lock.
- Euphrasia Rostkoviana*, Hayne. (*Fide* F. Townsend.)  
Reigate Heath, 1898. Near Friday Street, Leith Hill.
- E. nemorosa*, H. Mart. (*Fide* F. T.) Witley Common,  
1898.

- Mentha sativa*, var. *ryvalis*, Lond. Cat. (Confirmed by W. R. Linton.) By Wey, below Guildford.
- M. rubra*, Sm. Stream, Friday Street, Leith Hill. By Wey Navigation, just below Send ("tending towards *gentilis*," W. R. Linton).
- M. piperita*, vars. *officinalis* (Hull) and *vulgaris* (Sole). Stream, Friday Street, Leith Hill.
- Marrubium vulgare*, L. Plentiful near Gomshall Station. Plentiful on waste ground on heath S. of Shere, S. of railway.
- Chenopodium polyspermum*, var. *spicatum*, Moq. (Confirmed by W. H. Beeby.) Near Highridge Farm, N.W. of Edenbridge Station.
- C. urbicum*, var. *intermedium*, Moq. Waste ground, Highridge Farm, N.W. of Edenbridge Station.
- C. Bonus-Henricus*. About Newdigate Churchyard.
- Polygonum minus*, Huds. Dyke near Sutton Lock, below Guildford.
- Rumex pulcher*. Shalford Common.
- Sparganium neglectum*, Beeby, var. *oocarpum*, Celak. (Fide W. H. Beeby.) Wey Navigation between Bower's Mill and Sutton Lock.
- S. simplex*, Huds. Bookham Common, 1886. (Fide W. H. Beeby.) H. F. Parsons.
- Sagittaria sagittifolia*. Abundant by Wey, between Guildford and Newark Abbey.
- Potamogeton lucens*, f. Wey navigation, near Sutton Lock. Arthur Bennett reports: "I have compared your specimens with original (type) specimens of *P. macrophyllus*, Wolfgang (which is the same as *P. longifolius*, Gay, as shown by Gay's specimens in Kew Herb.), and though your specimens are a decided departure from *P. lucens*, L., towards *P. longifolius*, yet it cannot be placed under it. Yours differs in the leaves being wider, of a greener colour (in *longifolius* the colour in some specimens is quite a blackish-green), not so long; stipules in yours longer and wider, etc. Yours are one of a series that show

- longifolius* can only be considered a variety of *lucens*.  
 Cosson and Germain made it *P. lucens*, L.,  $\beta$ . *fluitans*.”  
*Carex pendula*. Plentiful by roadside between Parkgate and  
 Norwood Hill.

## PLANT RECORDS IN SURREY, 1900.

- Bunias orientalis*, L. Alien. Cult. field W. of Reigate  
 Heath, 2 or 3 plants.  
*Lepidium ruderales*, L. In two places, some way apart, by  
 roadside between Bowers Mill and Merrow Common.  
*Sisymbrium officinale*, Scop., var. *leiocarpum*, DC. Roadside  
 near St. Lukes, near Bowers Mill.  
*Cerastium glomeratum*, Thuill., var. *apetalum*, Dum. Chalky  
 bank near chalk-pit, near Dorking Station (S.E.R.).  
*Sagina nodosa*, Fenzl. Park Downs, near Chipstead.  
*Spergula vulgaris* (Bœnn.). Field, South Park, Reigate.  
 Two fields near Bowers Mill, above Guildford.  
*Geranium striatum*, L. Still in disused roadway near Chip-  
 stead, where I recorded it some years ago.  
*Melilotus arvensis*, Wallr. Fieldside, near Cheasley Town,  
 Lower Kingswood.  
*Vicia gemella*, Crantz. } Roadside near Outwood, plentiful.  
*Lathyrus Nissolia*, L. }  
*Pyrus torminalis*, Ehrh. Roadside wood between Parkgate  
 and Leigh.  
*P. malus*, var. *acerba*, DC. Wood, Reigate Hill.  
*Serratula tinctoria*, L. Merrow Common.  
*Primula acaulis*  $\times$  *veris*. South of Ockley; with the parents.  
*Myosotis sylvatica*, Hoffm. In plenty in a wood S. of Ockley.  
*Cuscuta racemosa*, Martius, var. *Chiliana*, Engel. On *Prunella*,  
*Cnicus arvensis*, *Ran. repens*, &c., in a field near Margery  
 Wood, Reigate Hill.  
*Euphrasia nemorosa*, H. Mart. (*Fide* F. Townsend.) Near  
 Chipstead.  
*E. Kernerii*, Wettst. (*Fide* F. T.) Riddlesdown, near Purley.  
*Mentha sativa*, L., var. *paludosa* (Sole). (Confirmed by W.  
 R. Linton.) Roadside ditches near Newdigate.

- M.* intermediate between *rubra* and *gentilis*. (Fide W. R. L.)  
Same locality as above.
- Marrubium vulgare*, L. Hedge-bank near Purley Station.
- Chenopodium polyspermum*, L., var. *spicatum* (Moq.). Plentiful  
in cult. field near Merrow Common.
- Polygonum Bistorta*, L. Reigate Heath. Mrs. J. Powell.
- Thesium humifusum*, DC. Riddlesdown, near Purley.
- Spiranthes autumnalis*, Rich. Same locality.
- Luzula Forsteri*, DC. Roadside, Ware Street, near Ockley.
- Potamogeton Friesii*, Rupr. (Confirmed by A. Bennett.)  
Gatton Lake.
- Carex divulsa*, Good. Roadside bank, Woodhatch, Reigate.
- C. axillaris*, Good. Sparingly at the edge of Gatton Lake.
- Setaria viridis*, Beauv. } Waste ground, Deerings Road,  
*S. glauca*, Beauv. } Reigate.
- Ophioglossum vulgatum*, L. Ranmore Common.

## PLANT RECORDS IN SURREY, 1901.

- Ranunculus fluitans*, Lam. River Mole, near Leatherhead.  
J. Groves & C. E. S.
- Claytonia perfoliata*, Donn. Abundant in sandy lane and  
near by, Bury Hill, Dorking.
- Elatine hexandra*, DC. Whitemoor Common, near Guild-  
ford.
- Hypericum dubium*, Leers. Field near Sutton Green, near  
Send.
- Myriophyllum verticillatum*, L. Lake, Bury Hill, Dorking.
- Eriogonon acre*, L. Field near Sutton Green, near Send.
- Gnaphalium sylvaticum*, L. Field near Sutton Green, near  
Send.
- Carduus crispus* × *nutans*. Field, summit of Colley Hill,  
Reigate.
- Onopordon Acanthium*, L. One plant by R. Mole, near  
Leatherhead. J. Groves & C. E. S.
- Lactuca virosa*, L. Field near Sutton Green near Send, in  
some quantity.

- Primula acaulis*, L., var. *caulescens* (Koch). Wood near Vann Pond, near Ockley.
- Echium vulgare*, L. Not on the chalk, in meadows near Newark Abbey.
- Fagopyrum esculentum*, Moench. Waste ground on river-bank at Send.
- Cephalanthera ensifolia*, Rich. Wood on hills near Gomshall. H. W. Pugsley & C. E. S.
- Acorus Calamus*, L. Lake, Bury Hill, Dorking.
- Damasonium stellatum*, Pers. On Whitemoor and Stringer's Commons, near Guildford.
- Phalaris canariensis*, L. Waste ground on river-bank at Send.
-

METEOROLOGY.—OXFORD ROAD, REDHILL (1898).

Month.	BAROMETER.				THERMOMETER.					RAIN.	
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.	Total fall.	No. of days.
January .....	30·67	29	29·39	1	54·0	30	26·0	10	42·44	INCHES. ·84	11
February .....	30·40	12	29·26	21	55·5	1	24·0	10	39·95	1·30	16
March .....	30·24	21	29·45	27	61·0	18	24·5	5	39·11	1·60	12
April .....	30·30	8	29·64	27	62·0	8	28·0	4, 5	46·57	1·15	10
May .....	30·37	7	29·30	12	73·0	23	33·0	16	51·29	3·38	22
June .....	30·33	17	29·60	25, 26	74·0	18, 20, 21	40·0	2	57·34	1·59	12
July .....	30·40	11	29·82	23	79·0	16	41·0	30	60·09	·94	7
August .....	30·31	25	29·72	8	82·0	15, 19	43·0	31	62·82	1·13	12
September .....	30·47	4	29·70	30	83·0	7, 8	33·0	28	59·19	·43	6
October .....	30·39	2	28·93	18	64·5	4	31·0	31	52·60	3·53	12
November .....	30·39	18	28·90	25	58·0	2, 3, 9	25·0	29	44·35	4·05	15
December .....	30·55	11	29·47	29	56·0	4, 7	24·0	39	43·77	2·65	15
Year .....	30·67	Jan. 29	28·90	Nov. 25	83·0	Sept. 7, 8	24·0	Feb. 10, Dec. 30	48·29	22·59	150

## METEOROLOGY.—OXFORD ROAD, REDHILL (1899).

Month.	BAROMETER.				THERMOMETER.				RAIN.		
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average	Total fall.	No. of days.
January . . . . .	30·63	26	28·95	2	54·0	21	27·0	24	41·09	3·16	20
February . . . . .	30·68	28	29·40	12	60·0	10	19·5	27	40·65	2·83	11
March . . . . .	30·60	13	29·15	9	59·0	29, 31	19·0	20, 24	39·43	·64	8
April . . . . .	30·34	23	29·02	14	63·0	1	28·0	18	46·45	2·91	18
May . . . . .	30·48	29	29·50	15	68·0	18, 31	31·0	4	50·36	1·23	9
June . . . . .	30·49	8	29·50	20	80·0	6	38·5	14	60·28	·89	6
July . . . . .	30·45	28	29·67	1	85·0	20	47·0	13	64·87	·64	8
August . . . . .	30·51	1	29·91	30	83·5	25	47·0	20	64·90	·73	6
September . . . . .	30·30	11	29·39	30	81·5	5	32·0	28	56·04	2·54	14
October . . . . .	30·45	22	29·46	2	62·0	28	29·0	9, 20	47·52	2·14	10
November . . . . .	30·70	17	29·52	8	60·0	2, 4	29·0	29	45·82	5·15	10
December . . . . .	30·56	3	28·65	29	54·0	6	18·0	13	34·78	1·49	19
Year . . . . .	30·70	Nov. 17	28·65	Dec. 29	85·0	July 20	18·0	Dec. 13	49·35	24·35	139

METEOROLOGY.—OXFORD ROAD, REDHILL (1900).

Month.	BAROMETER.				THERMOMETER.					RAIN.	
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.	Total fall.	No. of days.
January . . . . .	30.46	11	29.55	16	51.0	2, 24	24.0	13	38.48	3.78	21
February . . . . .	30.05	9	28.74	20	57.0	26	16.0	11, 12	36.75	4.85	19
March . . . . .	30.63	20	29.30	19	56.0	10	19.0	17	37.72	.79	7
April . . . . .	30.59	20	29.38	4	70.0	22	24.0	1	45.76	1.26	13
May . . . . .	30.38	29, 30	29.62	3	68.0	8, 28	34.0	15	51.30	1.23	7
June . . . . .	30.22	1	29.62	25	82.0	11	44.0	4	59.21	2.65	17
July . . . . .	30.34	18	29.76	1	86.0	16, 20, 25	42.0	7	65.15	1.38	8
August . . . . .	30.47	13	29.60	22	79.0	17	45.0	6, 30	59.94	3.19	16
September . . . . .	30.59	12	29.73	28	76.0	16	38.0	20	55.77	1.33	8
October . . . . .	30.59	22	29.49	27	67.0	8, 9	33.0	15	49.71	2.04	18
November . . . . .	30.34	19	29.21	29	59.0	1	28.5	22	44.66	3.06	22
December . . . . .	30.52	16	29.16	28	54.5	5	27.0	22	43.43	3.29	23
Year . . . . .	30.63	Mar. 20	28.74	Feb. 20	86.0	July 16, 20, 25	16.0	Feb. 11, 12	48.99	28.85	179

## METEOROLOGY.—OXFORD ROAD, REDHILL (1901).

Month.	BAROMETER.				THERMOMETER.					RAIN.	
	Max.	Date.	Min.	Date.	Max.	Date.	Min.	Date.	Average.	Total fall.	No. of days.
January . . . .	30.61	23	29.47	30	53.0	27	19.0	8	37.16	1.52	15
February . . . .	30.33	15	29.27	27	49.0	28	21.0	13	34.55	1.75	14
March . . . . .	30.50	23	29.19	1	52.0	5, 12	22.5	27	37.90	2.32	16
April . . . . .	30.34	18	29.50	16	70.0	23	27.0	1	46.50	2.14	14
May . . . . .	30.43	13	29.45	7	77.0	29	30.0	7, 10, 17	53.27	1.31	7
June . . . . .	30.50	29	29.74	14	76.0	22	39.5	18	58.34	1.66	9
July . . . . .	30.36	18, 31	29.64	2	85.5	19	45.0	8	63.77	1.97	6
August . . . . .	30.50	20	29.61	26	78.5	10, 19	45.0	22	61.73	2.19	11
September . . . .	30.40	27	29.58	21	71.5	8	40.0	15, 18	55.70	1.81	7
October . . . . .	30.42	27	29.54	18	70.0	1	28.0	26	49.30	3.20	17
November . . . .	30.62	24, 25	29.21	13	54.0	11	20.5	16	40.47	.78	10
December . . . .	30.45	4	28.90	25	53.5	7	23.5	16	38.34	4.83	20
Year . . . . .	30.62	Nov, 24, 25	28.90	Dec. 25	85.5	July 19	19.0	Jan. 8	48.08	25.48	146

## RULES.

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### NAME.

I.—The Association shall be styled “THE HOLMESDALE NATURAL HISTORY CLUB.”

### OBJECTS.

II.—The investigation of the Natural History of Reigate and its vicinity and the mutual improvement of the members in the study of Nature.

### CONSTITUTION.

III.—The Club shall consist of Members, Subscribers, Corresponding Members, and Honorary Members.

### MEMBERS.

IV.—Members shall be elected by ballot or show of hands at any Ordinary Meeting. The candidate to be recommended by one or more Members at any Ordinary Meeting, and the election to take place at the Meeting next ensuing.

### SUBSCRIBERS.

V.—Subscribers shall be elected in the same manner as Members, and shall have all the privileges of Members except of having any right or ownership in the property of the Club.

### CORRESPONDING MEMBERS.

VI.—It shall be competent for the Club to elect as Corresponding Members any gentlemen distinguished for their attainments in Natural History, either as collectors or authors, or to whom the Club may be indebted for contributions of papers or specimens; such Corresponding Members to have similar privileges to Subscribers without payment, and to be elected by the Club upon the nomination of the Committee.

### HONORARY MEMBERS.

VII.—Honorary Members shall be elected by the Club upon the nomination of the Committee; and shall be exempted from the payment of subscriptions, and shall have the privileges of Subscribers.

### OFFICERS.

VIII.—The Club shall, at the Annual General Meeting, elect from among themselves a President, Treasurer, Secretary, Curator, and nine Members to form a Committee of Management, three of whom to form a quorum.

## VICE-PRESIDENTS.

IX.—The President shall nominate annually two Vice-Presidents from the members of the Committee.

## ANNUAL GENERAL MEETING.

X.—This shall be held previous to the Evening Meeting on the fourth Friday in October, when the Committee shall present a Report detailing the general state, proceedings, and pecuniary condition of the Club, and proceed to the election of Officers.

## SPECIAL MEETINGS.

XI.—The Committee shall have the power to call a Special General Meeting at any time; and they shall do so within four weeks after receiving requisition to that effect, signed by at least five Members. The notice calling the Meeting shall state the objects for which the Meeting is called, and no other business shall be transacted.

## ORDINARY MEETINGS.

XII.—These shall be held on the fourth Friday in every month, from October to April, inclusive, or more frequently at the option of the Committee.

## SUBSCRIPTIONS.

XIII.—Each Member shall pay to the Treasurer Ten Shillings on his election, and the same sum at the Annual General Meeting each year; but may compound for such Annual Subscription by payment of Five Pounds. Each Subscriber shall pay to the Treasurer Five Shillings on his election, and the same sum at the Annual General Meeting each year. That it shall be optional with the Committee to strike out the name of any Member or Subscriber who shall be in arrear with his Subscription for twelve months or more.

## NEW RULES.

XIV.—Any five Members, wishing to propose a New Rule, or the omission or alteration of any existing Rule, must send notice to the Secretary, who shall within a month call a Special General Meeting to consider the change proposed.

## LIBRARY AND COLLECTIONS.

XV.—The Club shall form, as opportunity may offer, a Library of Reference, consisting of works bearing on the subject of Natural History, and obtain collections of the natural objects of the neighbourhood. The Library, Collections, and Funds to be the property of the Members for the time being, and shall be vested in Trustees for the use of the Members. Contributions of Life Members shall also be invested in the names of such Trustees in such manner as the Committee may direct, the interest arising therefrom to be handed to the Treasurer for the general purposes of the Club.

## ELECTION OF TRUSTEES.

XVI.—The Trustees shall consist of the President for the time being, and three other Members to be elected by the Club.

## LIST OF MEMBERS AND SUBSCRIBERS.

*Names marked \* are Honorary Members.*

- ADENEY, Miss; Cranford, Reigate.  
 ASHBY, J. STERRY; Brendon, Redhill.  
 ASHBY, J. WILLIAM; Wyresdale, Redhill.  
 AVEBURY, Rt. Hon. Lord; 15 Lombard Street, London, E.C.  
 BAKER, Rev. E. J.; Nutley Lane, Reigate.  
 BEEBY, W. H., F.L.S.; Hildasay, Thames Ditton.  
 \*BENNETT, ARTHUR, F.L.S.; 143 High Street, Croydon.  
 BONNOR, Miss F.; Hildersley, Cavendish Road, Redhill.  
 BOSSEY, FRANCIS, M.D.; Mayfield, Redhill.  
 BRASS, Rev. HENRY, M.A.; The Parsonage, Redhill.  
 \*BROWN, N. E.; Herbarium, Kew.  
 BULLEN, Rev. R. ASHINGTON, B.A., F.L.S.; Pyrford Vicarage, near  
     Woking.  
 BULLEN, Mrs. R. ASHINGTON; do.  
 BUTLER, G. W.; Candahar, York Road, Reigate.  
 BUTLER, Mrs. G. W.; do.  
 CAMPION, Miss ANNIE; Mayfield, Redhill.  
 CHAMBERS, S. A.; Linden Villas, Leatherhead.  
 CHAPMAN, Dr. T. A., F.Z.S.; Betula, Reigate.  
 CLAYTON, Miss; Side Elms, Beaufort Road, Reigate.  
 \*COOPER, THOMAS; Marathon, Kew.  
 CROSFIELD, ALBERT J.; Carr End, Reigate.  
 CROSFIELD, Mrs. A. J.; do.  
 CROSFIELD, JAMES B.; Undercroft, Reigate.  
 CROSFIELD, Miss; do.  
 CUDWORTH, Mrs.; Blackboro' Road, Reigate.  
 DAVIES, Rev. F. C.; The Vicarage, Reigate.  
 DRUCE, FRANCIS; Merstham, near Redhill.  
 \*EVELYN, W. J.; Wotton House, Dorking.  
 FRISBY, G. E.; 1 Clandeboye Villas, Fengates Road, Redhill.  
 GARDINER, Mrs.; The Briars, Reigate.  
 GARDINER, Miss Hilda; do.  
 GILFORD, WILLIAM; Beech Grove, Redhill.  
 GOUGH, ALFRED B.; Sandcroft, Redhill.  
 GURNEY, HENRY; Nutwood, Reigate.  
 HEINTZ, ARTHUR F.; St. Agnes, Fengates Road, Redhill.  
 HEINTZ, Mrs. ARTHUR F.; do.  
 HOOPER, T. R.; Glington, Elms Road, Redhill.  
 HORNE, Miss; Warwick Road, Redhill.  
 HUGHES, FREDERICK; Fairleigh, Reigate.

- JOHNSTON, WALTER ; Oak Bank, Bridge Road, Redhill.  
 JOHNSTON, Miss ALICE ; do.  
 JOHNSTON, Miss ANNIE J. ; do.  
 KLEIN, SIDNEY T., F.L.S., F.R.A.S., F.E.S. ; Hatherlow, Reigate.  
 LEMON, F. E. ; Hillcrest, Redhill.  
 LINNELL, JOHN ; Redstone Wood, Redhill.  
 LURY, SAMUEL H. ; Meadvale, Redhill.  
 MARTIN, Rev. G. CURRIE, M.A. ; Clifton, Reigate.  
 MARTIN, HOWARD ; Elstree, Redhill.  
 MARTIN, SAMUEL ; do.  
 MARTIN, Miss M. ; do.  
 MARTIN, Miss ; Lynton, Bridge Road, Redhill.  
 MORRISON, S. R. ; Stonifers, Reigate Hill.  
 MORRISON, Miss MARGARET ; do.  
 MORRISON, Miss MABEL ; Londonlands, York Road, Reigate.  
 MOTT, FRANK ; Ellora, Shaw's Corner, Redhill.  
 MOTT, Miss ; do.  
 PAWLE, FREDERICK C. J.P. ; Northcote, Reigate.  
 PEACOCK, Miss W. G. ; The Knowe, Reigate.  
 PEAT, J. T. ; High Street, Reigate.  
 PHIPSON, Miss ; 79 Bell Street, Reigate.  
 POULTER, DANIEL P. ; 16 Gloucester Road, Redhill.  
 POWELL, Mrs. ; Ivanhoe, Reigate.  
 POWELL, Miss VERA ; do.  
 RAGG, R. S. ; The Grammar School, Reigate.  
 RAGG, Mrs. R. S. ; do.  
 ROBERTS, Miss M. ; 27 Pearfield Rd., Perry Vale, Forest Hill, S.E.  
 ROGERS, F. J. ; 71 Eastcheap, London, E.C.  
 ROSS, Rev. J. M. E. ; Testerton, Redhill.  
 ROSS, Mrs. J. M. E. ; do.  
 SALMON, SAMUEL ; Clevelands, Reigate.  
 SALMON, Mrs. ; do.  
 SALMON, CHARLES E., F.L.S. ; do.  
 SALMON, ERNEST S., F.L.S. ; do.  
 SALMON, Miss I. E. ; do.  
 SARGANT, Mrs. ; Quarry Hill, Reigate.  
 SARGANT, Miss ETHEL ; do.  
 SHARP, J. B. ; Hill Brow, Reigate.  
 SIMPSON, Miss ; Wray Park, Reigate.  
 SMITH, Miss N. G. ; Wealden, Reigate.  
 SPRULES, G. H. ; Manse Field, Reigate.  
 TAYLOR, Miss M. C. ; Margery, Reigate.  
 TONGE, ALFRED E. ; Aincroft, Grammar School Hill, Reigate.  
 TROWER, ARTHUR ; Wiggie, Redhill.  
 TYNDALL, W. H. ; Morlands, Redhill.  
 VIPAN, Miss ; Side Elms, Beaufort Road, Reigate.  
 WALTERS, J., M.B. ; Church Street, Reigate.  
 \*WEBB, SYDNEY ; 22 Waterloo Crescent, Dover.

PRESENTED

13 FEB. 1903







347.  
12 MAR 1906

PROCEEDINGS OF THE  
HOLMESDALE NATURAL  
HISTORY CLUB FOR THE  
YEARS 1902, 1903, 1904, 1905.

TOGETHER WITH RULES  
AND LIST OF MEMBERS



REIGATE:  
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11. III 08.

HOLMESDALE NATURAL HISTORY CLUB.

OR

HON. SEC.:  
~~G. F. COLLARD F.Z.S.,~~  
~~178, STATION ROAD,~~  
~~REDFIRE.~~

Miss M. C. Crofield  
Undercroft  
Brigate.

B. B. Woodward Esq.

General Library British Museum  
(Natural History)

Dear Sir,

In reply to your letter of  
the 13<sup>th</sup> ultimo. I am directed  
by the Committee of the Holmesdale  
Natural History Club to send you  
a copy of their latest Proceedings  
and to say that they will put  
you on their free list for the future.

I may add that we are  
hoping it may be possible to build

Honorary Secretary :  
G. E. FRISBY, Esq.,  
9, Fengates Road, Redhill, Surrey.

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## Proceedings of the Holmesdale Natural History Club.

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MEETING held at Reigate, Jan. 24th, 1902.

Present—about 40.

A Lecture was given by Mr. H. Ringwood Peach, LL.B., entitled "Irish Folk and Fairy Lore." Many quaint and interesting stories of Irish superstition were alluded to, and the lecture brought to a close with a series of lantern views illustrating Irish scenery.

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MEETING held at Redhill, Feb. 28th, 1902.

Present—17.

The Secretary reported that Mr. E. S. Salmon, who had arranged to deliver a Lecture that evening, had telegraphed to say that illness prevented him keeping his appointment.

Mr. J. B. Crosfield very kindly gave an account of the Total Eclipse of the Sun, which he saw at Alcazar, Spain, in 1900, and showed some interesting specimens of dried plants collected whilst journeying there.

Miss E. Sargent gave an account of a visit to the Millport Biological Station at Cumbrae last summer, and described many interesting species of sea-weed met with there.

Mr. F. Hughes exhibited objects under the microscope and Mr. C. E. Salmon some dried specimens of plants.

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A SPECIAL GENERAL MEETING was held at the Museum, Public Hall, Reigate, on March 6th, 1902, "to discuss a suggestion to remove the existing Museum to the Old Town Hall, Reigate.

As a result of the discussion it was decided to move the Museum to the Old Town Hall, and Trustees were appointed.

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MEETING held at Reigate, Mar. 21st, 1902.

Present—16.

Mr. G. E. Frisby gave an address upon "Some habits of the Hymenoptera" and exhibited many interesting species to illustrate the Order.

#### SOME HABITS OF THE HYMENOPTERA.

Of all the Hymenoptera, the Hive Bee and a few of the Ants, have, I suppose, received more attention, and have had much more written about their habits than have all the remaining species put together. I propose, therefore, to give them but little attention on this occasion, and to deal almost entirely with the habits of the less known, but not less interesting, species.

A brief mention of a few of the Ants will be all that there will be time for.

You will probably all have read accounts of the continental slave-making Ant, *Polyergus rufescens*. Although it does not occur in England, we have one British Ant which keeps other species in a state of slavery. This is *Formica sanguinea*, very similar in appearance to our large Wood Ant, but living chiefly in banks. It raids the nests of the closely allied *Formica fusca* and *F. rufibarbis*, which are but little inferior in size, to carry off the pupæ of the workers.

Closely related to the Slave-maker, is our common Wood Ant, or Horse Ant, *Formica rufa*, which forms large nests of small sticks, leaves, pine needles, &c., often five or six feet in diameter. It has no sting but knows how to make good use of its jaws.

One of the most interesting of the exotic Ants is the Mexican Honey Ant, a species of *Myrmecocystus*, a genus which is also found in the south of Europe. In this Ant there are two forms of the worker, a small ordinary looking form, and another, larger, and with the abdomen much inflated and almost transparent. The use of these peculiar looking individuals seems to be to secrete honey for the use of the community. There is also an Australian species of Honey Ant, certain individuals of which become so distended, as to be merely animated honey-pots.

The *Sauba*, or Leaf-cutting Ant, is a Brazilian species, living in very large communities. They are very destructive to foliage, and prefer cultivated trees, such as the coffee, or the orange. Swarming over the branches, they cut off pieces of leaf about the size of a sixpence, and carry them off to their subterranean dwellings. The use they make of these leaves seems still open to doubt, some observers, as for instance, Belt, in his "Naturalist in Nicaragua," being of opinion that they are stored for the sake of the fungi which grow abundantly on them; whilst others, like Bates, in his "Naturalist on the Amazons," think that they are used only for thatching purposes. Probably the latter use is that for which the leaves are intended, though they also use, as food, the fungi which grow on them.

Leaving the Ants we now come to a group of insects of very diverse habits.

These are the Fossorial Hymenoptera, popularly known as Sand Wasps, from the yellow and black colouring of some of the most striking species.

The first family of these insects, the *Mutillidæ*, are often known as Solitary Ants. Their habits are, as yet, but imperfectly known, though it is very probable that all

the members of this family are parasitic. *Mutilla europæa*, our largest British species, has frequently been found in the nests of *Bombus*, no fewer than 76 individuals of this species having been found in a single nest of *Bombus Schrimshiranus* at Copenhagen by Herr Drewsen. However, it seems that it must sometimes find another host, as many species of *Mutilla* are found in Australia, where *Bombus* is unknown, and also in tropical Africa, where also *Bombus* is not known to occur.

We pass now to the only British genus of the next family, *Sapyga*, of which we have two species. It is generally found flying about old posts and palings, in which it excavates its burrows, and provisions its cells with small green caterpillars.

The genus, *Pompilus* and its allies are all extremely active creatures and are by no means easy to catch. They run rapidly, with short intervals of flight, and are very quick to take advantage of any sheltering twig or leaf. Most of them burrow in the ground, though some will use a hole in a wall or wooden post. Some of them make little clay cells, similar to those of some of the Solitary Wasps. Most of the *Pompilidæ* provision their nests with spiders, though crickets, and even cockroaches, are sometimes used.

Another active and interesting Fossorial genus is *Astata*, of which we have two species. They are to be found in sandy places, only in the very hottest sunshine, and are, I think about the most active of all the Hymenoptera. *Astata stigma* is the liveliest little creature I have ever met with. It is a rare species, and I have only met with it at St. Helens, in the Isle of Wight. In the Entomologists Monthly Magazine of Sept., 1898, Mr. E. Saunders records that he met with it in larger numbers than usual at Littlehampton, in June. He says "they used to sit and bask on the sand, and the males could easily be detected by the ivory-white spot on the face, which was distinctly visible, even at some distance."

A small fly, *Scopelia carbonaria*, with a silvery face, was abundant over the same ground, flying and moving almost

exactly in the same style as the *Astata*, and often deceiving one for the moment as to its identity.

*Tachytes pectinipes* is another closely-allied, but commoner insect in sandy places, yet accounts differ as to what it preys upon. According to continental authorities it always preys on the larvæ of Orthoptera, and Smith says that he has taken it at Weybridge with a small species of grasshopper. Shuckard, however, says that he has frequently caught it with a small sandy-coloured caterpillar, and I once took it at Sandown Bay, carrying a small light-brown caterpillar.

The members of the genus *Trypoxylon* nest usually in decaying wood, though they sometimes burrow in the ground. The commonest, and largest British representative of the genus, *T. figulus*, I have found burrowing both in old posts and in hard sandy banks. *T. clavicerum* I have only found burrowing in posts or palings. The slender *T. attenuatum* I have only obtained by collecting perforated bramble stems in winter. All the species prey on small spiders.

*Ammophila* is a widely distributed genus. The species are very striking in their appearance, their slender waists being particularly noticeable. The common *A. sabulosa* provisions its nests with caterpillars, while the more robust *A. hirsuta* captures spiders. The allied species of *Pelopæus* also prey on spiders.

The members of that showy and almost universally distributed genus, *Sphex*, make burrows in the ground, and usually, if not always, store species of Orthoptera. The beautiful species of *Ampulex* capture huge cockroaches.

The small, black species of *Pemphredon* provision their nests with Aphides, and are thus very useful to gardeners. They burrow in decaying wood, or in cut bramble stems. The larvæ spin no cocoon, and the change from the larval state to the perfect insect can be seen in its various stages by splitting perforated bramble stems in the spring. *P. lethifer* is by far the most abundant of the bramble burrowers.

*Diodontus* is another genus of small species, preying on

Aphides. I have never bred any of them from bramble stems, or from old wood, and I believe that they nearly always burrow in sandy soil, though I once found a large colony of *D. tristis* burrowing in the mortar of an old wall.

Another of these genera of small black species is *Passalocus*. I have bred *P. insignis* from bramble stems; *P. cornigera* and *P. gracilis* from old wood.

*Mellinus arvensis* is one of the commonest and most conspicuous of the yellow-banded sand-wasps. It burrows in sandy places, being abundant on Redhill Common, and provisions its nest with various species of Diptera. Smith, in his "Catalogue of British Fossorial Hymenoptera," describes the manner in which the flies are caught. He says, "This is managed by running past the victim slowly, and apparently in an unconcerned manner, until the poor fly is caught unawares and carried off by the *Mellinus* into its burrow."

*Philanthus triangulum* is a powerful-looking yellow-banded insect which catches Bees. It captures not only species of *Halictus* and *Andrena*, whose stinging powers are weak, but even the Hive Bee, whose sting is very severe.

*Cerceris* is somewhat similar in appearance, though not so large or so formidable looking. Most of the species provision their nests with beetles, many of them going so far as to restrict their captures to one species of beetle. One *Cerceris*, however, captures small bees.

*Bembex*, which is not represented in England, is remarkable in that it does not appear to close its burrow permanently until the larvæ are full grown. According to observations on the continent, and also in India, these insects pay periodical visits to their burrows to supply the larvæ with fresh food, which consists of various Diptera.

*Crabro* is a very extensive and widely-distributed genus, some species being small and black, others large and yellow-banded. Some burrow in bramble-stems, some in old wooden posts or decaying trees, and others in hard ground, even in much trodden pathways. Most of them prey on Diptera.

I have now come to the end of my notes on Fossorial Hymenoptera. One of their most interesting points is the manner in which they sting their prey in such a way as to pierce the chief nervous ganglia. This paralyzes the victim, depriving it of the power of motion, while it retains sufficient vitality to resist putrefaction, and thus a supply of perfectly fresh food is provided. The species of *Bembex*, which visit their burrows periodically, kill their prey outright, as it is to be devoured at once.

Of the Diptera, or true Wasps, the very common *Vespa vulgaris* is a good representative. The hibernated females, or queens, appear early in the spring and at once proceed to select a suitable spot for nest-building. A hole in a bank, especially under a stout root of a tree, is generally the favoured situation. In this the queen Wasp makes a nest of a small number of cells, suspended mouth downwards by a stalk from the roof. The whole of the structure is made of the pulp formed by the chewing of wood from a well-seasoned post or fence. Wasps are practically omnivorous. The queen carefully tends and feeds the grubs which are hatched from eggs laid in the cells mentioned, until the time when they are full-fed. When full-grown they spin a covering to the mouth of each cell, and quickly undergo the change to the perfect insect. As soon as they emerge, they take on all the work of building and enlarging the nest, feeding the larvæ, and keeping all clean, the queen having but little to do except laying eggs.

The Hornet is simply a large species of wasp, brown and yellow in colour, instead of black and yellow, as in the ordinary wasps. Although occasionally nesting underground, it more often builds in a hollow tree, or in the roof of an out-house.

The British Tree-wasps, *V. sylvestris* and *V. norvegica*, usually build in branches of trees or bushes, but the first named occasionally builds underground.

*V. austriaca*, which is rare as a British species, is suspected of being an inquiline, living in the nests of other wasps.

The different species of Solitary Wasps, such as *Eumenes* and *Odynerus*, make cells of mud, either attached to twigs, or in holes in walls, or in the ground. They provision their nests with caterpillars.

A Javan species of *Zethus*, though structurally belonging to the solitary wasps, lives in large social communities.

We now come to the Bees, and here we find a very much greater general resemblance between the different species, a few only being conspicuously different in colouring.

I have often been asked whether there are other Bees besides the Hive Bee, and one or two kinds of Humble, or Bumble Bee. There are about two hundred species of Bees in England alone, and they are very much more numerous in warmer regions.

Of our British Bees, only the Hive Bee, and the different species of *Bombus*, are social in their habits, living in communities and all working for the common welfare.

The members of the other genera are solitary, in as much as each bee makes a separate burrow. There may be colonies, consisting of a dozen or so, or even of some hundreds, of these burrows placed near together, but each of these burrows is quite independent of all the rest.

All the Bees, with the exception of three or four genera of Cuckoo Bees, as they are called, construct cells, in which is placed, in some cases honey, and in others a mixture of honey and pollen, and on this the larva, or grub, subsists.

First on our list of Bees comes the genus *Colletes*, comprising a small number of very pretty little Bees, found only when the summer is well advanced. They fly about in the hottest sunshine, together with *Megachile argentata*, *Saropoda bimaculata*, and a few others of similar habits. All Bees are fond of plenty of sunshine, but those I have just mentioned are most numerous, and most lively in places where the sand is so hot as to be unpleasant to walk upon.

With the exception of one large species, found only on sand-hills near Liverpool, and which is more like a Hive Bee in appearance, the members of this genus are much

alike, the prettily-banded little *Colletes Daviesana* being the most common. It burrows in hard sandy banks, often taking advantage however of a layer of softer sand between harder rocks. The cells which are placed in these burrows are very beautiful objects when fresh, but get duller when kept for some time. They are constructed of a very delicate membrane, which has been compared to gold-beaters skin. Each cell contains honey and pollen, and one egg, and they are placed end to end in rows of about half-a-dozen.

We now come to a number of very small coal-black, shiny Bees, with minute patches of delicate white pubescence, which form the genus *Prosopis*. Some of the foreign species are more or less red. They were at one time thought to be inquiline in their habits, as they have no pollen brush, but they are now known to construct delicate membranous cells, somewhat like those of *Colletes*, but much smaller, in bramble stems, holes in walls or posts. The late Frederick Smith records an instance in which one of these little Bees had chosen a hollow flint-stone, which on being broken open, was found to contain a number of cells, some containing perfect Bees. I have bred *P. brevicornis* from perforated bramble-stems collected near Fairlight Glen, at Hastings.

*Sphecodes* is another genus of small Bees with very little pubescence, but instead of being black, as in *Prosopis*, they are mostly black and red. This genus has been the subject of much controversy, some asserting that the various species are inquilines, quartering themselves on species of *Halictus*, while others maintain that they make and provision their own burrows. The former view is that which finds general acceptance at the present time. The circumstances which support this view are these:—The two genera are found in the same situations and in mixed colonies; they are destitute of the usual pollen-collecting organs; each species varies greatly in size, which is usually the case in known inquiline or parasitic insects; their ordinary behaviour is suspicious, as they appear to be always watching and dogging the movements of the *Halictus* females, much

in the same way as *Chrysis ignita*, a well-known parasite ; and then we have the evidence of several trustworthy observers, that certain species of *Sphcodes* are always found associated with certain species of *Halictus*. *S. pilifrons* and *H. leucozonius*, *S. similis* and *H. notatus*, *S. spinulosus* and *H. nanthopus*, are mentioned as occurring together, or being alike absent from certain definite localities. For my own part, though the evidence is very strong against *Sphcodes*, I consider the case as yet "not proven." That they are found together in mixed colonies is only what might be expected from two genera of similar habits. Both *Sphcodes* and *Halictus* are found in places where their small burrows can be made with facility, and in places that are somewhat protected from the cold winds of early spring, and which receive all the sunshine possible at that time of the year, when the hibernated females of both genera appear. That they are destitute of the usual pollen-collecting organs is not in itself any proof, as they also absent in *Prosopis*, which is now known to construct its own cells. Moreover, Dr. Sichel, of Paris, states that *Sphcodes* carries pollen on the head and clypeus, and also that it discharges honey. The variation in size is not peculiar to inquilines, as it occurs to a very large extent in males of the genus *Andrena*. The peculiar sneaking behaviour of *Sphcodes*, and its association with particular species of *Halictus*, are, I think, the two strongest points in the evidence against *Sphcodes*.

Our largest genus of British Bees, to which about a quarter of the total number belong, is *Andrena*. It is almost world-wide in its distribution, extending from Lapland to New Zealand, but unknown from South America.

Many species of *Andrena* are amongst our earliest spring Bees ; *A. Clarkella* I have taken as early as the 19th of February. Some of them form very extensive colonies while others are more solitary in their habits. They burrow into the ground, sometimes in a bank, but often in a hard pathway, to a depth of from six to ten inches. Each burrow is said to have short ones branching from it, but some that I have examined have apparently been quite simple.

At the end of each is stored a pellet of honey and pollen, on which the larva feeds. The early spring *Andrenæ* often assumes the perfect state in the autumn, and sometimes make their appearance then, but usually they remain in their burrows till the spring. A most interesting little parasite of *Andrenæ* is an insect called *Stylops melittæ*, though possibly two or more species go by this name. The *Stylops* is sometimes placed, with one or two allied genera, in an order by themselves, called the Strepsiptera, from the twisted wings of the male. They are now usually regarded as aberrant Coleoptera. *Stylops* is of small size, the male being about one-eighth of an inch in length. Its wings are milky white. The female *Stylops* is wingless and never leaves the body of the bee, where it can often be seen protruding between the segments of the abdomen. Smith says that if the Bee containing the female *Stylops* is kept alive for some days, the whole abdomen of the Bee will appear to be covered with a very fine dust. These specks of dust are the larvæ of the *Stylops*. When the Bee visits a flower, some of these larvæ are left behind, and attaching themselves to other Bees they are carried to other cells. From one to four specimens of *Stylops* can often be found infesting a single *Andrena*.

Coming now to the Cuckoo Bees, which get the name from their habit of depositing their eggs in the cells of other bees, we first notice those of the genus *Nomada*. They are not at all like bees in their general appearance, in fact, most people who are not entomologists would call them wasps, the greater number of them being conspicuously banded. Although many of them are very common, but little is known of their habits. It is thought that the *Nomada* deposits an egg on the mixed honey and pollen which has been collected by its host, and that it then closes the cell. At all events the *Nomada* has frequently been taken carrying pellets of clay attached to the posterior tibiæ. They are mostly, but not exclusively attached to *Andrena*. *N. sexfasciata* is associated with *Eucera longicornis*, a curious-looking long-horned bee, and *N. Fabriciana* is found with *Panurgus ursinus*, a jet-black bee found

on Hawkweed in June. *Nomada* has also been recorded as being attached to *Halictus*. This is now generally regarded as doubtful, though I have taken the little *N. furva* apparently associated with *H. morio*. The species of *Nomada* all emit a fragrant odour, especially when fresh-caught.

Another prettily-marked Cuckoo Bee is *Epeolus*, of which we have two closely allied species. It is found with *Colletes*, and is often quite common where large colonies of *C. Daviesana* occur. It is curious that, though many of the larger bees have very weak stings, both *Epeolus* and *Colletes* can sting very severely, and one has to be somewhat careful in taking them from the net when captured.

Two handsome Cuckoo Bees, black, with patches and spots of white pubescence, are *Melecta armata*, and *M. luctuosa*, both attached to our Mason Bee, *Anthophora pilipes*, though *M. luctuosa* also occurs with *A. retusa*.

Another striking looking genus of Cuckoo Bees is *Cælioxys*, coloured somewhat like *Melecta* but with the abdomen tapering off rapidly to a point. We have six British species. They are mostly attached to the Leaf-cutter Bees, *Megachile*, though also occurring with *Saropoda* and *Osmia*.

The genus *Osmia* is universally admitted to contain some of the most interesting of our British Bees. *O. rufa*, one of our early spring bees, will either make its own burrows, or as is more often the case, avail itself of any hole suited to its requirements. Key-holes it is particularly fond of, though a hole in a wall or a post will suit it as well. Smith records an instance where one took possession of a fife, in which it had constructed fourteen cells, and had commenced a fifteenth. *O. leucomelana* sometimes burrows in the ground, particularly if the soil is sandy, but it more often excavates the pith from old bramble-stems. The very rare Cuckoo Bee, *Stelis octomaculata*, is associated with this *Osmia*. Another of the genus, *O. fulviventris*, is, I think, always found burrowing into old or decaying wood, and with it occurs *S. phoeoptera*. *O. xanthomelana* I have never met with. It is said to construct its cells of mud,

somewhat pitcher-shaped, rough on the outside, but very smooth inside. They are nearly half an inch long, and are closed by a sort of lid at the top. Five or six of such cells are said to be found in each nest, which is usually placed at the roots of tufts of grass, though occasionally underground. Smith also describes the habits of *O. parietina*, a species which does not occur in the south of England. According to him, the bee attaches its cells to the under side of a stone lying in such a way on the ground as to have a hollow space beneath. A stone presented to the British Museum, and measuring ten inches by six inches, had no fewer than 230 cocoons attached to it. Some of the bees did not emerge from these cells until three years later. *O. bicolor* and *O. aurulenta* often construct their cells in empty snail-shells, and the same habit has been recorded of *O. rufa*. When using small shells, such as *Helix nemoralis*, or *H. hortensis*, the cells are placed singly, one on the other, until the shell is full; but in larger shells such as *H. pomatia*, two or more cells are placed side by side. At the foot of sea-side cliffs *O. aurulenta* will sometimes use empty whelk-shells.

There is a very interesting account by Mr. V. R. Perkins, in the "Entomologists Monthly Magazine" for 1891, of his observations of *O. bicolor*. He noticed them often collecting small dry sticks and bents, and for some years he was puzzled to think what the bees did with them. One day, however, crawling on his hands and knees where the *Osmias* were flitting about a sunny bank, he saw one of the bees fly up from a little pile of these bents; and on examination, he found under it a snail-shell full of the cells of the *Osmia*. These mounds he describes as being like miniature nests of the Wood Ant, from four to six inches in circumference, and about two inches high. They probably serve to protect the shell and its contents from the effects of the weather, and also to hide it from birds and other enemies.

A continental *Osmia*, *O. papaveris*, is in the habit of cutting pieces from the petals of the scarlet poppy to line its cells with, whence it gets its name of the Poppy Bee.

The Carpenter Bees, of the genus *Xylocopa*, are very hard-working insects. They make their burrows in a wooden post or decaying tree-trunk, often to the depth of about twelve inches. A small mass of honey and pollen is placed at the end of the burrow and an egg deposited. The cell is then closed with the wood dust that is produced by the excavating, well kneaded together. Another pellet of honey and pollen, and another egg, is then deposited, and so on until the tunnel is nearly filled.

Although we have no species of *Xylocopa* in this country, the Carpenter Bees are represented here by the very much smaller species of *Chelostoma*, which also burrow in old posts, and by the brilliant coloured *Ceratina*, which prefers to make use of bramble stems.

*Anthidium* is represented by a single species only in this country, and is the only British bee in which the male is larger than the female. This bee, which is rather striking in its appearance, can often be seen in the hot summer months scraping the downy substance from the stems and leaves of various plants. With this it lines a hole in a tree or post, or any other similar cavity. Although I have often watched this bee collecting the material for its nest, I have never yet seen the nest itself. Smith says: "The cells are not arranged in the systematic order usually observable in bee architecture; they are composed of a thin semi-transparent membrane, each cell being closed with similar membrane after being stored with a suitable supply of pollen and honey, upon which an egg has been deposited; in this manner, cell after cell is constructed, until the cavity chosen is filled with a suitable number."

The Leaf-cutter Bees, of the genus *Megachile*, are a number of very interesting species. They get their popular name from their habit of cutting pieces out of leaves of trees and petals of flowers. The leaves of the rose tree are frequently used. All our British species burrow either into the ground, or into decaying wood. One African species is said to burrow into the sides of the hard nests of a species of *Termes*, or "White Ant." The burrows, whether in the earth, or in wood, are lined with more

or less oval cuttings of leaves, a number of circular pieces being placed at the end, and also between the different cells, which are placed end to end in the burrows.

*Eucera longicornis* is chiefly remarkable for the very elongate antennæ of the male, which are as long as the whole insect. The bee is usually found burrowing in clayey soils, where a very smooth-walled chamber is constructed at about six inches under ground, and a store of honey and pollen provided.

The British Mason Bee, *Anthophora pilipes*, is so called because its cells are made so beautifully smooth on the inner surface. The female is black, and the male tawny with the intermediate pair of legs beautifully fringed. A tawny form of the female occurs on the continent. It is one of our very early spring species.

The Humble Bees, belonging to the genus *Bombus*, are fairly well known, some of the species being common everywhere. Their life history, in many respects, resembles that of the Wasp. The food provided, however, is different from that provided by any of our British Wasps for their progeny. The hibernated female Humble Bee appears in the early spring, and is soon engaged in searching for a suitable place for nest making. The choice varies with different species, *B. agrorum*, the "Moss Carder" Bee, and its allies making a nest of moss or hay on the surface, as also does *B. sylvarum*. The majority, however, nest underground. Sometimes an old birds nest is chosen. A heap of pollen is collected and eggs laid. These hatch soon and the grubs feed on the pollen. When full-fed they spin a tough cocoon, and the change to the perfect state is soon undergone. The first batch are always workers, who now take on all the work of enlarging the nest, collecting and storing pollen and honey, and so on. The first workers to be observed are those of *Bombus pratorum*. These are usually on the wing by the end of May. The females and males are the last to appear.

The species of *Psithyrus* closely resemble the *Bombi* in appearance. It has long been known that they lay their eggs in the nests of various Humble Bees, each species

being attached to one, or in some cases to two species of *Bombus*. From recent observations made by Mr. Sladen, it appears that in some cases, at least, the female *Psithyrus* kills the original owner of the nest and makes little wax cells on some portion of the comb for her own eggs.

We have now come to the end of the short number of Hymenoptera that I shall speak of in this paper. Of the Hive Bee it would be almost impossible to speak, without devoting a paper to it entirely. There are many other very interesting bees that I have not mentioned at all, and about which I may have something to say at a future date.

My paper has necessarily been rather "scrappy," owing to the number of species that I have spoken of. It would only be by taking one genus, or, in some cases, one species, that anything like a detailed account could be given.

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Dr. T. A. Chapman, F.Z.S., exhibited and made some interesting observations upon Spanish Butterflies collected by himself. The rare and beautiful specimens shown were much admired.

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MEETING held at Reigate, April 25th, 1902.

Present—29.

Mr. A. J. Crosfield exhibited some very beautiful examples of dried plants he had collected in California and explained the very successful methods of preserving them he had adopted. The colours of the majority were quite true to Nature.

Mr. C. E. Salmon exhibited some specimens of a Sea Lavender, *Limonium lychnidifolium*, var. *corymbosum*, collected on the West coast of France. It has lately come under the notice of British botanists, being discovered last year in Alderney. A reprint from the Journal of Botany, describing this species was presented to the club. Mr. Ernest S. Salmon then gave a Lecture entitled "Wanted: Field Workers."

## WANTED: FIELD WORKERS.

Whilst investigating lately a certain group of fungi, I have been much struck by the fact that there exists a certain kind of botanical work which is especially suitable for the members of a country Natural History Society to undertake.

If a botanist is working at the anatomy of plants, or at physiological problems, then he requires the delicate scientific instruments and accessories only to be found in laboratories; if he is engaged in systematic work, then, in order to monograph any group of plants he requires to work at the national herbaria, where access is to be had to types, *i.e.* the actual specimens from which the original descriptions were drawn.

But there exists, further, a kind of botanical work—of great scientific value—which, so to speak, must be performed in the laboratory of Nature. *This is Field Work.*

In the group of fungi which I have been studying, there is need of Field work being done to solve three problems connected with their life history.

In order to understand the nature of these problems, I must briefly describe the characteristics of these fungi.

The group is known as the *Erysiphaceæ*, or White Powdery Mildews. They are parasitic fungi, attacking a great number of common flowering plants, on the surface of the stems or leaves of which they form white cobwebby patches. They are extremely common, and are superficially, at least, known to most people. They cause considerable damage to many cultivated plants; *e.g.* there is the Rose Mildew, which covers with white powder the leaves of wild and cultivated roses; the Hop Mildew, to guard against which farmers sulphur their hops every year; the Vine Mildew, prevalent in all the vineyards of Europe and America. There is also the Gooseberry Mildew, the Strawberry Mildew, the Pea and Bean Mildew, the Corn and Grass Mildew, the Apple, Pear and Cherry Mildew, &c.

To anyone walking in the country, the white patches caused by the *Erysiphaceæ* must have been frequently

noticed on many wild plants, e.g. on *Burdock*, *Polygonum aviculare*, *Heracleum Sphondylium*, Meadow Sweet, Willow Herbs, Plaintain, &c.

Such are the characteristics and the life history, so far as it is known, of the *Erysiphaceæ*. Now I want to point out that in connection with this group of fungi there exist three problems—solutions to which could, I believe, be furnished by patient field work. These problems are not only of great scientific interest, but one of them is of very considerable economic importance. These problems may be presented in the form of three questions:—

First. How do the *ascospores* infect plants?

Now in books it is stated that the ascospores are incapable of germination when produced in the autumn, but “in the Spring germinate and infect fresh host-plants.” This bald statement—“in the Spring the ascospores germinate and infect fresh host-plants,” is all that one finds on the subject; and, when one enquires for details, it is found that this vague statement even rests on assumption. No details are forthcoming of the process as it must take place in Nature. We must remember that these perithecia are produced on the leaves of deciduous plants; in the autumn the leaves bearing the perithecia fall with the rest, and rot on the ground. How do the ascospores then find their way in the spring to fresh hosts? In the case of the species *Phyllactinia corylea*, which grows on trees—such as the oak, ash, beech, &c.—how do the ascospores get from the ground to the top of such tall trees?

Keeping to stern facts of observation, we have only one little piece of fragmentary knowledge on the subject. In 1874, Wolf, a German botanist, succeeded in germinating in a drop of water the ascospores of the Grass Mildew. These germinating ascospores when placed on a leaf of grass penetrated the cuticle and formed haustoria. This is the single positive result obtained up to the present on the subject of infection by ascospores.

Of course, theories rush in. One mycologist has stated his belief that the ascospores germinate in the humus of the soil, and there produce myriads of very minute, yeast-

like cells, which being very light and small, are blown by the wind to the host-plant.

The view has also been advanced that fresh infection in the Spring may be caused, not by ascospores, but by hibernating conidia, or by hibernating mycelium. This view has one very strong fact to support it, for it certainly does seem as if occasionally a mildew is able to appear year after year and yet never produce ascospores.

There is this well-known, historic example :—

In 1847, the British mycologist, Berkeley, described under the name *Oidium Tuckeri*, in the "Gardeners' Chronicle," a fungus which was attacking grapes at Margate. This *Oidium Tuckeri* appeared almost immediately in all the vineyards of the Mediterranean, and by 1851 it caused wholesale destruction throughout vast grape-growing districts in France, Switzerland, Germany, Italy, Spain, Algeria, and Asia Minor. So complete was the devastation caused by this mildew that, in consequence, in many districts the vineyards were destroyed. For several years hundreds of thousands of pounds were lost to the vineyard owners. Now, although the fungus was so terribly prevalent, no perithecia were found in connection with it for the first forty-seven years of its occurrence, the conidial form of the fungus alone being observed year after year. We may feel pretty sure that really no perithecia were produced, at any rate for the first ten years or so of its occurrence, because, so to speak, a price was set upon the head of the fungus.

The governments of the countries affected (at least those governments which patronize Science—the English government was not among the number) offered large sums of money to induce botanists to investigate fully the life-history of the fungus. Notwithstanding this, no perithecia could be found by investigators.

Not until 1892 was this form of fruit discovered in France, when a few perithecia were found in one vineyard. Last year I received from Germany a few perithecia which had been produced on the stalk of a bunch of grapes.

It seems impossible even now, when perithecia are apparently beginning to be formed by the fungus, that the

general infection of the vineyards in the spring can be caused by the ascospores of the few perithecia produced; and vinegrowers are still firmly of the opinion either that the mycelium hibernates in crevices of the bark or that the conidia are capable of living through the winter.

We see, therefore, that there is reason for refusing off-hand to accept the statement that every year infection is always caused by ascospores, and we see, further, how valuable any definite knowledge on the subject would be. Now, by field-work, some light could, I think, surely be thrown on this problem. Every year in the Spring we see mildews re-appearing on their host-plants. There are several ways one could work at the solution of the problem. One might collect a great number of leaves on which perithecia occurred, in the autumn, and keep them *under natural conditions* through the winter; then in spring, fix the fragments of dead leaves and their perithecia to the fresh living leaves of a host-plant, and watch if—and how—infection takes place. Or again, one might keep a sharp look out during the spring months for the *first* appearance of mildew on leaves, and then under the microscope examine such leaves, and see if germinating ascospores are present.

Now for the second question. Why do perithecia become reversed?

The phenomenon of the reversal of the perithecium takes place in two genera of the *Erysiphaceæ*—in *Phyllactinia* and *Uncinula*. In *Phyllactinia*, as the perithecium becomes fully ripe, the spine-like appendages, which are bulbous at the base, turn downwards, so that the perithecium finally comes to stand on the points of its reflexed appendages.

Now at this time a drop of mucilage is found on the apex of the perithecium. This drop of mucilage is produced by the breaking down of the walls of certain penicillate cells, which are outgrowths from the apex of the perithecium.

When the perithecium falls off from the leaf—which it readily does when the appendages are in the position shown

in the diagram, the apex of the perithecium with its drop of mucilage usually comes into contact with a new substratum. This is frequently the leaves of various plants which grow underneath the trees on which the *Phyllactinia* occurs—such as Violets, Plantain, Dogs' Mercury, &c. Now under certain conditions, chiefly atmospheric—the mucilage sets hard, with the result that the perithecium becomes fixed upside down on the new substratum. So firm is this re-attachment that it requires, relatively, considerable force to remove the perithecium with a needle.

It is only quite recently that this curious phenomenon of the turning over and re-fixing of the perithecium has become known. Previously it had been the cause of leading systematists into error. In the first place the various plants (herbs growing under the trees on which the *Phyllactinia* occurs), on to the leaves of which the perithecia have fallen and have become re-fixed, have been and are still given as *true host-plants* of the *Phyllactinia*, whereas in reality *Phyllactinia* is absolutely confined to *trees*. Further, when perithecia have fallen off they have frequently become re-attached to the *upper* surface of leaves, either of their own tree or of plants underneath. This had led to the false description of the fungus as being sometimes epiphyllous, whereas it is always, when really growing, truly *hypophyllous*, *i.e.* confined to the lower surface of the leaf.

Thirdly, the phenomenon has been the cause of the making of two supposed new species, and, moreover, wonderful species while they lasted!

In 1882, a fungus was described under the name of *Phyllactinia fungicola*, and was stated to be parasitic, not, like the rest of the *Erysiphaceæ*, on the leaves of flowering plants, but *on another fungus*, *i.e.* on the pileus of *Boletus duriusculus*, a fleshy fungus belonging to the *Polyporeæ*. This *P. fungicola*, however, proves to be founded simply on perithecia of *P. corylea* which, falling off from the leaves of a tree above, had become re-affixed to the pileus of the *Boletus* growing underneath.

In 1899, curiously enough, a similar error was repeated. A fungus was described, as one of the *Erysiphaceæ*, under

the name of *Erysiphella Carestiana*, as growing on the pileus of another fungus, viz. : *Fomes fomentarius*, one of the *Polyporeæ*. This was simply *P. corylea* again. In this case after the re-attachment had taken place, the appendages had become broken off, so that the fungus was put into a wrong genus.

In *Uncinula*, the other genus in which the reversal of the perithecium takes place, no special outgrowths occur, for the purpose of re-attaching the perithecium, but this function is performed by the apices of the appendages. When the perithecium becomes turned over, the walls at the apex of some of the appendages become somewhat mucilaginous and finally fixed to the surface of the leaf.

Again this phenomenon has caused disaster to systematists. In 1893, an American botanist described an *Uncinula* from the U.S. as *U. Columbiana*, and described it as growing on the leaves of a *Scutellaria*. The fungus was really only the old and well-known species, *U. Salicis*, which grows on willows and poplars. Perithecia of this species had merely fallen off from some tree or shrub of poplar or willow near, and become affixed by its appendages to the *Scutellaria*.

Further, in 1899, a Swedish botanist, Vestergren, described as a new strange variety of the same species, *U. Salicis*, a fungus under the name of *U. Salicis* var. *Epilobii*, growing on *Epilobium angustifolium*. Again, this proved to be founded merely on perithecia of *U. Salicis*, which had become attached to leaves of the *Epilobium*.

Lastly, Sredinski has lately described as a great novelty *U. Salicis*, occurring on Ivy. There is little doubt that here also the same error has been made, that the *Uncinula* is not, as supposed, really parasitic on the Ivy.

Now, *why* do the perithecia become reversed and re-affixed? No one knows.

Until the explanation has been found, it may be feared that at some time some one will start a theory that Nature has planned it all for the express purpose of leading systematists into error, and that a law exists, comparable to the physical one, viz. : "that Nature abhors a systematist!"

I feel convinced that a little patient field work would solve this problem. In the case of *P. corylea* the field worker should search under trees attacked by *Phyllactinia* for perithecia which have fallen off and become re-attached to leaves of the plants underneath. These leaves should be kept under observation, with the view of seeing if the ascospores really do escape from the base of the perithecium, as we must suppose them to do.

In the case of *Uncinula*, it must be noted, we do not know what causes the perithecium to turn over, as, unlike *Phyllactinia*, it is certainly *not* caused by the appendages. The field worker should observe closely at the beginning of autumn the common Maple Mildew, *Uncinula Aceris*, very common on the maples in the hedges about here. The perithecia of this Maple Mildew are very large, and therefore suitable for observation. The whole work could be done with a lens. Search should be made until some perithecia of this Maple Mildew are found turned over. The leaf should then be kept under close observation until the turning over of a perithecium is actually seen in Nature on the living leaf. The exact conditions under which the reversal took place should be carefully noted.

The third question is : Do biologic species exist in the *Erysiphaceæ* ?

This problem is the most interesting one, on account of the bearing it has on several interesting scientific subjects, and also on account of its great economic importance.

First, I must explain what mycologists mean by the term "biologic species."

About 1890, Dr. Jacob Eriksson, of Stockholm, made a number of careful experiments with certain parasitic fungi. These fungi belong to the genus *Puccinia* (of the *Uredineæ*). They are parasitic on cereals, and are popularly known as "rusts."

Eriksson found that the rust growing on (say) *Rye* (although identical in all its characters, even to the shape, size, and marking of its spores, under the microscope, with the rust on *Oats*) was not able to infect oats ; and conversely, the rust on oats could not infect rye.

The same state of things was found in the case of the rust of wheat, barley, brome grasses, &c.

We may state it thus : We have two forms or species (*a*) and (*b*), which *morphologically* are indistinguishable, showing even under the microscope no differences. Yet these two forms are essentially distinct *physiologically* or *biologically*, since we find that (*a*) can attack and live on only a certain host or hosts *x*, while (*b*) can only attack and live on other host-plants *y*. Such a form is called a biologic species.

Eriksson found in the case of these rusts that the seven species of rusts attacking cereals, described by morphologists, consisted really of no less than thirty "biologic species."

Some systematists are inclined to treat these "biologic species" with contempt. This is not surprising perhaps, considering what systematists are! and that the acceptance of the fact of the existence of biologic species prevents the systematist, pure and simple, from being that absolute king over his own dominion which he usually considers he has a right to be. In the old days, ten years ago, before Eriksson's time, if a parasitic fungus occurring on a host-plant—which we will call (*a*)—had been taken to a systematist he could have said with immense confidence : "This fungus is such and such a species!—notwithstanding the fact that this species has not hitherto been recorded on this host, because I have examined it microscopically, and it is identical."

Now-a-days, if he is a conscientious systematist, he can only say : "I have examined the fungus, and it agrees morphologically with such and such a species, but it may be quite distinct *biologically*."

Now, it is obvious what great economic importance is attached to the problem : Do biologic species exist in the *Erysiphaceæ* ?

Take the case of the Hop Mildew, *Sphærotheca Humuli*. This name was given by De Candolle in 1805 to the mildew growing on the Hop. Since then a form *morphologically* the same has been noted on twenty or thirty spe-

cies of plants, many of them common weeds of some hop gardens. Now, are these latter *biologically* distinct, *i.e.* are they capable or not of passing over on to the Hop and infecting it? If they are *biologically* distinct, farmers need not fear the presence of mildewed weeds in the hop garden, while if not biologically distinct, then farmers must be taught the necessity of cutting down certain weeds.

Returning to the question, *Do biologic species exist in the Erysiphaceæ?* let us first review the existing evidence on the subject.

The experiment of taking the conidia of a mildew growing on one host-plant, and sowing them on the leaves of another plant has been performed by three botanists.

1. Prof. Magnus, a well-known German botanist, took conidia of the Hop mildew from a hop leaf and placed them on the leaves of the Dandelion. After a few weeks, an *Oidium* was observed on the Dandelion leaves, due according to Magnus, to infection by the conidia of the Hop mildew. This experiment is unsatisfactory and quite inconclusive for two reasons. It is not stated that after the Dandelion leaves were sown with the conidia of the Hop they were guarded from subsequent infection by the conidia from other sources, and secondly, the mildew that is known to occur in Nature on the Dandelion, is *never* the Hop mildew. Dandelions are common in or near hop-gardens, so that if the Hop mildew were able to live on them, specimens would almost certainly have been collected on them.

2. Iwanowsky observed an *Oidium* on the leaves of some *Compositæ*, especially *Inula Helenium* and *Lappa tomentosa*. He took the conidia of this and sowed them on the leaves of the Tobacco plant (*Nicotiana Tabacum*). In a little time an *Oidium* appeared on the Tobacco, caused, according to Iwanowsky, by infection from the conidia of the *Compositæ*. No details are given of the experiment. We are not told if the Tobacco plants were guarded against infection from other sources. If we accept the conclusion, the experiment shows that an *Oidium* can pass from the leaves of plants belonging to the *Compositæ* to a plant belonging to the *Solanaceæ*.

3. Professor Neger, of Munich, states that conidia of the mildew on *Ranunculus* will infect *Galium silvaticum*. In this experiment the *Galium* plant was protected by a bell-jar. Neger observes that the *Oidium* they produced on the *Galium* had larger conidia than those of the *Oidium* on *Ranunculus*. Again, the results of this experiment are unsatisfactory, because in Nature according to all experience, the Mildew on species of *Galium* is not the species which occurs on *Ranunculus*.

Finally, Dr. Palla observed that in certain districts of Germany, *Phyllactinia corylea* attacks only bushes of barberry and hazel trees, notwithstanding that the trees, such as hornbeams, beech, birch, ash, &c., which in other districts are attacked by *Phyllactinia*, grew intermixed with the barberry and hazels. From this observation Palla considers that the morphologic species, *Phyllactinia corylea*, represents a collection of *biological* species, each capable of growing only on certain host-plants.

This is the whole of the existing evidence on the subject of the existence or not of biologic species in the *Erysiphaceæ*. We see how inconclusive and fragmentary are the few experiments that have been performed.

There is, I am convinced, a rich opportunity for the field-worker. There are numberless cases where out-of-door observations are required. For instance, every season in the autumn one notices that the leaves of the Vegetable Marrow become covered over with a mildew. This mildew is always found only in the conidial (*Oidium*) condition. Now where does the mildew come from? The field-worker should take conidia from the mildews growing on any surrounding plants, and try to artificially infect the vegetable marrow.

Indeed, so meagre is our knowledge on the subject of the *biological* characters of the *Erysiphacæ* that the successful infection of any one host-plant by means of conidia taken from another would be a fact of really scientific importance. Of course it would be important to note all such details as atmospheric conditions, constitution of host-plant, time of year, attending the experiment.

Everywhere Nature is performing successful infection-experiments. We need careful and patient field-workers to record how they are accomplished.

Numerous diagrams illustrating the life history of the *Erysiphaceæ* were exhibited.

### ANNUAL MEETING

held at the Museum, Old Town Hall, Reigate, Oct. 31, 1902.

The Annual Report and the Balance Sheet were read and adopted.

### ANNUAL REPORT.

Nine resignations from the Club have, unfortunately, to be recorded during the past year, but the welcome addition of ten new members and eight subscribers brings the total membership to 87—a larger number than for several years past.

The Evening Meetings were well attended and dealt with many interesting subjects, the following being a list of the papers given:—

#### 1901.

- Oct. 25. From Cloud to Glacier, by Mr. A. B. Harding.  
 Dec. 6. Reports of Excursions, and Delegates' Reports of the South Eastern Union Congress at Haslemere, and the British Association Meeting at Glasgow.

#### 1902.

- Jan. 24. Irish Folk and Fairy Lore, by Mr. H. Ringwood Peach, LL.B.  
 Feb. 28. The 1900 Total Eclipse of the Sun, by Mr. J. B. Crosfield, and A Visit to the Millport Biological Station, by Miss E. Sargent.  
 March 21. Some habits of the Hymenoptera, by Mr. G. E. Frisby, and Remarks on some Spanish Butterflies, by Dr. T. A. Chapman, F.Z.S.  
 April 25. Wanted: Field Workers, by Mr. E. S. Salmon, F.L.S.

The lectures were illustrated by lantern views, diagrams and specimens.

On March 6th, 1902, a Special General Meeting was held to discuss a suggestion to remove the existing Museum in the Public Hall, Reigate, to the Old Town Hall in the Market Place. After some discussion it was decided that it would be advisable to do so, if the Old Town Hall could be obtained for this purpose on reasonable terms.

At a subsequent Meeting it was announced that the upper floor of the Old Town Hall had been secured for a term of three years, as a Museum, and the Rev. R. A. Bullen, Mr. J. B. Crosfield, and Mr. C. E. Salmon were appointed Trustees.

The contents of the room at the Public Hall have since been transferred to the new premises and are now in course of being systematically arranged by an experienced curator.

As this matter entails a great deal of expense, it is to be hoped that special funds will be forthcoming to allow the collections to be properly displayed in show-cases and cabinets, so that a Museum may be formed that will prove a boon to the Town and one worthy of the traditions of the Club.

The following Societies have presented their publications to the Club. Proceedings of the Bath Natural History Club for 1901; Report and Transactions of the Belfast Natural History and Philosophical Society for 1900-1; Report of the British Association for 1901; Transactions of the Burton-on-Trent Natural History Society for 1898-99; Proceedings of the Croydon Microscopical and Natural History Club for 1901; Report and Transactions of the Nottingham Naturalists' Society for 1900-1; The Rochester Naturalist for October, 1901, and January and April, 1902; The South Eastern Naturalist for 1901.

The Rev. R. A. Bullen, F.L.S., has kindly presented to the Club, eight parts (Botany) of the Journal, and six of the Transactions of the Linnean Society. Mr. J. Linnell has given the Naturalists' Directory for 1902, and Mr. C. E. Salmon reprints from the Journal of Botany.

During the summer the following excursions took place :

WHOLE DAY.

- May 19. Ewhurst and Pitch Hill.  
 June 21. Frensham Ponds.  
 July 19. Ashdown Forest.  
 Sept. 20. Worplesdon.

AFTERNOON.

- April 26. Albury Heath and Albury.  
 July 6. Betchworth (with Croydon Club).  
 Sept. 6. Burford Bridge and Bookham.

Excursion to Thursley Common and Frensham Ponds, June 21st, conducted by Mr. J. B. Crosfield.

Nine members and friends took part in this excursion, a somewhat uncertain looking morning preventing others from attending this exceptionally fine walk. An early train was taken to Milford and the village soon reached ; from this point, wide stretches of heather and moorland lead away to Frensham and Farnham.

Close to Milford, several interesting plants occur, and the following were collected :—*Geranium lucidum* (very locally distributed in Surrey), *Lepidium Smithii*, *Hypochræis glabra* (found here and there in sandy districts throughout Surrey), *Claytonia perfoliata* (an alien in Britain, and generally found, as in this instance, near rhododendrons or other introduced shrubs or trees ; it seems to be gaining a footing in some parts of Surrey), and *Potentilla argentea* (this was also seen by a roadside near Farnham Common).

Lovely paths and wild tangled ways, open moorland and bushy common, led over Witley Common to an interesting pond lying in a hollow near Warren Lodge.

At its edge, *Scirpus sylvaticus*, *Carex Curta*, *C. remota* and the scarce *C. Bœnninghauseni* grew, and *Chara fragilis* occurred in the deeper parts in profusion.

A most beautiful walk, across the heather of Thursley Common, brought the party to Frensham Little Pond; on the way *Drosera longifolia* and *Lycopodium inundatum* were

## HOLMESDALE NATURAL HISTORY CLUB.

BALANCE SHEET, Aug. 10th, 1901, to Aug. 15th, 1902.

By	£	s.	d.	To	£	s.	d.
Balance, 1901... ..	10	0	7	Rent and Caretaker.	16	18	2
Subscriptions—				Stationery ... ..	2	4	4
In arrears ... ..	1	10	0	Secretary's account..	1	19	5
37 members ... ..	18	10	0	Treasurer's account..	6	9	
37 subscribers ... ..	9	5	0	Subs. to S.E. Union	10	0	
Sale of Transactions	1	6		Cheque book ... ..	2	6	
Rent from Lit. Inst.	6	0	0	Balance in bank ...	23	5	11
	<u>£45</u>	<u>7</u>	<u>1</u>		<u>£45</u>	<u>7</u>	<u>1</u>

MUSEUM FUND, to time (Oct. 31st, 1902) when transferred to separate account.

	£	s.	d.		£	s.	d.
Mr. Hughes ... ..	5	0	0	Knight (moving) ...	2	0	0
Mr. C. E. Salmon... ..	5	0	0	Mr. Buckman... ..	12	3	2
Rev. R. A. Bullen... ..	50	0	0	Transferred to Mu-			
Dr. Bossey ... ..	10	10	0	seum account ...	102	16	10
Mr. Tyndall ... ..	10	10	0				
Mr. Klein ... ..	5	0	0				
Mr. S. Salmon ... ..	10	0	0				
Mrs. Cudworth ... ..	10	0	0				
Mr. Poulter ... ..	1	0	0				
Mrs. Sargant ... ..	5	0	0				
Miss E. Sargant ... ..	5	0	0				
	<u>£117</u>	<u>0</u>	<u>0</u>		<u>£117</u>	<u>0</u>	<u>0</u>

seen, and swamps of waving Cotton-Grass here and there were dotted about.

In the pond, white Waterlilies were flowering and on its beach-like margin the little Plantain Shore-weed (*Littorella lacustris*) flourished; drifted to the shore, *Ranunculus circinatus* was also seen but in no great quantity.

The day was now nearing its end, so a hurried walk to Frensham Great Pond, and a still more hurried tea at the Inn, culminated in a sharp five mile burst to Farnham Station, where the train was luckily caught, but with little to spare.

Little botanising could be done the latter part of the walk, but *Corydalis claviculata* and *Arabis perfoliata* were noted by the roadside near Frensham.

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July 5th.—This was really a Croydon Club outing, for when I reached Betchworth Station I met six members of the Croydon Club, under the guidance of Mr. Whitaker, but no members of our own Club.

The weather was fine, though somewhat sultry, with a dark belt of clouds very low down on the horizon. Being an afternoon excursion it was too late in the day for many of the more interesting insects to be met with. In the lane leading to the hills were a few Humble Bees, *Bombus pratorum*, *B. sylvarum* and *B. muscorum*, all common species. The last named is the common Moss Carder Bee, but all three of the above-named species will make their nests of moss or dry grass stalks, on the surface of the ground.

Taking a footpath leading in the direction of Reigate, at the foot of the hills we soon met with a few plants more or less interesting to the botanical members of our little party. On a small patch of Umbelliferæ were a few insects, chiefly Coleoptera. Most of these were, of course, the very common *Telephorus lividus*. Another patch of Umbelliferæ, a little further on, yielded a few specimens of *Mordellistena pumila*, a somewhat uncommon little beetle.

A few Weevils were found by beating the bushes over a net with a stick. These were common species of *Apion*,

*Polydrosus* and a single *Balaninus nucum*. The Cardinal Beetle, *Pyrochroa serraticornis*, and two species of *Chryso-mela* completes the small number of *Coleoptera* observed. On the slopes of the hills the flowers of the Viper's Bugloss were attractive to the black variety *Harrisellus* of *Bombus hortorum*. *B. lapidarius* occurred on thistles.

Empty shells of the Apple Snail, *Helix pomatia* were very numerous and a short search soon revealed some living specimens. This and *Cyclostoma elegans* which seems to occur always on chalk, and which is I believe, our only British operculated land-snail were the most noticeable of the Mollusca.

The sky, which had gradually grown more overcast, now looked very threatening, and all haste was made to get to Reigate before the storm burst. The botanists, however, noted several interesting Orchids in the high grass. These, with the exception of a single specimen, were left growing. Our haste proved to have been quite unnecessary, for as we were reaching Reigate the clouds dispersed and the sun shone brightly once more.

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The following Officers were elected for the coming year:—

*President.* Mr. A. J. Crosfield.

*Secretary.* Mr. G. E. Frisby.

*Treasurer.* Miss Ethel Sargant.

*Committee.* Rev. R. A. Bullen, Rev. E. J. Baker, Mrs. Powell, Dr. T. A. Chapman, Messrs. J. B. Crosfield, C. E. Salmon, F. Hughes, J. Linnell, S. T. Klein, A. E. Tonge, and W. H. Tyndall.

The Meeting then resolved itself into an ordinary Evening Meeting.

Present—51.

Mr. Alfred B. Harding, Fellow of the Physical Society, delivered an interesting Lecture entitled "From Noise to Music." The Lecture was illustrated with many interesting experiments and with lantern slides. Glass plates, thinly covered with fine sand, were caused to vibrate in

waves by means of a violin bow, the sand being thrown into a variety of beautiful patterns, each note producing a distinct pattern ; a musical box, enclosed in a number of padded boxes until scarcely audible, was heard very much more distinctly when connected by a thin cane with an empty box, or other form of sounding board. Many other experiments were performed, one with a marvellously sensitive flame, which responded instantly to any noise, even to the ticking of a watch.

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MEETING held at Redhill, Dec. 5th, 1902.

Present—32.

The Secretary exhibited, on behalf of Dr. Chapman, a specimen of a rare Hymenopterous insect, *Gorytes bicinctus*, captured on the window of Dr. Chapman's house at Reigate.

Mr. A. J. Crosfield then gave a Lecture on—

#### THE BIRDS AND PLANTS OF CALIFORNIA.

California is a land of contrasts. Stretching as it does from Mexico to Oregon, between the Pacific Ocean and the great desert, it varies in elevation from 250ft. below sea level in the burning desert of the south to an altitude of 14,000 feet in its highest snow-clad mountain summit.

We entered California by the Southern Pacific Railway from the south, and spent our first six weeks at Pasadena—"the Crown of the Valley"—a delightful little city at the base of Mount Lowe, a peak of the Sierra Madré range, about thirty miles from the ocean, which on clear days is seen glimmering in the sunshine beyond the fertile plain.

My first afternoon introduced me to three species of birds, which proved to be the three most abundant in Southern California, namely Brewer's Blackbird, the House Finch, and the Mocking Bird.

The male Brewer's Blackbird is of a glossy black with bluish and greenish iridescence. He is of a very sociable nature and in manner constantly reminds one of our Starling. He whistles and chirps and tries hard to sing, but without complete success. Towards dusk the flocks sit in

long rows on the telegraph wires, but they are restless to a degree. Each bird seems to think it needful to shift his position every few minutes, till at last the whole flock flies off to roost in the eucalyptus or pepper trees.

Early in May I found a colony of these birds nesting in an orange grove. The nests were usually ten or twelve feet from the ground, and most of them contained newly-hatched young. At the Ostrich Farm it was amusing to see the Brewer's Blackbirds running over the Ostriches' backs.

The House Finch, commonly called the Linnet, is no friend of the farmer. His habits are very like our Sparrows, but he is altogether a neater bird, with crimson breast, head and rump, and his song is almost the same as our Chaffinch's. He often nests in the creepers on the side of the house or in the shrubs in the garden.

The Mocking Bird is another dweller in the gardens. His tame, familiar nature soon wins your affections, whilst his song recalls home associations as you recognise notes of the Nightingale and Thrush. As you sit under the spreading leaves of a palm tree, you hear a rattling amongst the branches and you see a Mocking Bird stealthily helping himself to the young dates; or you see him in the graceful pepper tree picking one by one the aromatic, crimson berries from the little procumbent bunches.

The spring of the year is a specially favourable time for seeing birds in Southern California. Migrants are arriving from Mexico, some to settle down and nest, others to move on, after a day or two, to the far north or the high Sierras. Other species that pass the winter in Southern California leave for the mountains or the north in March or April.

Amongst these is the Western Robin. On March 31st, I counted fifty-six Robins on a small lawn at Pasadena. A few days later they were gone. In June I found the Robins breeding in the Yosemite Valley, 4,000ft. above sea level. In September, being in Siskiyou County in the extreme north of the State, I found the Robins again flocking for their move south; and being at Pasadena again in December, I found that the Robins had arrived before me.

To one who has been a lover of birds from his youth, the day on which he sees his first Humming Bird is a red-letter day. Here is a copy of the entry in my diary:—"March 16, 1891. In the grounds of Raymond Hill saw our first pair of Humming Birds of one of the plainest species—Anna's Humming Bird. They had coppery throats and green-tinged backs, and were very tame. One sat on a bare twig and allowed me to come within two arms' lengths of it. They thrust their bills into the tube of a yellow-flowered shrub (Chinese Tobacco, *Nicotiana glauca*). Their note was high and shrill. As they hovered, their wings appeared double from the rapid motion."

I met with another of the Californian species of Humming Bird on Santa Catalina Island, namely the Rufous Hummer. I saw it carry some wool or willow-down up into a eucalyptus, and found it was building its nest on a bunch of eucalyptus seeds, working the stem of the bunch into the side of its nest. I was interested to find that Humming Birds are not exclusively honey-eaters. I watched one hovering over a lawn and catching gnats. A lady friend of ours at Pasadena has frequently had honey taken by a Humming Bird from a flower which she held between her lips.

Another abundant species which was amongst my early acquaintances is the California Towhee, allied to the Buntings. In shape and manner it reminds one of an enlarged Hedge Sparrow. It steals about under the bushes, jerking its long tail, which is ruddy below.

Amongst the orange groves one is pretty sure to meet with the California Shrike, the California Jay with bright blue wings and tail, and the Mourning Dove.

Sparrows are a multitude, but happily our English House Sparrow has not invaded Southern California. I saw him further north in San José and San Francisco. The common species in winter at Pasadena are the Golden-crowned and the White-crowned. The former go north to nest. The Western Chipping Sparrow, on the other hand, breeds round Pasadena but goes south for the winter. The Song Sparrow is a neat little bird with a song that reminded me

of our Tree Pipit's. Another of the Sparrow tribe is Thurber's Junco, which represents the Snow Bird of the Eastern States, with black head and throat, and slaty back blending into brown. In the winter they stole about the gardens in pairs. In summer and autumn I met with them amongst the mountains and in the far north of California. The Green-backed and Western Goldfinch frequents the roadsides.

One of the most showy birds that frequents the gardens in Pasadena is the Arizona Hooded Oriole, resplendent in its plumage of orange-yellow and black. Its nest is made entirely of palm fibres, curiously woven together, and is hung to the underside of a banana leaf. Near the end of June I saw a nest containing two young birds which swung about in a very perilous way. The banana leaf was old and had bent over till the nest could be reached from the ground.

Another bird of confiding habits that frequents the houses is the Black Pewee, a kind of flycatcher, black above and white beneath. Its nest is placed like the House Martin's, against the side of the barn.

The little grey Bush Tit hangs its bottle-like nest to a pendant bow of a pepper tree in one of the City Avenues.

On the west of Pasadena is a valley with steep banks and a river bed, dry during most of the year, called the Arroyo. Beyond this are hills covered with stiff spinous bushes known as chaparral, intersected here and there by wooded valleys.

From these hillsides comes the weird call of the Valley Quail, or Californian Partridge, "cu, cu, cu, pe-check, ah, hoy, hoy." In summer, when the young are strong, thirty or forty will sometimes rise together and scatter over the scrub.

Where there are trees there are Woodpeckers. Fourteen species are found in California. Of these, I met with eight. By far the commonest is the Red-shafted Flicker, the western representative of the Golden-winged Woodpecker of the Eastern States.

One of the most striking birds of California is the Road

Runner. In shape and manner he reminds you of a pheasant, but his general colour is greyish or brownish, glossed with iridescent green. He is essentially a ground dweller and he runs with great agility and speed. For all his looks he is no relative of our game birds, but is in fact a Cuckoo, having two toes in front and two behind. In the course of my rides round Pasadena, Redlands and Santa Barbara, I must have seen a score of Road Runners but I never saw two together. The nest is a great mass of sticks placed in a bush or tree and the eggs seem to be laid at irregular intervals.

In the more open fields, you meet with the Western Meadow Lark and the Mexican Horned Lark. The former is a sweet singer though the song is short. The bird is not really a lark but a starling. The yellow breast with its black crescent is decidedly handsome.

California is a land of contradictions, where the Rats nest in trees and the Squirrels nest in the ground. In an old nest of a rat at a height of about 18ft. from the ground I found six eggs of the Long-eared Owl.

Of birds of prey the most in evidence is the Turkey Buzzard, a small species of Vulture. These birds are often to be seen floating in the air in graceful circles. They help to thin out the ground squirrels whose holes are a source of danger to horsemen. Sometimes you find a hole big enough to break your horse's leg burrowed in the very middle of the road, and the fields are often riddled with their holes. Other common birds of prey are the Desert Sparrow Hawk, the Western Red-tailed Hawk and the Marsh Hawk.

The Golden Eagle I saw on the desert round Redlands; the Bald Eagle on the rocks at Catalina Island and the American Osprey at Mirror Lake in the Tosemite.

The Burrowing Owl one saw occasionally sitting demurely on a rail or standing at the mouth of its burrow in a dry field by the roadside.

Another bird, characteristic of the desert, where little grows but sage brush, yucca and cactus, is the Cactus Wren, a bird about the size of a Sparrow and with marks and streakings somewhat like those of a Wryneck. Its nest is placed

in the fork of a cactus bough and is a large and conspicuous object built of twigs and domed like a Dipper's. The Cactus Wrens nest in small colonies. It is evident that man is not the enemy they have to fear. But probably no creature but man can attack their nests without damage from the cactus thorns. Against rats, snakes, birds of prey, squirrels and other enemies the thorns are a sufficient barrier. Early in April I found nests in one colony containing respectively, nearly fledged young, and newly laid eggs. I found fresh eggs again in the first week in May. In February many of the nests were well lined and in perfect order and were, I suspect, used by the birds to roost in.

From the 15th of April till early in May the arrivals of migrants from the south were very numerous. I noted the following: Western Kingbird, Cedar Bird, Cliff-Swallow, Western Night Hawk, Western Purple Martin, Phainopepla, Lazuli Bunting, Western Tanager, Summer Warbler, Black-headed Grosbeak.

Of these the Cedar Birds and Purple Martins only stayed a few days before going northward to the mountains. The rest settled down to breed.

Several of these summer migrants are very handsome birds. The head of the male Tanager is Crimson, the back and wings are black, the latter barred with yellow. The breast is yellow.

The Phainopepla, a relative of the Waxwings, is glossy black and is crested. The under sides of the wing feathers are white and are conspicuous when the bird is flying.

The Lazuli Bunting is a bright azure blue.

The Summer Warbler is a canary yellow.

The Night Hawk is closely allied to our Nightjar. I found its pair of eggs laid on the bare ground in the "wash" at Redlands.

The plumage of the Black-head Grosbeak is made up of black, orange-brown and white. I found its flimsy nest of dry bents and fibres in an elder bush at a height of about 8ft. from the ground. The birds were very fearless. Both of them remained in the bush and scolded whilst I examined the nest. By the time I had ridden round the bush,

the cock had taken his place upon the eggs. The Black-headed Grosbeak has rather a good song.

The Cliff Swallows build under the eaves of the barns. The nests are of mud and are shaped like a bottle with a neck.

The Barn Swallow is another abundant summer visitor. Our Sand Martin also occurs in California. It is the only land-bird, except the intruding Sparrow, that is common to Europe and the Western States.

The Western Kingbird is a noisy, pugnacious bird of the Tyrant Flycatcher group. It has the flight of a Flycatcher, but is about the size of a Thrush.

Another bird I found nesting near Redlands is the Californian Thrasher, an inhabitant of the hillsides and bushy deserts. It is thrush-like, with a long curved bill. In the winter I saw it eating the fruit of the Christmas-berry Bush or Toyon, a rosaceous shrub, which does duty for Holly in California.

I must mention two other common birds which winter in Southern California and breed amongst the mountains or in the north, namely the Western Blue-bird and Audubon's Warbler. I met with both these birds in the autumn in the northernmost county of the State, flocking in readiness to migrate.

Hitherto I have been describing the inhabitants of Orange and Lemon and Olive Groves, of Avenues of Pepper and Eucalyptus, of the brushwood and hillsides of the South. It is time I took you to wilder scenes.

At the end of May, half a night and half a day's journey by rail northward took us to Raymond, whence a drive of sixty miles brought us to the Yosemite Valley, over a ridge 7,000ft. about sea level. On the way we stopped at Wawond to visit the celebrated Mariposa Grove of big trees, *Sequoia gigantea*. This grove stands on a mountain ridge at an elevation of 6,000 to 7,000 feet, and consists of about 620 giant trees, 260ft. in height or under. The Sequoia belt runs south from Mariposa Grove, over many mountain spurs to Deer Creek, 260 miles distant.

These giants of the forest are surrounded by other trees

of no mean height. The Sugar Pine, Yellow Pine, Douglas Spruce and Silver Fir are the most abundant. We estimated that half a million trees were in sight at a time as we climbed the mountain side between Wawond and Yosemite. Sixteen species of Conifers grow on the Sierras.

The birds of these forests are not numerous. The White-faced Woodpecker and Stellar's Jay enliven the solitudes; the Californian Brown Creeper (almost the same as our British bird) and three kinds of Nuthatch climb stealthily up and down the mighty tree trunks; the Golden-crowned and Ruby-crowned Kinglets take the place of our Goldcrest; the Mountain Chickadee represents our Cole Tit; on the streams the American Dipper dashes by in headlong flight; overhead the Black Swift circles. That large black and white bird jerking his way across the valley is Clarke's Nutcracker. The Mountain Quail from far up the hillside makes its high, nervous whistle; the Sooty Grouse takes refuge amongst the thick boughs of the lofty pines.

Let us now leave the pine forests and come down to the coast.

The tule or willow-beds in the lowlands are the home of a very fine bird, the Bicolored Blackbird. The shining black plumage of the male is ornamented with a brilliant shoulder patch of scarlet, margined with buff. These black-birds, or more properly, Starlings, are noisy fellows, who live in companies and make a sweet call, "twiddle, diddle, diddle." Their mates are smaller and very plain, streaked with brown and white.

Very different is the guttural cry of the Belted Kingfisher, which resembles a deep watchman's rattle. The bird is as large as a Jay and is bluish above and white beneath. It has a crest and a long, sharp bill. It haunts most of the rivers and streams in the State.

In the meadows near the coast you will meet with the American Crow, a local bird in California, but by far the most noticeable bird in winter time in the Eastern States.

From both coast and upland meadows comes the shrill "kill-der-kill-dee" of the Killdeer Plover, a bird which takes

the place on the N. American Continent that the Peewit takes with us. On the beach, too, you see the Kildeer in flocks along with the Snowy Plover, the Least Sandpiper and Long-billed Curlew, whilst here and there an American Pipit runs daintily over the sand.

The Pier at Santa Barbara in November was an excellent place from which to watch the sea-birds. Long rows of Gulls sat on the sides of the pier whilst the buoys, floating in the bay, were the favorite perches of the Cormorants. From the pier head a great Brown Pelican was generally to be seen lazily floating about; and Loons and Grebes were busily swimming and diving. But the most abundant bird in the bay was the little black White-winged Scoter. For hours together you could watch them playing about amongst the waves, diving through a breaker or floating over a roller. On shore they were very helpless, waddling along in a feeble manner, so that I easily cut off the retreat of more than one. When handled they were very inert.

I must close this paper on Californian birds with a description of the Water Fowl on Elsinore Lake in Riverside County, Southern California, which I visited last February. Twice before in my life I had seen a somewhat similar assemblage of birds, firstly on a bank at Hirankera in the Central Provinces of India, and secondly on Lake Menzaleh in Lower Egypt.

At Elsinore Lake, the most abundant species was the American Coot, which was numbered by thousands. Then came hundreds of Shoveller Ducks; nextly the little Ruddy Duck, rather a helpless species. In the shallow pools on the edge of the Lake it was easy to ride the Ruddies down. They tried to escape by diving till they got into shallows where they were readily caught. Five or six we took home with us refused to live. The other dwellers on the Lake were the Pintail, Mallard, American Widgeon, Canvas-back, and Green-winged Teal.

Out in the centre of the Lake were flocks of Geese, the American White-fronted, and the Canada Goose. At dawn, and again about 3 o'clock, the Geese rose in flocks and flew over the hills into the San Jacinto Valley to feed in

the grain fields. They were too wary to give you a fair chance with the rifle. "Wa-wa, honk-hwonk," were their respective cries.

On October 29th, 1891, Wild Geese were passing over Sissor, Lisky County, in flocks of forty to one hundred. One flock numbered about 200 birds. Their "wa-wa" showed them to be White-fronted. About 2,000 must have passed over in two hours, flying southward. The day was wet and cloudy, with a slight wind from the south. Popular report says that each flock has its recognised leader. Now more than once I saw the leader take a course which the main flock refused to follow, with the result that the former leader, with a few followers, dropped aside and rejoined the flock but no longer took the lead. The skeins were usually V shaped with smaller Vs branching from the main V.

A flock of five White Pelicans kept well out in the middle of Lake Elsinore, along with the Geese.

The other species seen there were two kinds of Grebe, Western Gull, Royal Tern, Great Blue Heron, American Avocet, Kildeer Plover, and Least Sandpiper.

I find I have mentioned exactly 100 species. Joseph Grinnell, in his "Birds of the Pacific Slope of Los Angeles County," enumerates 300.

I now come to my second subject, namely the Plants of California.

One is struck much more by the likeness of the Californian flora to the British, than by its dissimilarity. The London Catalogue includes ninety-two Natural Orders of Flowering Plants. The flora of Western Middle California includes ninety-seven. Of these, seventy-nine Natural Orders are common to Great Britain and California. Thirteen small Natural Orders (containing eighteen genera) of our Catalogue are missing from the Californian flora; and eighteen Natural Orders (containing thirty genera) figure in it that are not in our Catalogue.

Dealing with species, 219 are common to both floras; but of these 142 are grasses, or weeds of cultivation which have gained a footing in California, leaving only seventy-

seven species apparently indigenous to California and found also in Great Britain. Five of these are aliens in England.

Some of the introduced weeds are spreading very fast in California, and occupy waste lands where they must be choking indigenous species. Amongst these intruders I may name the Mallows, Horehound, Shepherd's Purse, Groundsel, Medick, and most noticeably Black Mustard (*Brassica nigra*), which covers acres of ground and grows from six to twelve feet high, with long, wiry stems.

But you would rather hear something of the beauties of the native flora. The most glorious flower for effect is the California Poppy, the *Escheholtzia* of our gardens. Its rich orange blossoms, covering acres of ground in the spring, shining in the sunshine, give dashes of colour to the landscape that can be seen from miles away. "To the poppy fields" the cars are labelled, and women and children come out from the city for the keen enjoyment of picking handfuls of nature's marvels.

Our home gardens owe much to California. Lupines, Larkspur, Collinsia, Godetia, Clarkia, Nemophillas, Gillias, Phacelias, Giant Sunflower, Flœrkia, Mimulus, Mirabilis, Bartonias, are all well-known to English florists. What a delight to see these old familiar flowers on their native hillsides. Amongst the most lovely adornments of the spring is the Mariposa Tulip (*Calochortus venustus*, Benth), with three large pale lilac petals, marked at the base with curiously bee-like stains. On the same hillside banks you may find the Azure Pentstemon of the most intense sky blue, and perchance the Scarlet Bugler, another Pentstemon of brilliant colour.

Of flowering bushes not a few are worthy of mention. The Ceanothus of our gardens tinges Mount Lowe in March or April with sheets of French blue. Californian Lilac is its popular name. Finest of all is the Matilija Poppy which makes a magnificent show with its white petals three or four inches across. The Sticky Mimulus is sometimes grown in greenhouses in our country. It helps to form the brushwood tangle on the Californian hillsides.

One bush we may be thankful to be without, though it looks innocent enough. I refer to the Poison Oak (*Thus diversiloba*). You might easily mistake it for a young maple. Its effect on many people is very serious. It causes swelling and irritation of the face and limbs, sometimes bringing on temporary blindness. It seems to be most poisonous in the spring when its flowers are laden with pollen.

At the time of my visit to Yosemite the white fragrant Azaleas (*Rhododendron occidentale*) were in full flower and formed a great part of the undergrowth. One hardly dared to gather them at first. One could hardly believe they were really wild.

Of forest trees a little more should be said. I have alluded already to the Redwood (*Sequoia Sempervivens*). It grows to about the same height as its kinsman, the Giant, and is perhaps the more graceful tree of the two. In one habit it differs from its congener, namely it throws out suckers from its roots, so that in the Redwood Groves you see a mighty tree surrounded by pillars of a lesser girth. It is sad to note that the Redwoods are for the most part unprotected by Government and many are daily falling to the axe of the lumberman. The wood is of splendid quality and makes most handsome veneers with rich graining. In a few hours the growth of perhaps thirty centuries is cut off for ever.

Another Conifer which is found wild only in a very small area on the coast near Monterey is *Cupressus macrocarpa Hartw.* It is grown in the most temperate regions of the World and is often used for fences and chipped into fantastic shapes like Yew.

Another species, *Pinus Torreyand*, is restricted to Santa Cruz Island, off the coast opposite Santa Barbara, and one locality in San Diego County.

The Nut Pine (*Pinus monophylla*) is but a small tree but it is of great importance to the Indians who yearly harvest its seeds, which to some tribes are the staff of life. In the early days of the settlement of white men in California, blood was often shed through their ignorantly destroying

a tree that was of such vital importance to their Indian brethren.

*Pinus attenuata* is of interest from the hardness of its cones which never open till the tree dies. They grow in whorls round the trunk and occasionally a cone becomes quite imbedded in the heartwood.

Closely allied to it is the Monterey Pine (*Pinus radiata*, Don—*Pinus insignis*, Dougl).

Of other Forest Trees the Oaks are the most important. The Black and White Oak are not unlike our English Oak. But more characteristic of California are the Live Oaks, which we call Ilex. In my mind they will always be associated with a certain valley running down to the coast near Santa Barbara, where their long, gnarled and twisted branches and grey foliage, laden with greyer lichen, gave a weird, awesome sense, that even our horses seemed to share; as though the valley were the haunt of some unseen, etherial beings.

The Sycamore (*Platanus racemosa*, Nutt) throws a grateful shade from its large leaves along the streams and rivers, mingling with Willows, Poplars and Alders.

The Mountain Leatherwood (*Fremontia Californica*, Tore) was a beautiful sight in May on the lower hills between Raymond and Wawona, with its showy yellow corolla-like sepals; and higher up we came upon the *Cornus Nuttallii*, And., with handsome, large, white sepals. The foliage of the Maples and the Cornel was glorious in the autumn.

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The lecture was illustrated with many specimens of plants and eggs, and also a large spider, *Mygale Henzii*.

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MEETING held at Reigate, Jan. 2nd, 1903.

Present—19.

Mr. C. E. Salmon exhibited specimens of *Althoea hirsuta*, discovered on the chalk-hills near Reigate by Mr. Wilfred B. Alexander of Tunbridge Wells, and made remarks on

its distribution and habit. Mr. Salmon presented a reprint from the *Journal of Botany*, giving a complete account of what is known of this rare Mallow.

Miss Sargent then gave a Lecture entitled :—

#### THE FAMILY TREE OF FLOWERING PLANTS.

The scientific meaning of the Flowering Plant is not very precise. In using it this evening, I intend to include Monocotyledons and Dicotyledons only.

The Flowering Plants defined in this way form a natural group, widely separated by the structure of the reproductive organs from any other race of plants—a structure identical in both Classes. The characters which separate them are now considered of minor systematic value. This view is strongly confirmed by recent research in two distinct branches of Botany: the study of the reproductive organs, and that of Fossil Anatomy. If it is well-founded we must consider Monocotyledons and Dicotyledons as descended from a common stock of Flowering Plants in which the structure of the reproductive organs was essentially the same as that found in both classes.

With respect to the characters which separate Monocotyledons from Dicotyledons, three possibilities must be considered. (1) The Primitive Flowering Plant may have been quite intermediate in those points, so that if now recovered botanists would be unable to rank it as a member of either Class. (2) It may have been essentially a Monocotyledon, perhaps with some characters approaching those of a Dicotyledon. Or (3) it may have been in all essentials a Dicotyledon.

The first hypothesis has never been seriously put forward, and it would be difficult to maintain. We may I think assume that the Primitive Flowering Plant was in essentials either a Monocotyledon or a Dicotyledon. Of these alternatives, the first has been most generally accepted. Monocotyledons have been considered more primitive than Dicotyledons. My own work has led me to the opposite conclusion, and I wish to-night to give some reasons

for considering that the Primitive Flowering Plant—if it could be reconstructed by botanists—would be ranked by them as an undoubted Dicotyledon.

Of the five or six characters which separate Monocotyledons from Dicotyledons, two are very constant indeed: the single cotyledon, and the absence of a true cambium or thickening-ring in the stem.

No known Monocotyledon possesses either more than one cotyledon, or a true cambium in the mature stem. The converse is not quite true. A few Dicotyledonous species, scattered among several families systematically remote from one another, have one cotyledon only, and others have lost the cambium ring more or less completely.

If the seedling of the Primitive Flowering Plant had two cotyledons, and its mature stem possessed a true cambium, it would certainly be now placed among Dicotyledons. There is some evidence to show that it did possess both features.

Recent work in two departments of Botany gives reason to believe that the mature stem of the Primitive Flowering Plant resembled that of a Dicotyledon in possessing a cambium. The cumulative weight of this evidence is very great, and in the absence of any to the contrary we are justified in assuming that the Primitive Flowering Plant was provided with a cambium.

My own work has been chiefly concerned with the second question. Had the Primitive Flowering Plant one cotyledon or two? The majority of botanists have assumed that it had one: a character retained by Monocotyledons. The two cotyledons of Dicotyledons would then be developed by fission of the original structure. Those botanists who maintain that the Primitive Flowering Plant had two cotyledons have, with one exception, assumed that the suppression of one gave rise to a monocotylous race, now represented by existing Monocotyledons.

A third view was suggested nearly a century ago by the Swedish botanist, Agardh, that the monocotylous form was derived from the dicotylous by complete union of the two cotyledons.

The only direct evidence which could be brought forward to decide between these possibilities would be drawn from the structure of Fossil Plants. We might discover the Primitive Flowering Plant, or some of its near allies, in ancient deposits, and if by some chance seedlings had been preserved among the mature plants, the question would be settled at once by counting their cotyledons. But all the fossil Flowering Plants which have been adequately examined so far are well-marked Dicotyledons or Monocotyledons, generally very near existing species.

Failing direct historical evidence, there remains the indirect evidence of anatomy, whether of existing species or of fossils. But it must be the anatomy of young seedlings, for the cotyledons commonly disappear at an early period in the life of the plant. Embryology—that is, the study of the immature plant—has been much neglected by botanists. The ripe seed contains a miniature plant (the embryo), together with supplies of nourishment. On germination the embryo becomes the seedling, bursting the seed-coats as it pushes its root downwards and its stem upwards. The life of the young plant is divided into two periods by the epoch of germination. In the first it is an embryo confined within the seed: in the second it leaves the seed and assumes by degrees all the characters of the mature plant.

The history of the embryo has been followed in a good many species from the time when it consists of a single cell to the period when the seed is ripe. During the whole of this interval the embryo develops in a very confined space, and consists mainly if not entirely of soft tissue. Its configuration seems determined rather by the pressure of surrounding tissues than by the influence of remote ancestors.

The development of the Monocotylous embryo as compared with the Dicotylous form has been thought to indicate fission of a single member to form two, but this interpretation is not clearly demanded by the facts, which are by no means always consistent. Indeed species belonging to the same genus are sometimes very unlike in the development of the embryo. No doubt the perplexing and

inconsistent results obtained by examining the structure at this early age have discredited embryology among botanists.

When the seedling struggles out of the seed-coats, its woody skeleton begins to develop. The veins of the leaf for example are complex structures, called vascular bundles by anatomists. A few of them are present in the embryo—those of the cotyledon are almost always there—but at that age they consist of soft tissue only. Immediately after germination the vascular bundles become stiffened by the hardening of some of their elongated cell-walls, and this of course gives firmness to the cotyledon and leaves as a whole. Similar bundles are found in the stem and roots.

When examining the young seedling of various Monocotyledons I paid particular attention to the skeleton formed by these bundles, tracing their course with the utmost care in cotyledon, stem, leaves and roots. The first leaf of all these seedlings always showed a well-marked midrib with one or more smaller bundles on either side of it. The cotyledon on the other hand very seldom possessed a typical midrib. Often it had two bundles only, parallel to each other throughout the length of the cotyledon, and sometimes so near together as to touch along a narrow line. If other bundles were present they were arranged on either side of the two main bundles, just as if the two together represented a midrib. In the very few instances in which the cotyledon possessed a single median bundle, the corresponding bundle in allied species would show the dual structure, or there would be two distinct bundles close to each other.

If there were no other indication of comparative antiquity, we could as well suppose the cotyledon with two bundles to be derived from an ancestor with one as the uninerved from the binerved. But the vascular skeleton of the species I examined seemed characteristic not only of species but even of genera and tribes within the *Liliaceæ*—the family most thoroughly studied. Series of types were linked together by intermediate forms, and it was often clear that a single type had been modified in two or three different directions, thus giving rise to several distinct

forms of skeleton. Such a type as this is clearly older than any one of the variations on it.

Now whenever reasoning of this kind led me to consider a type of vascular structure as relatively primitive, I found its cotyledon possessed two distinct bundles. In other words the evidence pointed to the development of the uninerved from the binerved cotyledon. The most primitive type of all is one which I believe to represent the vascular structure of the seedling in the ancestral Liliaceous stock. In this type the cotyledon possesses two massive bundles symmetrically placed opposite each other in the oval tranverse section of the cotyledon. They are inserted on the bundles of the axis at opposite sides, just as the midribs of two opposite cotyledons would be inserted. The structure at once suggested that the single cotyledon of this type had arisen from the fusion of two opposite cotyledons, each with its own midrib.

This conclusion naturally leads to the hypothesis that Monocotyledons are derived from a dicotylous race by gradual fusion of two cotyledons into one. The importance of this result makes it imperative to criticise the evidence on which it is based, and to seek for corroboration.

First as to the value of the evidence. Experience has shown that the systematic value of any character can be tested only by experience. But if a collection of embryological characters—such as the number and course of the vascular bundles in the young seedling—do indicate affinities,\*there is some reason for attaching special importance to them. Such characters have always been ranked high by systematists. The number of the cotyledons is itself an embryological character.

The most important corroborative evidence is the structure of certain Dicotyledons in which the Cotyledons are united almost to the apex. Such forms are not uncommon among the Ranales, and are found also in families system-

\* The evidence for supposing that they do, will be found in my paper, "A Theory of the Origin of Monocotyledons, founded on the Structure of their Seedlings." *Ann. of Bot.* 1903, p. 1.

atically remote from them. I have examined the seedlings of *Eranthis hiemalis*, *Podophyllum peltatum*, *Delphinium nudicaule*, *Anemone Coronaria*, and in all these species—but especially in the two first—the vascular skeleton very closely resembled that of *Anemarrhena asphodeloides*, the species which in my view best represents the primitive Lily-type. The two midribs remain distinct in the solid tube formed by the united cotyledons. They resemble the twin bundles of *Anemarrhena* in their position in transverse section, in orientation, in their internal structure. They join the bundles of the axis in the same way.

The importance of this comparison is obvious. Before making it we could only say that the vascular skeleton of the primitive Lily type suggested the fusion of two lateral members. Comparison of this skeleton with that of forms in which two cotyledons are undoubtedly united has revealed an almost identical structure.

The case for considering the cotyledon of Liliaceous seedlings as a fusion of two lateral members has now been shortly stated. What ground is there for extending this view to other Monocotyledons?

The vascular skeletons of the seedlings I have examined from other families are of two kinds. Among Amaryllids Irids, Aroids, are types already familiar within the Liliaceæ, and presumably to be interpreted in the same way. The Palms and Scitamineæ show distinct types in which the dual symmetry is very clearly marked. The vascular skeleton of the Grass seedling presents many difficulties, but it is most satisfactorily interpreted as a variant on that of the Scitamineæ.

If we suppose the origin of the Monocotyledonous cotyledon from two lateral members to be established as a working hypothesis, further questions arise. Can any cause be assigned for the original fusion of the cotyledons? And would the same cause favour the development of other Monocotyledonous characters?

The vast majority of Dicotyledons have two distinct

cotyledons. In some species however the cotyledons are united from the base upwards into a narrow tube which carries the two blades aloft. There are also a few species which have but one cotyledon. I have found references in botanical literature to above forty species in which cotyledonary tubes are formed, and about fourteen species in which the seedling of a Dicotyledon has but one cotyledon. Omitting two species of Mangrove whose seedlings germinate under most exceptional conditions, all these aberrant Dicotyledons have one feature in common. Their main stem is subterranean with much shortened internodes, and is almost always thickened to form a tuber. They are in fact well-marked geophytes: that is, plants which live above ground for part of the year only. Their aërial members perish during the the winter, or in the periodical dry seasons of some hot countries, and while the conditions above ground are unfavourable the plant is reduced to an underground stem, provided with buds which will develop when the weather becomes genial.

There are of course many geophytes with two cotyledons, but one feature is conspicuous in the seedlings of all such plants. They show very little green above ground in the first season. I have watched the germination of many geophytes. A few never come above ground at all in their first season. Some send up one cotyledon, some two: others—in which the cotyledons remain underground as sucking-organs—send up a foliage leaf or two, always very small. But they all form a squat colourless stem, generally tuberous, and sink it as deep as they can in the ground.

The reason for this behaviour is very simple when we consider the climatic conditions under which such plants have been developed. The cold which forces the mature geophyte in Alpine or Arctic regions to take refuge underground during the greater part of the year, or the periodical drought which has the same effect in many hot countries, is still more formidable to its seedlings. The seedling which germinates at the beginning of a season of good weather, is inevitably killed off if it cannot protect itself against the long period of drought or cold which will follow.

The first business of such a seedling therefore is to transfer the stores of food present in the seed to some safe position underground. For this purpose it converts its stem into a store-house, and plunges it into the soil. This is the most imperative work of the first season. The formation of green organs to renew the stock of food when it gets low is a minor consideration. The seedling cannot afford to waste much material in this task when time is so short and its underground development so essential to existence. So there is a very marked tendency among geophilous seedlings to reduce the green aërial organ during the first seasons of growth.

We have here a cause which has operated on some undoubted Dicotyledons, such as *Eranthis* and *Podophyllum*, to produce partial union of the cotyledons. There is reason to think that the single cotyledon of other Dicotyledons, *Ranunculus Ficaria* for example, and *Cyclamen*, is the result of complete union which has come about in a similar way. It can hardly be doubted that the like causes persisting for a long period might produce a monocotylous race.

Assuming then that a dicotylous stock was driven by stress of circumstances to become geophilous, the reduction of the green organs in the first-year seedling follows inevitably, and forms such as *Podophyllum*, *Eranthis*, *Ranunculus Ficaria*, show that this reduction may take the form of a partial or complete union of the cotyledons. If Monocotyledons, as we know them, are descended from a race developed in this way from ancestors which resembled modern Dicotyledons in essential features, some at least of the other characters which distinguish them ought to be referable to the geophilous habit.

The first of these characters in importance is the anatomy of the stem, and as there is independent evidence to show that the Primitive Flowering Plant possessed a cambium, I am bound to explain how Monocotyledons lost it by the adoption of a geophilous habit. I have attempted elsewhere to show that this consequence is perfectly natural,\* but the

\* The Evolution of Monocotyledons, Bot. Gazette, 1904, XXXVII.  
p. 336.

subject is too technical for treatment here. *Podophyllum* however may be mentioned as possibly a transitional case. It is a geophilous Dicotyledon in which the anatomy of the erect stem resembles that of a Monocotyledon, while the elongated horizontal rhizomes are nearly Dicotyledonous.

Proceeding to the other characters which distinguish Monocotyledons, two are clearly connected with a geophilous habit.

The first of these is the fibrous crop of roots which commonly replaces the primary root of Monocotyledons at an early age. It is characteristic of geophytes to produce a fresh crop of roots from the tuber each year in connexion with the year's crop of leaves.

The second character is the linear shape of the leaves and their parallel venation. They are usually inserted on the underground stem with very broad bases. Such leaves are well adapted to grow rapidly when the genial weather recurs, and they readily pierce the soil in which they are buried.

It is only fair to add that this character and the preceding one are found chiefly among that great majority of Monocotyledons which are still geophilous. They may be considered as direct adaptations to that habit rather than the repetition of ancestral features. Still, considering how many well marked geophytes are found among Dicotyledons, it is rather remarkable that the two characters just mentioned should be general among Monocotyledons and rare in Dicotyledons.

The connexion between the tripartite floral symmetry of Monocotyledons and the geophilous habit is not obvious.

I believe however that such connexion does exist, for tripartite flowers are occasionally found among Dicotyledons, and species exhibiting it are almost always geophytes.

The account of the evidence on this very important subject which I have given to-night is brief, and necessarily incomplete. I hope it is sufficient to show that the bal-

ance of evidence is so far in favour of the superior antiquity of the Dicotyledonous type. The question is by no means settled yet: we need more facts, especially concerning the seedling structure of Monocotyledons and tuberous Dicotyledons. But the evidence we have does I think justify the investigator in treating the theory just expounded as a working hypothesis. In brief it is that Monocotyledons are derived from a race of Flowering Plants which possessed two cotyledons, and a cambium in the mature stem: that the two cotyledons fused to form a single member: and that this process, and also the peculiar anatomy of the mature stem in modern Monocotyledons, may be considered as the direct consequence of the adaptation of the Primitive Monocotyledon to a geophilous habit.

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MEETING held at Redhill, Jan. 30th, 1903.

Present—35.

Mr. H. M. Wallis, of Reading, gave a Lecture on—

THE BIRDS ONE SEES ABROAD.

The lecturer remarked upon the difficulties which the average tourist experiences in determining the species of the birds which he sees whilst travelling. Books of reference, even the best, are of small avail, the plates, if coloured, shewing an adult male in nuptial plumage in the usual museum attitude, and giving long and minute descriptions of the various moults of the sexes and plumage of the immature. Now the average tourist will not have the birds in his hands, he will not once in twenty times see the birds in museum attitudes and under museum conditions, nor can one guarantee an adult male in full breeding plumage. Some means must be found of determining, roughly it may be, the species of what one sees whilst upon the wing and at a distance.

To this end the lecturer illustrated with broad chalk outlines the salient characteristics, differences and attitudes of several common continental species, the discrepancies between the tails of the Red Kite and the Black Kite; the different under-markings of the Common and the

Rough-legged Buzzards were shewn; the marks by which to distinguish a Lanner Falcon from a Peregrine on the wing, a Hobby from a Kestrel, a Lammergeyer from a Vulture, and an Egyptian Vulture from an Eagle or from a Griffon were depicted by outline sketches of the characteristic curvatures of the wings of each in flight, or the barrings, and massings of colour as seen from below. The Black Tern and the White Winged Black Tern, the Fire-Crest and Gold-Crest, were similarly treated, whilst rude sketches of the Great Black Woodpecker, the Nutcracker, Alpine Swift, Wall Creeper, Snow Finch and Snow Bunting were shewn, enough perhaps to give a casual observer some clue to what he was looking at. Coming to the waterbirds, the lecturer spoke of the difficulty of seeing these at all except upon the wing in the act of escape, or resting or swimming at a considerable distance; rough sketches of the Golden-eye, the Goosander, Red-breasted Merganser, Tufted Duck, Pochard, &c., were given shewing the general distribution of white and black. The Eider and King Eider were similarly dealt with—the Scaup and Harlequin and Shoveller. The Velvet Scoter, as distinguished from the Scoter and the Gannet, from any of the Gulls were insisted upon, whilst coming to those, a small, creeping and dull-coloured birds, the Warblers, it was only possible to shew the striations of the Aquatic Warbler, the eye-brow stripe of the Bonelli, the peculiar size of the Great Reed Warbler. Savi's may be recognised from the Grasshopper Warbler by its unspotted back (if you can find them in the pestilential swamp which he loves). Among the Larks the crest of the Crested Lark, the big, coarse bill of the Calandra, the square-cut tail and soft flute call-notes of the Wood-Lark were mentioned, whilst the black ear tufts of the Shore Lark and his black external tail feathers (just where the other Larks have white) was depicted. The Shrikes were touched upon; the startling plumage of the Woodchat is warrant for itself, but the black forehead of the Lesser Grey Shrike is as good if less generally known. The Hoopoe is not easily mistaken for any thing else and literally "speaks for itself"; its loud

"Hoop" may be heard at mid-day in the woody valleys in Northern Lombardy. The three forms of the Skua, the Great, the Potamorhine and the Arctic were rudely drawn so as to shew the differing lengths of the central tail-feathers and the crescentic markings upon the sides of the body; also their darker hoods.

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MEETING held at Reigate Feb. 27th, 1903.

Present—42.

The Rev. R. Ashington Bullen, F.G.S., F.L.S., delivered his Lecture on "Harlyn Bay; the problems set by its Imterments, its Implements, its Mollusca." Harlyn Bay, on the north Cornwall coast, is the site of a prehistoric burial-ground, of Neolithic age. The lecturer gave an interesting account of the excavations, revealing more than 200 slate cists, containing skeletons, which had been buried in the "Crouched" position. Many specimens of Stone Implements, and of the Mollusca found, were exhibited, and the lecture was also illustrated with a number of lantern slides, which were kindly shown by Mr. S. H. Lury.

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MEETING held at Reigate, March 20th, 1903.

Present—38.

A Lecture on "Protective Resemblance and Mimicry in Insects," was then delivered by Mr. J. W. Tutt, F.E.S. The Lecture, which was illustrated with lantern slides, dealt with the variations in the colouring of insects, enabling them in many instances to rest in perfect concealment on tree-trunks, stone walls, and lichen covered palings. In some cases, insects possessing no other means of self-defence, mimicked the shape and colouring of some conspicuously marked species which were known to be unpalatable to insect-eating birds. It was noticeable that many species became darker each year in the vicinity of large towns, especially in the manufacturing districts. They thus more closely resembled the more grimy trees and palings to be found in such localities.

On April 24th a Soirée was held in the Small Hall, Redhill, when about 42 members and friends spent a most enjoyable evening.

The programme included Songs by Mr. F. J. Rogers ; Violin Solos by Mr. Walter Wiltshire ; Lantern Slides of British Orchids, lent by the S.E. Union of Scientific Societies ; a display of "Electrical Fireworks," by Mr. A. B. Harding ; and Lantern Views of Surrey Scenery, lent by members and exhibited by Mr. S. H. Lury.

Among the numerous exhibits were Geological and other specimens, lent by Rev. H. Brass, M.A.; Foreign Helices, incense vessel from Silwan, bronze palstave, neoliths, &c., by Rev. R. Ashington Bullen, F.L.S., F.G.S.; Fish Ova, by Mr. G. W. Butler, B.A., F.Z.S.; Foreign Sphinges, by Dr. T. A. Chapman, F.Z.S.; Flexible Stone from Agra, by Mr. T. R. Hooper ; Sea Gull, Mr. W. Johnston ; Foreign Birds, Mr. F. C. Pawle, J.P.; Microscopic and other objects, Mr. D. P. Poulter ; old Botanical Books, Mrs. Powell ; British Orchids, Mr. C. E. Salmon, F.L.S. ; British Lepidoptera and Living Larvæ, Mr. A. E. Tonge.

The Hall was tastefully decorated with plants kindly lent by Miss Ethel Sargant and Miss M. C. Taylor.

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### ANNUAL MEETING

held at the Museum, Old Town Hall, Reigate, Oct. 23, 1903.

The Annual Report and the Balance Sheet were read and adopted.

#### ANNUAL REPORT.

Seven resignations and one death have to be recorded during the year, but the addition of four new members and twenty-three subscribers brings the total membership to one hundred.

The evening meetings have been better attended, the average attendance being thirty-six, the highest fifty-one, and the lowest nineteen.

The following lectures were given :—

1902.

- Oct. 31.—From Noise to Music, by Mr. A. B. Harding.  
 Dec. 5.—Birds and Plants of California, by Mr. A. J. Crosfield.

1903.

- Jan. 2.—The Family Tree of Flowering Plants, by Miss Ethel Sargant.  
 „ 30.—The Birds one sees Abroad, by Mr. H. M. Wallis.  
 Feb. 27.—Harlyn Bay; the problems set by its Interments, its Implements, its Mollusca: by Rev. R. Ashington Bullen, F.L.S., F.G.S.  
 March 20.—Protective Resemblance and Mimicry in Insects, by Mr. J. W. Tutt, F.E.S.

On April 24th a Soirée was held at the Market Hall, Redhill, at which a small number of members and friends enjoyed a very pleasant evening.

The following publications have been presented during the year :—

Reminiscences of a Yorkshire Naturalist, by the late Dr. W. C. Williamson, presented by his widow; Harlyn Bay, and the discoveries of its Prehistoric Remains, presented by the author, Rev. R. Ashington Bullen; Reprints from the Journal of Botany, presented by Mr. C. E. Salmon; Description of a Well Section in Suffolk, presented by Rev. R. A. Bullen; Mycological Notes, by G. G. Lloyd, of Cincinnati (Nos. 5-9); the Bulletin of the Lloyd Library, by J. U. and G. G. Lloyd, 1900-01-02: ditto, Mycological Series, Nos. 1 and 2; Notes on Holocene Mollusca from N. Cornwall, by Rev. R. Ashington Bullen; the Distribution of *Hypochæris maculata*, by Mr. Arthur Bennett; Reprints from the Geological Magazine, by Mr. S. S. Buckman; Proceedings and Transactions of the Croydon Natural History and Scientific Society, Feb., 1901, and Jan., 1902; Report and Transactions of the East Kent Scientific and Natural History Society, 1901; the Rochester Naturalist, Oct., 1902; the Hastings and St. Leonards



Natural History Society, Ninth Annual Report; the Field Naturalists' Quarterly, May, 1902; Epsom College Natural History Society, Report, 1901; Proceedings of the South London Entomological and Natural History Society, 1901; the Report and Transactions of the Cardiff Naturalists' Society, 1900-01; the Marlboro' College Natural History Society's Report, 1901; the Report and Transactions of the N. Staffordshire Field Club, 1901-02; the Proceedings of the Bath Natural History and Antiquarian Field Club, 1902; a complete set of the Reports of the Southport Society of Natural Science, from 1890 to 1901; the Alga Flora of Yorkshire, being part 27 of the Transactions of the Yorkshire Naturalists' Union; Report and Proceedings of the Belfast Natural History and Philosophical Society, 1901-02; Journal of the City of London College Science Society, June, 1902; Journal of the Marine Biological Association, Feb., 1895, and Jan., 1902.

Your committee have considered the desirability of providing better accommodation for the various collections belonging to the Club. After a careful comparison of various plans and estimates, they have commissioned Messrs. Potter & Sons, of Aldersgate Street, E.C., to make a new Entomological cabinet, Geological cabinet, and an upright centre case for the Ornithological collections. These are now completed and will be delivered in a few days. It was hoped that they would have been here in time for our Annual Meeting, so that members could judge of what had been done.

The following Excursion Programme was arranged, but has been much interfered with by the unusual amount of rainy weather.

AFTERNOON.

- April 5.—Holmwood Common.  
June 6.—Bletchingley and Godstone.  
July 4.—Mickleham Downs.  
Sept. 5.—Hills above Shere.  
Oct. 17.—Penshurst.

## WHOLE DAY.

May 16.—Kew Gardens.

June 20.—Battle Abbey.

July 18.—Hog's Back, Puttenham Common, and Comp-ton.

Sept. 19.—Postford Ponds and Farley Heath.

The following Officers were elected for the coming year :—

*President.* Mr. J. B. Crosfield.

*Treasurer.* Miss Ethel Sargant.

*Treasurer of Museum Fund.* Mr. A. E. Tonge.

*Secretary.* Mr. G. E. Frisby.

*Committee.* Rev. R. A. Bullen, Rev. E. J. Baker, Dr. T. A. Chapman, Messrs. C. E. Salmon, F. Hughes, and W. H. Tyndall.

The Meeting then resolved itself into an ordinary Evening Meeting.

Present—39.

An interesting lecture on "Familiar Insects" was then delivered by Mr. Edward Connold.

MEETING held at Redhill, Dec. 4th, 1903.

Present—14.

The President, Mr. J. B. Crosfield, gave a brief introductory address, and made several suggestions for increasing the usefulness of the evening meetings. He hoped that members would bring interesting objects to exhibit and describe to other members.

The President then nominated the Rev. E. J. Baker and Mr. C. E. Salmon as Vice-Presidents for the ensuing year.

Miss Ethel Sargant then delivered an interesting lecture entitled "The Effect of the Seasons on Plant Life," tracing the various modifications of habit undergone by seedlings of various plants to enable them to cope more effectually with adverse climatic conditions. The lecture was illustrated with diagrams and with actual specimens.

MEETING held at Reigate, Jan. 29th, 1904.

Present—19.

Mr. C. E. Salmon F.L.S., exhibited specimens of all the British Cotton-grasses, *Eriophorum*, including *E. alpinum* from Forfarshire, where it is now extinct, and made remarks on the various species.

Mr. G. W. Butler, B.A., F.Z.S., exhibited eggs and larvæ of Teleostean Fishes, and read a paper thereon.

The *Teleostean* group of fishes (with bony skeleton) contains the great majority of existing fish. So far as fish are concerned we are living in the age of Teleosts, and though the ancient Elasmobranch stock (the Sharks, Dogfish, and Skates whose skeleton is mainly cartilaginous) is still well represented, the other groups of living fish are mostly, so to speak, but small twigs of the Life-tree that project here and there at the present surface, to represent large branches that are found buried in the rocks of past ages.

In most cases the eggs of Teleosts are so small, and contain so little food, that the fish has to hatch and learn to find food for itself, when quite immature and unlike its parents, just as the young insect or frog has to do; and in such cases the fish, when first hatched, are called *Larvæ*.

The exhibit included (1) the Eggs and Larvæ of many species in spirit, and larvæ as micro-slides, and enlarged diagrams and camera-sketches of these small objects (x. 40)—an exhibit essentially similar to one which I have already described in the S.E. Naturalist, vol. 10, 1905, pp. xxvi.-xxviii.—and (2) the living eggs and larvæ of three species of Marine Teleosts, sent in jars of sea-water from the Marine Biological Association's Laboratory at Plymouth. One of these was *Cottus bubalis*, a shore fish which has non-floating eggs, that adhere in clumps; but the other two were species that have small transparent floating eggs, one-twenty-fourth and one-thirtieth inch in diameter respectively. In some of these latter eggs, placed under the microscope after the paper had been read, the beating of the heart, and the movements of the body, of the transparent little fish were seen, within the tiny egg.

These transparent floating eggs of Marine Teleostean Fishes (the type of egg of practically all our best-known marine food-fishes except the Herring) stand out *unique among the eggs of vertebrates*, as regards the facilities they afford, by reason of their transparency and small size, for following the development, from hour to hour, and day to day (under a fairly high power) of a vertebrate animal, *in one and the same living egg.*

The paper, so far as time permitted, directed attention to some of the interesting points about the structure, shape, size, floating and non-floating, and free or adhesive habit of the eggs, and the special peculiarities of certain Larvæ, and the nursing or nesting habits of certain fish. As regards all of these we see Nature's "infinite variety," and how the same idea is "fulfilled in many ways."

Some of these points are touched on in the S.E. Naturalist loc. cit. Those interested may consult "The Natural History of the Marketable Marine Fishes of the British Islands," by J. T. Cunningham, M.A. There is also the more copiously illustrated but more expensive work, "The Life Histories of the British Marine Food-Fishes," by Prof. McIntosh and A. T. Masterman, B.A., B.Sc. Most of our scientific knowledge of the life histories of Teleostean Fishes has grown up within the last thirty years, and is scattered in scientific periodicals, and in the Reports of Fishery Boards, Fish Commissions and Marine Biological Stations, British, American and Continental.

Dr. T. A. Chapman, F.Z.S., exhibited Butterflies from Spain, Italy and Brazil, and made remarks on Mimetic Resemblance.

Mr. G. E. Frisby moved and Mr. C. E. Salmon seconded: "That the members of the Holmesdale Natural History Club desire to express their deep regret at the loss of one of their earliest and most active members, Mr. W. H. Tyndall, who has always taken so great an interest in the welfare of the Club." This was supported by the Rev. E. J. Baker and carried unanimously. It was resolved that this expression of regret be sent to the deceased gentleman's cousin, Miss Maxwell Smith.

MEETING held at Redhill, Feb. 26th, 1904.

Present—21.

Mr. G. E. Frisby read notes on "Snails and their Allies," and exhibited specimens of land, freshwater, and marine Mollusca.

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MEETING held at Reigate, Mar. 18th, 1904.

Present—about 80.

The President urged members to observe and report on Natural History phenomena. Such things as the dates of arrival and departure of migratory birds, the flowering of plants, and the occurrence of rare or interesting species, were well worth noting and reporting at the evening meetings of the Club.

An interesting Lecture was then given by Mr. S. T. Klein, F.L.S., F.R.A.S., F.E.S., who exhibited Radium and also some "Unique Writings" from the Valley of the Euphrates.

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MEETING held at Reigate, April 22nd, 1904.

Present—13.

Mr. C. E. Salmon, F.L.S., exhibited specimens of a very rare British Willow-herb, *Epilobium collinum*, and made remarks on its distribution, and on the characters which distinguish it from the allied species, *E. montanum*, and *E. lanceolatum*. The specimens were probably collected about sixty years ago, in Scotland, by Dr. Power.

An account of the plant, reprinted from the "Journal of Botany" was presented by Mr. Salmon to the Club.

Mr. E. S. Salmon, F.L.S., then gave an interesting lecture entitled "New Facts about Mildews." The lecturer recounted the result of a large number of experiments, proving to what degree plants were immune from the attack of Mildews infesting other species, particularly in grasses of the genus *Bromus*. One of the grasses, *B. hordeaceus*, acts apparently as a "bridging" species, being very suscep-

tible to infection, and then passing it on to species that cannot be infected without such agency. An account was also given of the enemies of the Mildews, the principal being the larva of a gnat of the genus *Cecidomyia* and a minute fungus.

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## ANNUAL MEETING

held at the Museum, Old Town Hall, Reigate, Oct. 28, 1904.

The Annual Report, Balance Sheet, and Museum Fund Balance Sheet were read and adopted.

### ANNUAL REPORT.

In presenting their Report for the past twelve months, your committee have to record three deaths and fourteen resignations, a total loss of seventeen. The number of new members and subscribers elected during the year is twelve. This leaves the total membership at ninety-five as against one hundred last year.

Since our last Report we have had to lament the loss by death of three very old and valued members of the Club, Mr. W. H. Tyndall, who died in January last, the Rev. H. Brass in August, and Dr. F. Bossey in September. Dr. Bossey was President of the Club in 1876 and Mr. Tyndall from 1880 to 1897 inclusive. Both were frequent contributors of papers or exhibitors of objects of interest, and were constant attenders of the excursions. Dr. Bossey's interests were chiefly botanical and microscopical. Mr. Tyndall for many years furnished regular annual reports of meteorological observations. To him the Club was also especially indebted for liberal assistance for various special purposes. The Rev. H. Brass on various occasions contributed geological papers, and also took frequent part in the outdoor meetings.

Six evening meetings were held during the last session, at which there was an average attendance of thirty-one.

The following lectures and papers were given :—

1903.

- Oct. 23.—Some Familiar Insects, by Mr. E. Connold.  
 Dec. 4.—The Effect of the Seasons on Plant Life, by  
 Miss Ethel Sargant.

1904.

- Jan. 29.—Eggs and Larvæ of Fishes, by Mr. G. W. Butler,  
 B.A., F.Z.S., F.G.S.  
 Feb. 26.—Snails and their Allies, by Mr. G. E. Frisby.  
 Mar. 18.—Radium, by Mr. S. T. Klein, F.L.S., F.R.A.S.,  
 F.E.S.  
 April 22.—New Facts about Mildews, by Mr. E. S. Salmon,  
 F.L.S.

The following publications have been presented during the year :—

The Rochester Naturalist for April, 1903, and July, 1903; the Journal of the Marine Biological Association for Nov., 1898, and July, 1900, presented by Mr. C. E. Salmon; the Proceedings of the Bath Natural History and Antiquarian Field Club, 1903; the Eighth Report of the Southport Society of Natural Science, 1902-03; the Museums Journal, July, 1901; the Report of the Corresponding Societies Committee of the British Association for the Advancement of Science, 1903; the Annual Report and Transactions of the North Staffordshire Field Club, 1902-03; the Report of the Marlborough College Natural History Society, 1902; the Nottingham Naturalists' Society Fifty-first Annual Report and Transactions, 1902-03; and three Reprints from the Journal of Botany, presented by Mr. C. E. Salmon.

Since the last Annual Meeting the new Centre Case and Cabinets have been delivered; the Entomological collections are undergoing re-arrangements, and efforts are being made to fill the blanks, in which your committee trust to have the assistance of any entomological members of the Club.

Your committee have invited the South Eastern Union of Scientific Societies to hold their Annual Congress at Reigate in June, 1905, and they trust to have the hearty



*Committee.* Mrs. G. R. Taylor, Rev. R. A. Bullen, Rev. E. J. Baker, Dr. T. A. Chapman, and Messrs. A. J. Crosfield. C. E. Salmon, F. Hughes, R. S. Ragg, and G. W. Butler.

The Meeting then resolved itself into an ordinary evening meeting.

Present—30.

The President referred to the recent death of two of the Club's oldest members, and moved the following resolution:—"That the members of this Club wish to express, and place on record, their deep regret at the death of two of their oldest and most valued members, Dr. Francis Bossey and the Rev. Henry Brass, M.A., F.G.S., and request that a copy of this resolution be forwarded to the nearest relatives with an expression of their sincerest sympathy." This was seconded by Mr. T. R. Hooper and carried un-animously.

Mr. Edward Lovett, F.R.H.S., then delivered an interesting lecture on "An Alpine Garden," profusely illustrated with lantern slides. The lantern was lent by Mr. Gedge, who kindly gave his services.

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MEETING held at Redhill, Dec. 2nd, 1904.

Present—63.

Objects of interest in Natural History were exhibited by Dr. T. A. Chapman, Messrs. C. E. Salmon, G. W. Butler, and G. E. Frisby.

Mrs. D. H. Scott, F.L.S., then gave a very interesting exhibition of Kammatograph Pictures, representing "Plants in Motion." These pictures, which were exhibited at the Cambridge meeting of the British Association, included flowers opening and closing, buds expanding and developing into full-grown flowers, the sensitive plant closing and slowly re-opening, the movements of climbing plants, and the visits of insects to flowers. Mrs. Scott also kindly explained the apparatus used, and the manner in which the pictures were obtained.

MEETING held at Reigate, Jan. 27th, 1905.

Present—20.

Dr. F. Curtis gave an instructive lecture on the "Colouring of Birds' Eggs," in which he described the varying colours and shapes of the eggs of many species of birds, and the manner in which these differences were associated with the nesting habits and with the colour of the plumage of the parent birds. The lecturer illustrated his remarks by many interesting specimens of birds and eggs, many of the latter being shown with their natural surroundings.

A very interesting discussion followed.

MEETING held at Redhill, Feb. 24th, 1905.

Present—19.

Mr. G. E. Frisby then read the following notes on the Ants of the Reigate district, and exhibited specimens:—

I have compiled the following short list of Ants that I have met with in this district, mainly in the hope I may induce others to add to the number.

*Formica rufa*, the Wood Ant, or Horse Ant. I have not seen a nest of this species in the immediate neighbourhood, but four years ago I took a winged female on Redhill Common.

*Formica fusca*, and *F. rufibarbis*. These two Ants, which are usually regarded as races of one species, are both common on banks and pathways in the district, and are very partial to the flower-heads of *Heracleum*, and several other umbelliferous plants.

*Lasius fuliginosus*, the Jet Ant. Occurs sparingly at Redhill.

*Lasius niger*. The little Dusky Ant that is common everywhere, the winged sexes often covering the pavements at swarming time.

*Lasius niger*, race *alienus*. Occurs on Reigate Heath, and doubtless in many other places.

*Lasius flavus*, the Yellow Ant. Common, particularly in pastures.

*Myrmica ruginodis*, *M. scabrinodis*, and *M. lævinodis*.

All common on wayside vegetation, *M. laevinodis* being the most common of the three.

*Leptothorax acervorum*. This little Ant I have, in this district, only found in a decaying post on Nutfield Marsh.

A lecture on "Plant Folklore," by Mr. W. H. Griffin, was then given in a very interesting manner, and was well illustrated by prepared specimens.

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MEETING held at Reigate, Mar. 31st, 1905.

Present—23.

Specimens of Marine Shells, belonging to the genera *Nautilus*, *Litoria*, and *Cassis*, from the Philippine Islands, and also specimens of nests of the Edible-nest Swiftlets, presented to the Club by Mrs. Powell, were then exhibited.

The Rev. R. Ashington Bullen, F.L.S., F.G.S., then lectured in an interesting manner on the Alcores, in the province of Seville, and on the Roman Cemetery at Carmona.

The lecture was well illustrated with lantern slides.

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MEETING held at Reigate, April 28th, 1905.

Present—22.

Mr. A. E. Tonge then exhibited a unique series of lantern slides, prepared from photomicrographs of "Eggs of Butterflies and Moths," and also gave a paper on the method employed in taking the photographs, giving a short description of each slide.\*

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### ANNUAL MEETING

held at the Museum, Old Town Hall, Reigate, Oct. 27, 1905.

The Annual Report and the Balance Sheet were read and adopted.

### ANNUAL REPORT.

In presenting their Report for the past year, your committee have to announce that three new members and three subscribers were elected during the year. The total number of members is now ninety-three as against ninety-five last year.

\*Printed in "The South Eastern Naturalist," for 1905.

Six evening meetings were held.

The following lectures were given :—

1904.

Oct. 28.—An Alpine Garden, by Mr. Edward Lovett.

Dec. 2.—An exhibition of Kammatograph pictures, representing Plants in Motion, by Mrs. D. H. Scott.

1905.

Jan. 27.—The Colouring of Birds' Eggs, by Mr. F. Curtis, F.R.C.S.

Feb. 24.—Plant Folklore, by Mr. W. H. Griffin. The Ants of the Reigate District, by Mr. G. E. Frisby.

Mar. 31.—The Prehistoric Archæology of the Alcores, province of Seville. The Roman Cemetery at Carmona. By the Rev. R. Ashington Bullen.

April 28.—Photomicrographic lantern slides of Eggs of Butterflies and Moths, exhibited and described by Mr. A. E. Tonge.

The average attendance at the evening meetings was thirty, the highest being sixty-three and the lowest nineteen.

From Wednesday, June 7th, till Saturday, June 10th, on the invitation of your committee, Reigate was visited by the members, associates, and delegates of the S.E. Union of Scientific Societies.\* The very adverse weather interfered largely with the excursions, but it is gratifying to be able to state that the Congress was the largest in point of numbers, and also the most successful that the S.E. Union has yet held.

Owing largely to the Congress proceedings, one excursion only of the Club has been held, to Godstone on Sept. 6th, conducted by Miss Crosfield.

The following publications were presented during the year :—

The Report of the British Association for the Advancement of Science, 1903 ; Proceedings of the S. London En-

\*A record of the Proceedings will be found in "The South Eastern Naturalist" for 1905.

tomological and Natural History Society for 1902 and 1903; the Report of the Marlborough College Natural History Society, 1903; the S.E. Naturalist, 1904; the Rochester Naturalist, April, July, and October, 1904, and January and April, 1905; the Transactions of the Yorkshire Naturalists' Union, parts 28 and 29; the Transactions of the Cardiff Naturalists' Society, 1904; the Nineteenth Report of the Watson Botanical Exchange Club; the Eleventh Annual Report of the Hastings and St. Leonards Natural History Society; the Report of the Marine Biological Association of the West of Scotland, 1902; the Proceedings of the Bath Natural History and Antiquarian Field Club, 1904; the Annual Report and Transactions of the North Staffordshire Field Club, 1903-04; a reprint from the Proceedings of the Malacological Society, on Jarvan and Australian Mollusca, presented by the author, the Rev. R. Ashington Bullen; and a reprint from the Journal of Botany, containing Notes on the genus *Limonium*, presented by the author, Mr. C. E. Salmon.

Specimens of Marine Shells, of the genera *Nautilus*, *Lotoria*, and *Cassis*; and also specimens of the nests of the Edible-nest Swiftlets, Collocalia, were presented to the Club's collections by Mrs. Powell.

BALANCE SHEET

from July 30th, 1904, to July 31st, 1905.

By	£	s.	d.	To	£	s.	d.
Balance from 1904...	13	19	8	Rent and Gas... ..	22	15	2
Arrears ... ..	3	15	0	Repairs ... ..	16	3	
34 members at 10s...	17	0	0	Fire Insurance ...	13	6	
32 subscribers at 5s.	8	0	0	Secretary's account..	1	14	10
Grammar School ...	2	0	0	Stationery ... ..	1	3	7
In advance ... ..		10	0	Lecture Fees ... ..	4	4	0
Subletting of Museum	15	0		Subs. to S.E. Union	10	0	
Donation—Rev. R. A.				Balance ... ..	15	3	4
Bullen ... ..	1	1	0				
	£47	0	8		£47	0	8

Examined and found correct, 25th Oct., 1905,  
ALF. E. TONGE.

The following officers were elected for the ensuing year :

*President.* Dr. J. Walters.

*Treasurer.* Mr. A. E. Tonge.

*Secretary.* Mr. G. E. Frisby.

*Curators.*

*Committee.* Miss Ethel Sargant, Mrs. G. R. Taylor, Dr. T. A. Chapman, Rev. R. Ashington Bullen, Rev. E. J. Baker, Messrs. G. W. Butler, J. B. Crosfield, E. Dukinfield Jones, R. S. Ragg, and C. E. Salmon.

The Meeting then resolved into an ordinary evening meeting.

Present—23.

Miss A. Lorrain Smith, F.L.S., lectured on—

HOW THE LILY IS ATTACKED AND DESTROYED BY THE  
BOTRYTIS FUNGUS.

There is no branch of botanical science to which more attention has been given in recent years than that of the diseases of plants, especially of those caused by parasitic fungi. It is the business of the plant pathologist to study these diseases, to determine their cause and, if they are due to living organisms, to trace their development and find out the weak stages in their life history, when a "cure" may be satisfactorily applied.

Disease has been defined as a "disturbance of the normal condition of nutrition" and may be due to a variety of causes. Plants share with other living beings the incidents and accidents of eventful life; they are more or less sensitive to sudden or unseasonable changes of temperature; they pass through spells of extreme drought and of extreme cold often with disastrous consequences. But disease in plants is nearly always caused by some foreign organism that settles on the plant or invades its tissue, using up the food materials for itself and so gradually weakening and destroying the host. These intruders may be fungi, including bacteria which work havoc in the tissues of plants as well as of animals gaining entrance by wounds or abrasions, or the "disturbance" may be due to animals, insects, worms, &c.

One of the most frequent causes of disease in plants is the fungus that causes the "Lily disease." Like many other fungi it has a somewhat complicated life history consisting of two distinct stages: the resting stage when a *Sclerotium* is formed which sometimes produces a cup shaped fungus called *Sclerotinia*, and a summer stage which is known as the *Botrytis* or conidial stage.

If we take the summer form which is far the commonest, and examine the injured lily on which the fungus has settled, we find growing from the surface of the damaged organ a tiny forest of delicate, dark coloured stalks which can easily be distinguished with a hand-lens, each stalk being crowned by a greyish-looking head formed of a multitude of minute, light-coloured, oval-shaped bodies called spores or conidia. The terms spore and conidium are used for the reproductive bodies of the fungus, just as seed is used for the higher plants. The conidia of *Botrytis* do not require any resting period. If they alight on a suitable substratum, such as moist rotting vegetation, or even a drop of water, germination takes place at once. They can be easily cultivated on gelatine mixed with prune juice and the whole process of growth can be watched by the aid of a microscope.

The conidia respond to the moist environment, and in a few hours they are seen to have pushed out a tube or even more than one. The tube elongates to a filament and imbibes nourishment more especially at the growing point. It continues growing and branching till there is formed a confused tangle of thread-like filaments; each individual filament is termed a hypha, the whole mass of hyphæ is known as the mycelium of the fungus. From any point of the mycelium there may rise vertical stalks, which are stronger and darker in colour than the creeping filaments. They are the fertile hyphæ, the conidiophores or conidia-bearers and attain a height of one or more millimetres. At the lip of the stalk, a series of short stout branches or projections are formed which are studded with the oval-shaped conidia. If the food supply is abundant and atmospheric conditions favourable, the stalk sheds

the head of conidia, the projections shrivel up and the main hypha pushes on to form a further similar head at a short distance from the first; it may also send out side branches which bear successive fertile heads. This then is the summer or conidial stage and represents the *Botrytis* fungus.

In some forms of *Botrytis* there seems to be no other stage, but in the case of the lily disease another form has been discovered. At some stage of growth, the mycelium develops a close ball of thread, so compact and so tightly interwoven that, when it is cut through, it seems exactly like a continuous tissue. These bodies are about the size of a small pea, quite black on the surface and white inside, and called, from their hard nature, *Sclerotia*, from a Greek word signifying hard. These hard little bodies represent the resting stage of the fungus and they retain their vitality a fairly long time, in any case they last through the winter.

In spring, when the moist warm weather comes, they wake up and begin to grow out: it may be into a tangle of mycelium only, or a growth of *Botrytis* conidiophores, or there may be formed a stout elongated stalk ending in a cup shaped *Peziza* fungus, called *Sclerotinia*, the inside of the cup—the disc—being lined with closely packed stout tubes each containing eight spores. When these spores alight on a favorable soil they germinate exactly like the conidia; they form mycelium and sometimes go on to produce conidiophores and *Botrytis* heads of conidia. The complete life-cycle is not reproduced in all the species; there may be the *Botrytis* form only, the conidia or mycelium of which manages to persist during the winter, ready to become active again in the warmer weather. Very frequently the variation lies between the loose mycelium and the hard *Sclerotia*; this is the case in the clover disease, the mycelium burrows in the plant and balls itself up into *Sclerotia*. Neither *Botrytis* nor *Sclerotinia* has ever been detected in this species; when the *Sclerotium* germinates it produces mycelium only. Again there is a *Sclerotium* that is frequently to be found in autumn on stems of dead herbaceous plants such as the larger Umbelliferæ: in cultivation it always produces directly a fluffy growth of *Botrytis*. These fungi seem to vary

with each set of conditions; but though each species follows its own line of growth, the generic or specific resemblance remains strong and unmistakable.

We are now in a position to examine more closely the effects of *Botrytis* on the lily. Professor Marshall Ward made a prolonged study of this fungus on *Lilium candidum*, many years ago, and I quote largely from his paper. He had observed small, discoloured, orange-brown or buff spots on the stems, pedicels, leaves and buds of the white lily, which appeared in great abundance in spring. The lower leaves, which were attacked first, shrivelled and died, leaf after leaf of the flowering shoots followed and the buds were finally attacked. If the attack were early enough, the whole head rotted off; if the disease did not reach the bud before it opened, the flowers were formed, but they were all rather spotted and poor-looking.

Closer examination of the diseased patches showed the *Botrytis* mould on the surface, while the diseased tissues were permeated through and through by a vigorous mycelium from which rose the conidiophores. Conidia were produced on the heads in countless numbers and were carried to other plants by every puff of wind or by wandering insects to which they adhered. The conidium alighted on the epidermis of the host plants, and if sufficient moisture were present, it germinated, pushing out a small tube. The tip of the tube excretes a ferment capable of dissolving the cell-wall which it then penetrates. Feeding on the dissolved and swollen cellulose of the wall, the hyphæ grow and branch more and more, and excrete larger quantities of ferment. The cells lose water, the protoplasm turns brown and dies, and the fungus flourishes as the plant decays.

A point of peculiar interest in connection with these *Botrytis* moulds is that they are really saprophytes, that is they live on dead organic substances. From being saprophytes some of them have passed over into semi-parasitism and prey on living plants, as for example the lily *Botrytis*, but they have never entirely acquired the parasitic habit; the hyphæ secrete a poison which kills the cells and the

fungus then lives on the dead material. Most of the forms are unable to penetrate the living cell until they have germinated first on some waste material such as withered leaves, &c., then after a short period of vigorous growth, the hyphæ are able to pierce the cells of the living tissue. This fact was emphasized strongly in a paper published lately on a disease of haricot beans. The writer says that he does not think the *Botrytis* could at once attack healthy pods, but the spores alight on some vegetable remains such as withered petals which might be still adhering to the immature bean. They thus get a start on the dead vegetation and then attack the living plant. The Lily *Botrytis* has exceptionally large conidia, full of food material, and Marshall Ward says, on this account, they can at once germinate and enter the host plants without any organic intermediary. The killing of the tissue by the poison excreted accounts for the rapid destruction of the plants attacked.

The number of plants that are subject to disease of *Botrytis* or *Sclerotinia* is very large and varied. There are the lily and its allies; beans and potatoes have their stalks destroyed; whole fields of clover are laid waste by one form, and another causes a disease of the vine. Pæonies and gooseberries, and even lime trees, are attacked in the stems just at the surface of the ground, and it is a virulent disease of seedling pines. Besides all these cases, *Botrytis vulgaris* is one of our commonest moulds and grows everywhere as a harmless saprophyte on decaying vegetation.

No account of plant diseases is satisfactory without a suggested cure; the remedy in this case is a drastic one. All diseased plants should be burned, care being taken that no part of the diseased tissue is left behind. Then the crop should be changed and the fungus left to die of starvation for want of its particular pabulum. Fungicides are of little avail, as the fungus has penetrated too deeply into the tissue; in the case of sclerotia, they would have no effect whatever. Partial sterilization of the soil has been recommended, that is putting a surface layer of sterile sand on the diseased area. It seems more practicable and safer to change the crop.

Though many of the *Botrytis* forms may belong to the same morphological species and are quite indistinguishable in size and appearance, they may not be able to attack the same host. They become biological species and grow on only one genus or species of the higher plants. This selective parasitism has been proved for a number of fungi and makes the work of extermination much easier for the cultivator.

The conditions most favourable to fungoid attacks are cold and wet seasons, with little sunlight and deficient transpiration. The plant cells are then turgid with moisture and their walls soft and flaccid. The fungus spores are seemingly always at hand, ready to take advantage of these conditions. We cannot control the atmosphere, but we can see that the soil is well drained and healthy, and that the plants are well nourished and as far as possible disease proof. The unnatural condition of crowding individuals in too close proximity, as in a potatoe field or an orchard, must be counter-balanced by protective measures in the choice of stocks, and by all the advantages that can be afforded by good sanitation. The cultivator will always find that "prevention is better than cure."

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MEETING held at Redhill, Nov. 24th, 1905.

Present—31.

An instructive lecture on "Weather Forecasting," was then given by Mr. Wm. Marriott, Assistant Secretary of the Royal Meteorological Society.

The lecturer explained how the various instruments are used at the numerous stations at which observations are taken; how isothermal and isobaric charts are constructed; and how the "forecasts" are made up from the different data obtained. Excellent lantern slides of cloud forms, snow crystals, meteorological apparatus, charts, &c., were shown. One of the wettest places in England, Sty Head Pass, in the neighbourhood of Seathwaite, Cumberland, has an average annual rainfall of about 175 inches, London having only about twenty-four inches. An instructive discussion took place at the close of the lecture.

# RULES.

## NAME.

I.—The Association shall be styled "THE HOLMESDALE NATURAL HISTORY CLUB."

## OBJECTS.

II.—The investigation of the Natural History of Reigate and its vicinity and the mutual improvement of the members in the study of Nature.

## CONSTITUTION.

III.—The Club shall consist of Members, Subscribers, Corresponding Members, and Honorary Members.

## MEMBERS.

IV.—Members shall be elected by ballot or show of hands at any Ordinary Meeting. The candidate to be recommended by one or more Members at any Ordinary Meeting, and the election to take place at the Meeting next ensuing.

## SUBSCRIBERS.

V.—Subscribers shall be elected in the same manner as Members, and shall have all the privileges of Members except of holding any office in the Club, or of voting upon any matter connected therewith, or of having any right or ownership in the property of the Club.

## CORRESPONDING MEMBERS.

VI.—It shall be competent for the Club to elect as Corresponding Members any gentlemen distinguished for their attainments in Natural History, either as collectors or authors, or to whom the Club may be indebted for contributions of papers or specimens; such Corresponding Members to have similar privileges to Subscribers without payment, and to be elected by the Club upon the nomination of the committee.

## HONORARY MEMBERS.

VII.—Honorary Members shall be elected by the Club upon the nomination of the Committee; and shall be exempted from the payment of subscriptions, and shall have the privileges of Subscribers.

## OFFICERS.

VIII.—The Club shall, at the Annual General Meeting, elect from among themselves a President, Treasurer, Secretary, Curator, and nine Members to form a Committee of Management, three of whom to form a quorum.

## VICE-PRESIDENTS.

IX.—The President shall nominate annually two Vice-Presidents from the members of the Committee.

## ANNUAL GENERAL MEETING.

X.—This shall be held previous to the Evening Meeting on the fourth Friday in October, when the Committee shall present a Report detailing the general state, proceedings, and pecuniary condition of the Club, and proceed to the election of Officers.

## SPECIAL MEETINGS.

XI.—The Committee shall have the power to call a Special General Meeting at any time; and they shall do so within four weeks after receiving requisition to that effect, signed by at least five Members. The notice calling the Meeting shall state the objects for which the Meeting is called, and no other business shall be transacted.

## ORDINARY MEETINGS.

XII.—These shall be held on the fourth Friday in every month, from October to April, inclusive, or more frequently at the option of the Committee.

## SUBSCRIPTIONS.

XIII.—Each Member shall pay to the Treasurer Ten Shillings on his election, and the same sum at the Annual General Meeting each year; but may compound for such Annual Subscription by payment of Five Pounds. Each Subscriber shall pay to the Treasurer Five Shillings on his election, and the same sum at the Annual General Meeting each year. That it shall be optional with the Committee to strike out the name of any Member or Subscriber who shall be in arrear with his Subscription for twelve months or more.

## NEW RULES.

XIV.—Any five Members wishing to propose a New Rule, or the omission or alteration of any existing Rule, must send notice to the Secretary, who shall within a month call a Special General Meeting to consider the change proposed.

## LIBRARY AND COLLECTIONS.

XV.—The Club shall form, as opportunity may offer, a Library of Reference, consisting of works bearing on the subject of Natural History, and obtain collections of the natural objects of the neighbourhood. The Library, Collections, and Funds to be the property of the Members for the time being, and shall be vested in Trustees for the use of the Members. Contributions of Life Members shall also be invested in the names of such Trustees in such manner as the Committee may direct, the interest arising therefrom to be handed to the Treasurer for the general purposes of the Club.

## ELECTION OF TRUSTEES.

XVI.—The Trustees shall consist of the President for the time being, and three other Members to be elected by the Club.

## LIST OF MEMBERS AND SUBSCRIBERS

*Members marked \* are Honorary Members.*

- ALLEN, Mrs. STEPHEN, Hesperia, Doods Park, Reigate.  
 ASHBY, J. STERRY, Brendon, Redhill.  
 ASHBY, J. WILLIAM, Wyresdale, Redhill.  
 AVEBURY, Rt. Hon. Lord, 15, Lombard Street, London, E.C.  
 BAKER, Rev. E. J., M.A., Nutley Lane, Reigate.  
 BARLOW, Mrs., The Dial Ground, Reigate.  
 BAXTER, Miss, Wray Park, Reigate.  
 \*BENNETT, ARTHUR, F.L.S., 5, Edridge Road, Croydon.  
 BONNOR, Miss F., Hildersley, Cavendish Road, Redhill.  
 \*BROWN, N. E., Herbarium, Kew.  
 BULLEN, Rev. R. ASHINGTON, B.A., F.L.S., F.G.S., The  
 Locks, Hurstpierpoint, Sussex.  
 BULLEN, Mrs. ASHINGTON, do.  
 BUTLER, G. W., B.A., F.Z.S., F.G.S., Candahar, Yorke Road,  
 Reigate.  
 BUTLER, Mrs. G. W. do.  
 BUTLER, Miss G., Springfield, Reigate.  
 CAMPION, Miss ANNIE, Mayfield, Redhill.  
 CHAPMAN, Dr. T. A., F.Z.S., Betula, Reigate.  
 CHAPMAN, Miss L. M., do.  
 \*COOPER, THOMAS, Marathon, Kew.  
 CROSFIELD, A. J., 5, Madingley Road, Cambridge.  
 CROSFIELD, J. B., Undercroft, Reigate.  
 CROSFIELD, Miss M. C. do.  
 CUDWORTH, Mrs., Whitfield, Blackboro Road, Reigate.  
 CURTIS, FREDERICK F.R.C.S., Lyndens, Station Road, Redhill.  
 DICKIN, Miss E. M., Melsonby, Deerings Road, Reigate.  
 DRUCE, FRANCIS, Merstham, Redhill.  
 \*EVELYN, W. J., Wotton House, Dorking.  
 FRISBY, G. E., 9, Fengates Road, Redhill.  
 GOUGH, ALFRED B., Sandcroft, Redhill.  
 GURNEY, HENRY, Outwood, nr. Redhill.  
 HEESOM, E. E. D., L.D.S., Lowcroft, Station Road, Redhill.  
 HODGSON, Dr. G., Stoneleigh, Oxford Road, Redhill.  
 HOOPER, T. R., Glinton, Elms Road, Redhill.  
 HORNE, Miss, Kent Cottage, Warwick Road, Redhill.  
 HUGHES, FREDERICK, Fairleigh, Reigate.  
 HUGHES, H. F., do.  
 IRVING, Miss A. W., The Rowans, Horley.  
 JOHNSON, Mrs., Beulah, Chart Lane, Reigate.

- JOHNSTON, WALTER, Oak Bank, Redhill.  
 JOHNSTON, Miss ANNIE J. do.  
 JOHNSTON, Miss ALICE do.  
 JONES, E. DUKINFIELD, F.Z.S., Castro, Reigate.  
 KLEIN, SIDNEY T., F.L.S., F.R.A.S., F.E.S., Hatherlow,  
 Reigate.  
 LINNELL, JOHN, Redstone Wood, Redhill.  
 LURY, SAMUEL H., Brynymor, Mead Vale, Redhill.  
 MOORE, OWEN W., Glyngarth, Reigate.  
 MORRISON, Miss MABEL, Londonlands, Yorke Road, Reigate.  
 MOULD, Miss, Cotswold, Evesham Road, Reigate.  
 OSBORN, J. N., The Grammar School, Reigate.  
 PAWLE, F. C., J.P., Northcote, Reigate.  
 PAYNE, Miss M. R., Elmhurst, Evesham Road, Reigate.  
 PEAT, J. T., High Street, Reigate.  
 PHIPSON, Miss, 79, Bell Street, Reigate.  
 POLLARD, G. F., The Grammar School, Reigate.  
 POLLEN, Capt. HUNGERFORD, Farley, Reigate.  
 POWELL, Mrs. JAMES, Ivanhoe, Reigate.  
 RAGG, R. S., B.A., The Grammar School, Reigate.  
 RAGG, Mrs. R. S. do. [S.E.  
 ROBERTS, Miss M., 27, Pearfield Road, Perry Vale, Forest Hill,  
 ROMER, RALPH C., Brooklyn Lodge, Horley.  
 ROMER, Mrs. R. C. do.  
 SALMON, CHARLES E., F.L.S., Pilgrims' Way, Reigate.  
 SALMON, Mrs. C. E. do.  
 SALMON, ERNEST S., F.L.S., Cleveland, Reigate.  
 SALMON, SAMUEL do.  
 SALMON, Mrs. S. do.  
 SALMON, Miss I. E. do.  
 SARGANT, Mrs., Quarry Hill, Reigate.  
 SARGANT, Miss ETHEL, F.L.S. do.  
 SAVILL, SYDNEY, Hadleigh, Redhill.  
 SHARP, J. B., Hill Brown, Reigate.  
 SIMPSON, Mrs. G., Wray Park, Reigate.  
 SPRULES, G. H., Manse Field, Reigate.  
 STEPHENS, Mrs. P., Rookwood, Merstham.  
 TAYLOR, Mrs. G. R., Clears Corner, Reigate.  
 TAYLOR, Miss M. C., Margery Hall, Reigate.  
 TAYLOR, R. L., B.A., The Grammar School, Reigate.  
 THOMPSON, ARNOLD, Garlands, Redhill.  
 THOMPSON, F. WILFRID, Clovelly, Lynwood Road, Redhill.  
 TONGE, ALFRED E., Aincroft, Reigate.  
 TROWER, ARTHUR, Wiggie, Redhill.  
 WALLIS, G. A. F., B.A., The Grammar School, Reigate.  
 WALTERS, Dr. J., Church Street, Reigate.  
 \*WEBB, SIDNEY, 9, Waterloo Crescent, Dover.  
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PRESENTED

12 MAR 1908









PROCEEDINGS OF THE  
HOLMESDALE NATURAL  
HISTORY CLUB FOR THE  
YEARS 1906, 1907, 1908, 1909.

TOGETHER WITH RULES  
AND LIST OF MEMBERS



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AND LIST OF MEMBERS



REIGATE:  
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1910.

MUSEUM: Great Doods, Reigate.

Hon. Curator and Treasurer:  
A. E. TONGE, F.E.S., Aincroft, Reigate.

Hon. Secretary:  
Miss M. C. CROSFIELD, Undercroft, Reigate.

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## Proceedings of the Holmesdale Natural History Club.

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### **Meeting held at Reigate, Feb. 9th, 1906.**

Present 28.

A large cabinet, containing Fossils, was presented to the Club by Mr.F.Hughes.

A lecture was then given by Mr.E.Dukinfield Jones,F.Z.S., entitled Scenes in Paraná, with Natural History Notes.

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### **Meeting held at Redhill, Feb. 23rd, 1906.**

Present 36.

The Secretary read the Report of the Club's Delegate (the Rev.R.Ashington Bullen) to the Meetings of the British Association on Oct.30th and 31st,1905.

Miss E.L.Turner,F.L.S., delivered a lecture on Bird Life in the Norfolk Broads.

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### **Meeting held at Reigate, Mar. 23rd, 1906.**

Present 24.

An instructive lecture entitled Homeward across the World was delivered by Mr.A.H.Dunning,F.R.G.S.,F.R.P.S.

**Meeting held at Reigate, April 27th, 1906.**

Present 37.

The Secretary exhibited and made remarks on a living green Hornet, sent from the South of France by Dr. T.A. Chapman.

Dr. Jonathan Hutchinson, LL.D., F.R.S., then delivered his extremely interesting lecture on Museums in their Relation to Modern Education. The lecturer advocated the teaching as far as possible of all subjects from actual examples, and claimed that such teaching in a well-organised Educational Museum should take precedence of all class-room instruction. An account was given of the arrangement of the Museum at Haslemere, a description of the buildings being followed by brief particulars of the various departments, their collections, methods of exhibition and storage. Diagrams and schedules emphasised the lecturer's remarks. Dr. Hutchinson also pointed out various ways in which small museums could make the most of the space and material at their disposal.

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**ANNUAL MEETING held at the Museum, Old Town Hall, Reigate, Oct. 26th, 1906.**

The Annual Report and Balance Sheet were read and adopted.

**ANNUAL REPORT.**

In presenting their report for the past year your Committee have to announce that four new members and ten subscribers have been elected. The total membership is now 90, including 5 honorary members, and 12 Grammar School boys admitted on special terms. Six evening meetings were held, at which specimens were exhibited, and the following lectures were delivered:—

- 1905
- Oct. 27. How the Lily is attacked and destroyed by the Botrytis Fungus. Miss A. Lorrain-Smith, F.L.S.
- Nov. 24. Weather Forecasting. Mr. William Marriott.

1906

- Feb. 9. Scenes in Paraná, with Natural History Notes, Mr. E. Dukinfield-Jones, F.Z.S., F.E.S.
- Feb. 23. Bird Life in the Norfolk Broads. Miss E.L. Turner, F.L.S.
- Mar. 23. Homeward across the World. Mr. A.H. Dunning, F.R.G.S., F.R.P.S.
- April 27. Museums in their relation to Modern Education. Dr. Jonathan Hutchinson, F.R.S.

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The report of the Club's delegate to the meetings of the British Association on October 30th and 31st, 1905, was read by the Secretary at the meeting on February 23rd.

The average attendance at the evening meetings was 30, the highest 37, and the lowest 23.

The following publications were presented during the year:— Report of the British Association for the advancement of Science, 1904; 3rd Annual Report of the Horniman Museum; Annual Report and Transactions of the North Staffordshire Field Club, 1904-05; Transactions of the Cardiff Naturalists Society, 1904; 52nd Annual Report and Transactions of the Nottingham Naturalists Society, 1903-04; the Rochester Naturalist for July and October, 1905, and January and April, 1906; the South-Eastern Naturalist and Supplement, 1905; the Journal of the City of London College Science Society, Sept., 1903, to May, 1904 and October, 1904, to April, 1905; the Museums Journal, April, 1905; Proceedings of the Bath Natural History and Antiquarian Field Club, 1905; Bulletin No. 7 of the Lloyd Library, and a series of Mycological Notes, presented by Messrs. Lloyd of Cincinnati; Some Materials towards a History of Wisley and Pyrford Parishes, presented by the writer, the Rev. R. Ashington Bullen; Reprint from the Journal of Botany, containing Notes on the Flora of Sussex, presented by the author, Mr. C. E. Salmon; A History of British Fossil Mammals and Birds, by Richard Owen, and The Testimony of the Rocks, by Hugh Miller, both presented by Mr. F. J. Buckland.

The Club's Proceedings for the years 1902-1905, inclusive, have been published, and have been sent to all members, and to all corresponding societies.

Two evening excursions were held during the summer. The first, to Betchworth on May 22nd, conducted by Mr. J. B. Crosfield was very well attended. The second, to Merstham, on July 18th, conducted by Mrs. G. R. S. Taylor, was somewhat marred by the unfavourable weather. It is hoped that further evening excursions may be arranged next summer.

BALANCE SHEET  
for twelve months ending 30th June, 1906.

Cr.	£	s.	d.	Dr.	£	s.	d.
43 members at 10s. ....	21	10	0	Rent of Museum .....	22	10	0
4 arrears of ditto .....	2	0	0	Gas .....	2	8	4
30 subscribers at 5s. ....	7	10	0	Lecture fees .....	3	8	0
1 arrear of ditto .....	5	0	0	Renewal of lease .....	5	0	0
1 member in advance ...	10	0	0	Fire Insurance .....	13	6	0
Donations—				Subscriptions—			
Mrs. Cudworth .....	11	0	0	Surrey Survey			
Miss E. Sargent				1905 & 1906 ...	5	0	0
(lecture fee) ...	1	0	0	S. E. Union ...	10	0	0
Miss Crosfield .....	13	6	0				15 0 0
	2	5	6	Use of North Room,			
Grammar School .....	2	0	0	Redhill .....	1	0	0
Brewer's Flora sold (one				Advertising .....	3	0	0
copy) .....	2	6	0	Marriage & Co.—			
Rent, Guild of Crafts ...	10	0	0	Cleaning Museum	1	1	6
Balance from 1905 .....	15	3	4	Fitting stove & new			
				fittings .....	10	3	0
				James Knight—			
				Removing cabinet	3	0	0
				Distribution of Pro-			
				ceedings .....	13	6	0
				Secretary's expenses ...	2	14	5
				Treasurer's do. ...	3	4	0
				Balance .....	15	7	6
	£51	16	4		£51	16	4
Balance in hand .....	15	7	6	Unpaid a/cs.			
				Pubn. of Proceedings	14	10	0
				Handscombe & Co. ...	3	9	3

The following Officers were elected for the ensuing year:—

- President* Dr. J. Walters, J.P. (re-elected).  
*Treasurer* A. E. Tonge, F.E.S.  
*Secretary* G. F. Pollard, F.Z.S.  
*Committee* Miss E. Sargent, F.L.S., Mrs. G. R. S. Taylor, M.A.,  
 Dr. T. A. Chapman, F.Z.S., F.E.S., Rev. R. A. Bullen,  
 F.G.S., Messrs. R. S. Ragg, B.A., C. E. Salmon, F.L.S.,  
 G. W. Butler, F.G.S., F.Z.S., E. Dukinfield Jones,  
 F.Z.S., F.E.S., and J. B. Crosfield.

The Meeting then resolved itself into an ordinary Evening Meeting.

Present 34.

Mr. E. A. Martin delivered a lecture on Freshwater Life. The lives and habits of the Hydra, the May-fly, the Water-Spider, the Gnat, and many other aquatic creatures of interest were described at length, the lecture being illustrated by admirable lantern slides. The lantern was kindly lent and manipulated by Mr. G. E. Frisby.

### Meeting held at Redhill, Nov. 23rd, 1906.

Present 17.

Mr. W. Ruskin Butterfield, M.B.O.U., Hon. Sec. Hastings and St. Leonards Natural History Society delivered a lecture entitled Remarks upon some Theories in regard to the Migration of Birds. Migration, the lecturer described as the greatest mystery of the animal kingdom. After touching on the various causes of migration, Mr. Butterfield passed on to consider the question of Sense of Direction, remarking that he did not agree with the theory that birds do not follow definite routes, though these routes are of course by no means narrow.

### Meeting held at Reigate, Feb. 1st, 1907.

Present 20.

Mr. R. R. Hutchinson, Hon. Sec. Tunbridge Wells Natural History and Philosophical Society delivered an address on Dispersal

of Seeds, Fruits and Plants by the three distributing agencies, water, air and animals. In connection with the first-named, the lecturer instanced cases of seeds carried by the Atlantic currents from the Gulf of Guinea to Brazil, and also via the Gulf of Mexico to Europe. The lecture was illustrated by impromptu diagrams and by a quantity of most interesting specimens.

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### **Meeting held at Redhill, March 1st, 1907.**

Present 39.

A paper was read by Mr. W. P. D. Stebbing entitled *Geology, the Landscape Gardener*, after which the lecturer exhibited a considerable number of photographic slides, some of which were of extreme beauty, illustrative of the scenery of Devonshire, North Wales and of other parts of the country. An admirable lantern was lent and manipulated by Mr. Mumford.

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### **Meeting held at Reigate, March 22nd, 1907.**

Present 31.

A presentation was made to the late Hon. Sec. to the Club, Mr. G. E. Frisby. The presentation, to which over thirty members of the Club had subscribed, took the form of an Address, together with a cheque for the sum of £16 10s. 6d. Mr. Crosfield in making the presentation, remarked on the whole-hearted zeal that had marked Mr. Frisby's tenure of office, and on the genuine loss sustained by the Club on his retirement. Mr. Frisby in a short speech, expressed his warm thanks for the gifts, and intimated his regret at being obliged to sever his official connection with the Club.

An exceptionally interesting lecture was then delivered by Mr. H. M. Wallis entitled *Birds' Feet*. The lecturer commenced by tracing the descent of birds from the gigantic lizard-like creatures that once roamed the earth, and by way of illustration, drew sketches of the foot of a Penguin and of that of an Iguanodon, the close resemblance between the two being very apparent. Owing to the fact that the Penguin's foot is used for walk-

ing on land and for steering, not paddling, in the water, it has changed very little in appearance from that of its progenitor.

The Golden Eagle, which is said occasionally to kill wolves, has a heel-claw three inches in length, which is driven into the brain of the victim; so with the Falcon, which is known to rip up other birds from the tail to the back of the head, the head being sometimes completely severed from the body.

Owls have what may be termed a 'reversible' foot, i.e.: they may at will shift the position of one toe, so as to have two in front and two behind, instead of the usual arrangement of three in front and one behind. The Osprey's foot is formed on a similar principle.

The Ostrich's foot, used solely for purposes of running, has two toes only, although its near relative, the Emu, has the full number of four.

Swifts never perch, and consequently have very small feet, the toes of which all project in the same direction.

The foot of the Ptarmigan, a bird fond of very high altitudes, is covered with woolly feathers, resembling fur.

Owing to the discovery on a recent Antarctic expedition, it is now known that Terns spend the summer in the Antarctic regions, while they pass the winter in the Arctic. Their wings are developing, but as these birds are coming to swim less and less, their feet are getting smaller and the webs are retreating.

Another bird, the web of whose feet has greatly diminished, is the Frigate-bird. This lives almost entirely on the wing, and has only once been reported as having been seen floating on the water—floating, for the very minute web precludes, save in a very small way, the possibility of swimming. Contrast this with the foot of the Wild-duck, which is very fully webbed, though in this bird the heel-claw still remains free. An even better example is the Pelican, to which the heel-claw is joined to the first toe.

The Moor-hen has the beginnings of webs only, hence its difficulty in swimming, but these (or more probably lobes, as in Coots) would come were the Moor-hen family hard pressed. The Moor-hen's foot at present is more adapted to walking on water-lilies, etc. Still more is this the case with the Chinese Jacana.

Birds of prey have very strong legs, in some cases covered with hairy feathers, the heel-claw being especially long and powerful.

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## ANNUAL MEETING held at the Museum, Old Town Hall, Reigate, Oct. 25th, 1907.

The Annual Report and Balance Sheet were read and adopted.

### ANNUAL REPORT.

In presenting their report for the past year, your Committee have to announce that six new members and eight new subscribers have been enrolled during the session just ended. The total number of members is now 88, as against 77 at this time last year.

Five evening meetings have been held, on which occasions lectures have been given, as follows:—

1906

- Oct. 26. Freshwater Life. Mr. E. A. Martin.  
 Nov. 23. Remarks upon some Theories in regard to the Migration of Birds. Mr. W. Ruskin Butterfield, M.B.O.U.

1907

- Feb. 1. Dispersal of Seeds, Fruits and Plants. Mr. R. R. Hutchinson.  
 March 1. Geology, the Landscape Gardener. Mr. W. P. D. Stebbing.  
 March 22. Birds' Feet. Mr. H. M. Wallis.

The average attendance at the evening meetings has been 28, the highest being 39, and the lowest 17.

The following excursions have been held:—

May 11 (Afternoon), an Ornithological ramble to Rice Bridge, under the guidance of Mr. J. B. Crosfield. Many nests were discovered, and among other birds, the Nightingale was observed, and listened to with delight. The party returned to tea at Lucas's Tea Rooms.

June 5 (Evening), Botanical ramble to Reigate Heath, under the guidance of Miss Sargant and Mr. C. E. Salmon.

June 19 (Afternoon), Geological ramble to Betchworth Pits, under the guidance of Mr. E. W. Dann. Taking train to Betchworth, the party explored the pits under the joint guidance of Mr. Dann and Mr. Taylerson, but few specimens of fossils were discovered. The party partook of tea at Betchworth village, returning home along the top of the hills.

July 6 (Afternoon), Entomological ramble, under the guidance of Mr. A. E. Tonge, to Shere Hills. A fair number of specimens were taken, and after a most enjoyable walk from Gomshall station, the party reached the Silent Pool, when tea was partaken of; after which, they returned to Gomshall station by way of the lower road.

July 17 (Whole Day), Zoological and Photographical excursion to the Zoological Gardens, under the guidance of Mr. G. F. Pollard. The Gardens were reached about 11 a.m. The party made the personal acquaintance of many of the animals, and some good snap-shots were obtained.

September 28 (Afternoon), Fungus ramble, under the guidance of Mr. J. B. Crosfield, to Ranmore Common. The party ascended the Downs from Dorking station, passing through the grounds belonging to Lord Ashcombe. Very few specimens of fungi were found, owing to the very dry weather of the previous three weeks, but many interesting species of plants were observed, including *Hypericum montanum* (in fruit), *Epipactis latifolia*, *Ruscus aculeatus*, *Thesium humifusum*, *Erythraea pulchella*, *Myriophyllum Spicatum* and *Peplis portula*.

The following publications have been presented:—Report of the British Association for the Advancement of Science (1905); Rochester Naturalist (July, 1906, October, 1906, January, 1907, April, 1907); Hastings and East Sussex Naturalist (November, 1906); Transactions of the Cardiff Naturalists' Society (1905); South-Eastern Naturalist (1906); Proceedings of the Bath Natural History and Antiquarian Field Club (1906); Entomologists' Record and Journal of Variation; Transactions of the Burton-on-Trent Natural History and Archæological Society; Museums Gazette (January, 1907); 'Southport' (a handbook); 10th and 11th reports of the Southport Society of Natural Science; Proceedings and Transactions of the Croydon Natural History



The Annual Meeting then resolved itself into an ordinary Evening Meeting.

Present about 20.

Mr. H. M. Wallis lectured on the Heads and Beaks of Birds, illustrating his remarks by numerous black-board sketches.

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### Meeting held at Reigate, Nov. 22nd, 1907.

Present 28.

Mr. A. E. Tonge exhibited a case of moths of the species *Calocampa vetusta*, the Red Swordgrass Moth, which had been bred from eggs obtained from South Tyrol.

Mrs. Durrant exhibited a flint shaped like an arrow tip, which she had found near the sand pit, The Way, Reigate.

Miss Winifred Smith delivered a lecture on The Relations of Ants with Plants, which was illustrated by lantern slides. The paper opened with a sketch of the habits of the leaf-cutting ants of the American tropics, and the peculiarities of trees by which their ravages are withstood. The attractions in the way of food and habitation offered by *Acacia* & *Cecropia* to warrior ants, which protect them from their enemies, were described.

The adaptations of several plants belonging to the Eastern tropics were also mentioned. Among these plants were *Cordia*, *Myrmecodia*, *Hydnophytum*, *Smilax*, *Humboldtia*, *Macaranga*, *Dischidia* and others. Various theories as to the true relations of ants and plants, were quoted, and evidence was collected to show how far the benefits conferred were reciprocal, how far they were one-sided, and how far the peculiar features of so-called ant plants were truly adaptive, and procured by natural selection. It was pointed out that the test of true symbiosis was the suffering and ultimate reversion to the common type, on the part of plants which are separated from their animal allies.

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### Meeting held at Redhill, Jan. 24th, 1908.

Present 21.

A lecture was delivered by Mr. James Edmund Clark, F.G.S. entitled Nature and Travel in S. Africa.

**Meeting held at Reigate, Feb. 28th, 1908.**

Present about 40.

Mr. A. E. Tonge exhibited a photograph of a tropical house Spider (*Heteropoda regia*) from Jamaica, found at Rimer Mids, on a bunch of bananas.

Mr. A. E. Carey, M. Inst. C.E. delivered a lecture entitled Prehistoric Man on the Highlands of East Surrey, which was illustrated by 38 lantern slides. Mr. S. H. Lury very kindly lent his lantern, and showed the slides.

At the close of the lecture Mr. A. E. Trower exhibited a very interesting collection of neolithic arrow heads and flakes which he had collected from Redhill and Merstham, and a fine adze, which Sir John Evans refers to as of an uncommon type.

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**Meeting held at Reigate, March 27th, 1908.**

Present about 55.

The meeting was held in a lecture room at the Grammar School, which had been conveniently arranged for the series of exhibits on which short lectures were given by various members of the Club and their friends.

After a few introductory remarks, Dr. T. A. Chapman exhibited and described a fine series of butterflies from Spain. Mr. E. Dukinfield-Jones followed and gave an interesting account of the habits of several genera of Brazilian Butterflies and Moths and of the methods he used in capturing them, and showed a selection of exquisite examples from his extensive local collection of Paraná.

Mr. C. E. Salmon brought dried specimens of insectivorous plants, and very clearly described the various British species, and the methods by which they attracted, captured and either digested or absorbed the flies and insects; in one case, that of the Teasles, the apparatus for capture is probably merely protective.

Mr. A. E. Tonge showed a fine collection of stereographs of his own making of insects, and explained the stereoscope. Miss

Ethel Sargant exhibited some sections of fossil plants showing microscopic structure. They are prepared from coal-balls found in the Lancashire coalpits.

Mr. E. W. Dann explained a very interesting raised map showing the Geology of the district, which he had made in plasticine.

Mr. R. S. Ragg showed a collection made by his brother Dr. Ragg, of West Indian Land and Freshwater Shells.

Mr. G. W. Butler brought an interesting collection of volcanic rocks, chiefly acid and basic lavas, and described them in some detail.

The President reminded the members that the collections of the Club were now stored at Great Doods, the transference from the Old Town Hall, having taken place that day.

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### Meeting held at Redhill, April 24th, 1908.

Present 22.

Mr. E. S. Salmon, F. L. S., member of the Council National Fruit-growers Federation, Mycologist to the S.E. Agricultural College, Wye, delivered a lecture on Economic Biology and Natural History Clubs; Fungus diseases of Cultivated plants. The lecturer described a large number of diseases, to which various fruit trees were subject including the Apple Fungus, Pear Scab, Brown Rot on Cherries (usually attributed to frost as it chiefly attacks the flowers), Apple Mildew, the American Gooseberry Mildew, and European Gooseberry Mildew, describing the difference, the latter being confined to the leaves; Apple Canker, Potato Blight, Potato Scab, Potato Warty Disease, &c., and illustrated them with a large number of very fine lantern slides. He described the various methods of combating these diseases, by spraying with a fungicide solution, at suitable times cutting and burning affected parts, &c., and showed how Natural History Clubs, and interested persons, could help by reporting cases of the various diseases, which came under their notice, to the proper authorities, so that they might be dealt with in their early stages.

## ANNUAL MEETING held at Reigate, Oct. 23rd, 1908.

The Annual Report and Balance Sheet were read and adopted.

### ANNUAL REPORT.

The Committee have pleasure in submitting the 50th Annual Report of the Club.

The number of members and subscribers at the close of last session was	...	...	...	...	...	88
	Elected during the year	...	...	...	...	6
	Resignations and removals	...	...	...	...	6
	Deaths	...	...	...	...	1
	Total	...	...	...	...	87

By the death of W. J. Evelyn, Esq., of Wotton House, Dorking, we lose one of our oldest members, for he was elected an honorary member in August, 1859.

Six evening meetings have been held, with an average attendance of 31, as against 5 held last year with an average of 28·2. Having regard to our small membership the attendance may be considered good.

The following is a list of the papers read:—

1907

- Oct. 20. The Heads and Beaks of Birds. Mr. H. M. Wallis, M.B.O.U.  
 Nov. 22. The relations of Ants with Plants. Miss Winifred Smith, F.L.S.

1908

- Jan. 24. Nature and travel in South Africa. Mr. J. E. Clark, B.A., B.Sc., F.G.S.  
 Feb. 28. Prehistoric Man on the Highlands of East Surrey. Mr. A. E. Carey, M.Inst.C.E.  
 March 27. Exhibits and short lectures by various members & friends, comprising Fossils from the Coal Measures. Miss Ethel Sargent, F.L.S.

Insectivorous Plants. Mr. C. E. Salmon, F.L.S.  
 Spanish Butterflies. Dr. T. A. Chapman F.Z.S., F.E.S.  
 Brazilian Butterflies and Moths. Mr. E. Dukinfield  
 Jones, F.Z.S., F.E.S.

Stereograms of Insects. Mr. A. E. Tonge, F.E.S.  
 West Indian Land and Freshwater Shells. Mr. R.S.  
 Ragg, B.A.

Some Volcanic Rocks. Mr. G. W. Butler, F.G.S.,  
 F.Z.S.

Plasticine Geological Map of the District. Mr. E. W.  
 Dann, B.A., F.R.G.S.

April 22. Economic Biology and Natural History Clubs; Fun-  
 gus Diseases of Cultivated Plants. Mr. E. S. Salmon,  
 F.L.S., Member of the Council of National Fruit  
 Growers Association, Mycologist to the S.E. Agri-  
 cultural College, Wye.

The Club's lease of the Old Town Hall ceased in March, 1908, and it became necessary consequently to find other accommodation for the collections. As no adequate building could be found, where they could be displayed, the Committee were of the unanimous opinion that the occasion should be taken to erect a public museum, if the necessary funds could be obtained. At their request, a Special General Meeting was called to consider the whole subject. It met on the 30th January, 1908, and after considerable discussion, Mr. J. B. Crosfield moved the following resolution: That this Club approves of the recommendation of their Committee that a museum be built in Reigate if the necessary funds can be raised. This was seconded by Miss Ethel Sargent, and carried with only one dissentient vote. Donations amounting to £699 12s. 6d. in support of the scheme have already been promised, and an appeal to the general public is to be issued immediately. Members are urged individually to interest their friends in the erection of the museum, for without their loyal and enthusiastic support the Committee will be unable to obtain the necessary funds.

The following Societies have presented their Publications to the Club:—

Proceedings of the Bath Natural History and Antiquarian Field Club for 1907; Report of the British Association, Leicester, 1907; Transactions of the Cardiff Naturalists' Society, 1907; Proceedings and Transactions of the Croydon Natural History and Scientific Society, 1906-07; Transactions and Journal of Proceedings of the Dumfriesshire and Galloway Natural History and Antiquarian Society, 1905-06, and 1906-07; Report of the Marlborough College Natural History Society, 1907; 55th Annual Report and Transactions of the Nottingham Naturalists' Society, 1906-07; Proceedings of the North Staffordshire Field Club, 1907-08; the Rochester Naturalist for Oct. 1907; the South Eastern Naturalist, 1907 (2 copies), and 1908 (1 copy); Proceedings of the South London Entomological and Natural History Society, 1906-07, and 1907-08; the Twelfth Report of the Southport Society of Natural Science, 1906-07; Bulletin of the Lloyd Library; Catalogue of Birds and Animals contained in the Tolhouse Museum, Great Yarmouth, 1908.

Mr. Alfred E. Tonge, F.E.S., has kindly presented a copy of his book entitled *Some Moths and Butterflies and their Eggs*, and Mr. Alfred E. Carey, M.Inst.C.E., a copy of his paper on *Prehistoric Man on the Highlands of East Surrey*.

During the summer there were the following Excursions:—

AFTERNOON.

- June 17.—Merstham and Upper Gatton.  
 June 27.—Shere Hills.  
 July 8.—Reigate Hill.  
 July 22.—Headley.  
 August 12.—Gomshall.

WHOLE DAY.

- October 2.—Tilgate Forest.

June 17. This was an evening ramble lead by Mr. J. B. Crosfield. The route was from Merstham Station, Upper Gatton and Mugs-well to Reigate; field paths were followed most of the way. The very wet morning caused the attendance to be small, and only eight members and friends went.

June 27. A very pleasant excursion, conducted by Mr. A. E. Tonge, was made by twelve members and friends, and favoured

by ideal weather. The party met at Reigate Station, and travelled by the 2.5 to Chilworth, where, by the courtesy of the Railway Company the train stopped specially to allow them to alight. The route followed at first was by the lane leading towards Merrow, then along a bridle path eastwards and up the steep path to St. Martha's Chapel, where the clerk, Mr. King, met the party and conducted them round the interior, pointing out objects of special interest including the tombstones of Stephen Langton and Alice. After admiring the extensive views to be obtained from the Churchyard, a walk of about a mile along a lovely winding path across the downs brought the party to Newland's Corner, where a halt was made to admire the glorious stretch of country spread out to the southward. Unfortunately, there was a good deal of haze, and this rather limited the extent of the view, and the number of landmarks visible. Attention was drawn to the high level gravels which contain chert fragments, derived from the Lower Greensand Beds, to the south and south-east. From this point the green ride along the top of the hills was followed in an easterly direction until directly above the Silent Pool, when a turn was made southward, and a woodland path down the steep hillside followed to the pool, which was duly admired while waiting for tea at the cottage.

July 8. The Geological walk round Reigate, conductor Mr. E.W.Dann, was frustrated by steady rain. A visit was paid by a few members, who met at the foot of the Chalk Path to the Colley Pits in the Upper Greensand. By an unfortunate misunderstanding they failed to meet the conductor, and this with the heavy rain prevented the full programme being carried out.

July 22. This was an afternoon excursion to examine the Eocene Outlier on which Headley Church stands, and which is the nearest exposure of Tertiary beds to Reigate. The party, numbering seven, was conducted by Mrs.G.R.S.Taylor and Miss Crosfield. After leaving Betchworth Station at 2.15, the attention of the party was first called to the low escarpment of the Upper Greensand, through which the railway is cut. The well-known quarry near Hill Farm, was visited, but the section is not now very clear, as excavations for Hearthstone are now being carried on by a shaft and tunneling. The party rested half way up

the face of the chalk escarpment, and a short account of the origin and development of the structure of the Weald and its physical features was given. The path through the wood to the east of Betchworth Clump was followed, and then the field path to Headley Heath. Attention was called to the deposits of gravel and sand, and their possible connection with those seen above Newland's Corner, and near Chipstead on previous excursions. In Headley Lane the clayey sand of the Reading Beds was examined, and many specimens of *Ostrea bellavacina* found. A quarry in Upper Chalk was next visited, and the recently found proofs of the presence of the Zone of *Marsupites testudinarium* all along the N. outcrop of the Chalk were mentioned. The party then returned to tea at the Village Institute, after which, the track by field-paths and lanes to Walton Heath was taken, and the descent into Reigate made by the Pilgrims' Way.

August 12. The party numbered ten and was conducted by Miss Ethel Sargant and Mr. C. E. Salmon. Starting from Gomshall Station we climbed to the top of the North Downs, and walked for some way westward along the ridge. We came down by a lane near the Silent Pool which was visited by some of the party. We all met at tea at Albury, saw Albury Church, and walked back to Gomshall Station by the valley road. The most interesting botanical find was a new station for *Epipactis violacea*. The plants observed in flower were chiefly *Umbellifers*, *Composites* and *Labiates*, as might be expected at that season: some were characteristic of the chalk as *Scabiosa columbaria* and *Calamintha acinos*.

Oct. 2. This was a most enjoyable and successful excursion to Tilgate Forest in search of Fungi, conducted by Mr. J. B. Crosfield. The party which numbered 19, took train to Three Bridges; from here we walked on the east side of the railway southward through the forest. A small detour was made to see the old furnace ponds, now a charming ornamental lake. A Heron (*Ardea cinerea*) was seen flying over, and near by a flock of long-tailed Tits (*Acredula caudata-rosea*) was observed, and the following flowers found: *Pilularia globulifera* L. (Pepper Grass) and *Litorella lacustris* L. (Plantain Shore-weed). *Epipactis media* Fries was also recorded from one or two

localities, and *Campanula hederacea* was found still flowering.

The day was a phenomenally hot one for October (the thermometer registering 80° in the shade), so that the shelter of the trees in the wood was very welcome. Among these the Turkey Oak (*Quercus cerris*) with its beautiful frilled acorn cup and long narrow leaves, deeply indented, was common. In the middle of the forest a halt was made for lunch, and the Fungi which had been found were displayed. Among them the following species and genera were recognised, and there were many other kinds which no one would name:

*Amanita phalloides* Fries, *A. muscarius* L, *A. pantherinus* D.C., *A. rubescens* P.

*Armillaria melleus* Vahl.

*Clitocybe laceatus* Scop.

*Hypholoma fascicularis* Hud.

*Coprinus comatus* Fries.

*Lactarius* various species.

*Russula nigricans* Fries.

*Cantharellus cibarius* Fr.

*Lenzitis betulina* Fr.

*Boletus lutens* L.

*Boletus scaber* Fr.

*Clavaria fusiformis* Son.

*Scleroderma vulgare* Fr.

Near the bridge which crosses the railway N. of Balcombe Tunnel *Agrimonia odorata* Mill. was plentiful, and also *Erythraea pulchella* var *schwarziana* found not far away. In the bottom of the deep cutting the clayey soil indicated that the East Grinstead Clay was cut into. In the banks and upper slopes were the Tunbridge Wells Sands, but the section is poor. From the top of the tunnel, Reigate Hill could be dimly seen in the haze. The following butterflies were also seen: two specimens of the Small Copper (*Chrysophanus phlaeus*) were whirling wildly about at 8.30 a.m. on Redhill Common, and near Balcombe the Scarlet Admiral (*Pyrameus atalanta*) was noted.

After tea in Balcombe the party returned by the 4.26 train. At the Three Bridges station swans were seen flying over.

BALANCE SHEET  
for twelve months ending 30th June, 1908.

Cr.	£	s.	d.	Dr.	£	s.	d.
36 members at 10s. ....	18	0	0	Rent of Museum.....	16	17	6
2 ditto in advance.....	1	0	0	Gas .....	3	8	10
1 ditto arrears paid .....	10	0	0	Lecture fees & expenses	14	0	0
29 subscribers at 5s.....	7	5	0	Use of North Room,			
1 ditto in advance.....	5	0	0	Redhill .....	2	0	0
4 ditto arrears paid .....	1	0	0	Fire Insurance.....	13	6	0
Grammar School sub....	2	0	0	Advertising.....	1	19	0
Ditto 1906-07.....	2	0	0	Marriage & Co. ....	6	10	0
Amt. borrowed from the				Secretary's expenses..	2	11	11
Holmesdale Museum Fund	5	12	6	Printing & Stationery	5	13	3
Use of Museum for meet-				Treasurer's expenses.	3	6	0
ings, 10 evenings, 2/6 each	1	5	0	Removal of Museum.	2	13	6
Sales of 'Flora of Surrey'	2	6	0	Cleaning do.....	10	6	0
Balance from 1907.....	3	15	0	Surrey Survey Sub.			
Subscriptions unpaid:				1907 and 1908.....	5	0	0
1906-07, 2 at 5/-				S. E. Union of S. S. do.			
1907-08, 3 at 5/-				1907 .....	10	0	0
ditto, 1 at 10/-				Repairs .....	5	6	0
				Cheque Book .....	5	0	0
				Balance.....	3	17	2
	£42	15	0		£42	15	0

Examined and found correct,  
E. DUKINFIELD JONES,  
C. E. SALMON.

The following Officers were elected for the ensuing year:—

<i>President</i>	Dr. J. Walters, J.P. (re-elected).
<i>Treasurer</i>	A. E. Tonge, F.E.S. (re-elected).
<i>Secretary</i>	Miss Margaret C. Crosfield (re-elected).
<i>Committee</i>	Rev. R. Ashington Bullen, F.G.S., F.R.A.I., Messrs. G. W. Butler, F.G.S., F.Z.S., and J. B. Crosfield, Dr. T. A. Chapman, F.Z.S., F.E.S., Messrs. E. Dukinfield Jones, F.Z.S., F.E.S., R. S. Ragg, B.A., C. E. Salmon, F.L.S., and Miss Ethel Sargent, F.L.S. The vacancy caused by Mrs. G. R. S. Taylor's retirement which was due to her leaving the neighbourhood, was not filled.

The President, Dr. J. Walters, gave a short address dealing with the origin of the Club 51 years ago, its history and present position.

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The Annual Meeting then resolved itself into an ordinary Evening Meeting.

Present 57.

Mr. C. E. Salmon called the attention of members to the new Flora of Surrey which he hopes to publish, and for which he asks the help of members and friends. This work is the completion of what has been prepared by Mr. W. H. Beeby during the last 23 years.

Mr. A. E. Tonge, F.E.S., exhibited a series of Coast Dart Moths (*Agrotis cursoria*) which he had caught during the summer at Southwold, which shew infinite variations, and a series of the Poplar Kitten Moth (*Cerura bifida*) which he had bred *ab ovo* from parent captured in Reigate, 1907. Also a series of Ear Moths (*Hydræcia nictitans*) from Southwold, including the November Moth (*H. paludis*), and a series of the large White Butterfly (*Pieris Brassicæ*), bred from wild larvæ collected at Potton, Beds., Oct., 1907, the specimens showing a partial black edge to hind wings.

Mr. Alfred B. Gough, M.A., Ph.D., then read a Paper on:

### **The Primitive Savage in Early Art and Tradition.**

The persistence of archaic and less vigorous forms of animal or vegetable life in remote and isolated regions which the allied but more highly organised and efficient forms have not yet penetrated, is a phenomenon familiar to naturalists. This is as evident in anthropology as in other departments. No little of the tragedy of human history is due to the clash of two populations, one of which still lingers at a stage of development long since passed by the other. As even now there is an enormous gulf between the highest and lowest races of mankind, it is not improbable that for long ages after our ancestors had attained their full human endowment, there lingered in certain secluded fastnesses and places of refuge the gradually dwindling hordes of semi-human or not fully human beings.

Is there any evidence for the existence of such belated representatives of the ancestral Ape-man? I propose to draw your attention to some recent discoveries, which, though of dubious interpretation, appear to point in this direction. I shall further venture to throw out some suggestions (pp. 34ff.) which I admit are speculative in the extreme, and of which strict science can take no account. It seems however, sometimes permissible for a Society such as ours to give the layman an opportunity of asking questions or offering hints in all humility which may provoke enquiry on new lines.

We need not be surprised if no actual remains of these stragglers in the human procession, if such there were, have as yet been found. The enormous denudation which followed the glacial age, and the presumable absence of the custom of burial, greatly reduce the chance of such a discovery. Moreover, analogy leads us to conclude that like all survivals they were few in number. There are now numerous tribes in outlying places, difficult of access, who maintain themselves in a state of extreme savagery in very small numbers, groups of a few thousands, or even hundreds. Collectively they form an almost infinitesimal fraction of the human race. Such are various Indian hill-tribes, the Veddas of Ceylon, the Andamanese, the Negritos of the Philippines, the Central African Pygmies, the Bushmen, the Digger Indians of N. America, and the now extinct Tasmanians. Some of these were till recently in the palaeolithic stage. Most of them are characterized by certain common features—a small brain with few convolutions, a bony development of the face and jaws, long arms, short legs, and short stature. Although it is claimed by a small school of anthropologists that many of these tribes are degenerate, the weight of authority supports the view that for the most part their physical and mental characteristics and their geographical distribution prove them to be belated representatives of primitive man. The survival of these scattered and minute groups is of great significance. We are however, still very far from the semi-human stage, and must turn to the geological record.

The famous *Pithecanthropus erectus* or Ape-man of Trinil in Java is known from the roof of a skull, two teeth and a femur

found beneath a lava-stream by Dr. Dubois in 1892. The stratum is Pliocene, or, in the opinion of some geologists, Pleistocene. The usual view is that this animal was a being intermediate between man and the generalized type from which man and the anthropoid apes sprang. Some authorities however, like Sergi, hold that it is not a direct ancestor of man, but a by-form, allied to the gibbons, though vastly superior to them. One notes the narrow and retreating forehead, the remarkable posterior development of the skull, and the huge ridges over the eyes. While the brain-capacity of the highest anthropoid apes does not exceed 550 c.c., that of the *Pithecanthropus* is reckoned at 930-1000, that of the prehistoric Neandertal race of man at 1150, that of the lowest existing races, Bushmen, Veddas, etc., at 1250, and that of intelligent Europeans at 1500-1650. A Scotchman naturally holds the record with 1800.

Passing over the still disputed question of Tertiary man, I must say a few words on Quaternary man, in and immediately after the Glacial Period. It is in W. Europe that nearly all the earliest traces of man have been found. Rude flint implements abound from the last warm interglacial period, and probably much earlier. The skulls of palaeolithic men, the makers of these tools, till recently presented a great puzzle, for they belonged to extremely different types, and seemed to show no sequence or progress. Now however it is claimed by Koepens and †Sergi that rigid investigation of the conditions under which they were found has led to the following result. The only race that is certainly known to have inhabited Europe before the end of the glacial period is the extremely low and animal type known as Neandertal man, so named from the valley near Düsseldorf where a famous skull was discovered. When the ice-cap was shrinking and the climate growing warmer, in the so-called Reindeer Age, a new and vastly higher race appeared, represented by the skull of Chancelade and many others. Prof. Sergi, one of the most eminent of living ethnologists, maintains that this race was not descended from Neandertal man, but that it penetrated Europe from the South, coming from N. Africa, where, as well as in Europe, its representatives still live, and

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† G. Sergi, *The Mediterranean Race*, 1901, esp. Chap. X.

form in many countries the bulk of the population. The remarkable thing is that this highly endowed Eurafrikan race, as Sergi calls it, appears in Europe practically full-fledged, and seems in the early post-glacial period to have been almost as intelligent as it is now.

Apart from the hardly human or non-human *Pithecanthropus*, the Neandertal race is the lowest and most ape-like variety of mankind known. Its remains have been found in many parts of Europe. Among the best examples are skulls from Spy and Engis in Belgium, Brûx in Bohemia, Krapina in Croatia, Gibraltar and Neandertal. Huxley has thus described the men of this race: 'They were short of stature, but powerfully built, with strong, curiously curved thigh-bones, the lower ends of which are so fashioned that they must have walked with a bend at the knees. Their long-depressed skulls had very strong brow-ridges; their lower jaws, of brutal strength and solidity, sloped away from the teeth downwards and backwards, in consequence of the absence of that especially characteristic feature of the higher type of man, the chin prominence.'† We may add that not only was the skull very thick but that the forehead was 'villainously low,' and the posterior part of the brain comparatively large, the canine teeth were large, the fore-arms were long, heavy and clumsy with a divergent radius and ulna, and the shins were short. A human head carved in crystalline talc, found near Mentone, has been thought to represent a member of this race.‡

Inside the lower jaw of a man there is found a bony process known as the genial tubercle, to which one of the muscles which move the tongue is attached. This is wanting in the apes and in all other brutes. A jaw-bone found at La Naulette in Belgium has a depression in the place of this tubercle: hence it was supposed by de Mortillet that some of the Neandertal men were unable to produce fully articulate sounds, if not utterly incapable of speech. This is supported by the fact that certain consolidations of the internal spongy tissue of the jaw-bone, due to the tension of the muscles regulating speech, are

† *The Aryan Question*, 1890, in *Collected Works*, vii., p.322.

‡ E. Piette, as above, p.32.

only slightly developed in the Neandertal man, but prominent in modern man. In the teeth of a jaw-bone from Krapina in Croatia the folds of enamel more nearly resemble those of a certain anthropoid ape of the Miocene, the *Dryopithecus*, than those of a normal man.†

We may reasonably suppose that certain rudimentary features which at the present day are either sporadic and atavistic or characteristic of low races were far more frequent in this exceedingly remote age than they are now, although fossils can afford no evidence regarding them. Such are the muscles with which some persons can move their ears, or the pointed tips which we can all see in a rudimentary state in our own ears, and which in new-born infants form the apex towards which the hairs of the ear are directed. In Europeans general hairiness, as in the 'wild boy' of Aveyron, is atavistic. The Ainos of Japan, who are considered akin to the early inhabitants of Europe, are frequently covered nearly all over with hair. The same peculiarity is often observed among the Australian blacks, in whom on other grounds some would see the nearest congeners of the Neandertal race.

Some monkeys use large stones for breaking open the kernels of fruit. The Neandertal men made rude tools of flint, chiefly for splitting bones for the marrow, scraping hides, and hammering. Great stone spear-heads, although found, are said to be very rare at this period. These people caught fish and probably trap-

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† See H. Bedrow, *JB. der Natutkunde*, II. (1904) 294f. Of two very recent discoveries I have seen no scientific account, but it appears from reports in the *Daily Telegraph* of 16th Dec., 1908, and *Illustrated London News* of 27th Feb., 1909, that at La Chapelle aux Saints in the Corrèze there have been found associated with rhinoceros teeth parts of a skeleton of more or less pithecoïd character, although the skull was 'quite voluminous.' M. Perrier, the Director of the Paris Museum of Natural History, considers these remains to be those of a very primitive man. 'The appearance of the bones of the limbs seems to indicate that their owner went about more on all fours than erect.' (*D. T.*) Further, Otto Hauser has found in the valley of the Vezère the skeleton of a youth with a very similar skull. The forehead recedes, the supra-orbital ridges are big, the jaw is strong but receding, the legs are short as in a child, and the knees must have been bent. The body had been buried, and with it a well-cut flint dagger and a scraper. On what ground this is held to be the oldest human skeleton ever found in virgin ground I know not.

ped animals and drove the wild cattle over precipices. Probably they were cannibals, as split human bones have been found, but opinion is divided on this point. It is uncertain whether they could make fire. Of huts and clothing during the warm interglacial period nothing is known, but when the cold increased caves were inhabited, and if the bone needles were the work of these men, skins were probably used for dress. That the race was capable of progress to some extent is shown by the gradual improvement in the tools found in the gravel-beds. But at his best the Neandertal man was a savage of a low type. He was dispossessed from the plains and valleys of Central Europe by the intelligent invaders from the S., and driven, it would seem, to take a last refuge in the marshy coasts and islands which fringe the North Sea, a district admirably adapted by nature for purposes of shelter. Here, among the Frisians, it is maintained, his blood, greatly diluted, still flows. I shall revert to this subject later, but shall now speak of the discoveries which have led some anthropologists to suppose that the Eurafrian invaders encountered among the aborigines individuals of a truly brutal type.

The Eurafrians, if we are to accept the conclusions of Sergi and others, conclusions which are finding wide acceptance, were and are the most gifted of all races. Branches of them created the wonderful civilizations of Egypt and Crete, and formed in later times the bulk of the population of Greece, Italy and Spain, and a large element in those of France, Britain, Scandinavia, and W. Germany. We are however here concerned with their first appearance in France in the Reindeer Age, when the climate was slowly becoming warmer. Later they produced the Neolithic culture. The skull of Chancelade, dating from the time of their first appearance in Europe, has a capacity of 1730 c.c., much greater than that of the average European of to-day. At this early time, more than 10,000 years ago at the lowest computation, the Chancelade race left numerous traces of its manner of life in caves, which have been explored in recent years, especially in the basin of the Garonne and the Pyrenaean slopes. They constructed wooden huts of which they have drawn pictures. They had even the elements of writing, for in the cave of Mas d'Azil there are symbols written on pebbles, not unlike

the oldest Cretan script.\* When they attained to the Neolithic stage of culture, at any rate, they had some kind of religion, as is indicated by their mode of burial and their dolmens and stone circles. But what concerns us here is their astonishing artistic skill. They carved in relief and scratched on bone and on their cave-walls, and painted on the latter, figures of the animals they hunted. The artistic merit of these drawings varies very greatly. The best of them, as you are well aware, would do credit for realism and vigour to a modern artist. Such are the well-known representations of running and belling stags, long-haired mammoths, or grazing and charging bisons. Representations of men are extremely rare. Children, it has been noted, draw beasts before they are interested in the human figure. It is remarkable too that the animals represented are nearly all such as were objects of the chase. Lions, tigers, jackals, hyenas and wolves are absent, though we know that they lived in the country at the time. M. Salomon Reinach suggests that these drawings were magical, and intended to bring the desirable beasts into the power of the hunter†.

Now in one of these late Quaternary caves, that of Mas d'Azil, between Toulouse and the Pyrenees, the same cave where the quasi-alphabetic signs were found, there was discovered a few years ago a fragmentary disc of bone engraved on one side with an ordinary human figure and on the other with an enigmatic representation. Of the genuineness and antiquity of this relic there is no question. The late eminent French anthropologist, E. Piette, exhibited it in 1902 to the Society of Anthropology in Paris. A reproduction‡, together with a discussion of this strange figure, will be found in the *Bulletin de la Société d'Anthropologie de Paris*, 1902, 3 sér. III. p. 771ff. On the missing portion of the disc there must have been a bear, as a huge hairy outstretched paw armed with claws is visible. Facing it is a naked man or man-like animal grasping a thick shaft or branch, which he appears to be thrusting into

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\* Facsimiles in Sergi, *op. cit.* p. 291.

† *L'art et la magie*, in *L'Anthropologie*, xiv. 1903, p. 257ff.

‡ Another in a small popularly written book by Dr. L. Wilser, *Menschwerdung*, Stuttgart, 1907, p. 27.

the body of his antagonist. Dr. Wilser however thinks he is swinging himself up into a tree, an attitude with which the position of the arms hardly agrees. The hips are sharply, and the knees slightly, bent, so that Piette seems to have thought the creature was dancing. He points out a number of decidedly simian characters. The face is a muzzle (I admit more canine than simian), the forehead retreats, the skull is flattened at the top and does not project in the least behind. The assumption of the erect posture by man is accompanied by the shifting of the foramen or spinal orifice from the back of the skull, where it is with apes, towards the centre. Although the upper arms are very short, which Piette would ascribe to an error in drawing, the fore-arms are very long. The trunk and belly are simian in form, and apparently covered with hair. As in apes, there is no inward curve to the back; man's doubly-curved spine is also connected with his erect posture. The buttocks and calves are flat, as in apes, and the legs short. The feet are badly drawn, being too thick and short for human feet, neither are they prehensile organs, but are suited to the vertical position. Piette dismisses the idea that it is an anthropoid ape, these being, as far as we know, all frugivorous tree-climbers of the tropics, incapable of living under the semi-arctic conditions of Pleistocene Central Europe. The only known French apes lived in the hot climate of the Miocene. A higher form, which had adopted the walking habit, and with it a different diet, might, he thinks, have lived in France in this cold period. He concludes that the figure represents a relative of the *Pithecanthropus*, more nearly related to man than any ape. The artist cannot have made a fantastic combination of man and ape without travelling to equatorial regions, which is out of the question. Besides, these cave-artists were most stringent realists.

In the same cave, Piette afterwards discovered a much rougher sketch† of a man whose great toe is shorter than the others, and widely separated from them, just as in the prehensile foot of an ape. By a curious error of drawing, the great toe is on the outer side of the foot. The hip and knee are sharply flexed.

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† Figured in Wilser, *op. cit.* p. 28.

In the French journal *L'Anthropologie*, 1904, xv., p.625ff., two distinguished scientific observers, M. E. Cartailhac and the Abbé Breuil, give a short account of a cavern they have explored in N. Spain, that of Altamira, near Santillana in the hills behind Santander. They have since drawn up a fuller report, of which I have only seen a brief abstract. From the end of the Pleistocene Period until its discovery in 1879 this cave was closed by falls of rock. It contains not only sketches which it is thought were first attempts to devise a hieroglyphic system, but also numerous pictures scratched and painted on the walls, of very varying degrees of merit. The wild horse, ox, goat, bison, deer and wild boar are depicted. The explorers certify the genuineness of the drawings and ascribe their origin to the period of the French caves. Among the figures some of the roughest sketches, two of which are reproduced in the above-mentioned journal, bear a certain resemblance to the figure of Mas d'Azil. In the words of the investigators, 'a relatively considerable number of these drawings represent strange silhouettes, the meaning of which left us at first dreamy and hesitating; but their analogies and the comparisons which they suggest leave no doubt as to their signification, and the discoveries made since in our French caves have confirmed us in the conclusion that they are human beings, doubtless incorrect and devoid of all expression, but recognizable after all by the arms, the legs when there are any, the rump, the phallus, and in some cases the ear. But none has the face of a man, and all are furnished with strange muzzles, just like those which the Eskimos or Redskin sorcerers put on as masks for their magic dances. The drawing of Mas d'Azil . . . of a man with the head of a carnivore, dancing naked is probably related to these fellows of Altamira. The gesture of the arms stretched out in front or raised in the air is so often repeated that we can hardly believe the artists only portrayed this attitude because they did not know where to place them. One cannot ignore the analogy of this gesture with that which in all antiquity and nearly all peoples indicates supplication and prayer.' The opinion that we have here and at Mas d'Azil, men performing rites in beast-masks was shared by M. Boule. Now however MM. Cartailhac and Breuil have made a more

minute examination of the Altamira figures, and in their new report they regard their old explanation as very improbable, and also as failing to explain certain other animal characteristics. They suggest that Piette was right, and that when these drawings were made there still lived in Europe creatures related to the common ancestor of the anthropoid apes and man. With this opinion the German anthropologist, Dr. Wilser, fully concurs. A glance at the two facsimiles† in *L' Anthropologie* shows that the head does not project backwards, that the back is simply convex, and that the legs, at least in one figure, are bent. The faces I admit are hardly what one would expect, but recall those of weasels or even birds, though perhaps big teeth are indicated. But the drawings are so rough that it is useless to insist on details.

Turning in doubt from these mysterious drawings, we will enquire whether tradition throws any light on the subject. There is an enormous gap to bridge, which may well make us hesitate. But, firstly, if the Ape-man, or a not fully human animal, survived, as seems possible, until the close of the Ice Age, it would be a comparatively small matter for him to linger on under favourable circumstances for a few thousand years more in the vast wildernesses of mountain and forest in Central and Northern Europe, while the more advanced races were gradually multiplying in the plains and river-valleys. And though we may assume that at the time when the earliest known European traditions arose, the lowest forms of the Neandertal race whom our ancestors encountered had already become extinct, and that the survivors had risen somewhat in the scale, the latter may well have been far more savage and brutish than the lowest of existing races.‡ Moreover, traditions are known in some cases to have persisted for an almost incredible length of time. You have very likely heard the authentic story of the English villagers who told of a ghost in golden armour that haunted a certain barrow. When it

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† Also figured, with parts omitted, in Wilser, *op. cit.* p. 30.

‡ If we are to believe the Scottish chroniclers, there were a few cannibalistic cave-dwellers in that country even as late as the fourteenth and fifteenth centuries. See, *e.g.*, Lindsay of Pitscottie's *Chronicle*.

was opened for the first time a skeleton in gilt armour was found within. Here the tradition had persisted a thousand years or more, but this is little compared with cases where practically identical tales are told by widely separated races, going back perhaps to the time, about 2000 years B.C., before the separation of the conquering tribes who spoke the parent Aryan language. The view is widely accepted that the tales current in parts of N. Europe of swarthy cunning dwarfs who were clever at metal-work and lived in subterranean houses, preserve a memory of a prehistoric conquered race. May we not similarly look for memories of a still older race?

One difficulty is that it is hard to separate the demonic and purely imaginative elements from those based on reality. It is extremely common to find in folk-tales a fusion of mythical and historical elements.

The great Sanskrit epic *Ramayana*, though perhaps put into its present form c. 400 B.C., is based on traditions dating from the time some centuries earlier when the Aryans conquered S. India. The hero Rama fights the Rakshasas, a race of fierce demons in the S., who have carried off his wife. Rama is aided by an army of monkeys under their king Hanuman. The traditional explanation is that by the demons and monkeys are represented respectively the hostile and friendly aboriginal savages.

The Greek physician Ctesias, who lived at the Persian court in the fifth century B.C., collected information about India from the Persians. Of the fragments of this work Dr. L. Schmitz† writes that 'it does not in any way deserve to be treated with contempt . . . . Many things in his description which were formerly looked upon as fabulous, have been proved by the more recent discoveries in India to be founded on facts.' It contains the following quaint passage. 'In the mountains [of the N.W.], they say men live, with dogs' heads, who dress in the skins of wild beasts. They have no language, but bark like dogs and understand one another. Their teeth are larger than those of dogs, their nails like dogs' claws, but stronger and longer. They live in the mountains as far as the Indus. They are black and very just, like the rest of the Indians with whom they have to do. They

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† In Smith's *Dict. of Class. Mythol. and Biogr.*

understand what the latter say to them, but they can only reply by barking and gesticulating like the deaf and dumb with their hands and fingers. They live on raw flesh. The Indians call them *Kalystrioi*, that is the dog-headed.' This account is said to be supported by an ancient Sanskrit tradition, which also names the tribe dog-headed.

I will just mention in passing the Hebrew *Se'irim*, or 'hairy ones,' who are spoken of in Isaiah xiii, 21, as dancing amid the desolate ruins of Babylon, and seem to have been objects of worship (Lev. xvii, 7, 11 Chron. xi. 15). A Hebrew scholar tells me that he thinks 'they may preserve a hint of early traditions concerning some tribe or tribes of 'hairy beings' who were supposed to dwell (and play pranks) in the desert, were regarded as formidable, and looked upon as devils.'

Turning to Europe, we find traditions which, though very far from conclusive, are more circumstantial. Just as the beings figured in the Quaternary caves are connected with the Pyrenees, and the *Kalystrioi* with the Hindu Kush or Himalaya, so these are mainly to be traced to the great mountain masses of Europe, the systems of the S.E. peninsula (Pindus, Rhodope, etc.), the Alps, and the Norwegian mountains.

Various semi-human, hairy, savage creatures appear in early Greek art and tradition, such as Seileni, Satyrs, Cyclopes and Centaurs. You may be surprised that I adduce the last, but they afford a good illustration of the way in which these Greek conceptions changed. The four-footed Centaur does not appear till the fifth century B.C. All the above-mentioned beings at the earliest period to which we can trace them were very similar to one another, but as time went on they were differentiated, partly, it would seem, through the influence of mythological accretions, and they took more and more the character of monstrous and generally composite beings. Thus the Satyrs became half-goats and the Centaurs half-horses. The original differences were less generic than due to the diversity of the localities where the stories arose.†

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† Mr. J. C. Lawson, in his *Modern Greek Folk Lore and Ancient Greek Religion*, 1910, describes the *Kallikantzari* of contemporary belief as shaggy black monsters of human form with beasts' legs, who

The Centaurs, according to the earliest accounts, says Leonhard Schmitz, were 'a race of men who inhabited the mountains and forests of Thessaly. They are described as leading a rude and savage life, occasionally carrying off the women of their neighbours, as covered with hair and ranging over the mountains like animals . . . . In these earliest accounts [Homer, Hesiod], the Centaurs appear merely as a sort of gigantic, savage, or animal-like beings; whereas in later writers they are described as monsters.' In the Iliad they are the 'strong beasts of the mountains,' whom Theseus and others fought and destroyed (i. 268f.), the 'hairy beasts' on whom Peirithous avenged himself, and whom he drove from Mt. Pelion to Mt. Pindus (ii. 743f.). This, as we learn elsewhere, was the feud that arose from the attempt of a drunken Centaur to carry off the bride of Peirithous from the marriage feast. The Odyssey (xxi. 295ff.) tells how after his heart was darkened with wine he wrought foul deeds in his frenzy, and the heroes cut off his ears and nostrils. Hesiod (*Scut.* 184ff.) says that the black-haired Centaurs swing trees in their hands. They are elsewhere described as dwellers in caves and eaters of raw flesh, but possessing a secret knowledge of herbs. They use trees and stones in combat.

Very similar are the Cyclopes, whom Plato‡ considered to typify the original condition of uncivilized man. Their original seat is thought to have been the mountainous island of Euboea, but in the well-known description in the ninth book of the Odyssey they live in the West, possibly in Sicily. They have neither agriculture, laws nor religion, but live in caves in the desert mountains, keep flocks and make cheese. They hurl stones at their enemies. They are gigantic cannibals, who clutch their victims, dash out their brains, and devour the flesh like wild beasts. Polyphemus, *i.e.* 'the loud shouter,' the only Cyclops actually stated in the Odyssey to be one-eyed, is induced to drink heavily of wine, and blinded.

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plague or amuse the peasants, especially about Christmas-tide. He explains the name as 'fair Centaurs,' the epithet being propitiatory, and he is inclined to connect this whole class of monsters with the belief that certain human beings can transform themselves into beasts, *e.g.* were-wolves.

‡ As quoted by Strabo, xiii. p. 592.

The Cercopes, whose name apparently means 'the tailed ones,' were associated by Plutarch with the Seileni, and have been supposed by others to be identical with the Cyclopes, although they are conceived in a more droll and playful spirit. They were located on the inaccessible rocks above the Pass of Thermopylae, and descended thence to annoy and rob travellers. Two of them having robbed Heracles while he slept were caught by him and suspended by their feet from a pole.\* According to a story of which we have only the late authority of Ovid†, the Cercopes inhabited the Pithecusae, rocky islands in the Bay of Naples, and were turned into monkeys for their sins.

In considering the Seileni and Satyrs we must dismiss from our minds the obese tipsy dotards and the horned and goat-legged monsters of the Decadence and of Roman art. In their earliest graphic forms they are almost indistinguishable, and are mere wild men of the woods with hairy bodies, bestial snouts, pointed ears and tails. The tails, like those of the Centaurs and Cercopes, so far from supporting the Ape-man theory, tell rather the other way. It appears that tailed men have been recorded‡, but only as rare 'freaks,' and biologists consider that our immediate ancestors were tailless, like the anthropoid apes. But may not the addition of a tail have been the first step taken by the Greek imagination in the transformation of a brute-like man into a composite monster? On early Macedonian coins the Seileni are sometimes tailless.

It is especially in the folk-lore and art of the Ionic Greeks round the Ægean coasts, and of their neighbours the barbarians of Thrace and Phrygia that the Seileni appear. The Phrygians were an offshoot of the Thracian stock. As the Seileni were also known to the Illyrians, cognate with the Thracians, but far removed from all Ionian influences, it is more reasonable to suppose that the Ionians obtained the conception from the Thracians than *vice versa*, though of course they may have had

\* The scene appears on a metope from Selinus, of which there is a cast in the British Museum.

† *Metam.* xiv. 89 ff.

‡ See O. Mohnike, *Ueber geschwänzte Menschen*, München, 1878, also Frederici in *Archiv für Anthrop.*, 1908, 16 ff.

similar tales of their own. The Doliones, a Thraco-Phrygian tribe, not only claimed descent from Seilenos, but regarded him as the ancestor of the human race. While the Seileni are represented on the early Attic and Corinthian vases with human legs and feet, they appear on the somewhat older coins of Macedonia and the Cyclades (perhaps in some cases before 600 B.C.), with hoofs attached to human ankles, or with the legs of horses or asses. We have seen that the Neandertal race had bent and hairy legs. May not these have suggested the hind-legs of animals?

Sixth century vases from Athens, Thebes, and Corinth, of which there are good examples in the British Museum, present a most curious type of Seileni. They are figures standing upright or slightly leaning forward, with human legs, powerful bony arms, long tails, bodies more or less covered with curly hair, long pointed ears, very retreating foreheads, massive brow-ridges, flat noses and prognathous bestial muzzles, in some cases excessively prominent. I do not suggest that the artists had actually seen men of the Neandertal type, but merely that they follow an ancient artistic tradition.†

The name *Seilenos* is explained by Tomaschek as standing for \**seslenos*, i.e. one with a rolling gait, or one fond of leaping. They haunt caves in the wild mountains, especially near streams, and are regarded with dread. A relief in the British Museum from Xanthos in Lycia shows two of the human-footed variety attacking a bull and a boar with tree-trunks, which reminds one of the Centaurs.

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† On the other hand M. Edmond Pottier remarks in his *Douris* (Eng. tr. 1909, p.60): 'It would not be difficult to prove, documents in hand, that the large anthropoid apes met by the Phoenicians in their explorations in Africa, and drawn by them on their metal cups of the seventh century, furnished the Ionian artists, when combined with the Bes of the Egyptians, with the prototype of the hairy and shaggy Silenus, with the flat-nosed face, that one sees on certain sarcophagi of Klazomenai.' This of course cannot apply to the original Seilenos conception, as found among the Balkan tribes, but to the Ionian artistic rendering of it. May not the sources of the latter be various? The Seileni depicted by the vase-painters Brygos and Douris, and figured in the above-mentioned work, are considerably later than those I have described above, and while more refined and human in form are more simian in their postures, in fact they are models of animal grace and agility.

'The race of worthless unemployable Satyrs' as Hesiod (*frag.* 13,2) calls them, were known by several names, as *sobades*, 'those who move about restlessly and violently,' as *skirtoi*, 'leapers,' and as *satyroi*, perhaps 'the lascivious ones' (cf. *sathe*). They were chiefly known to the pre-Dorian population of the N.E. Peloponnese, but have been so blended with the Seileni that they cannot be altogether distinguished. The story of Midas, the legendary king of Phrygia, offers some interesting features. He is represented with the ears of a Satyr or of an ass, and was indeed related to the Satyrs. He led the Phrygians into Asia from Mount Bermius in Macedonia. It was here that a Seilenos was captured while drunk, brought to him and induced to prophesy.\* According to another account he caught a Satyr by mixing wine in a well†. This incident not only recalls what has been said about the Centaurs and Cyclopes, but appears to connect the Greek or Thracian stories‡ with still current folk-tales of Central Europe.

Wilhelm Mannhardt in his great work *Wald- und Feldkulte* (vol. i., 1875, pp. 96ff., 112ff.) has drawn attention to this connection. He has collected a great number of current or recent tales from the Alpine lands and elsewhere relative to similar beings. They are known in the Grisons and Tyrol as *Wildleute*, *Waldfänken*, *Geissler*, (*i.e.* goatherds), and *Salvanel*, and near Mantua as *Gente salvatica*. They are described as very strong and monstrous, with hideous faces, the mouth in some cases extending from ear to ear. Their bodies, which are naked or girt round the loins with skins, are covered with hair and bristles, and the hair of the head falls down the back. In the Mantuan version they have tails. They inhabit caves in the forests or mountains (*e.g.* the Eichelberg in Baden), and fight with stones or with pine-trees which they have torn up. Some are lascivious, others are cannibals and carry off men or children to devour, like the *Silvani* of the Romans, who crept into houses for this purpose. But they have a milder side to their character. They tend goats on the Alpine pastures in return for wages of milk or cheese

\* Herodotus viii. 138.

† Philostratus, *Vita Apollon.*, vi. 27.

‡ For the above Greek beliefs concerning Centaurs, Satyrs, etc., cf. Roscher, *Lex. der Mythol.*, Preller, *Griech. Mythol.*, O. Gruppe, *Griech. Cullen u. Mythen*.

which are laid on a stone,† as no man has speech with them. Sometimes however they are intoxicated with wine which has been mixed with the milk. They will then give medical advice, or will teach their captors how to make butter and cheese. Others help in agricultural operations. Once the spring from which a *Geissler* drank was filled with cherry-brandy by the villagers. They lay in wait, caught him dead drunk and locked him up, or in another version beheaded him.

In these tales, which seem to me to give a vivid and scarcely exaggerated picture of the relations between the last semi-human or at least savage refugees in the Alpine fastnesses and the intelligent settlers in the valleys, we find features common to the Centaurs, Cyclopes and Satyrs. We even find in the Engadine a variant of the well-known story how Odysseus tricked the Cyclops by calling himself *Outis* or 'Noman.' In the German version the ambiguous word is *Selb*. Here of course the influence of the *Odyssey* is quite possible.

Mannhardt, one of the chief exponents of the theory which interprets primitive tales as nature-myths, seeks to find an explanation of all these stories in natural phenomena, such as weather, vegetation, etc. A generation has passed since he wrote, and folk-lorists are no longer so ready to find a universal key in nature-myths. There is a tendency to look for a basis of fact in many quarters where the school of Max Müller saw the poetic faculty humanizing inanimate nature.

However, one slight but singular detail led Mannhardt to suggest dubiously 'the effect upon the tales of a real recollection of the aboriginal savages.' The wild women of Central and N. Europe are often described as having long and pendulous breasts, and in Sweden the troll-wife, one of this class, hangs hers over her shoulders. This, as Mannhardt notes, is actually done by some of the Australian black women. Is not this just such a grotesque and uncanny fact as might impress itself on the fancy and memory of the immigrants?‡

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† Cf. the hairy 'lubber-fiend' and his 'cream-bowl duly set' in *L'Alle-gro*, also the Scottish *Brownie*.

‡ This physical peculiarity is perhaps not very rare. It was indeed observed by Lithgow in Ireland in 1619, and has since been noted in New Britain, Tasmania, etc. See G. L. Gomme, *Ethnology in Folklore*,

It is perhaps significant that although there are tales of wild men and women of the woods in many parts of Europe, they appear to be nowhere so precise and circumstantial or so similar to the old Greek stories as in the Alps. Here if anywhere one might expect the savage aborigines to have lingered long.

Another likely region is the central mountain mass of Scandinavia. The highest part of the Norwegian chain is still called *Jötunheim* or *Jötunfjeld*, i.e. the home or mountain of the *jötunar*, pl. of the Old Norse *jötunn*. The word has been connected with the verb *eat*,† and appears to mean a devourer or cannibal. The *jötunar* were represented as savage, hairy, half-human beings of great strength and ferocity, who according to the *Voluspa* (c. 1000 A.D.) lived very long ago. We gather from Old Norse poetry that they were the enemies of gods and men, hated for their wildness and treachery, but despised for their clumsiness and stupidity. It has been suggested that they preserve the memory of actual pithecoïd beings. The Christians extended the name to their heathen neighbours. Various *kennings*, that is conventional poetic synonyms, often very fantastic, are applied to them, e.g. mountain-dwellers, crag-men, cave-men, dwellers in the waste, foes of earth, folk of the beach, whales of the wilderness, seals of the surfing caverns. *Atli and Hrimgerthr*‡ is a vivid dialogue between a warrior and a female *jötunn*. She says, 'A rare rib-stretching thou shalt get, thou champion, if thou comest within my clutches.' He calls her 'a monster greedy for corpses,' and taunts her, 'Shaggy is the name of the *jötunn* that shall wed thee, loathsome as thou art to mankind.' But what is probably the most graphic description of a *jötunn* is much older than this, and not in Old Norse, but in Old English, in the famous epic of *Beowulf*, which may be roughly dated c. 700 A.D. Here Grendel is a monstrous man-shaped being of the cursed race, and is repeatedly described by the very rare Old English word *eoton*, the equivalent of *jötunn*. His name, which has been interpreted either as 'the grinder' or

1892, p. 180. Chap. X. contains some remarkable instances of the survival of savage types in the British Isles, notably in Wales.

† Cf. E. Mogk, in Paul's *Grundriss der germanischen Philologie*, 1898, iii. p. 300.

‡ In York Powell's *Corpus Poeticum Boreale*, vol. i., with translation.

more probably 'the snarler, growler, or grinner'† is supposed to recur in Grindelwald, so that it may have been a generic name. In early times Grindelwald must have been a savage and lonely retreat. The Grendel of *Beowulf* is located near Roeskilde on the Danish island of Zealand. He dwells with his mother, who is almost as fierce and strong as himself, in a cavern which can only be reached by diving through the water. An outcast, hating and hated of men, and filled with rage at the sight and sound of the pleasures of civilised people, he haunts the misty moors and fens. At night it is his habit to raid the royal hall, and to slay one or other of the sleeping warriors by crushing him in his mighty arms. He bites and rends them on the spot, or carries them off to devour in his den. He carries no weapons, but confides in the strength of his grip‡. Neither he nor his mother utters a word in any one's presence, though there are opportunities for their speaking. We are not however told that they are speechless. When Grendel is attacked by the hero he utters loud shrieks.

Such are some of the chief characteristics of the *eoton* or *jötunn* Grendel. The story, though not the poem, was probably brought from the continent. It has of course been usually interpreted as a series of myths; *e.g.* Grendel is the raging sea, which bursts the dykes, and ravages the homes of men, or the pestilential fog of the fens, which steals at night into houses; but it seems far less forced to regard him as a primeval cannibalistic savage at war with men of a higher race. The only writer, so far as I know, who takes what I venture to call the common-sense view is the Rev. Stopford Brooke in his *History of Early English Literature*. He writes (i. 121 f.), 'It was necessary, since so much has been made of it, to discuss this story from the point of view of the Nature-mythologists; but I think that we may wander far, and with great vagueness, in that direction. I am much more disposed to refer the whole story of Grendel to such a tale as may have arisen all over the North in the remoter days of history. In very early times a general tale might have grown up

† So Mogk, *op. cit.*, p. 302.

‡ His mother wields a dagger (*seax*) on one occasion, l. 1545. The word, which is cognate with Lat. *saxum*, has been thought to have originally (though hardly here) betokened a flint knife.

of the struggle of the first Teutonic settlers with the aboriginals who lived in caves in the unknown lands, and whose size would be magnified by superstitious dread. There are stories of this kind in Iceland, of wights who lived in deep and gloomy caverns. There is a cave-dweller's tale (edited by G. Vigfusson), and the cave-wight in it, whose burning eyes are like two full moons, chants monstrously and in a big voice a song which is supposed to be a death-song over the cave-kin of the country. (Grettis Saga, Magnusson and Morris, Notes, p. 277.)\*

I have already (p. 30) alluded to the opinion that a modified Neandertal type can still be traced among the Frisians. If Virchow, Huxley, Spengel, de Quatrefages, Davis and Sergi† are right in this opinion, the Frisians, who of course are a Teutonic people (and a branch of Sergi's Eurafrikan race), must have been next neighbours to a lingering group of aboriginal savages and must have finally absorbed the remnants of them. Now in *Beowulf* (l. 902) a Danish king, Heremod, is said to have been driven out by his subjects among the Eotons, where he seems to have perished miserably. In another episode‡ the word *eoton* is four times applied to the N. Frisians, who under their King Finn carried on wars with the Danes. They are treacherous, and their king carries off a Danish princess. But they are not represented as savages, still less as beings like Grendel or the Norse *jötnar*. This use of *eoton* has aroused much discussion, into which I cannot enter here, but some take it to be the ordinary word in a supposed specialized sense 'enemy,' and not a proper name at all. However this may be, there are fairy-tales still current in the N. Frisian island of Sylt to the effect that Finn was king of the dwarfs, who were conquered by Frisian giants.¶ A writer in *Blackwood's Magazine* (July, 1888) sees here an echo of the conquest of an earlier race by the Teutonic immigrants. May we not therefore see in the Finn episode in *Beowulf* a half-forgotten tradition of the existence of the Neandertal race in the

\* Mr. Brooke says (p. 118) he would like to refer the myth of Grendel to the Stone Age.

† Huxley, *Coll. Works*, viii. p. 326f.; G. Sergi, *Medit. Race*, p. 203, with references.

‡ *Beow.* 1068ff.

¶ See Earle, *Deeds of Beowulf*, p. 146.

marshes and islands of the North Sea coast? On this view, which I put forth tentatively, there are in *Beowulf* two divergent traditions about these Eotons. In one they remain fierce cannibal semi-human outcasts, in the other they have been advanced to a comparatively civilized condition, though still credited with a good deal of their native wildness. It is interesting to add that those critics who believe there are interpolations in *Beowulf* attribute the Finn episode to a different poet from the original author.

Here I must close. Other branches of folk-lore might have been adduced, notably the nursery tales about ogres. But the field is a wide one. The evidence seems to point to the existence of traditions regarding ferocious savages in early Europe. How far they had really attained to humanity is a question that will probably never be decided. If I have suggested any new line of enquiry the object of this paper is attained.†

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### Meeting held at Reigate, Nov. 27th, 1908.

Present over 50 members and friends.

Mrs. Durrant exhibited a series of British and alien Limpets, and gave a description of several of them. Among them were some beautiful specimens of *Crepidula fornicata*, an alien found in the Oyster beds of Whitstable.

Mr. Tonge exhibited a Saw Fly (*Sirex juvencus*) found in

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† A distinguished archæologist, Miss Jane Harrison, has in her *Prolegomena to the Study of Greek Religion* expressed views which concern the subject of this paper, but were unknown to me until it was in print. I quote from the 2nd edition (1908), pp. 379-386. She holds that the Satyrs were to Homer and Pindar 'the representatives of an actual primitive population,' in fact they are the Satrae, a wild Thracian tribe who lived S. of the Rhodope range. They 'have many traits in common with the more mythological Centaurs . . . Homer knew quite well who the opponents of Peirithoös were, [p. 37] not cloud-demons, not mountain torrents, but real wild *men* (*pheres*).' 'The Centaurs are in art what they are in reality, *men* with men's legs and feet, but they are shaggy mountain men with some of the qualities and habits of beasts; so to indicate this in a horse-loving country they have the hind-quarters of a horse awkwardly tacked on to their human bodies.' 'The Satyr . . . remained . . . a wild man, with horse adjuncts of ears, tail and occasionally hoofs.' Mr. J. C. Lawson also identifies the Centaurs with aborigines.

Reigate by Mr. Shaw. It is a rare species, and was probably introduced in an early stage in foreign timber.

The Rev. Ashington Bullen exhibited two old Maps of Surrey and Kent of the year 1593, and also a Shell (*Hygronia rufescens*) found at Inval, Haslemere.

Mrs Ashington Bullen gave a *resumé* of some of the papers delivered at the Congress of the S.E. Union of Scientific Societies held at Hastings. Her paper was illustrated by numerous lantern slides.

### Meeting held at Reigate, Jan. 22nd, 1909.

Present 25 members and friends.

Mr. G. W. Butler, F.G.S., exhibited a series of Rocks from the Betchworth Chalk Pit, weighing about 40lb. They were chiefly pebbles of Quartzite and grit, with a few granitic fragments, and were part of a deposit of about 100lb weight, which were found by the workmen and shown by them to Mr. Dibley, F.G.S. They occurred in the zone of *Rhynconella Cuvieri*. Similar deposits have very occasionally been found before in the Betchworth Quarry.

Dr. T. A. Chapman exhibited specimens of the Chimney-sweep Moth (*Odezia atrata* var. *pyrenaica*) which were bred at Reigate from eggs brought from Gavarnie, Pyrenees. They are characterised by having brownish yellow scales spread on the wings. In England the ordinary form looks quite black.

Mr. A. E. Tonge, F.E.S., exhibited two photographs of Moths, life size, at rest in nature, taken quarter natural size and enlarged so as to include more of the surroundings. One, *Agriopsis aprilina* (Marvel-du-Jour), on green lichen on oak trunk, the other, *Trephtrosia crepuscularia*, on a larch trunk.

Mrs. Durrant exhibited two Cowries cut into cameos and showing the three layers of shell. The use of Cowries for this purpose is unusual, helmet shells being more ordinary. She also exhibited an old herbal dated 1545, the work of Leonard Fuchs, one of the fathers of Botany and a distinguished professor of medicine in Bavaria, after whom the Fuchsia is named.

Mr. E. S. Salmon, F.L.S., Member of the Council of the National Fruit-growers' Federation, Mycologist to the S.E. Agricultural College, Wye, then delivered his lecture on:

## The Economic Aspect of Fungus Diseases.

I have thought that some remarks on the subject of those kinds of Fungi which do damage to cultivated crops and fruits might be of interest. The subject is one of very considerable economic importance, since the loss to every country through injury inflicted on cultivated plants by fungus pests must be estimated at many millions of pounds annually.

If we proceed to investigate the subject, we find that among the species of fungi which are doing this damage there are many whose life-history is either unknown or but very imperfectly known. But in a number of cases we find that scientific knowledge has now been obtained both as regards the manner in which a particular species causing a certain disease lives and increases and also as to how it can be dealt with; such knowledge requires to be imparted to the practical grower.

Looking at the subject from the economic point of view, we can divide fungus diseases of cultivated plants into two distinct classes.

The first class consists of those diseases caused by species of fungi which are *not native* to this country, but which have been, or are being introduced. For some time after being introduced such diseases are not very widespread, but are confined to certain districts. If, however, no concerted measures are taken against them, they soon spread through the country. That is to say, there is a class of fungi which ought to be dealt with *by law* as 'undesirable aliens' and immediately destroyed. It is a matter of opinion whether any human 'alien' should be considered undesirable, but there can be no question, I think, that 'alien' fungus pests should be exterminated on arriving at our shores.

The second class consists of destructive species of fungi which are widely spread and abundant everywhere, occurring practically in every garden or farm or fruit plantation. Such pests can be dealt with in two ways: (1), by taking remedial measures which are founded on a knowledge of the life-history of the particular species causing the disease; (2), by spraying the plant, on which the fungus grows and feeds, with certain chemical sprays. Such sprays are either protective, preventing the fungus from attacking the plant; or destructive, killing the fungus directly without injuring the plant.

Let us consider now examples from these two classes of fungus diseases.

As an instance of the introduction of a fungus disease the Powdery Mildew of the Vine (*Uncinula necator*) may be taken. The first appearance of this mildew in Europe was notified in 1845, on hot-house vines at Margate. It was at first treated as somewhat of a curiosity, and for many years no steps were taken to deal with it seriously.

On its discovery it was named *Oidium Tuckeri*, after a Mr. Tucker who was the gardener who first noticed it. The next year, 1846, it was observed that it had spread considerably in the hot-houses in the neighbourhood of Margate. In 1847 it was reported from one locality in France. In 1848 it occurred in several localities in France and also in Belgium. In 1850 the vineyards round Paris were seriously affected; the disease was also reported from Spain and Italy. In 1851, six years from its first recorded appearance in Europe at Margate, the mildew was general in all the vineyards in France and in those of the Mediterranean basin; it was reported also from Hungary, Greece, Switzerland, Syria, Asia Minor, and Algeria. This year it wrought wholesale devastation in several districts in France. In 1852, 1853, and 1854, all the French vineyards without exception were invaded to such an extent that their yield of grapes sank to a tenth or even a twentieth of the usual crop. The effect of this epidemic on the economic conditions of the country was such that in certain districts the population had to emigrate. In Madeira the industry of vine-growing was blotted out. In all the countries affected, Government Commissions were appointed to investigate the matter, and voluminous Reports were issued, in which is found recorded the consternation which this new disease caused among all those connected with grape-growing, as well as an account of the enormous loss—amounting to many millions of pounds sterling—which this one disease occasioned to the revenues of the countries concerned.

The disease by about 1855 had reached its climax as regards its epidemic nature, and during the years 1855-60 it was less devastating and the harvest of the vineyards was estimated at from one-third to one-fourth of the normal yield. It was

moreover, found possible to control or even stop the disease by throwing finely-divided sulphur over the leaves and young grapes, a practice followed to this day. It must be noted, however, that the fungus has never left Europe since its first visitation in 1845, and at the present time still causes a great annual loss, being certain to appear sooner or later wherever grapes are grown, and then can be kept in check only at the cost of repeated sulphurings which entail much labour. In fact, Europe is taxed annually to the extent of hundreds of thousands of pounds for having neglected to stamp out the vine-mildew on its first appearance in Europe.

A curious point in connection with this vine-mildew is that for 47 years after its first appearance in Europe its exact identity was not discovered, since during all these years the mildew either did not complete its full life-history or no one was able to observe it. In 1892, however, the further stages of its development were found in France, and its full life-history thus became known; it was then found that the so-called '*Oidium Tuckeri*' was identical with a mildew called *Uncinula necator*, long known as attacking both wild and cultivated species of *Vitis* in North America. It is probable, therefore, that the mildew was introduced into Europe about 1845 on diseased vines imported from the United States.

Another instance of the introduction into Europe of a destructive fungus attacking fruit is that of the American Gooseberry-mildew (*Sphaerotheca mors-uvae*). At the present time this mildew is invading Europe in exactly the same manner as the Vine-mildew did in the Forties. The American Gooseberry-mildew was imported about the year 1900 into Ireland, Russia and Denmark on diseased gooseberry-bushes obtained from the United States. In 1900 the mildew was discovered in one or two spots in Ireland—its first recorded appearance in Europe; nothing was done to check its spread, and it is now widespread over practically the whole of Ireland. Soon after 1900 it broke out on the Continent—in Russia, Denmark, Sweden, Norway, Finland and Germany. In 1906 it was first found in England; outbreaks have now occurred in most of the fruit-growing centres in this country. This fungus, besides covering the young

shoots of the gooseberry-bush with a white powdery 'meal' or 'mildew' (and thereby checking the growth of young bushes), also attacks the berries, and either prevents them growing out, or covers the half-grown berry with a brown 'scurfy' film, making them useless for any purpose, while not killing the bush. It is capable of ruining the crop year after year, and making the cultivation of gooseberries unprofitable. It is the prevalence in the United States of this mildew which alone prevents the cultivation there of European varieties of the gooseberry.

Another new and most destructive disease which is just taking possession of this country is the Wart disease or Black Scab of the Potato (*Chrysophlyctis endobiotica*). This was first recorded for Hungary in 1896—when it was new to science. It was first recorded for England in one or two counties in 1901; it is now present in a considerable number of the midland counties, being widespread in several of these; it occurs also in several Welsh and Scotch counties. In certain districts the soil of allotments and cottage gardens has become so infested with the spores of this fungus that it is practically impossible to grow potatoes there. Under the attack of this fungus, the potato tuber develops big 'warts' or excrescences, which begin to rot about the time potatoes are lifted. The above-ground parts of the potato plant are not attacked, but the entire crop of tubers may be destroyed. This disease is slowly but surely spreading through the country by the sale of diseased 'seed' tubers.

Lately Agricultural authorities have been aroused and induced to take some steps against freshly introduced pests, both fungus and insect. Full legislative powers in this direction were conferred on the Board of Agriculture under the 'Destructive Insects and Pests Act,' passed into law in July, 1907. It remains to be seen whether the two diseases, mentioned above, which have been given a handicap of several years' start, will be overtaken and prevented from spreading over the entire country.

To turn now to the second class. As instances of species of fungi where the knowledge of the life-history is of the utmost practical importance for the grower may be mentioned the following:—Apple and Pear Scab, Cherry Leaf Scorch, Brown Rot, Apple-canker, and Pear-leaf Cluster-cups.

The fungus, *Fusicladium dendriticum*, which causes Apple Scab, is as a rule noticed by the apple-grower on the apple alone, since here it forms conspicuous black spots or blotches, or it may cause the apple to crack. But when the life-history of this fungus is followed out, it is found that the same fungus occurs on the leaves and on the young wood of the apple. It is on the leaves where the fungus increases so rapidly and whence it spreads to the apples; while it is on the young wood that the fungus lives during the winter months, and whence it infects the new leaves in the following spring. Possessed of this knowledge, the grower, by spraying the young wood in the winter with a winter-wash, and then if necessary, the young leaves directly they are unfolded with the summer-wash of 'Bordeaux mixture,' can entirely protect his crop of apples from injury.

With regard to the Pear-Scab, *F. pirinum*, the same facts as to life-history and preventive treatment hold good.

The fungus which caused Cherry Leaf Scorch is called *Gnomonia erythrostoma*. Cherry trees which suffer from this disease gradually become unfruitful and stunted in growth, and the cherries develop hard blackish spots in the flesh. The leaves turn yellowish during early summer, and then instead of falling from the tree in the autumn, remain, although dead, firmly attached to the boughs. A Cherry orchard attacked by 'Cherry Leaf Scorch' can thus be recognised during the winter and spring at a glance, through the dead leaves hanging on the trees, giving them the appearance of trees which have been killed by fire. The reason for this phenomenon is that the threads of the spawn, (*mycelium*) of this fungus grows down the leaf-stalk during the summer months, and finally kills those cells at the base of the leaf-stalk which normally form the special layer of cork-cells which brings about the fall of the leaf. As a result the dead leaf remains permanently attached through all the winds and gales of winter, until it rots away. Now these dead leaves bear the fruit-conceptacles (with their contained *spores*) of the fungus *Gnomonia*. These fruit-conceptacles are ripe in the spring and then eject their *spores*; since the dead diseased leaves of one season remain on the tree until the following summer, the young leaves as they unfold become inevitably infected year after year.

No deeper infection of the cherry tree takes place, that is to say, the spawn (*mycelium*) of the fungus stops short at the base of the leaf-stalk and does not enter into the tissue of the branch. When this life-history is known, the grower sees that if he can once prevent the re-infection of the young leaves in the spring his trees will stand healthy again. He can secure this by one of two methods. He can pick off (and burn) during the winter months all the leaves hanging on the trees. In the largest cherry-growing district in Prussia, when a severe outbreak of the present disease occurred, the State passed an Order making the picking off and burning of all the leaves compulsory over the whole of the affected district; in two years the cherry orchards were restored to perfect health, although previously for many years the trees had been attacked and the crop ruined. Or the grower can spray the trees with a wash containing copper, at the time when the young leaves have just opened, so as to cover them with a spray which will kill the spores of the *Gnomonia*, when ejected from the conceptacles, before they can enter and infect the young leaf.

The 'Brown Rot' disease is caused by the fungus *Sclerotinia fructigena*. This fungus attacks all kinds of fruit-trees; cherry, apple, pear, peach, plum, &c. A knowledge of the life-history is of the greatest help to the grower. The details of the method of attack are slightly different according to the plant attacked; we will take the plum as an example. The signs of the presence of 'Brown Rot' in plums are the withering of much of the blossom; the 'dying back' of the branches, and especially the rotting of the plums just when they should be ripening. In some varieties, e.g. in Pond's Seedling, it is no uncommon thing for 'Brown Rot' to destroy one-third of the crop, season after season, besides injuriously affecting the growth of the tree. Now the peculiarity of this disease is that the plums (or it may be apples or cherries) which are turned rotten, do not for the most part fall from the tree, but remain, bearing the fungus in a dried-up or 'mummified' condition on the boughs of the tree. It is a very common sight to see numerous bunches of a dozen or more of these 'mummified' plums, covered over with an abundant growth of the fungus, on a plum-tree in flower. Such bunches have remained on the tree from the previous summer,

and form the source of infection the next year. As a rule the grower is entirely unaware that these bunches of 'dried-up' plums have anything to do with the cause of the rotting of his crop, and of course takes no steps to remove them. When he does so, and at the same time cuts out the dead wood—on which also the fungus lives through the winter—the trees become healthy again.

Apple 'canker' is the worst disease of the apple known. It is caused by the fungus *Nectria ditissima*, but we find that the fungus is, so to speak, the *secondary* cause. This species of *Nectria* is an example of the class of Fungi known as 'wound parasites.' If the *spores* of this fungus are placed on the uninjured wood of an apple tree, they are unable to infect it. If, however, the surface of a branch or if the stem is wounded,—that is to say if the bark or skin is cracked or torn so as to expose the inner tissue—the *spores* are able to grow into the tree, and ultimately form a 'canker,' and commonly kill the branch or stem. Such wounds arise from a number of causes; hail-storms, attacks of hares, careless pruning, frost-blisters, &c., but in 90% of cases it is found that an insect is associated with 'canker.' This insect is the 'green fly' known as the 'American Blight' or 'Woolly Aphis,' which punctures the bark of the branch in order to feed on the 'sap,' and by means of these minute punctures or wounds the 'canker' fungus finds its way into the tree. The knowledge of its particular life-history, *i.e.* the fact that this fungus is a 'wound-parasite,' enables the grower at once to understand why it is that 'American Blight,' and 'canker' increase side by side; and also make him realize that the first step in the cure of 'canker' is to rid his trees of the insect, and thus remove the chief factor which is rendering his trees susceptible. It frequently happens that with the removal of this insect through spraying, the fungus (against which no spraying is of any use) disappears also.

The value of a knowledge of the full life-history of the fungus is nowhere better seen than in the disease known as 'Pear-leaf Cluster-cups,' caused by the fungus *Gymnosporangium Sabinae*. This disease, which affects more particularly pear-trees trained against walls, is characterised by the appearance

in July or August of conspicuous yellow blotches on the upper surface of the pear-leaf. When these blotches are numerous, a premature defoliation takes place, with the result that the young wood of the pear does not 'ripen' properly, and the pears themselves do not grow to their proper size. On the under surface of the affected leaves (whether on the tree or on the ground), exactly opposite the yellow blotches on the upper surface, the fungus forms a fructification known as 'cluster-cups.' Now the curious fact is that if *spores* are taken from these 'cluster-cups' and placed on a pear-leaf, no infection results. The present fungus is one which requires *two* distinct plants to live upon in order to complete its life-history. In the present case the second plant is a species of Juniper, viz.: *Juniperus Sabinae*. *Spores* from a pear-leaf infect this species of Juniper and give rise there to spawn (*mycelium*) which lives perennially in the stem of the Juniper, breaking out from cracks in the stem each spring in the form of a yellow jelly-like fructification. *Spores* from this stage of the fungus on *Juniper*, while unable to infect the Juniper, are able to infect pear-leaves, and form there 'cluster-cups.' I have known several instances in which trained pear-trees have suffered severely from the present fungus, and in these cases the growers,—though of course anxious to keep their pear-trees free of the disease—have been growing in some corner of their garden a plant or two of the particular Juniper necessary for the continuance of the life-cycle of the pest. On this information being conveyed to them they have—although sometimes not a little incredulous of any good resulting—made short work with a spade of the Juniper bushes. They have seen no more 'pear-leaf cluster-cups.'

In conclusion, I should like to make the suggestion that Natural History Societies such as ours would find a very profitable field for work in connection with plant-diseases, not only in investigating the still unknown life-histories of many of the species of fungi and insects which cause these diseases, but also in disseminating the scientific knowledge which has been gained in connection with the subject. There are many ways in which a Natural History Society can act. The Norwich Natural His-

tory Society, for instance, holds a number of free public meetings in their museum, at which lectures are given—followed by discussions—on the various diseases of cultivated plants caused by fungi and insects. Gardeners, cottagers, and allotment-holders are specially invited to attend these meetings. Then a great deal of educational work can be done by means of exhibits in a museum. Photographs, and actual specimens, illustrating the life-histories of the noxious species of fungi or insects, as well as typical preserved specimens of the diseased plant, can be mounted in glass cases. Information as to remedies should of course be supplied.

### Meeting held at Reigate, Feb. 26th, 1909.

Present 27 members and friends.

Mr. A. E. Tonge, F.E.S. exhibited a case containing 39 species of butterflies which he had taken, or verified as being taken by friends, within the last five years, in the neighbourhood:

#### *Diurni.*

<i>Pieris</i>	<i>Arge</i>	<i>Lycæna</i>
<i>brassicæ</i>	<i>galathea</i>	<i>agestis</i>
<i>rapæ</i>	<i>Satyrus</i>	<i>alexis</i>
<i>napi</i>	<i>egeria</i>	<i>adonis</i>
<i>Anthocharis</i>	<i>megæra</i>	<i>corydon</i>
<i>cardamines</i>	<i>semele</i>	<i>alsus</i>
<i>Gonepteryx</i>	<i>janira</i>	<i>argiolus</i>
<i>rhamni</i>	<i>tithonus</i>	<i>Nemeobius</i>
<i>Colias</i>	<i>hyperanthes</i>	<i>lucina</i>
<i>edusa</i>	<i>Chortobius</i>	<i>Syrichthus</i>
<i>hyale</i>	<i>pamphilus</i>	<i>alveolus</i>
<i>Argynnis</i>	<i>Vanessa</i>	<i>Thanaos</i>
<i>paphia</i>	<i>urticæ</i>	<i>tages</i>
<i>aglaia</i>	<i>polychloros</i>	<i>Hesperia</i>
<i>euphrosyne</i>	<i>io</i>	<i>sylvanus</i>
<i>Thecla</i>	<i>atalanta</i>	<i>comma</i>
<i>rubi</i>	<i>cardui</i>	<i>linea</i>
<i>quercus</i>	<i>Polyommatus</i>	
<i>w-album</i>	<i>phlæas</i>	

Mr. E. Dukinfield-Jones, F.Z.S., F.E.S., read the following paper on:

### Some Methods of Protection and Defence in Caterpillars.

The subject of Protection in Caterpillars is so large a one that in a short paper like the present it is not possible to do more than barely mention some of the well-known and more general methods of protection; and I shall chiefly confine myself to a few specialized cases that came under my own observation in Brazil.

Perhaps the commonest mode of protection in Caterpillars, as in so many other insects, is that of colouration to harmonise with surrounding objects, thus rendering them less likely to be seen by their enemies. A very large proportion of caterpillars that feed upon the foliage of plants, especially the smooth-skinned ones that are not protected in any other way, many species of the Noctuidae, for instance, are coloured partly if not wholly green, of a shade that will be of most use to them according to their special habits. Species that feed on the leaves of trees at night only and retire to the branches or trunk of the tree during the daytime are often grey or of some colour that resembles the bark, or the lichen growths so common on forest trees. An interesting example of this colouration is shown in two species of *Molippa*, large Saturnids, both of which feed upon the same tree (*Mimosa*). But one of them (*M. simillima*) has the habit of remaining when at rest, as well as when feeding, on the twigs of the tree, amongst the yellow flowers, and these caterpillars have bright yellow spines and black and yellow bodies, harmonising perfectly with their surroundings. The other species (*M. sabina*) retires to the limbs of the tree during the daytime, or often to the trunk quite near the ground, and these are greyish white and black, the spines are greyish white, and when a group of half a dozen or a dozen of the caterpillars are clustered together on the trunk they might easily be mistaken for a patch of lichen. I may mention that in this particular case the caterpillars are further protected by venomous spines, a more detailed account of which I shall give later on.

Some species that feed upon the leaves of trees but descend to the ground for pupation are green until they are about to pupate, when, without casting the skin, they change to a dark grey or other colour that harmonises with the bark of the tree or the ground over which they pass before finding a suitable place for pupation. Thus they are specially protected at the important time of their lives when they have completed growth and are about to undergo the dormant period of their existence, during which the wonderful changes take place that transform the crawling larva into the glorious flying imago. As an instance of this I will mention a Sphingid, *Pachylia syces*, Rothschild. The caterpillar is bright green, but it turns a smoky colour before descending to the ground. Another case of special interest in this connection, the change of colour to suit the different periods of the larval existence, is that of a large Saturnid (*Heliconisā caina*). This species feeds upon an *Eryngium* that grows much in the manner of the pine-apple, with long sword-shaped leaves radiating from the centre and sheathing one over the other; and in the early stages the caterpillar is black, and it has the common habit of curling up and falling when disturbed; as in this case it falls into the dark recesses of the leaves, the dark colour is distinctly advantageous. But after the last change the prevailing colour is green, and the caterpillar does not disappear amongst the leaves when disturbed. As in the case of *Molippa*, this caterpillar is also protected by venomous spines.

The next method of protection that I will mention is that of form that imitates surrounding objects; so well exemplified in the Stick caterpillars, the larvæ of the *Geometridae*; their resemblance to short spurs from the stem of the plant on which they feed affording them protection from their enemies. The protection of form is naturally accompanied by that of colour; form alone if the colour was such as to call attention to the insect would be no protection at all.

A combination of protective colour and form is well shown in a *Limacodid* larva I took feeding on a Lauraceous shrub. When it has devoured the whole of a leaf and still remains attached to the stalk and midrib, it might well be mistaken for the leaf itself. I was not fortunate enough to rear this species,

only finding one specimen which pupated just as I was leaving Brazil. I brought the pupa to England, but the moth did not emerge.

Another good example of protective colour and form in combination is a large Sphingid larva, *Pholus labruscae*. The resemblance to the head and fore part of a snake is sufficiently perfect to scare away any bird that might catch sight of it amongst the leaves of the vine on which it feeds. Some other species of *Sphingidae*, as for instance in the genus *Hemeroplanes*, more closely resemble snakes than this species, but they have not come under my own personal observation.

Some of the Brazilian *Lasiocampidae* are especially well protected by shape and colour; their habit is to rest in the daytime on the trunk of the tree on which they feed, and they are covered with protuberances and hairs that give them the appearance of bits of lichen.

The protective habit of folding the edges of leaves and binding them together, to form chambers in which the caterpillars pass all their time when not feeding, is very general in many families of moths, and in the *Hesperidae* amongst butterflies. It is hardly necessary to mention the countless numbers of grubs with this habit that do so much damage in our gardens and orchards.

The protection of a case or covering formed by the caterpillar from its food-stuff or surrounding objects is well shown in the Clothes-moths in the *Tineidae*, and in the cases made of grass-stalks, etc., in the *Psychidae*. In Brazil we have also the *Drepanulidae*, the caterpillars of which form protective coverings in which to pass the larval and pupal conditions.

The most specialised protection in the *Tineidae* that I have come across occurs in the species *Endrosis braziliensis*. The caterpillar lives in a chamber excavated in the dead bark of a tree, and from the mouth of this chamber it forms a long tube of silk and minute particles of bark. The tube is soft and flexible, and the free end is very loose and baggy, forming an excellent covering for the caterpillar when feeding. The length of the caterpillar when full-fed is 12 millimeters, and the tube is 11 centimeters long, more than nine times the length of the caterpillar. The diameter of the tube at the fixed end is a little

over 1mm. and at the free end between 2mm. and 3mm. The caterpillar never ventures outside the tube and is very timid, darting with wonderful rapidity down the tube when alarmed. Pupation takes place in the tube, a bulb 5mm. in diameter being formed in the middle, the tube by this operation being shortened to 6cm. in length.

Amongst the Brazilian *Psychids* we have the genus *Oiketicus* the larvæ of which make protective coverings of silk and bits of stick, etc., woven into a very strong fabric. In *O. kirbii* the case is, when the caterpillar is full-fed, 8 or 9 centimeters in length and 2 or 3 centimeters in diameter at the thickest part, tapering to about 1 centimeter at the lower end.

I was fortunate enough to see the young larva just emerged from the egg make its first coat. I followed the whole operation through a lens, as described in the following note made at Sao Paulo in 1880.

On January 17th I found a brood of the larvæ just out of the egg, and I determined to watch them carefully and see if possible the first steps in the formation of the protective covering. After a little while I observed that one individual was about to begin operations, so I brought my lens to bear upon him.

The first thing he did was to cut about a dozen minute pieces from the epidermis of a leaf of the Guava on which I had found the caterpillars; these were carefully collected and kept together by the feet. When a sufficient quantity was ready they were strung together with silk, the string thus formed being attached at each end to the leaf, but left free in the middle. The caterpillar then turned 'head over heels' through the loop. One end was then cut from the leaf and bound round the body, making a girdle between the thorax and abdomen, the other end of the loop still being attached to the leaf. The cutting of material was then resumed, and each time a piece was cut it was added to the thoracic side of the girdle and bound to it with silk. After a short time the girdle was cut loose from the leaf and the building up of the case went on with order and regularity. As the band grew in width it was pushed back towards the 'tail' and, always increasing in diameter, gradually

formed a conical case, the foundation of the house in which the insect passes its larval and pupal stages; indeed in the case of the female, the imago state also, for it is only the males that emerge, the females remaining in the case and dying there.

It took two or three hours to complete the cone.

Later on in life the case is strengthened with bits of stick woven between the outer layer of silk and the inner lining, and I have often watched the operation of adding the sticks. First the case is attached at the mouth of the baggy upper end to the stalk of the food-plant, so as to leave the legs of the caterpillar free for building purposes; a bit of the stem of the plant of the required size, say 15 or 20 millimeters long is now cut off, and being seized by the feet is brought to the place where it is to be added to the case; here it is lightly secured with silk and the caterpillar withdraws into the case. Soon its head appears cutting with its powerful jaws through the side of the case where the bit of stick is; the stick is seized and drawn forcibly to the hole and bound tightly from the inside, afterwards being covered on the outside also with a tough cloth of silk. The stick is thus incorporated in the case, between the inner and outer layers of silk. The intelligence shown by this caterpillar in its work is quite uncanny.

In another species (*O. jonesi*) the case is formed entirely of silk and mucilage, making a very strong, tough, tapering tube from 8 to 12 centimeters in length and about 12 millimeters in diameter at the upper end and 6 at the lower end.

To illustrate the *Drepanulid* group I shall take only one species, *Perophora sanguinolenta*, Felder.

This caterpillar feeds on a species of myrtle that is very plentiful in open spaces round Sao Paulo. It constructs a gondola-shaped case that is slung from the twigs of the food-plant by silk threads; when all the leaves within reach are eaten the case is moved by the suspending cords being cut at one end and fastened to a new support; the other end is then cut free in the same way and thus the caterpillar can reach any part of the shrub.

I was not fortunate enough to observe the first stage in the construction of the case, as in *Oiketicus*, but I often saw the

later stages. The case is built of the dung of the caterpillar, which instead of being cylindrical as in most caterpillars is in the shape of flat bricks, admirably suited for the purpose. As the caterpillar grows the case has to be enlarged, and this is done as follows:—The caterpillar, starting at one end close to the opening, attaches pieces of the excrement by one edge to the case with silk and gum; the edges of the new work are brought gradually back about two thirds of the length of the case and curved inwards till the two sides meet in an arch; the portion of the case inside the new work is now cut away and the enlarged case is ready for the increase in size of the caterpillar; the additions are made alternately at opposite ends of the case. The walls are made beautifully smooth both inside and out with silk and gum, and are so strong that it is quite impossible to crush them between the thumb and finger. The caterpillar spends hours of his 'spare time' in going over the outside of the case with silk, until all vestiges of the separate bricks are lost and the surface is perfectly smooth.

When about to pupate the caterpillar fixes the case in a vertical position to a twig by the lower end, the upper opening being thus protected from wet by the turned up end of the case, and any water that may possibly get into the case will escape by the lower end, so that there is no possibility of flooding the inside, as might happen if it was fixed horizontally.

A well known protective habit in caterpillars, common in many of the *Noctuidae*, is to bury themselves during the daytime in the ground, issuing at night to feed.

But I will now come to what we may call Weapons of Defence in Caterpillars.

Many caterpillars are protected by special odours which we may well believe to be disagreeable to their enemies, though we must be on our guard against assuming that an odour offensive to man is necessarily so to other animals.

A good example of protection by an offensive odour I have observed in the caterpillar of *Morpho laertes*. This is a very beautiful and brightly coloured caterpillar, a conspicuous object at any time, but especially so when hanging in a cluster of a dozen or so to a leaf of the tree on which they feed, which is

their habit during the daytime. When full-fed the caterpillars are from 7 to 8 centimeters long and about a centimeter thick, and a cluster will form a ball as big as ones fist. This brightly coloured ball swinging about among the foliage must be easily seen by birds and other enemies. But there is a very strong and disagreeable 'choky' sort of smell about the caterpillars that probably prevents the approach of such.

In the genus *Papilio* there is a distinct organ on the prothoracic segment of the caterpillar to produce the offensive odour, a V-shaped fleshy fork that can be protruded at will and is highly charged with a pungent liquid of a very unpleasant smell; in most of the Brazilian species that I have observed it is something like a mixture of rotten oranges and acetic acid. In the case of *Papilio thoas* the caterpillars rest during the daytime in large clusters on the trunks of the orange, their food-plant; and when disturbed and the scent organs are exerted the smell could be 'cut with a knife.'

In the Notodont species, *Aneurocampa mingens* possesses the protection of offensive odour in perfection, being capable of directing a fine spray of pungent liquid from the mouth exactly on to the spot where it is touched by an offending object. This must be an unailing weapon of defence against insect enemies such as ichneumons as well as against birds or mammalians. The liquid smells exactly like acetic acid and has a strong acid reaction, as tested by blue litmus.

I have observed the same habit in a closely allied species, *Psorocampa dentilinea*, Schaus.

The caterpillars of many families, e.g., *Arctiadae*, *Lymantriadae*, *Lasiocampidae*, etc., are clothed with barbed hairs which are easily detached or broken when handled, and cause considerable irritation when brought into contact with the skin; a very effective protection against birds and other devouring enemies, though they would not interfere with ichneumons.

But the most highly specialised weapon of defence that I have observed occurs in the *Saturniadae*, the *Ceratocampidae*, the *Megalopygidae* and the *Limacodidae*, whose caterpillars are furnished with hollow needle-pointed spines that inject a virulent poison into the skin of an attacking enemy. The poison is

only ejected when pressure is brought to bear against the spines, and is not under the control of the caterpillar; the most venomous species may be allowed with impunity to crawl over the hand so long as no pressure is brought to bear that would cause the points of the spines to touch the skin. In the *Saturniadae* the spines are arranged in branching clusters springing from the tubercles, varying a good deal in the different genera. In *Automeris* and *Dirphia* the spines are tree-like and are very long on the 1st, 2nd, 11th and 12th segments. In *Hyperchiria* they are more even in length and more spreading, so that they form a close mat over the body. In *Attacus* they are minute and scattered.

In the *Ceratocampidae* the spines are short and horny, often arranged on long fleshy protuberances as in *Citheronia brissotii*.

These large and powerful caterpillars of the *Saturniadae* and the *Ceratocampidae*, though the function of the spines is passive, are able to inflict a painful wound by swinging the head and thorax and striking an intruder with the spines.

My experience with the venomous caterpillars of Brazil tends to point to the *Megalopygidae* as the most virulent of all the families; in this family the spines are clustered in the form of a rosette round the tubercles, not branched, and they are generally concealed by long silky hairs of various forms. I will conclude this paper with the account of an experiment with one of this family, *M. dorsimacula*, made in Sao Paulo in 1878 and published in the Proceedings of the Literary and Philosophical Society of Liverpool in the same year.

The note is as follows:

“On February 28th, 1878, I found a beautiful species of caterpillar about an inch and a half long and very thick in proportion to its length. The whole body is covered with long red-brown hairs which grow in tufts arising from the centre of each segment, and at the base of the long hairs are bunches of venomous spines, which are quite concealed by the hairs. The body is very soft and fleshy and of a paler colour than the hairs. There are six pairs of abdominal legs, the first and last pairs, however, not being fully developed. The head is very small, and is when eating quite covered with a fleshy mantle formed by

the first segments of the body; when walking the head is protruded a little.

Feeling certain that this was an exceedingly venomous caterpillar I determined to sting myself with it and observe the results.

At 11 a.m. I applied the back of the caterpillar to the back of my left hand with sufficient pressure to feel the pricking of the spines. In ten minutes I had violent pain in the hand, and the place of contact had swollen up into a white lump, surrounded by a dark red inflamed patch. A few minutes later, violent pain set in under the armpit. I applied strong ammonia to the hand, but the only result was to remove the white lump, the pain and the red patch remaining the same. I next tried vinegar, but with no effect. At 11.30 a red rash appeared on the inside of the elbow, and this gradually extended up to the shoulder along the biceps, and down the arm to the place of injection on the hand. The rash was slight excepting at the elbow. At 12 o'clock the pain was still violent and burning, but not so bad as it had been.

I have been informed by Brazilians that the mere crawling of the caterpillars over the skin causes this rash and burning pain; but such is not my experience, for I have allowed several species to crawl over me without any ill effects at all. It appears that pressure must be brought directly on to the ends of the spines to make them eject the poison, the caterpillar being merely passive and incapable of ejecting the fluid itself.

Soon after 12 o'clock I noticed a sensible weakness in the hand and arm, but was not able to say for certain whether it was the effect of the extreme pain or a distinct effect of the poison; but from later symptoms I lean to the latter opinion.

At 12.15 the rash down the arm began to disappear, and the pain under the arm was sensibly diminished though still considerable. The affected area on the hand began to perspire profusely though the rest of the body had no visible perspiration. The pain in the injected spot was as violent as ever, burning horribly. The effect was more like a scald than anything else I can compare it with. The pain increasing, at 12.30 I applied a wet bandage to the hand. At 1 p.m. the pain in the armpit had nearly ceased, and the rash on the arm had dis-

appeared; but the pain in the hand had increased greatly and was almost unbearable. Boring a hole with a red-hot iron comes nearest to the effect.

At 2.30 the pain in the hand was still violent, extending through to the palm, the ball of the thumb and base of the first finger. The weakness was so great that I could not grasp anything with any force.

At 5 o'clock the burning pain was much diminished, but there was a dull aching pain all over the hand.

At 6 o'clock the burning had quite given place to the dull pain, but the place of contact was still very much inflamed and sore to the touch. There was a dull red patch about an inch in diameter round the spot, and the soreness reached some distance beyond this, even as much as three inches in the direction of the arm. The weakness in the hand was still considerable.

At 8.30 the pain was still there though much reduced. The red patch and soreness much the same. The immediate neighbourhood of the affected part still perspiring. The wet bandage did not seem to do any good, so I removed it after it had been on about an hour. I afterwards tried olive oil on the place but it had no effect. At 10 o'clock I went to bed, the aching in the hand still being pretty bad. At 1.30 a.m. I awoke with the pain still considerable, and the soreness very great. Next day the pain had quite gone, but the soreness continued till the day after. The marks of the points of the spines, 36 in number, are still visible (March 16th)."

After the above experiment I think we may safely say that any bird or mammalian that tackled one of these caterpillars would not be inclined to repeat the experiment, and I myself am certainly not prepared to do so.

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### Meeting held at Redhill, March 26th, 1909.

Present 27 members and friends.

Alfred E. Tonge, Esq., F.E.S., lectured on the Natural Resting Attitudes of Insects, illustrated by a fine series of slides from photographs taken by the lecturer.

### Meeting held at Reigate, April 23rd, 1909.

Present about 13 members and friends.

Mr. A. E. Tonge exhibited the hibernated larva of the Purple Emperor Butterfly (*Afatma Iris*) from the New Forest, which had been slieved on a growing willow bush in a Reigate garden for seven months and were now little, if any, larger than when put in, but had just wakened up and recommenced feeding.

William Whitaker, Esq., B.A., F.R.S., F.G.S., gave an admirable geological lecture, based on a fine series of geological photographs, which when seen on the sheet as lantern slides, beautifully illustrated the various geological processes that he described. It was a matter of regret that so few availed themselves of the opportunity of hearing this lecture. A vote of thanks to Mr. Whitaker (who had come at some personal inconvenience) and one to the Head-master for allowing us to meet at the Grammar School, concluded the proceedings.

### ANNUAL MEETING held at the Grammar School, Reigate, Oct. 22nd, 1909.

The Annual Report and Balance Sheet were read and adopted.

#### ANNUAL REPORT.

Since last year's Report was submitted to the Club, six new subscribers have been elected, but as one member and seven subscribers have resigned, and one member and one subscriber have left the neighbourhood, the total membership is reduced to 83, as against 87 last year. This year we have again had kind permission from the Head-master to meet at the Grammar School, and we beg to tender him our cordial thanks for his hospitality.

The average attendance this year was 33, slightly higher than last year, when the average was 31. Six evening meetings were held, and owing to the nearly central position of the Grammar School five of these were held in Reigate, and only one in Redhill. The exhibits brought by members and friends to the meetings have been of considerable interest, but if a larger proportion of our members would bring specimens that they have

collected during the course of the summer, the interest of the meetings would be still further increased.

The following is the list of the papers read during the Winter Session:—

1908

- Oct. 23. Annual Meeting. Address from the President on the History of the Club followed by a paper on The Ape-man in Primitive Art and Tradition, by Dr. A. B. Gough, M.A.
- Nov. 27. Resumé of Papers, and Proceedings of the Hastings Congress, by Mrs. R. Ashington-Bullen.

1909

- Jan. 22. The Economic Aspect of Fungus Diseases, by Mr. E. S. Salmon, F.L.S., Mycologist S.E. Agricultural College, Wye.
- Feb. 26. Some Methods of Protection and Defence in Caterpillars, by Mr. E. Dukinfield Jones, F.Z.S., F.E.S.
- Mar. 26. The Natural Resting Attitudes of Insects, by Mr. A. E. Tonge, F.E.S.
- April 23. Geology Illustrated by Photography, by Mr. W. Whitaker, B.A., F.R.S.

We regret that it has not been possible yet to proceed further with the proposal to build a Public Museum of Natural History. Very little interest in the scheme has been shown outside the members of the Club, and this, together with the fact that the donations promised are not yet sufficient to make it wise to commence building, have caused the scheme to remain for a time in abeyance.\*

The following publications have been received from the Societies with which we are in correspondence.

56th Annual Report and Transactions of the Nottingham Naturalists' Society, 1907-08; Epsom College Natural History Society, Report for year ending Christmas, 1908; Transactions of the Cardiff Naturalists' Society, vol. XLI, 1908; Proceedings of South London Entomological and Natural History Society, 1908-09; The North Staffordshire Field Club Annual Report and Transactions, 1908-09; Report of the Marlborough College

\* Since this Report was received the Club has acquired Great Doods as a small permanent Museum.

Natural History Society, 1908; Transactions and Journal of Proceedings of the Dumfries and Galloway Natural History and Antiquarian Society, 1907-08; Proceedings and Transactions of the Croydon Natural History and Scientific Society, 1907-08; Journal of the Torquay Natural History Society, vol. I, 1909; The South-Eastern Naturalist being the Transactions S.E.U. of S.S. for 1909; Report of the British Association for the Advancement of Science, Belfast, 1908; 6th and 7th Annual Reports of the Horniman Museum and Library, Forest Hill, 1908; and the following reprints: The British Species of Arctium from the Journal of Botany, December, 1908; On the Flora of Shetland, both presented by the Author, W. H. Beeby, Esq., F.L.S.

The following excursions were taken. The attendance was adversely affected by the wet season, rain having fallen heavily just before the time of starting on several occasions.

May 19. Conducted by E. W. Dann, Esq., F.R.G.S. The first excursion of the season was to Reigate Hill and Colley Hill returning by Colley Lane and Reigate Heath. Unfortunately the day chosen was that of the Horse Show which accounted for the smallness of the party which consisted of only six. Mr. Dann gave an interesting description of the Geology of the district, and called attention to the fact that the combes on the hill corresponded in certain instances to gaps in the Greensand range to the south; this was followed by a short discussion on the origin of the beautiful horse-shoe curves.

June 5. To Haslemere and Hindhead, conducted by T. P. Newman, Esq. As it was a wet morning, only one member went this excursion. A very interesting visit was paid to Sir J. Hutchinson's admirable Educational Museum which was explained by Mr. Swanston the Curator. A remarkable collection of local flint implements being of peculiar interest. The rest of the detailed programme was not followed.

June 23. To Leith Hill, conducted by Dr. A. B. Gough, M.A., and C. E. Salmon, Esq., F.L.S. A threatening morning developed into a delightful day, and thirteen members and friends joined in the walk from Ockley Station by Leith Hill and Holmbury Hill to Gomshall Station. In the woods west of Ockley Station *Myosotis sylvatica*, *M. palustris* var *strigulosa* and *Valeriana*

*Mikanii* were seen, also *Hypericum Androsæmum* (Tutsan), which was again noted in a bushy place below Leith Hill. Beautiful paths through these woods and over fields led to Ockley Green; a short piece of road and then more paths, until we were right under the shadow of Leith Hill. *Valerianella dentata* occurred in the fields between Ockley Green and Leith Hill, and by a streamside the variety *siifolium* of the common watercress, and in a wood *Carex pallescens*. On the summit of Leith Hill *Cerastium tetrandrum* was found, a very scarce plant in Surrey, and this is a new locality for it. Over heaths and through woods, paths were found leading to Holmbury Hill, by which *Carex pallescens* was again noted, and on reaching the Hill a small prostrate milkwort, *P. Oxyptera*, was gathered. From Holmbury Hill the glorious woodland tracks of the Hurwood and open field ways led to Peaslake, where tea was obtained, and afterwards the road and pleasant footpaths were taken to Gomshall Station. On the way a remarkable little Composite, *Arnoseris pusilla* was seen in abundance in a cultivated sandy field, and close to Gomshall Station, *Marrubium vulgare* was noted to be increasing at a spot where it was first seen some ten years ago.

June 26. This was a walk taken in conjunction with the members of the Croydon Natural History and Scientific Society, conducted by W. Whitaker, Esq., B.A., F.R.S. About fifteen visitors came and were joined by five of the Reigate Club. The junction of the Gault and Greensand in the Clears Pit was first visited, and attention was called to the presence of Phosphatic Nodules here and their absence in a pit a mile to the E. Very heavy rain drove the party to seek shelter, but later the unusual deposit of Calcite in the newly opened chalk pit on Colley Hill was examined.

July 7. To Gomshall, conducted by J. S. M. Ward, Esq., B.A. The small party of four who were not deterred by a heavy rain storm were met by their Conductor at Gomshall Station. In Cold Kitchen Lane many land shells and snails were found. The walk was continued along the Downs eastward, and after tea at The Compasses a pleasant excursion was ended by a walk through the watercress beds and along the banks of the Tillingbourne. The following is the list of shells found:

<i>Helix cantiana</i> Mont.	<i>Helix aricetorum</i>
„ <i>aspersa</i> Müll.	<i>Bulinus obscurus</i> Müll.
„ <i>nemorialis</i> L.	<i>Clausilla laminata</i> Mont.
„ <i>lapicida</i> L.	<i>Vitrina pellucida</i> Müll.
„ <i>caperata</i> Mont.	<i>Pomatias elegans</i> Müll.
„ <i>Virgata</i> Da Costa	

July 22. A party of eight including the President was conducted to Penshurst by Dr. A. B. Gough, M.A. After following field paths to Chiddingstone, with its picturesque 17th Century houses, the members crossed the Park where stands a weathered mass of sandstone 18 feet high (the so-called 'Chiding Stone'), and proceeded by way of Salmon's Farm and South Park, to Penshurst Place, the historic home of the Sidneys and now the residence of Lord de l' Isle and Dudley. Here an hour was spent in examining the ancient building, with its furniture and portraits, the Conductor having previously sketched in brief the history of the place. The Rev. E. W. Bowell, M.A., of Penshurst, showed the Church and the Register, with its records of the Sidney family, and kindly exhibited an interesting series of microscopic preparations and photographs of the palates of snails, etc., and explained the use of some valuable instruments. He also took the party round the celebrated gardens of Swaylands (by kind permission of C. J. Drummond, Esq.) where the beautiful rock gardens alone occupy several acres. Mrs. Ernest Hills, of Red Leaf, had also kindly allowed the Club to visit her grounds, and in the evening some of the party were conducted by the head gardener through the magnificent arboretum, which contains a collection of well-grown and rare conifers, perhaps unique in the district.

Oct. 16. To Worth and Tilgate Forest, conducted by J. B. Crosfield, Esq. This, the last excursion of the season, was attended by only four members although a large attendance had been anticipated. Rain fell heavily from before the start, and continued with scarcely any intermission throughout the day. Starting from Three Bridges station, field paths and lanes were followed to Worth Church. The fine Saxon windows and walls were examined and then, undeterred by the wet, one of the tracks across Tilgate Forest was taken. In the undergrowths about twenty species of fungi were collected, but they were

not so abundant as last year. The latter part of the programme for the day was abandoned, and an earlier train taken at Three Bridges station, instead of the later one at Balcombe as originally planned.

BALANCE SHEET  
for twelve months ending 30th June, 1909.

Dr.	£	s.	d.	Cr.	£	s.	d.
Balance brought forward	3	17	2	Loan, Museum Fund	17	11	2
30 members at 10s. ....	15	0	0	Insurance .....	13	6	
3 ditto in advance.....	1	10	0	Postages.....	2	8	4
26 subscribers at 5s. ....	6	10	0	Printing & Stationery	2	16	6
2 ditto in advance.....	10	0	0	Advt. in Surrey Mirror	2	12	6
2 ditto arrears paid .....	10	0	0	Rent, from 25.3.08, 5qs	7	10	0
Rent, Guild of Crafts.....	16	0	0	Use of North Room, Redhill .....	10	0	
Amt. borrowed from the Museum Fund, 1906-8, still unpaid.....	17	11	2	Lanternist, 4 lectures	2	12	0
				Gas .....	10	3	
				Cleaners & Caretakers	13	3	
				Sub. to Surrey Survey	2	6	
				S. E. Union, 1908..	10	0	
				do. 1909..	10	0	
Subscriptions for 1908-9 unpaid:				Removing Gasfittings from Old Town Hall to Great Doods and refitting.....	2	15	9
7 Members				Balance carr. forward.	4	8	7
12 Subscribers							
Grammar School special Sub.							
Estimated to produce £6 15s.							
	£46	4	4		£46	4	4

Examined and found correct,  
E. DUKINFIELD JONES.

The following Officers were elected for the ensuing year:—

- President* E. Dukinfield Jones, F.Z.S., F.E.S.
- Treasurer* A.E. Tonge, F.E.S. (re-elected).
- Secretary* Miss Margaret C. Crosfield (re-elected).
- Committee* Rev. R. Ashington Bullen, F.G.S., F.R.A.I., Messrs. G.W. Butler, F.G.S., F.Z.S., and J. B. Crosfield, Dr. T.A. Chapman, F.Z.S., F.E.S., Dr. A.B. Gough, M.A. Messrs. R.S. Ragg, B.A., C.E. Salmon, F.L.S., J.S.M. Ward, B.A., and Dr. J. Walters, J.P.

The Meeting then resolved itself into an ordinary Evening Meeting.

Present 22.

Miss Ethel Sargant, our delegate, gave her Report of S.E. Union Meetings at Winchester and delivered a lecture entitled A Modern Development of Field Botany, of which the following report is an abstract:—

Ecology is the study of the interaction between plants and their habitat, and its subject matter falls naturally under those two heads.

The modern science of ecology endeavours to measure with all possible accuracy the external conditions which affect a species or a group of species *in situ*. These conditions constitute the habitat: they are of two kinds, physical and organic. The physical conditions include details of climate and soil. The complete ecologist requires, besides a meteorological outfit, instruments for obtaining samples of soil at various depths, and a field laboratory for analysing such samples. Organic conditions depend on the neighbouring animals and plants. The characteristic vegetation of any spot is due even more to the competition of plants with each other than to the physical conditions, or the influence of animals present in the district. It is the balance of all these conditions which determines what plants shall survive these.

The facts of plant distribution in any locality are recorded on detailed maps. In certain selected areas the ecologist may even record every individual plant on a large-scale chart of a square metre of ground. In maps on smaller scale this is of course impossible.

The methods of modern ecology are indeed largely those of a botanical land-surveyor, and ecology bears the same sort of relation to botanical geography as land-surveying to physical geography.

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### Meeting held at Reigate, Dec. 3rd, 1909.

Present 20 members and friends.

The Rev. E. W. Bowell, M.A., of Peshurst, read the following paper:—

## The Developement of Conchology.

By Conchology I mean the collecting of snails, and the various enquiries to which snail-collecting leads. Though my own experiences have been mainly with land and freshwater snails, what I have to say applies equally to all the divisions of the class which we call Mollusca. I hope to show that Conchology is a very much more serious study than most people think.

By the developement of Conchology I mean the progressive changes which have come over the study since men first began to collect snails; and in particular certain extensions of Conchology, certain improvements in its methods which will be of great importance to the future of Science, if it is possible to induce a sufficiently large number of naturalists to work at them.

My first task is to try to show that the study of Conchology may become in the immediate future a matter of first-class importance.

Fifty years ago Darwin showed that there was good reason to doubt the view which till then generally prevailed, that the various species of living beings had been distinct since their origin. I am careful to say only that this view generally prevailed; of course it is true that others before Darwin had had their doubts, and I think that the real value of his work lay in the fact that it was sceptical; it showed that there was good cause to doubt what men in general had never doubted before. I do not hesitate to say that there are many things intimately connected with life and existence which men take for granted now, but will be compelled in the near future to submit to a searching sceptical criticism.

Even if the subject matter of the Darwinian theory had been of no importance in itself, it would have gained importance from being thus used to challenge the general opinion of mankind. But not only is it true that it was thus used, and successfully thus used, but also it is in itself a matter of the closest importance to all of us. There is no department of human thought or action upon which the doctrine of evolution is without influence; in many cases it is a powerful solvent of ancient ideas. And there is no field in which Darwin's ideas can be fairly tested, except the field of Natural History.

If the diversities of the animal body have been evolved, there is no apparent reason why the mind should not have been evolved

also; and the same must be true, unless we can show some supreme cause to the contrary, also of those moral characteristics which are intimately connected with the mind, and sometimes rule it; and of the higher animal functions which constitute Life, in the sense in which ordinary people use that word. Moreover, the whole of this statement may be put equally well in the present or the future tense; we may say also that they are being evolved, and that they will be evolved. This particular wideness of outlook is essential to the theory; and here again I must remark that even if the subject matter were of no practical importance, the wideness of its outlook, into past, present, and future, might justly serve to draw our attention to Darwin's idea.

The information and the methods that were at Darwin's disposal were insufficient to prove his theory. But by his industry and clearness of thought he was enabled so to present it that almost all naturalists who had not theories of their own to nurse, came to regard it as much more probable than any other view. Strictly speaking, neither of Darwin's great works is logically convincing; this fact still leads certain philosophers to construct ingenious proofs that the doctrine of evolution never can be proved. On the other hand, there is to many minds an immense attraction to be found in any idea that revolutionises thought; they think that mankind has in the past made so many mistakes that any downright reversal of widespread beliefs, if accompanied by a tolerable amount of evidence, is certain to point towards enlightenment and truth. It seems likely that there is exaggeration in both of these views; but I think there are few naturalists who are not convinced that Darwin's theory is fundamentally true. I do not think we have yet grasped the methods and causes of evolution; but I think it may be done in the course of the next fifty years, if the progress of Science is not stopped by certain unworthy human tendencies.

Amongst such tendencies, which we must oppose with all our might, we may class the insidious inclination to shorten our work by appealing to Authority. It is our duty to see for ourselves that things are as we describe them, and not to rely upon the statements of others, who may have looked at facts from a different point of view, or (so to speak) through different spectacles.

Science may also be terribly hindered by being worshipped too much. Some of the worship will inevitably be reflected on her high-priests; and it is extremely bad for them. If it be necessary to personify Science, let her be represented as a supremely practical wench, with not much decoration about her and no nonsense.

And the study of Science must not be confined to a special class of persons; when that is done, a kind of scientific sacerdotalism results, whence comes forgetfulness of the great aims of knowledge.

But supposing that the science of Natural History steers safely through all these perils, I see no reason to doubt that within another half a century it will hold a position of unique importance amongst human studies. It will be the fountain of all practical philosophy; it will condemn or justify the present attitude of the Man in the Street towards all kinds of poetry and mysticism; it will afford sound principles for the politician, the critic, and the economist. I suspect that we shall then discard the motives of glorified selfishness, put various unreasonable kinds of Pride in a museum—of antiquities—and work for the good of the race, which we shall then be beginning to understand. Fifty years is too soon for anything but the beginning of this; but a scientific age, if it ever does arrive, an age influenced by Natural History, the most human of all the sciences, will not be crudely mechanical and non-moral, as some writers have been pleased to foreshadow. It is a great insult to religion to call the ages of superstition the ages of Faith; it is an equally great insult to science to call this present age a scientific age.

I do not think I have overstated the importance of the Evolution theory. And this theory has to be tested, checked, and developed, by the systematic study of Natural History. In order that this may be done as completely and perfectly as possible, some branch of Natural History must be selected for special attention; the animals constituting the class to be thus studied must be neither too large nor too small to be thoroughly examined; they must reach their maturity in a reasonably short time; and there must be available a complete record in the rocks, showing the forms assumed by some characteristic organ of the

class, from the earliest times down to the present. I may add that the class to be studied must not be of too small an extent, nor confined to a few regions of the earth. And there is only one class in the animal kingdom which meets these requirements; it is the class Mollusca, consisting of snails and snail-like animals; the characteristic organ, rarely absent, being the shell. There is another organ characteristic of the Mollusca, found in practically all the species except the headless class; though we have no fossils which show this organ (except possibly a few Cephalopoda), it is of singular importance in classification. This organ is a tongue provided with many rows of chitinous hooks or teeth. It has been known since the beginning of modern Conchology, but until lately has not received the attention it deserves. Of course it cannot in any case be seen properly without the microscope. Our conchologists of fifty years ago made many careful estimations of the numbers of hooks or teeth occurring on the radulae of our different native species; but it was soon found that these estimates were only approximately correct, the actual number varying within rather wide limits. It was also noticed that there was a very great similarity between the radulae of allied species; and this fact, instead of stimulating interest in the subject, as it ought to have done, led to the radula being disregarded, since the main object of collectors has been to establish differences rather than similarities. It is, however, a mistake to suppose that the radula does not exhibit differences in closely allied species. The differences may be small, but they are perceptible, as you will observe in the drawings I now submit to your notice, which represent the radulae of our British *Helices*, a group that has until lately been included under one genus. Certainly there is a very great similarity between these radulae; but when they are examined carefully with a good microscope, due care being taken to mount them to the best advantage, they present the differences which you see in the drawings. These being slight, and the habits of the animals being to some extent known, these radulae afford us an excellent opportunity for speculating about the means whereby their present variety of form was brought about. The later geological history of these snails is continually becoming better known, chiefly through the

researches of Messrs. Woodward and Kennard. There are considerable difficulties in mounting and examining the radulae of the smaller species, the older methods being liable to several serious objections; but lately I have been able to work out a process by which preparations of any species can safely be made. As in every case where comparison of many somewhat complicated objects is required, it is here of advantage to take photomicrograms, which can be compared more readily than the original objects. In connexion with these I have had what I suppose to be the usual experience of photographers; one is much delighted with the first results; then the growth of the critical spirit produces a very decided measure of dissatisfaction, which is only removed after a very careful study of the special necessities of the case. I need hardly add that the results of my experiments in mounting radulae and producing photographs of them are entirely at the disposal of any member of the Club who may desire to take up similar work.

The Developments of Conchology to which your attention has now been directed have had for their object the gathering of evidence which bears upon the theory of Evolution. In their turn they involve other developments. In connexion with the geological view of the history of snails, we require to have the most precise evidence that can be obtained about the present distribution of the various species. Much valuable work in this line has been done by the Conchological Society, and especially by Mr. J. W. Taylor, whose *Monograph of British Land and Fresh Water Mollusca* is now being published in parts. If we know exactly where the different species are now to be found—and on this point it is to be remarked that positive evidence is more valuable than negative—and also know where they occur in fossil or sub-fossil deposits, we shall be able to form some idea of the migrations in which they have taken part, and Dr. Scharff has written an important book on this subject. This leads us to the study of the dispersal of snails, the various means by which they have become transported from one place to another. Darwin himself took a considerable interest in this investigation, and Mr. Wallis Kew has contributed a suggestive treatment of it to the *International Scientific Series*. It is evident that in connexion

with such things we shall want information about the food affected by the different species; for our gardening friends are by no means right in assuming that all snails and slugs invariably eat everything that they ought to leave uneaten.

Mr. W. A. Gain has made many experiments bearing on this point. I believe that a better method still remains to be tried; the examination of the contents of the snails' stomachs. It is a regrettable fact, but snails must be killed in order that their shells may figure in collections; and the body, which contains the precious radula and various other points of interest, is generally not utilised. It should be very little trouble to examine the contents of the stomach under the microscope, when an experienced botanist, well acquainted with our native flora, would be able to recognise the remains of the tissues of different plants.

The study of the radula also forces us to make further developements. It is a very much more complicated organ than has generally been supposed, consisting of many other elements besides those rows of hooks and the membrane that bears them. We naturally ask how it has grown to that particular pattern; whether there is any important variation of its form in earlier stages. There is; and in the earlier stages the radula often shows close similarity to that of some other form; thus providing an interesting confirmation of Hyatt's observations described by the President of the Malacological Society in his annual address this year. Hyatt showed, 20 years ago, that certain species never grew up to full maturity; many of course reached the maximum of age that was proper for the group, while others habitually attained what we may call the senile condition. He recognised that this fact could be put to good account in classification; and he named the stages of growth and decline by using suitable Greek adjectives: Embryonic, Nepionic, Neanic, Ephebic and Gerontic. He himself worked mainly at the Cephalopoda; but his observation is, I believe, destined to provide a key to the classification of that extremely complicated family the Helicidae, more especially when we take into account not the shells only, but also the radulae and maxillae.

To form a just idea of the nature of the radula, we shall require to explore much more deeply into its embryology. This

involves the cutting of many sections; with regard to which I should like to say, in order to save the time of others who may be embarking in this direction, that a good microtome and a good incubator are sources of perpetual pleasure, while the reverse is true of rudimentary or superannuated appliances.

The sectioning method is also requisitioned for the general study of the anatomy of snails. Hitherto most of the work has been done by dissecting, with or without the aid of a magnifying glass or erecting microscope. But the time has come for the results so obtained to be checked by special sections of material properly fixed and afterwards properly stained. The histology of the snail is as yet very imperfectly known. But the following facts are known, and may be worked in with Hyatt's valuable observation; the different species have constituent cells and cellular organs of widely varying dimensions. This variation is not always proportionate to the bulk of the animal. (For example, the radula in a large species is not so much larger, and in a small species not so much smaller, than would have been expected from comparison with a medium-sized species). It is found that certain sorts of cells vary according to circumstances much more readily than others do. Consequently every variation in size necessarily implies a variation in the form and symmetry of the animal, viewed as a whole. This principle is worth further working out, since the fact of the immense amount of variation in form is one of the most difficult of the problems connected with evolution. And in order that it may be worked out, a precise knowledge of snail histology is needed.

These few observations, which I have been obliged to condense as much as possible, will, I think, satisfy you that snail collecting is a pursuit which may lead to important and interesting developments. Within the last quarter of a century the instruments of research—the microscope, the microtome and the camera, have been improved almost beyond recognition; and the most effective means of using them are now known. We now insist upon knowing the reasons why we employ different processes, instead of trusting to tradition and rule-of-thumb.

Time was, when snails were collected for ornament; and pearls are still valued for a mixture of financial and aesthetic

reasons. Again, there was a period, now almost gone by, when the rarity of the shells in his cabinet, and their consequent money-producing power, was the chief concern of every collector, for all the world as though they were like so many gloomy old pictures or wax busts or postage stamps. The history of this extraordinary phase of the collecting instinct might well provoke a learned pen; but for to-night I do not consider it a legitimate development of Conchology. I leave with you the thought that although the snail is in himself an insignificant beast, yet he and his congeners bear in their insides and in their shells the interpretation, as yet not fully read, of many problems which are daily vexing the hearts of men, both wise and foolish.

# SURREY PLANT RECORDS.

By C. E. Salmon, F.L.S.

1906

- Trifolium pratense*, var. *parviflorum*. Near Crabtree Farm, Norbury Park.  
*Hypochaeris glabra*. Walton-on-Thames.  
*Mentha Pulegium*. Pettridge Wood Common.  
*Polygonum maculatum*. „  
*Damasonium stellatum*. „  
*Carex axillaris*. Near Thorpe and on Thorpe Green.  
*C. acuta*, var. *prolixa*. Near Thorpe.

1907

- Fumaria Vaillantii*. Clandon Downs, in broken ground in cut down shaw.  
*Reseda phyteuma*. An alien, but growing in some plenty in a chalky field near Pebble Hill, Betchworth, with *R. lutea*, *Specularia*, *Anagallis*, etc.  
*Malva moschata*, var. *heterophylla*. Buckland Hill, plentiful.  
*Tilia platyphyllos*. Lane side, Buckland Hill, and may well be native here. Rev. E. F. Linton thinks it may be *T. mutabilis*, Host., rather than *platyphyllos*.  
*Medicago maculata*. Roadside near Boxhill.  
*Epilobium roseum*. By the Gad Brook S. of Brockham Park.  
*Galium sylvestre*. Foot of the chalk downs, near Pilgrims' Way, Reigate.  
*Valeriana Mikanii*. Clandon Downs, in an enclosure.  
*Onopordon acanthium*. Gravel Pits near Burford Bridge.  
*Hypochaeris glabra*. Sparingly in field near Netherlands, near Albury Downs.  
*Pulicaria vulgaris*. Norley Common, near Wonersh.  
*Phyteuma orbiculare*. Clandon Downs.  
*Anagallis caerulea*. Potato field, Chilworth.  
*Orobanche elatior*. Near Clandon Downs.  
*Melissa officinalis*. Cottage hedgebank near Brockham Park.  
*Polygonum convolvulus*, var. *subalatum*. Betchworth, near the Station.  
*P. minus* and *P. maculatum*. Norley Common, near Wonersh.  
*Euphorbia platyphyllos*. Cult. ground near Isolation Hospital, Earlswood.

*E. exigua*, var. *retusa*. Field near Clandon Downs.

*Betula verrucosa*. Boxhill.

*B. pubescens*. Mickleham Gallops.

### 1908

*Fumaria parviflora*. Field near Tot Hill, Headley.

*Cardamine amara*. Near Brook Farm, Tandridge.

*Silene dubia*. Downs above Reigate. An addition to the Surrey Flora.†

*S. noctiflora*. Field near Mickleham Gallops.

*Althæa hirsuta*. Still on the chalk hills between Reigate and Buckland.

*Impatiens parviflora*. Near Pond, Titsey Park.

*Cerastium arvense*. Between Titsey and Tatsfield. Field near Tot Hill, Headley.

*Lathyrus sylvestris*. Gatton Park.

*Alchemilla vulgaris*, var. *filicaulis*. Woking! Miss M. Saunders.

*Epilobium roseum*. Leatherhead.

*Carum verticillatum*. Near Woking! Miss M. Saunders and Miss R. Cardew.‡

*Torilis infesta*. Near Chipstead.

*Valerianella olitoria*, var. *lasiocarpa*. Woking.

*Serratula tinctoria*. Banstead Downs.

*Pyrola minor*. Near Maybury! Miss R. Cardew.

*Atropa belladonna*. Road N. W. of Titsey Park.

*Euphrasia Kernerii*. Leatherhead Downs; Banstead Downs.

*Hippuris vulgaris*. Pond, Titsey Park.

*Polygonum bistorta*. Roadside, Mid Street, Nutfield.

*Anthoxanthum puellii*. Near Leatherhead.

*Bromus secalinus*. Near Leatherhead; var. *velutinus*. Woking.

### 1909

*Helleborus viridis*. Sparingly near Chipstead! C. E. Britton.

*Nasturtium officinale*, var. *süfolium*. Streamside near road in Jayes Park, Ockley.

*Barbarea intermedia*. Alien. In field near Tattenham Corner, several plants.

† *Journal of Botany*, Sept., 1908.

‡ *Op. cit.*

- Lepidium draba*. Roadside, Bletchingley.  
*Silene dubia*. Building operations have destroyed this species mentioned in last year's list.  
*Cerastium arvense*. Colley Hill, Reigate, sparingly.  
*C. tetrandrum*. Leith Hill.  
*Geranium pyrenaicum*. Amongst bushes on a Down near East Clandon.  
*Prunus cerasus*. Shaw between Chipstead and Burgh Heath!  
 C. E. Britton.  
*Pyrus torminalis*. Roadside near Leigh, a fine tree! W. B. Adeney  
*Smyrniolum olusatrum*. Plentiful in copse at W. Horsley.  
*Galium erectum* and *G. sylvestre*. Down, near E. Clandon.  
*Valeriana Mikanii*. Wood W. of Ockley Station.  
*Valerianella dentata*. Fallow field, Chipstead; field near Clears, Reigate; fields S. of Leith Hill Tower.  
*Taraxacum erythrospermum*. Colley Hill, Reigate.  
*Filago spathulata*. Fallow field, Chipstead.  
*Erythrœa pulchella*. Foot of Colley Hill, Reigate.  
*Gentiana amarella*, var. *præcox*. Down, near E. Clandon, C. E. Britton.  
*Teucrium botrys*. In abundance in fallow field near Chipstead!  
 C. E. Britton.  
*Ajuga chamæpitys*. Fallow field, Chipstead.  
*Prunella laciniata*. Down near E. Clandon! C. E. Britton.  
*Thesium humifusum*. Walton Downs; White Down near Dorking; Chalky slope near Chipstead.  
*Euphorbia Esula* var. A fine clump on Epsom Downs.  
*Luzula Forsteri*. How Green, Chipstead; roadside between Godstone and Bletchingley; near Chiphouse Farm, Chipstead.  
*L. Forsteri* × *pilosa* (= *Borreri*). Near Chiphouse Farm, Chipstead! C. E. Britton. Wood W. of Ockley Station.  
*L. maxima*. Near Chiphouse Farm, Chipstead! C. E. Britton.  
*Orchis morio*. Colley Hill, Reigate.  
*O. maculata* × *Habenaria conopsea*. Gomshall! C. E. Britton.  
*Carex pallescens*. Wood between Jayes Park and Leith Hill, and also between Leith and Holmbury Hills.  
*C. strigosa*. Wet copse below Buckland Hill.  
*Lolium temulentum*. Casual, roadside, Pilgrims' Way, Reigate.

# RULES.

## NAME.

I.—The Association shall be styled "THE HOLMESDALE NATURAL HISTORY CLUB."

## OBJECTS.

II.—The investigation of the Natural History of Reigate and its vicinity and the mutual improvement of the members in the study of Nature.

## CONSTITUTION.

III.—The Club shall consist of Members, Subscribers, Corresponding Members, and Honorary Members.

## MEMBERS.

IV.—Members shall be elected by ballot or show of hands at any Ordinary Meeting. The candidate to be recommended by one or more Members at any Ordinary Meeting, and the election to take place at the Meeting next ensuing.

## SUBSCRIBERS.

V.—Subscribers shall be elected in the same manner as Members, and shall have all the privileges of Members except of voting upon any matter, or of having any right or ownership in the property of the Club.

## CORRESPONDING MEMBERS.

VI.—It shall be competent for the Club to elect as Corresponding Members any gentlemen distinguished for their attainments in Natural History, either as collectors or authors, or to whom the Club may be indebted for contributions of papers or specimens; such Corresponding Members to have similar privileges to Subscribers without payment, and to be elected by the Club upon the nomination of the Committee.

## HONORARY MEMBERS.

VII.—Honorary Members shall be elected by the Club upon the nomination of the Committee; and shall be exempted from the payment of subscription, and shall have the privileges of Subscribers.

## OFFICERS.

VIII.—The Club shall, at the Annual General Meeting, elect from among themselves a President, Treasurer, Secretary, Curator and nine Members to form a Committee of Management, three of whom to form a quorum.

## VICE-PRESIDENTS.

IX.—The President shall nominate annually two Vice-Presidents from the members of the Committee.

## ANNUAL GENERAL MEETING.

X.—This shall be held previous to the Evening Meeting on the fourth Friday in October, when the Committee shall present a Report detailing the general state, proceedings and pecuniary condition of the Club, and proceed to the election of Officers.

## SPECIAL MEETINGS.

XI.—The Committee shall have the power to call a Special General Meeting at any time; and they shall do so within four weeks after receiving requisition to that effect, signed by at least five Members. The notice calling the Meeting shall state the objects for which the Meeting it called, and no other business shall be transacted.

## ORDINARY MEETINGS.

XII.—These shall be held on the fourth Friday in every month, from October to April, inclusive, or more frequently at the option of the Committee.

## SUBSCRIPTIONS.

XIII.—Each Member shall pay to the Treasurer Ten Shillings on his election, and the same sum at the Annual General Meeting each year; but may compound for such Annual Subscription by payment of Five Pounds. Each Subscriber shall pay to the Treasurer Five Shillings on his election, and the same sum at the Annual General Meeting each year. That it shall be optional with the Committee to strike out the name of any Member or Subscriber who shall be in arrears with his Subscription for twelve months or more.

## NEW RULES.

XIV.—Any five Members wishing to propose a New Rule, or the omission or alteration of any existing Rule, must send notice to the Secretary, who shall within a month call a Special General Meeting to consider the change proposed.

## LIBRARY AND COLLECTIONS.

XV.—The Club shall form, as opportunity may offer, a Library of Reference, consisting of works bearing on the subject of Natural History, and obtain collections of the natural objects of the neighbourhood. The Library, Collections and Funds to be the property of the Members for the time being, and shall be vested in Trustees for the use of the Members. Contributions of Life Members shall also be invested in the names of such Trustees in such manner as the Committee may direct, the interest arising therefrom to be handed to the Treasurer for the general purposes of the Club.

## ELECTION OF TRUSTEES.

XVI.—The Trustees shall consist of the President for the time being, and three other Members to be elected by the Club.

## CORRESPONDING SOCIETIES AND LIST OF EXCHANGES.

1. Bodleian Library, Oxford.
2. British Association for the Advancement of Science, Burlington House, W.
3. British Museum.
4. British Museum of Natural History, South Kensington.
5. Horniman Museum, Forest Hill.
6. Lloyd Library, Cincinnati, Ohio.
7. University Library, Cambridge.
8. Bath Natural History and Antiquarian Field Club.
9. Belfast Natural History and Philosophical Society.
10. Burton-on-Trent Natural History Society.
11. Cardiff Naturalists' Society.
12. City of London College Science Society.
13. Croydon Natural History and Scientific Society.
14. Dumfriesshire and Galloway Natural History and Antiquarian Society.
15. East Kent Scientific and Natural History Society.
16. Epsom College Natural History Society.
17. Glasgow Natural History Society.
18. Hastings and St. Leonards Natural History Society.
19. Marlborough College Natural History Society.
20. North Staffordshire Field Club.
21. Nottingham Naturalists' Society.
22. Penzance Natural History and Antiquarian Society.
23. Rochester Naturalists' Club.
24. Southport Society of Natural Science.
25. South Eastern Union of Scientific Societies.
26. South London Entomological and Natural History Society.
27. Torquay Natural History Society.
28. Warwickshire Field Club.
29. Yorkshire Naturalists' Union.

# Holmesdale Natural History Club

(Founded 1857).

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