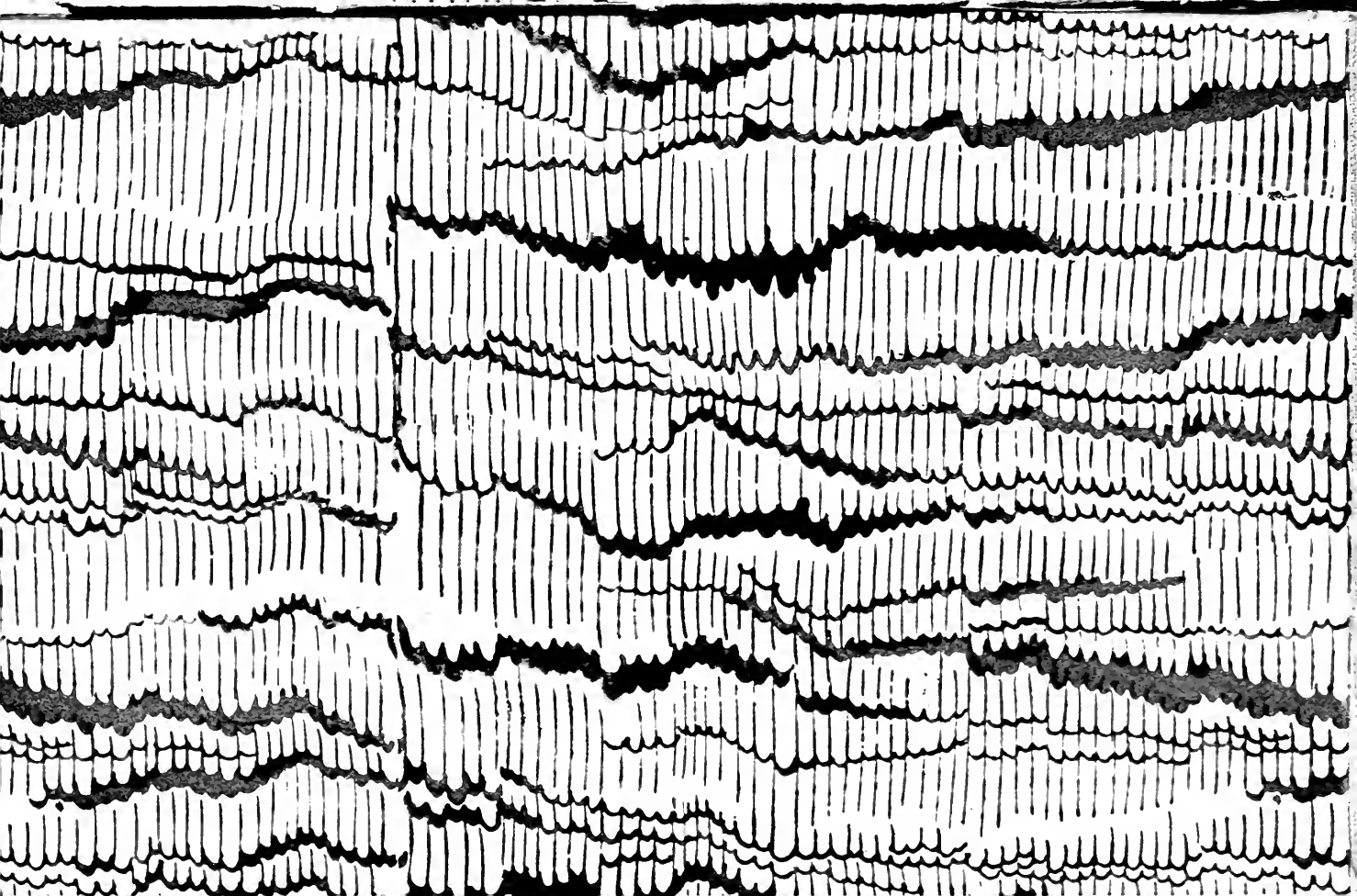

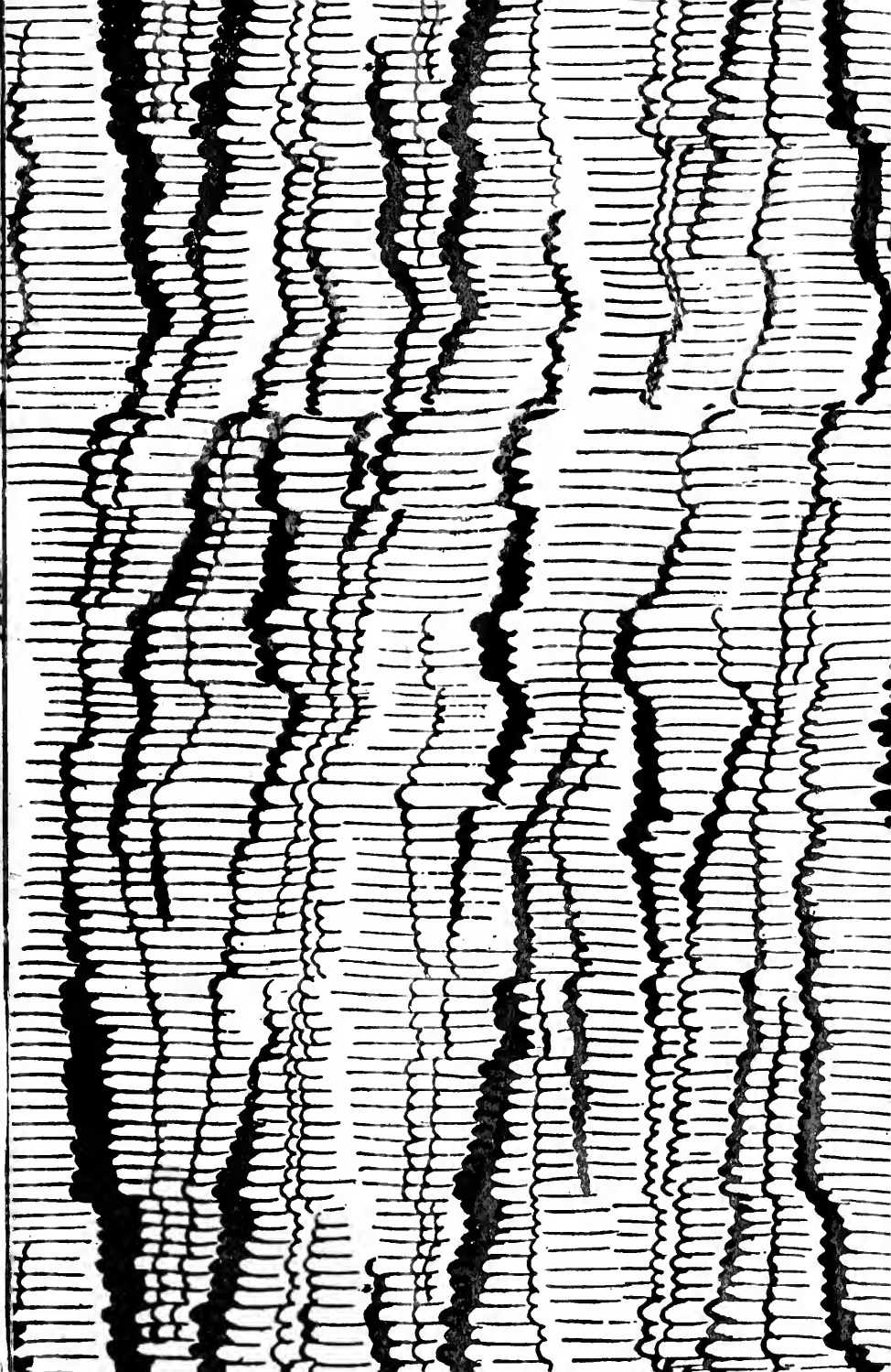

Proceedings

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ENTOMOLOGICAL & NATURAL HISTORY

SOCIETY

1921-22

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1921 COTTAM, Major T. M., 13, Waldegrave Park, Twickenham. *l.*

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Year of Election.

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1889 MOORE, H., F.E.S., 12, Lower Road, Rotherhithe, S.E.16. *l, h, d, e l, e h, e d, mi.*

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1920 Simms, H. M., b.sc., f.e.s., The Farlands, Stourbridge.

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1916 Syms, E. E., f.e.s., *Council*, 22, Woodlands Avenue, Wanstead, E. *l.*

1920 Talbot, G., f.e.s., The Hill Museum, Witley. *l.*

1894 Tarbat, Rev. J. E., m.a., The Vicarage, Fareham, Hants. *l, ool.*

1913 Tatchell, L., f.e.s., 43, Spratt Hill Road, Wanstead, E. 11. *l.*

1902 Tonge, A. E., f.e.s., *Hon. Treasurer*, Aincroft, Grammar School Hill, Reigate. *l.*

1887 Turner, H. J., f.e.s., *Hon. Editor*, 98, Drakefell Road, New Cross, S.E. 14. *l, e, n, he, b.*

1921 Vernon, J. A., Lynmouth, Reigate, Surrey. *l.*

1921 Vesterling, A. W., 107, Castle Street, Battersea, S.W. 11. *l.*

Year of Election.

1889 Wainwright, C. J., f.e.s., 139, Daylesford, Handsworth Wood, Staffs. *l*, *d*.

1911 Wakely, L. D., 11, Crescent Road, Wimbledon Common, S.W. 19. *l*.

1880 Walker, Comm. J. J., m.a., f.l.s., f.e.s., "Aorangi," Lonsdale Road, Summertown, Oxford. *l*, *c*.

1920 Watson, D., 12, Park Place, Gravesend.

1922 Watson, E. B., Winthorpe Grange, Newark, Notts. *l*.

1911 Wells, H. O., Inchiquin, Lynwood Avenue, Epsom. *l*.

1922 West, A. G., Clive Road, West Dulwich, S.E. 21. *l*.

1920 West, W., 29, Cranfield Road, Brockley, S.E.

1911 Wheeler, The Rev. G., m.a., f.z.s., f.e.s., 28, Gordon Square, W.C. 1. *l*.

1887 Whiffen, W. H., 21, Elphinstone Road, Hastings. *l*.

1920 Wightman, A. J., 35, Talbot Terrace, Lewes, Sussex. *l*.

1914 Williams, B. S., St. Genny's, Kingscroft Road, Harpenden. *l*, *c*, *hem*.

1912 Williams, C. B., m.a., f.e.s., Ministry of Agriculture, Cairo, Egypt. *l*, etc.

1920 Withycombe, C. L., b.sc., f.e.s., 12, Prospect Hill, Walthamstow, E. 17. *l*, *b*, *n*, *mi*.

1918 Wood, H., Albert Villa, Kennington, near Ashford, Kent. *l*.

1921 Worsley-Wood, H., 31, Agate Road, Hammersmith, W. 6. *l*.

1920 Young, G. W., f.r.m.s., 20, Grange Road, Barnes, S.W. 13.

Members will greatly oblige by informing the Hon. Sec. of any errors in, additions to, or alterations required in the above Addresses and descriptions.

REPORT OF THE COUNCIL, 1921.

IN presenting the fiftieth Annual Report the Council is pleased to be able to state that the Society is in a very satisfactory condition. The membership has reached the total of 192, a higher figure than it has attained for many years past. Sixteen new members have been elected, while only two have resigned, and two have been taken off the list under Byelaw 10(2). The Council also regrets to say that four deaths have to be reported (one took place in 1920). In the death of Dr. T. A. Chapman, F.R.S., the Society loses one of its most distinguished members; he joined the Society soon after coming to the S.E. of England, in 1897, and was 79 years of age on his decease in December last. Mr. J. Jäger died on January 5th, at the age of 88; he joined the Society in 1886, and for many years was a regular attendant. Mr. A. E. Hall died on December 30th, at the age of 51; he joined in 1888, and although living at a distance took a keen interest in the Society's work. Mr. Woolacott joined in 1917. The Council have to regret the resignation of Mr. A. Russell through ill-health. He joined the Society in 1898, and for some time was a very active member, serving on the Council.

A Special Exhibition of Orders other than Lepidoptera was held on June 23rd, with considerable success.

The Annual Exhibition took place on November 24th, and constituted a further record, 170 members and friends being present.

The Lantern has been used on several occasions, Mr. Dennis again acting as a very efficient Hon. Lanternist.

The following papers have been read before the Society :—

"The Parasite of *Sirex gigas*, *Rhyssa persuasoria*," by Miss L. E. Cheesman.

"The Natural History of Macedonia," by the Rev. T. Waterston, F.E.S.

"The Water-Mites, Hydrachnina," by Mr. D. Soar, F.R.M.S.

"The Common Lands of London," by Mr. Laurence Chubb.

Lantern slides were shown on all these occasions.

The Honorary Curator reports:—

"During the past year the Society's Collections have been greatly augmented by the incorporation of further portions of the late Mr. Ashdown's bequest, and also by the very generous gitts of our member Mr. Stanley Kemp, who is in India. Mr. Kemp's British Odonata make the Society's almost a complete series, as we now possess 36 out of the 39 species described by Mr. Lucas in his book. Mr. Ashdown's Collection of the British *Coccinellidae* is now in the Society's cabinet, and available for reference and study. Donations of specimens have also been received from Messrs. Blenkarn, Bowman, and Grosvenor."

The Hon. Librarian reports:—

"The Library has been very freely used during the past year both by borrowers and for reference on meeting nights, and there has also been a very good demand for back numbers of the Society's Proceedings. The volumes bequeathed by the late Mr. Ashdown will soon be available."

Field Meetings were held at Oxshott, Eastbourne (a whole day outing, when Mr. R. Adkin conducted and entertained the party at his house at Meads), and Chalfont Road (when Mr. T. W. Hall entertained the party to tea at his house at Chorley Wood). No Fungus Foray was held owing to the unusual dryness of the autumn.

Messrs. Stanley Edwards and Hy. J. Turner were your Delegates at the Congress of the S.E. Union of Scientific Societies held at Reading in June, and Mr. R. Adkin was your Delegate at the meeting of the Representatives of the Corresponding Societies of the British Association, held at Edinburgh in September.

The volume of Proceedings for 1920, published in June, consisted of xvi. and 103 pages.

The following is a list of the additions to the Library during the year, mainly by donations and exchange:—

Books.—"Annelids collected in the Philippines"; "Polychaetous Annelids of the Philippine Islands"; "Foraminifera of the Atlantic Coast"; "Anthropological Studies on Indians"; "Mollusca of N.W. America"; "Animal Life of the British Isles," E. Step (from the Author); "Bird Life of Peru."

Magazines and Periodicals.—"Entomologist"; "Entomologist's Monthly Magazine," (by purchase); "Entomological News";

"Bulletin of the Entomological Society of France"; "Irish Naturalist"; "Canadian Entomologist"; "Entomologische Mitteilungen"; "Philippine Journal of Science"; "Essex Naturalist"; "Entomologisk Tidskrift," Stockholm; "Zoologiska Bidrag," Upsala (all by exchange).

Reports and Transactions.—Reports of the British Association at Cardiff, from Mr. R. Adkin; Entomological Society of Ontario; Croydon Natural History Society; Hastings and St. Leonard's Natural History Society; Smithsonian Society; U.S. National Herbarium; Perthshire Natural Science Society; Haslemere Society; Torquay Natural History Society; Hampshire Field Club; Bournemouth Natural Science Society; London Natural History Society; Zoological Society; Congress of the South-Eastern Union of Scientific Societies; Bolletino Lab. Zool. Portici, Italy (all by exchange).

Pamphlets and Separata.—"The Genus *Dolichopus*"; Colorado College separata.

TREASURER'S REPORT, 1921.

The report which I have to make on the finances of the South London Entomological and Natural History Society for the year ending December 31st, 1921, is on the whole a satisfactory one, as it shows our position to be at least as good as it was a year ago; but I am just a little disappointed that it does not show the advance I had hoped for in the regular income of the Society, which is still far from being sufficient to meet the regular expenses. This is clearly shown by the credit balance on revenue account being less than £1 more than the amount brought in from last year, in spite of the £15 raised by donations to the Publication Fund.

Current subscriptions amount to a trifle more than in 1920, but advance subscriptions and arrears are both down, and there are a larger number of unpaid subscriptions than I had to deal with in my last report, more than 20 members having so far failed to meet their liability for 1921.

As some members have expressed a wish to pay their Annual Subscriptions through their bankers on the first day of each year, I have had some forms printed for the purpose, and shall be glad to give one to any member who wishes for a copy, so that he may fill it in and return it to me. This will, I hope, help to make matters easier.

The Ashdown bequest has produced a very welcome addition to the Society's assets. The four cabinets bequeathed to us having been sold for £32, while duplicate books from the Society's library, which have been replaced by better copies from the library of the late Mr. J. W. Ashdown, have been sold for a further sum of £3 16s. 8d. This has augmented the balance to credit of Suspense account, and as we have received a life membership fee and £2 7s. 6d. entrance fees during the year, we shall I hope be able to invest a further £40 on behalf of the Society, which should bring us in another £2 annually in dividends.

Publishing our Proceedings cost slightly less than it did in 1920,

and we sold a larger number of copies, with an increased benefit to the funds of nearly £2; but donations were again needed to enable us to meet our liability under this heading without unduly weakening our balance at the bank, and I am very grateful indeed to those gentlemen who so nobly responded with practical assistance.

The balance sheet shows the Society to be in a sound and satisfactory position. Investments appear at cost, which was roughly 96½, and as 5% War Bonds are worth to-day just about 93½, the depreciation on the £60 worth we hold amounts to a matter of a couple of guineas only. Subscriptions in arrear have been carefully valued at £8, and will I hope bring in substantially more; while all the various accounts show a balance on the right side. The total shows an excess of assets over liabilities amounting to £123 14s. 7d.

Having now mentioned the more noteworthy items in my figures for 1921, I will not bore you longer, but I should like to thank the officers and members of the Society very heartily for their very kind help during the past twelve months, and with your permission will conclude by reading the statement of accounts in detail, as vouched for by your auditors, Messrs. E. Step and T. W. Hall.

THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

STATEMENT OF ACCOUNTS FOR THE YEAR 1921.

REVENUE ACCOUNT.

Expenditure.	£	s.	d.	£	s.	d.
To Rent	25	0	0			
,, Fire Insurance	1	6	6			
,, Attendance	2	10	0			
,, Brit. Oxygen Co.	1	19	0			
,, Hire of chairs	2	0	6			
,, Subscriptions:—				32	16	0
South-Eastern Union of Societies	0	15	0			
Footpaths Preservation Society..	0	10	6			
,, Postages, Stationery, etc. :—				1	5	6
Secretaries	7	0	0			
Treasurer		19	8			
				7	19	8
,, Entrance fees to Suspense a/c ..			..	2	7	6
,, Life Membership to Suspence a/c			..	6	6	0
,, Vote to Publication Fund			..	33	0	0
,, Credit Balance			..	8	11	5
				£92	6	1

Income.	£	s.	d.	£	s.	d.
By Credit Balance brought forward				7	16	7
,, Subscriptions :—						
Current	56	14	6			
Advance	10	4	0			
Arrears	5	17	6			
				72	16	0
,, Entrance fees				2	7	6
,, Life Membership fee				6	6	0
,, Dividends				3	0	0
				£92	6	1

ENTRANCE FEES AND LIFE-MEMBERSHIP SUBSCRIPTIONS ACCOUNT.

	£	s.	d.
To Balance carried forward	47	16	0
	£47	16	0

	£	s.	d.	£	s.	d.
By Credit Balance brought forward				3	5	10
Ashdown bequest—Cabinets sold	32	0	0			
Duplicate books sold	3	16	8			
				35	16	8
,, Entrance fees, 1921				2	7	6
,, Life Membership fees, 1921				6	6	0
				£47	16	0

LIBRARY FUND.

	£	s.	d.		£	s.	d.
To Andrews—Binding	1	11	0	By Balance brought forward	0	5	9
,, Carriage	0	1	7	,, Fines	0	8	0
,, Balance	0	11	2	,, Sale of Surplus Books	1	10	0
	£2	3	9		£2	3	9

PUBLICATION FUND.

	£	s.	d.		£	s.	d.
To printing Transactions	62	8	10	By Balance brought forward	7	11	3
,, Balance	0	16	10	,, Sales of Proceedings	7	8	11
				,, Donations	15	5	6
				,, Vote from General Fund	33	0	0
	£63	5	8		£63	5	8

BALANCE SHEET.

Liabilities.	£	s.	d.		*Assets.*			£	s.	d.
To Balance, being excess of assets over liabilities ..	123	14	7	By Credit balances—						
				,, General Fund		8	11	5		
				,, Suspense a/c		47	16	0		
				,, Library Fund		0	11	2		
				,, Publication Fund		0	16	10		
				,, Investments at Cost :—					57	15	5
				£60 of 5% National War Bonds					57	19	2
				,, Subscriptions in arrear :—						
				Good		8	0	0	8	0	0
				Doubtful		3	15	0			
	£123	14	7						£123	14	7

Examined with Vouchers and found correct, this 18*th January*, 1921.

EDWARD STEP,
T. W. HALL, } *Auditors.*

Rhyssa persuasoria:—Its Oviposition and Larval Habits.

By Miss Evelyn Cheesman, F.E.S.—*Read April 14th*, 1921.

The larvæ of this Hymenopteron are parasitic on the larvæ of *Sirex gigas*: the female *Rhyssa* is furnished with an extremely long ovipositor for reaching the burrows of the latter.

During the summer of 1918, Lord Sligo happened to observe a female of *Rhyssa persuasoria* in the act of ovipositing in a post of larch wood. He carefully observed and described the mode of procedure, and from his notes a sketch was made by Mr. Staniland of the Imperial College of Science, which differs markedly from the figure by Riley in "Insect Life," vol. i. (178), of an allied species *Thalessa lunator*.

As noted by Lord Sligo the insect first walked about on the trunk for some time; touching the bark with its antennæ, then halting as if waiting for some sound below. (Other observers have recorded this behaviour, and it is probable that the larvæ of *Sirex gigas*, moving or feeding below are audible to the *Rhyssa*, who is thus able to locate the burrows before inserting her ovipositor. It is extremely necessary that the spot should be chosen with great care, for should the position be miscalculated, or the wood be too hard, the ovipositor may become fixed, and if not broken the insect must starve.)

Having decided upon the right place for commencing operations, and taken her position head downwards parallel with the post, the insect raised her abdomen to its utmost capacity, raising herself at the same time on the long posterior pairs of legs, until the ovipositor was brought under the body, and held in position by the legs, which apparently guided it. The ovipositor was now resting against the wood, but at the wrong angle for boring. Next there appeared to be convulsive movements of the abdomen, and the ovipositor was very gradually shortened until it was brought to the required length to take a vertical position at right angles to the surface of the post —then boring commenced.

As fully described by Riley in the paper on *Thalessa lunator* quoted above, the shortening of the ovipositor is compassed by the action of some powerful muscles at its base, by which it is drawn backward into a membranous sac situated between the 6th and 7th segments, within which it is coiled like a watch spring.

Subsequently the larch logs, in which *Rhyssa* had been observed ovipositing, were sent to the Insect House of the Zoological Gardens, Regent's Park, to be kept under observation. Five adults of *Sirex gigas*, four males and one female, emerged during the

following three months ; and twelve months later, as no other adults emerged, the logs were split open to ascertain their contents.

The whole centre of the log was intersected by tunnels, and eleven burrows contained larvæ of *Rhyssa persuasoria*, of whom eight were full fed and three about half grown. Only three larvæ of *Sirex* remained ; two of these were in burrows not communicating with tunnels; the third was probably similarly placed, but its position is uncertain as it fell out while the wood was being split. It was evident that the *Rhyssa* larvæ had been unable to reach these three in their solitary burrows.

The larvæ of *Sirex* are white and fleshy furnished with mouth-parts of the usual wood-boring type, and the apex of the abdomen carries a chitinous spiked process for assisting the six prolegs in propelling the larvæ along the tunnels.

The *Rhyssa* larvæ are also white and fleshy but legless, and move by muscular contractions of the folds of skin which form lateral expansions of the abdomen. The mouth-parts are of a degenerate, parasitic type ; the maxillæ are fused with the mandibles to form a chitinous hooked proboscis, and the palps are merely represented by unsegmented sense organs. Prior to pupation the proboscis is used for collecting minute chips left by *Sirex* larvæ in their tunnels, and teasing them into a very fine soft material with which to line the burrow.

The *Sirex* larva which had been injured when the logs were split, was placed in a box together with three *Rhyssa* larvæ : the next morning each had its proboscis plunged into the luckless *Sirex*. I separated them, placing wads of cotton wool between them and their prey, but the next day they had made their way through the wool to their victim, and little remained of the *Sirex* larva but an empty skin.

The logs further contained two adults of *Sirex gigas* which had died on the point of emerging. It was not difficult to realise the cause in the first specimen, for the exit was blocked by a hard knot of wood impossible to pass. At first sight it was not obvious what had baulked the second specimen until upon moving it a *Rhyssa* larva was discovered occupying the corpse which had been reduced to a few chitinous rings, the head and wings only entire.

The *Rhyssa* and *Sirex* larvæ were replaced in portions of the log and sealed up again, but a most regrettable accident destroyed all this material and put an end to further observations.

British Hydracarina.

Abstract of lecture by Chas. D. Soar, F.L.S., F.R.M.S., *Given October 13th*, 1921.

Students of insects, known as Entomologists, find the pursuit of their own study so very absorbing and interesting, that we find very few who will turn aside to give some portion of their time to the Acarina or mites. Why this should be, I am unable to say, one appears to me to be as interesting as the other, and of quite as much importance, particularly from the economic point of view. As a proof of this, of all the mites, the Ticks, I suppose, have caused more trouble than any other super-family of the Acarina, and in consequence they have received more attention than the other groups, particularly in America where some very fine work has been done. But I have not come before you to talk about Ticks, I only mention them as an example of how interesting the study of the Acarina has proved in the country in which they have caused such trouble to the live stock.

The Acarina or mites form an order in the great Class Arachnida. They are closely related to the Spiders and Scorpions. Several attempts have been made at classification: the best, I think is by Banks, who divides the order into eight super-families of which Hydrachnoidea is one. The super-family is again divided into two families, the *Halacaridae* (Marine Mites), and *Hydracarina*, nearly the whole of which are found in fresh-water. It is with these fresh-water mites that we are concerned this evening.

The Hydracarina have been known for some considerable time, but no serious work or description was attempted until O. F. Müller described the Danish species in 1781. Müller, in his work on the water mites, figures and describes forty-nine species in all. It is a very beautiful little volume with all the figures coloured. Since Müller's time so much work has been done that we now have considerably more genera than Müller described species, and of species themselves over a thousand have been described and recorded from different parts of the world. For the area of Britain alone we have recorded about 250 species representing about forty genera.

The full-grown adults vary very much in size, from half a mm. to eight mm. long according to species. The females are always larger than the males, particularly so if the females are in a gravid state. But even then the difference is not so great as we find in the ticks.

The bodies are more or less oval or round, with some exceptions amongst the males of one or two genera. Sometimes laterally the

body is very highly arched, in others it is rather flat. The body is not divided into cephalothorax and abdomen as we find in the spiders. The skin in some species is soft, in others hard. It may be smooth, finely or coarsely lined, or papillated ; some are also provided with more or less porous plates on the dorsal or ventral surface. In the hard-skinned mites, like the species of the genus *Arrhenurus*, for instance, the colouring appears to be in the skins. The colouring in these cases is easily preserved. But in the soft-skinned mites the colouring appears in most cases to be due to the contents of the body, which when dissolved out, leaves the skin quite colourless and transparent.

The water-mites are the most beautifully coloured of all the Acarina. The lower forms are usually red, the higher forms exhibiting all the colours of the pallet. This is most noticeable with species of the genus *Arrhenurus*. The eyes of one or two genera are on the median line on the anterior portions of the dorsal surface ; but in the majority of the genera the eyes are near the margins of the body, and some species, not satisfied with the marginal eyes, have a median eye as well. This median eye may be on a well marked chitinous plate, or free on the body skin without a special eye plate.

The epimeral plates on the ventral surface, to which the legs are attached, show a great variation : they may be in groups of four, three, or one. There is also a distinct difference in the sexes of some species, in the shape and grouping of the epimera

The adults, like spiders, have eight legs. But in the larval stage they have six only. In a number of the adults the legs are well provided with swimming hairs, particularly on the third and fourth pairs of legs. What we call the "crawlers," mites that crawl about on the mud at the bottom of the water and on the stems and roots of aquatic plants have legs which are usually only furnished with short hairs or bristles.

The genital area also shows great variety in structure. The greater number of species are furnished with chitinous plates on each side of the genital opening on which are placed small discs, known as "acetabula," which vary in number from three to more than fifty on each plate. In the lower forms there is very little difference in the genital area of the sex, but in the higher forms they are usually very distinct. These plates assume different shapes, the most common being lunate or tongue-shaped. Some again have plates in the form of flaps which cover or partly hide the acetabula. A few are without plates and have the discs free on the body skin. Between the first pair of epimera is a shield-like plate called the "capitulum." This part contains the mouth organs and the palps are attached to it. The capitulum varies much in shape, usually projecting into a snout which in some species is rather pronounced. The posterior margin usually shows an anchoral process, which

sometimes extends beyond the back of the first epimeral plates. The palps consist of five segments and are sometimes chelate. These palps are of great value in identification and where possible a side view of them should be taken.

All the water-mites, as far as we know, deposit ova, and none bring forth their young alive. But they do not all use the same material on or in which to deposit their ova. A large number use the leaves and stems of water-plants. *Piona* and *Arrhenurus* use this method, depositing the eggs in masses covered with a gelatinous film to protect them. This film becomes quite hard or horny, and remains so until the escape of the larvæ. The species of the genus *Eylais* deposit their eggs round and round the stems of water-plants. I have seen these ova in such quantities that the *Elodea canadensis* on which I have found them deposited is quite pink with them. The eggs of most mites are red or orange in colour, and this showing through the gelatinous envelope gives a very strong pink appearance. Some of the genus *Unionicola* deposit their eggs in the mantle of fresh-water Mollusca, and those of *Unionicola crassipes* I have found several times in fresh-water sponge. I have also found the ova of *Hygrobates longipalpis* in the same material. *Sperchon* usually deposit their ova on stones or in the green slime on the stones. Species of the genus *Hydrarachna* use a different method. They bore holes in reeds with their mandibles and deposit the eggs inside.

The length of time taken up by the incubation of the egg varies from ten to forty days, according to the species; and is also influenced by temperature and environment. I have found a great difference in the time of incubation in the same species, due, no doubt, to these causes, for we must allow that breeding mites in a small tank at home, must be quite different from their native habitat in a river or pond. The vitality of these eggs is also very great, a provision no doubt made against drought. Dr. George, who first wrote about the water-mites in "Science Gossip" some years ago, had a batch of eggs of an *Eylais* deposited in a glass bottle. The water was thrown away, the bottle left to dry and was quite forgotten. Many months afterwards the bottle was refilled with water; the young larvæ which had remained in the bottle so long forgotton, were immediately set free, apparently none the worse for their long imprisonment in the protective film already mentioned.

The larva when it leaves the egg is hexapod, having six legs like insects. Some larvæ immediately make for the top of the water and run about on the surface-film, while others remain under water. Once while looking from a boat on the Norfolk Broads I found the surface of the water literally covered with the larvæ of a water-mite. This patch of red larvæ extended for quite a couple of yards from the boat, which was resting at the time near a lot of reeds at Sutton Broad. In this larval stage, as far as we know, they all become parasitic on some other form of aquatic animal life.

Their first duty appears to be to look out for a suitable host on which to feed and develop towards the next stage. We used to think that each species had its own favourite host, but now we find that some are not so particular, as some species of larvæ are found on different insects. *Hydrarachna globosa* is a good example of this. It has been found on *Nepa*, *Dytiscus*, *Ranatra* and others.

Limnochares aquatica larvæ are parasitic on *Gerris lacustris*. Species of *Eylais* on *Dytiscus*; they are also reported as being found on Dragonflies and on *Tipulidae*. A species of *Hydryphantes* I found on a fly, *Caenia obscura*, Mg., the larvæ of which live in water-plants. Species of *Hydrarachna* are found, as already mentioned, on *Dytiscidae*, *Ranatra*, *Hydrophilus* and *Nepa*. *Hygrobates longipalpis* I have found in fresh-water sponge in the larval stage. Several species of *Unionicola* are found in *Unio* and *Anodonta*. One species, *Unionicola crassipes*, I have found several times in all stages in fresh-water sponge. Species of the genus *Arrhenurus* the largest genus we have, have been found on Dragon-flies. Krendowsky gives a figure of a Dragon-fly with the wings showing a number of parasitic larvæ, which he says is *Arrhenurus papillator*, Müll. I have taken a number of Odonata with the larval parasites, but I have never been able to identify the species. I cannot do better than refer those interested to a paper by Dr. C. Wessenberg-Lund "Contribution to the knowledge of the postembryonal development of the Hydracarina," 1919.

At the end of the larval stage—which if all are parasitic must vary very considerably in the time spent on the host—in those we know of, the posterior end of the envelope breaks away and the nymph escapes and becomes at once a free swimming animal like the adults, with eight legs in place of the six in the previous stage. They are no longer parasitic, but forage for themselves. They are very like the adults in general appearance except in the provisional genital area. Of course, they are much smaller and in the majority of species the sexes cannot be identified in this stage. After some time as nymphs, a period that no doubt varies with the species, they pass into the adult stage, and in the higher forms attain that variety of beautiful colouring for which they are noted and also the great differences in structure so noticeable amongst the Arrhenuri.

Such in brief is an outline of the little known life-history of these interesting creatures.

Slides showing the larvæ, parasitic stages, and species of the principal genera were thrown on the screen; several being in colour taken direct by Mr. Taverner from the living mites.

Highways and Byways.—Synopsis of a Lecture.

By Mr. Lawrence W. Chubb, Secretary of the Commons and Footpaths Preservation Society.—*Given November 10th*, 1921.

A highway is a strip of land over which every subject of the King is entitled to pass. Highways are of different kinds, those most frequently occurring being :—

(*a*) Footpaths, which are only open to the public for passage on foot ;

(*b*) Bridleways, which are Footpaths and also ways over which horses may be ridden ; and

(*c*) Carriage roads, which may be freely traversed by vehicles as well as by horses and foot-passengers.

The public right is strictly confined to an easement of passage and does not embrace the ownership of the soil. It has even been held that a pedestrian may not lawfully walk backwards and forwards over a public path or carriage road for purposes unconnected with the use of the ways as thoroughfares.

All highways are presumed to have arisen either by an Act of Parliament—such as Inclosure Acts (under which many public ways have been awarded) or by dedication by some owner of the land over which such ways pass. "Dedication" connotes the grant to the public, by some past or the present freeholder, of a perpetual right of passage over his land. "Dedication" may on rare occasions be proved by some definite grant or other express act of an owner, but in the vast majority of cases express dedication cannot be shown to have occurred. To prove a public path it is nearly always necessary to produce such evidence of long-continued public use enjoyed freely, openly and as of right, that a Judge will be bound to presume that at some time some owner must have dedicated the way as a public path.

Once a path can be shown to have become public it can only be destroyed by Act of Parliament or by a Magistrates' Order enrolled by Quarter Sessions, for the ancient principle "Once a highway, always a highway" is sound law. The Highway system in Great Britain started with the Romans, who constructed between 2,500 and 4,500 miles of streets. Country roads gradually fell into disrepair, and it was not until the growing vehicular traffic necessitated concerted action that the improvement and repair of highways was attempted on a broad basis in the 18th century. 1,100 Turnpike Trusts were created, and they controlled 23,000 miles of roads which had now become the main County roads of the country.

The work of protecting public rights of way is one of the main

functions of the Commons and Footpaths Preservation Society which annually deals with many hundreds of open or overt attempts to close Footpaths and Bridleways. The attacks which most frequently require to be met are definite acts of obstruction, the exhibition of notices denying public rights of passage, the placing of barbed wire in close proximity to paths, the removal or decay of stiles and footbridges, the depasturing of bulls or other savage animals in fields through which public ways may run, and the ploughing up of meadow tracks. All such attacks were illegal and could now be dealt with by the District Councils whose duty it is to maintain every public right of way within their area. They had power to remove obstructions, to repair paths, stiles and gates and, if necessary, to institute legal proceedings for the protection of public interests. Parish Councils had power to put the machinery in motion and to repair public footpaths. It had to be remembered, however, that some Councils were not free agents as obstructions frequently occurred on the Estates of large landowners who, in some cases, were members of the local authorities.

Representatives of the Commons and Footpaths Preservation Society were engaged in surveying and recording all public paths in the Home Counties. The Society was often chosen as arbitrator to settle disputes with regard to disputed paths and within the past year it had laid out over 50 miles of public ways. It was further endeavouring to bring about an amendment of the law by means of the Public Rights of Way Bill. This Bill proposes that where land is in the possession of an actual freeholder, public user for 20 years shall be sufficient to raise the presumption of dedication of the path or other way as a highway. If, however, the estate is entailed or subject to strict family settlements, so that the owner for the time being is only tenant for life and not the actual and unrestricted owner of the whole freehold interest, the period of years of public user proposed was 40 instead of 20 years. This amendment of the law would get over technical difficulties that had led to the loss of innumerable paths.

The maintenance of field paths and woodland tracks was a matter of prime importance to every member of a Natural History Society and of Field and Rambling Clubs as such ways were essential to the full enjoyment of the countryside. The Footpaths Society claimed their sympathy and support in the efforts being made to safeguard the interests of nature lovers and it would always be happy to give technical advice, information, or assistance to the members of the South London Entomological Society.

ANNUAL ADDRESS TO THE MEMBERS

OF THE

South London Entomological and Natural History Society.

Read January 26th, 1922.

[In the absence of Mr. Blair through illness, the Address was read by Mr. N. D. Riley.]

By K. G. Blair, B.Sc., F.E.S.

LADIES and GENTLEMEN, the year upon which we are just entering is a very momentous one for our Society, for, as you know, in 1922 we celebrate our Jubilee. The date of our origin "1872" goes further back than perhaps most of those here present can remember. I think I am right in saying that of our original members one only is surviving to-day, but though well known to us all, if not in person at least by name, he has unfortunately long ceased to be a member of this Society. I feel sure, however, that all our members will unite in sending him a very hearty message of congratulation upon the occasion of the Society's Jubilee, and of hope that he will yet be spared many years to continue his work on behalf of Entomology, work that had made his name as an entomologist honoured by entomologists throughout the world—I refer of course to George Charles Champion.

Accompanying our message of congratulation I think it would be a very fitting action on our behalf if we would extend to him a very cordial invitation to resume his connection with the Society and allow us to add his name to our Roll of Membership as an Honorary Member.

Though Mr. Champion is the only surviving member of the little band of enthusiasts that gave us birth, there is one other name on our list of members that dates from the same year, in this case I am pleased to say the bearer of that name is with us to receive in person our very hearty congratulations on his fifty years membership of the Society ; amongst other services he has rendered

the society, he has been twice President, and I know not how many times he has served on the Council, a position he now holds.

Long may he still be with us and continue to produce those handy little volumes of the "Wayside and Woodland Series," that have done so much to popularise the study of nature; books that to nature lovers as such, unsupported by a scientific training, have made so special an appeal, and have enabled them to recognise and know by name, have, as it were, introduced them personally to, the flowers, and insects and animals of the countryside, and have made the name of Edward Step a household word amongst nature lovers of all degree.

The fifty years upon which we can look back, are fifty years of continued progress and prosperity. Our membership is now close upon 200, and as you have heard from the Treasurer's and the Council's reports the affairs of the Society are in a very satisfactory and flourishing condition; in fact our greatest, I may say our only trouble just now is that in some respects the Society is growing too large for its accommodation. Our meeting room certainly is large enough to enable us to face another 50 years expansion without a qualm, but unfortunately the space available for our Library and Collection is not so happily situated, in fact in these respects we are very seriously cribbed, cabined and confined.

As regards the past twelve months we have very nearly had to report the passage of a year without the death of any member of the Society. Unfortunately, only at the last meeting it was the Chairman's sad duty to report the death of Dr. T. A. Chapman, F.R.S., F.E.S., F.Z.S. Dr. Chapman joined us in 1897 and since then has, until this last year, been a familiar figure at our meetings. Probably his most notable work is that in connection with the 'Blue' butterflies, of which he has worked out the life-history and defined the limits of many, not only of our British species, but of Continental species also. His work is perhaps mainly characterised by its bionomic interest, and he has worked out or elucidated life-histories of many insects of divers orders besides butterflies.

We also have to deplore the death of one of our early Presidents, Albert Brydges Farn, who died on October 31st last, in his 81st year. Though he has for years ceased to be a member of our Society, and was in consequence personally known probably to but few of us, Mr. Farn was President in 1875-76, being only the second to hold that office.

Though, as we have heard, the society at 50 years of age is in a very flourishing and active condition, it seems to me that more might be made of the activities of its members than is done, that more real *work* might be done. Too many of us are content merely to follow in the steps of our predecessors and simply collect; and since a collection is not interesting unless nicely set, named and arranged, we are much too much inclined to limit our collections to that order in which the naming and arrangement are most easy of accomplishment. I refer, of course, to the Lepidoptera. Now I do not deny that there is still work to be done even with the Lepidoptera, though too many of us do not even attempt that, but are merely content to go on filling up vacancies. Yet while the Lepidoptera are, I am afraid, over collected, other orders of insects, almost any other order, are crying out for workers. The Coleoptera, it is true, are fairly well worked, but even here there are vast numbers of genera, let alone species, of which we know nothing of the bionomics or life-history. It is, however, the more obscure groups, some of the families of minute Hymenoptera and Diptera, that stand most in need of collecting before we know even what species are to be found in the country.

Many of these "neglected orders" are neglected I know mostly because of the difficulty of naming one's captures, but one of the main objects of a Society like ours should be to put collectors of little worked orders in communication with one another, so that by mutual help and mutual discussion difficulties may be overcome.

It is not only to the younger men that I appeal to specialise in one of these neglected groups before they become involved in the ruts of Lepidoptera, but often it is the older men who have more leisure for the necessary preparation and investigation. The actual collection of the material is not of paramount importance, since I am sure that any member has only to announce that he is taking up the study of one of these little-worked groups, and he will find that material will very quickly crowd in upon him from all quarters. The necessary literature is perhaps another difficulty, but again not insuperable, as almost any work required may be obtained either from our Library or from that of the Entomological Society of London. Indeed, it will probably be to a worker's advantage to familiarise himself with these resources before starting on the formation of a library of his own, as he will find that, except for occasional reference, comparatively few works are so indispensable that he must necessarily have a copy of his own.

I turn now to the special part of this address.

Will-o'-the-Wisp.

I wish to devote a few minutes to-night to the consideration of a subject to which I alluded in a paper on "Luminous Insects," read before this Society a few years ago*, *viz.*: the phenomenon known variously as Will-o'-the-Wisp, Jack-o'-Lantern, Ignis Fatuus, etc.

We must all be familiar with the popular superstition concerning this mysterious light, regarding it as a mischievous sprite dancing before the wayfarer, deliberately luring him on into the marsh or bog to which he ultimately falls a victim. It is important that we should bear this idea in mind when considering the accounts of its appearance that I am going to put before you, for you will see that some of these accounts obviously relate to phenomena of a different nature. In order to have definite authority that the above is a correct statement of the generally accepted idea of the meaning of the term, I will quote the *Oxford Dictionary*:—"*Ignis Fatuus.* A phosphorescent light seen hovering or flitting over marshy ground, and supposed to be due to the spontaneous combustion of an inflammable gas (Phosphoretted Hydrogen) derived from decaying organic matter.

"It seems to have been formerly a common phenomenon, but is now exceedingly rare. When approached the Ignis Fatuus appears to recede and finally to vanish, sometimes re-appearing in another direction. This led to the notion that it was the work of a mischievous sprite intentionally leading benighted travellers astray."

Probably you will all agree that this is a substantially correct resumé of the actual appearance, the theoretical cause, and the hypothetical purpose of the phenomenon we know as the Will-o'-the-Wisp.

Now just note its appearance:—a phosphorescent light seen hovering or flitting over marshy ground. (We will not cavil for the moment over the term 'phosphorescent;' it *looks like* a phosphorescent light, whether it *is* so or not). Obviously then it must be visible for some measurable time during which it moves irregularly about (hovering or flitting), details which quite accord with, and indeed are essential to its hypothetical purpose, *viz.*, to lead benighted travellers astray. But what about its theoretical cause:—'supposed to be due to the spontaneous combustion of an inflammable gas

* May 28th, 1914.

derived from decaying organic matter'? Imagine a bubble or stream of bubbles of phosphoretted hydrogen rising to the surface of the swamp and igniting spontaneously on coming into contact with the air. Surely they would be observed as sudden flashes or a stream of flashes at one spot, with similar flashes visible all around. There would be no hovering or flitting about in regard to them.

There is, however, another theoretical cause not mentioned in the *Oxford Dictionary*, and so far as I am aware not generally considered nowadays, though as we shall see later very generally accepted a century or so ago, and that is that the appearance is due to a light-giving insect hovering or flitting about. Such an explanation would, I think, be most obvious and probable were it not for the difficulty of accounting for the luminous insect. Attempts have been made to surmount this difficulty in various ways. Some naturalists have thought that the luminous insect must be the glow-worm (*Lampyris noctiluca*), but the reasons against this are overwhelming. The glow-worm is, of course, the only insect in this country that is normally luminous, but only the male glow-worm is endowed with wings and capable of 'hovering and flitting' about, and any light emitted by him is for the present purpose so minute as to be negligible. Then there is the possibility that it may be 'the male glow-worm bearing on amorous wing his joyous partner,' as one worthy has it,* but this would, I am afraid, be far beyond the wing power of the male glow-worm.

The belief that the Will-o'-the-Wisp is caused by some flying insect apparently dates back at least to the time of Bacon who calls it the *Flying-Glowworm*:—"The nature of the *Glowworm* is hitherto not well observed. Thus much we see, that they breed chiefly in the hottest months of *Summer*; and that they breed not in *Champaign*, but in *Bushes* and *Hedges*. Whereby it may be conceived, that the *Spirit* of them is very fine, and not so to be refined, but by *Summer heats*. And again, that by reason of the fineness, it doth easily exhale. In *Italy*, and the Hotter Countreys, there is a flie they call *Lucciole*, that shineth as the *Glowworm* doth, and it may be is the *Flying-Glowworm*; but that flie is chiefly upon *Fens* and *Marshes*. But yet the two former observations hold, for they are not seen but in the heat of Summer; and *Sedge* and other green of the Fens give as good shade as *Bushes*. It may be the *Glowworms* of the Cold Countreys ripen not so far as to be winged." (*Nat. Hist.*, Cent. VIII., Exp. 712, p. 149.)

* *Annals of Nat. Hist.*, New Series, vol. i., 1837, p. 551.

Probably the best known direct observation in support of the 'luminous insect' theory of the Will-o'-the-Wisp is that given by Kirby and Spence, related by the Rev. Dr. Sutton of Norwich. A farmer, of Ickleton, Cambridgeshire, "brought to him a mole cricket (*Gryllotalpa vulgaris*, Latr.), and told him that one of his people, seeing a Jack-o'-Lantern, pursued it and knocked it down, when it proved to be this insect, and the identical specimen shown to him."

As to the accuracy of this observation I shall have something to say later.

Another account of the actual capture of a Will-o'-the-Wisp is recorded by Mr. J. Main (*Ann. Nat. Hist.*, vol. cit., p. 548). He relates how "travelling by coach through Dedham Vale someone in the company mentioned that it was famous for Will-o'-the-Wisps seen dancing about on nights. His companion, a farmer, immediately exclaimed that all the world was mistaken with respect to this delusive light, for, said he, 'it is nothing but a fly,' and related how he once saw one hovering over the backs of some cattle he was driving and struck it down with his stick. He picked it up, but its light was extinguished, and it appeared exactly like a Moggy-long-legs. (? *Tipula*.)"

Of course, it has been objected that the story of the mole cricket requires confirmation, that a mole cricket is not ordinarily luminous, and that if it were to become so, frequently enough to give rise to the popular conception of the Will-o'-the-Wisp, other observers who have kept the insect in captivity could hardly fail to have found it on occasions to be luminous. The advocates of this solution of the mystery point out that certain other insects, as we shall see later, not normally luminous, have been definitely ascertained to become so sometimes, when in a diseased condition, owing to the presence of luminous bacteria in their bodies; and that being so there is no *prima facie* reason why mole crickets should not become similarly attacked and luminous. Such a contention does not perhaps transcend the bounds of possibility, but what is the *probability* of such being the true explanation of the phenomenon we are considering ?

You will note also that nothing further is said about the mole cricket being luminous. Now surely had you or I had a mole cricket brought to us with such a story we should have carefully observed it after dark to see if it were really so. The presumption is, therefore, that it was not!

Let us consider a few more accounts of the phenomenon as witnessed by observers, and see if they help to throw any light upon the subject.

In a paper read before the Linnæan Society in 1830* Richard Chambers relates how his friend James Dickson, the botanist [hence presumably capable of making reliable observations], saw an Ignis Fatuus settle on a plant and fly off again ; and how his father ' when a lad observed a Jack'o-Lantern behind him which followed him through the wood (Bultham Wood, Lincoln); when it came to the gate it rose to clear the upper bar, and flew into the adjoining meadow.' At another time he saw two of them ' flying about each other, apparently at play, which they did for a considerable time, and at last settled on a furze bush.'

He also quotes an observation recorded by Derham [a well known and careful observer], *Trans. Roy. Soc.*, vol. v., "My own observations I made at a place that lay in a valley between rocky hills, which, I suspect, might contain minerals, in some boggy ground near the bottom of those hills. When seeing one in a calm dead night, with gentle approaches I got up by degrees within two or three yards of it, and viewed it with all the care I possibly could. I found it frisking about a dead thistle, growing in the field, until a small motion of the air (even such as was caused by the approximation of myself) made it skip to another place, and thence to another and another."

[This certainly has every appearance of relating to some insect, though the narrator appears to favour the mineral origin of the luminosity.]

The same author then quotes an observation of his friend Thomas Stothard who said : "As I was returning from Plymouth early in June, 1821, having travelled all the preceding day and night, and had passed Blandford early in the morning, considerably before sunrise, when objects were just distinguishable, I saw what was new to me, and which fixed all my attention, for the short time allowed to observe it while mounted on the outside of the coach, passing at the usual rate of 7 or 8 miles an hour. On my right hand, and the side on which I was placed, at the distance of 40 or 50 paces, appeared an irregular light, bounding or rising to the height of three or four feet over some heathy shrubs which covered the high and marshy ground spreading to a great extent : amongst

* *Annals of Nat. History*, New Series, vol. i., 1837, p. 353.

these it sank and reappeared with a motion somewhat between flying and leaping . . . . The experienced coachman pronounced it to be a Will-o'-the-Wisp." Mr. Stothard was of the opinion that the supposed Ignis Fatuus was a Mole Cricket, bringing a specimen from his cabinet and pointing to the structure of the wings in proof of this conclusion; for it could not fly high nor long together; the habitat of the *Gryllotalpa* being the same as where this luminous appearance is usually seen is another coincidence.

Mr. Stothard's conclusions are probably influenced by Dr. Sutton's experience above related. None of these accounts definitely state the size of the luminous appearance, but there is no reason why we should not adopt Mr. Chambers' interpretation of them as being caused by some luminous insect. To these accounts may be added many others of a like or similar nature. In them there is nothing contrary to such a supposition; the only difficulty is to find a luminous, or apparently luminous, insect capable of producing such an effect. So far the only insect definitely associated with the Will-o'-the-Wisp is the Mole Cricket, but against this various objections have been raised. As we have seen, there is the fact that this insect has never been definitely observed to be luminous. Also the flight of the Mole Cricket is quite different from the actions described. I have never myself observed this insect on the wing, but I have no doubt of the correctness of the statement of one observer who has repeatedly seen them dug out of the earth that "they make a convulsive kind of leap to regain the broken ground; but this was very imperfect flight." He adds, however, "It may happen at certain seasons during darkness they may exercise a volant power which they do not seem to possess by day; and from the habit of their living constantly in the dark it is likely they may make their distant migrations, if any, in the night." This may be so, but even supposing that it is, I greatly doubt whether such "volant power" would enable them to hover and flit about as described.

Then again, what lepidopterist has not on some occasion when without a net seen some very desirable insect on the wing and has not attempted to knock it down with his hat? Has he then always been able to find the creature which he feels sure he has knocked to the ground? From personal experience I should say not! If then it is not always easy to find an insect that one has knocked down by day, what must it be after dark? I suggest in fact that the labourer after knocking down his Will-o'-the-Wisp could not at first

find it, and groping among the herbage found what he at once assumed to be the creature he was seeking, but that the Mole Cricket thus found had no connection whatever with the Will-o'-the-Wisp.

Now destructive criticism is all very well, but, you may ask, have I anything more likely to suggest in place of the Mole Cricket? I think we are justified in assuming a luminous insect, or apparently luminous insect, to be the cause of the apparitions we have so far considered. Also I fail to find any satisfactory explanation of a truly luminous insect capable of producing this kind of appearance; but "apparently luminous insect;" I think that gives us a clue. Many of you lepidopterists when out dusking or later on a June evening have no doubt seen the appearance of a shining luminous object hovering in one spot for a time, then moving off to repeat the motions a few yards away, then off again, and then disappearing altogether, only to appear again a few moments later. You know it at once to be a male Ghost Swift Moth displaying his attractions in the hope of finding a mate. But would the average countryman know it for such? Would it not appear to him as indeed a pale light hovering over the herbage? *You* have heard of the Will-o'-the-Wisp perhaps, and know it to be caused by the spontaneous ignition of marsh gas given off by the decomposition of organic substances, so that there is no connection in *your* minds between it and the Ghost Swift; but *he* sees this pale hovering light and has heard his father or his grandfather describe the Will-o'-the-Wisp; and the identity of the two is obvious. Then when he knocks it down, it falls back downwards, or with only the underside of the wings exposed, and in the darkness is practically invisible. No wonder then that when he finds an extraordinary looking animal like a Mole Cricket he at once jumps to the conclusion that that was what he knocked down.

It is well to bear in mind, too, the traditional appearance of the Will-o'-the-Wisp; it is described as a 'phosphorescent' light, *i.e.*, it does not look like an actual flame, but is a pale shining luminosity suggesting phosphorescence, which is exactly the appearance of the male Ghost Swift.

That the Ghost Swift is the substantial basis of this class of phenomena appears to some extent to be confirmed by the following paragraph that appeared in the *Westminster Review* in October, 1832 (reprinted in *Ent. Mag.*, 1833, p. 216).

"*Ignis Fatuus.* This appearance has been strongly surmised to be a luminous insect. It is many years since the similarity of its

motion was observed to that of an insect avoiding pursuit. A subsequent examiner has stated that he approached one near enough to see distinctly the form of an insect with wings like a dragon-fly. Two or three years ago an anonymous article in a country paper announced that some person in digging up the mud of an old pond had discovered two creatures which he surmised to be the insects in question, and which he described as looking like crayfish with wings. The entomologist who can ascertain the fact by securing an *Ignis Fatuus* in a bottle will have drawn a tooth from the jaws of superstition and human suffering."

The editor asks, is the insect in question the Mole Cricket? But the description of 'an insect with wings like a dragon-fly' seems clearly to indicate the Ghost Swift, for the two pairs of long narrow wings, the hinder pair free from the fore pair, are very much the shape of the wings of a dragon-fly, and the shining white wings of the male Ghost Swift are the only ones that would be clearly discernible in the dark.

Mr. Bond suggested that the insects dug up from the mud of the pond, looking like 'crayfish with wings' must have been the larvæ of some large *Libellula*. That is possible, though such larvæ would have only wing pads; their identity, however, does not much concern us, as the surmise that they had anything to do with the *Ignis Fatuus* is after all—well, very much of a surmise.

In the *Entomological Magazine* for 1833 appeared some interesting articles and experiences in relation to the same phenomenon. Mr. Geo. Wailes relates an experience of his father's: "He was riding with a friend along the road between Hexham and Alston, in the month of May, and in crossing the wild moors, near the place where the counties of Northumberland and Cumberland join, about ten o'clock p.m., were surprised by the sudden appearance of a light within fifteen yards of the roadside. It was about the size of the hand, and its shape, which was oval, very well defined. The light is described to me as more like that of a bright white cloud than of a flame. The place where it appeared was very wet, and the peat moss had been dug out, leaving what are locally termed "peat pots," which soon fill with water, affording nourishment to numerous *Confervae* and the various species of *Sphagnum*, which in their turn are metamorphosed into peat. Doubtless these places, during the decomposition of the vegetable matter, give out large quantities of gaseous particles. The light was about three feet from the surface of the ground, and,

hovering over the peat pots, moved for the distance of about fifty yards nearly parallel with the road, and then, probably on the failure of the supply of gas suddenly went out. In order to obviate the question, was not this the alighting of the insect, supposing it to have been one? I inquired whether the light approached the ground on going out, and find that it did not, but the manner of its disappearance was similar to that of a candle being blown out."

Now although Mr. Wailes assumes the gaseous origin of the light thus seen by his father, it is scarcely conceivable that a flame thus caused could behave as described; hover about three feet from the ground and then move for fifty yards or so. It is much more like the motions of some insect. Its size, 'as big as a hand,' is certainly too large for a Ghost Swift with wings outspread, though it would not take much exaggeration to transform it to that. Against the possible insect origin of the appearance, Mr. Wailes argues that it did not approach the ground before going out (presumably thinking of the Mole Cricket); but if it alighted on a stem, as a Ghost Swift might, with its ventral side towards the spectator it would apparently go out not unlike a candle.

But to some accounts that I will now quote it is not possible to assign this explanation.

Mr. Chambers, before quoted, gives a description of an Ignis Fatuus seen by a young coachman and related to his friend Mr. Cole, Surgeon. "I was coming home with the boy from looking after the sheep at the farther side of the farm. Our path lay near a hedge; and on a sudden there appeared at a distance a ball of fire about as big as my head. We stopped; and it came directly towards us. It had a dancing kind of motion, and advanced under the hedge till it came quite close to us; it then divided into a dozen or twenty parts, forming so many balls of fire about the size of my fist, which flew apart from each other, and played about for a short time. They then joined together again into one large ball, and turned over the hedge into the next field." When asked if he thought it like the playing of gnats or flies in the sun (I wonder what prompted this question!) he said it was precisely similar. The occurrence was in the spring, and the ground dry with no marshy ground in the vicinity.

This obviously could not have been a Ghost Swift, but neither does it conform to our ideas of a Will-o'-the-Wisp.

In the same volume also appears the following extract, taken from the *Kentish Gazette*:—"On Tuesday evening, July 4th, 1837,

the old castle, at the southern entrance to the city of Canterbury, appeared as if a stream of light was issuing from the old ruins. On repairing to the spot it was discovered that the light emanated from an innumerable swarm of small insects which had collected on the walls and about the old ruins. They disappeared at sunrise next morning. A similar phenomenon was witnessed in the same place about thirty years ago." There is an editorial note appended:—"The above paragraph appeared in one of the London papers as a quotation from the *Kentish Gazette*, but we have some reason for believing the statement to have been a mere fabrication." Possibly it was, but the following observation appears to afford a more satisfactory explanation of both this and the preceding account.

Hearing that I was interested in this subject the late Mr. Benjamin Harrison of Ightham, Kent, was good enough to send me one of his old notebooks drawing my attention to an entry which I will quote *in extenso*:—

Met Bridger the butcher, who formerly resided on the confines of Woolmer Forest.

He said:—"Did you see Old Will of the Wisp?"

I replied:—"Once, in passing a boggy spot near Brasted late at night, I fancied I saw a faint light over the water, but it was impossible to approach near."

"Well then, I have; and not only seen Old Will, but caught him!"

"Oh! how was that?"

"Well, I'll tell you. Me and a friend had been to a cricket match and stayed late. It were about midsummer, and as we were passing a boggy spot in Woolmer Forest we saw a lot of lights dancing up and down, and I said, 'There's Old Will of the Wisp.' Presently the trackway led us close by the outside of the bog and we saw a lot more of the light. We were both on horses, and seeing the light get close to my mate, who was in front, I shouted out 'Here he comes, Strike at un with your whip.' He did so, and hit un too, and in a minute his horse's mane was all alight, as it were. We stopped and examined, and saw lots of little lights all entangled in the mane; and so it kept on until we put our horses in the stable, where the light became stronger. 'Wait a bit' I said, 'let me go and get something to catch un in.' I went indoors and got a tumbler, and came back and shook the mane over the glass, and then covered it with my hand, and took it indoors. We

found a lot of little gnats something like the flies on the hops only bigger, and kept until the next day, and their little tails all shone like little glowworms. There was about twelve or thirteen of them, and we showed to lots of our neighbours the next day, and they shone a little the next night, but not so bright." (30th October, 1888.)

Now these last three accounts seem all to relate to one type of phenomenon, but it is to be noted that this does not conform with our preliminary notion of the Will-o'-the-Wisp, but refers to a large ball of light, in one case definitely stated to be on dry ground. on another about the ruins of an old castle (in this case the swarm of gnats had apparently settled on the wall of the ruin before they were observed), in the last only was it on boggy ground. The ball of light dances up and down, and moves along, but does not "hover" or "flit" about, in fact it behaves very much like the small clouds of gnats that may sometimes be observed dancing in the sunshine. It is true that we have here to fall back again upon the luminosity of an insect not usually luminous, but it is not here a case of one unconfirmed observation of questionable exactitude, in fact we have other scientific records of such luminosity being observed in gnats of different species, without the incidents being associated with the Will-o'-the-Wisp. Two species thus identified as luminous are *Chironomus plumosus* and *C. tendens*. The luminosity is noted as embracing the whole body and its appendages (in the instance related by Mr. Harrison only the "tails" are mentioned), and was proved to be entirely independent of the will of the insect, persisting for some time after death, even in alcohol. The insects exhibiting the light are always in a moribund condition, sitting upon the bushes, from which if shaken they merely drop to the ground unable to fly. It is supposed that this is a case analogous to that of the amphipod crustacean *Talitrus*, which is sometimes found to exhibit a similar kind of luminosity. In this case the body of the animal has been found to be swarming with bacteria, which are the actual source of the luminescence. Search has been made for bacteria in the luminous *Chironomus*, but in no case was the material suitably preserved for bacteria to be recognisable.

I now pass to the consideration of accounts relating to yet another class of phenomena.

The article by Mr. Chambers, above quoted, elicited a very scathing reply from W. Weissenborn, of Weimar (who was a

frequent contributor about that time to the "Annals of Natural History"). He refers to the article, "which ought to be refuted, as it tries to explain the phenomenon of the *Ignis Fatuus* by the phosphorescence of insects." He says, "I have observed the meteor (!) too well myself to give the least credit to any attempt of ascribing such effects to such causes; not to mention that the seasons at which the *Ignes Fatui* are commonly observed (November) is one at which scarcely any insect is able to stir." He considers that "the insulated observation of a farmer of Simpringham cannot, I think, militate against the negative testimony of the many who, like myself, have kept that animal (the mole cricket) in confinement during long periods without observing it in the least phosphorescent." He then gives his own experience. "In the year 1818 I was fortunate enough to get a fine view of the *Ignis Fatuus* operating on an extensive scale. I was then in Schnepfenthal, in the Duchy of Gotha, and in a clear November night, between eleven and twelve o'clock, when I had just undressed, the bright light allured me to the window to survey the expanse of boggy meadows that stretched away from the house . . . . . As soon as I had posted myself at the window I perceived a number of reddish-yellow flames in different parts of the expanse of almost level ground. I descried perhaps no more than six at a time; but dying away, and appearing in other places so rapidly, that it was impossible to count them. Some were small, or burned dimly; others flashed with a bright flame, in a direction almost parallel with the ground, and coinciding with that of the wind, which was rather brisk . . . . When I reached the meadow (in order to examine the phenomenon in its laboratory) the atmospheric conditions which gave rise to the *Ignes Fatui* had ceased to exist. From what I saw I must judge that the *Ignes Fatui* are owing to the causes given by Volta, *viz.*, that the phosphoric hydrogen exhaled by certain swamps is kindled by coming into contact with the atmospheric air, but that there is a certain electrical tension of the atmosphere necessary to cause the combustion . . . . In calm nights the flames may play in a vertical direction, so as to imitate the motions of gnats, and they may even *appear* to alight on some object, though when this has been observed it is more probable that the case has been one of St. Elm's fire."

It is very evident that the *Ignes Fatui* here observed belong to a totally different category from those hitherto attributed to insect origin, though our worthy German evidently considers that it is the

different interpretation placed by his trained scientific mind to that placed by a country farmer and various unscientific persons on the same phenomenon.

The following extract from Professor Jameson's *Edinburgh New Philosophical Journal*, January, 1833 (quoted in *Entom. Mag.*, 1833), gives more detailed observations on apparently kindred phenomena: "Observations on the *Ignis Fatuus*, or Will-o'-the-Wisp, Falling Stars, and Thunderstorms," by L. Blesson, Major of Engineers, Berlin.

"The first time I saw the *Ignis Fatuus*, or Will-o'-the-Wisp, was in a valley in the Forest of Gorbitz, in the Neumark. This valley cuts deeply in compact loam, and is marshy on its lower part. The water of the marsh is ferruginous, and covered with an iridescent crust. During the day bubbles of air were seen rising from it, and in the night blue flames were observed shooting from and playing over its surface. As I suspected that there was some connection between these flames and the bubbles of air, I marked during the daytime the place where the latter rose up most abundantly, and repaired thither during the night; to my great joy I actually observed bluish-purple flames, and did not hesitate to approach them. On reaching the spot they retired, and I pursued them in vain; all attempts to examine them closely were ineffectual. Some days of very rainy weather prevented further investigation, but afforded leisure for reflecting on their nature. I conjectured that the motion of the air, on my approaching the spot, forced forward the burning gas; and remarked that the flame burned darker, when it was blown aside; hence I concluded that a thin stream of inflammable air was formed by these bubbles, which, once inflamed, continued to burn—but which, owing to the paleness of the light of the flames, could not be observed during the day.

"On another day, in the twilight, I went again to the place, where I awaited the approach of night; the flames became gradually visible, but redder than formerly, thus showing that they burned also during the day; I approached nearer, and they retired. Convinced that they would return again to the place of their origin, when the agitation of the air ceased, I remained stationary and motionless, and observed them again gradually approach. As I could easily reach them, it occurred to me to attempt to light paper by means of them; but for some time I did not succeed in this experiment, which I found was owing to my breathing. I therefore held my face from the flame, and also interposed a piece of

cloth as a screen ; on doing which I was able to singe paper, which became brown coloured, and covered with viscous moisture. I next used a narrow slip of paper, and enjoyed the pleasure of seeing it take fire. The gas was evidently inflammable, and not a phosphorescent luminous one, as some have maintained. But how do these lights originate? After some reflection I resolved to make the experiment of extinguishing them. I followed the flame ; I brought it so far from the marsh, that probably the thread of connexion, if I may so express myself, was broken, and it was extinguished. But scarcely a few moments had elapsed, when it was again renewed at its source (over the air-bubbles), without my being able to observe any transition from the neighbouring flames, many of which were burning in the valley. I repeated the experiment frequently, and always with success. The dawn approached, and the flames, which to me appeared to approach nearer to the earth, gradually disappeared.

"On the following evening I went to the spot, and kindled a fire on the side of the valley, in order to have an opportunity of trying to inflame the gas. As on the evening before, I first extinguished the flame, and then hastened with a torch to the spot from whence the gas bubbled up, when instantaneously a kind of explosion was heard, and a red light was seen over eight or nine square feet of the surface of the marsh, which diminished to a small blue flame, from two and a half to three feet in height, that continued to burn with an unsteady motion. It was, therefore, no longer doubtful that this Ignis Fatuus was caused by the evolution of inflammable gas from the marsh.

"In the year 1811 I was at Malapane, in upper Silesia, and passed several nights in the forest, because ignes fatui were observed there. I succeeded in extinguishing and inflaming the gas, but could not inflame paper or thin shavings of wood with it. In the course of the same year I repeated my experiments in the Kouski in Poland. The flame was darker coloured than usual, but I was not able to inflame either paper or wood shavings with it; on the contrary their surface became speedily covered with a viscous moisture. In the year 1812 I spent half a night in the Rubenzahl Garden, on the ridge of the Riesengebirge, close on the Schneekoppe, which constantly exhibits the Will-with-the-Wisp, but having a very pale colour. The flame appeared and disappeared, but was so mobile that I could never approach sufficiently near to enable me to set fire to anything with it.

"In the course of the same year I visited a place at Walkenried, in the Hartz, where these lights are said always to occur; they were very much like those of the Neumark, and I collected some of the gas in a flask. On the day after, I found by experiment that it occasioned cloudiness in lime-water, a proof of its containing carbonic acid.

"I observed accidentally another phenomenon allied to this, at the Porta Westphalica, near Minden. On August 3rd, 1814, we played off a firework from the summit to which we had ascended during the dark, and where no ignis fatuus was visible. But scarcely had we fired off the rocket, when a number of small red flames were observed around us, below the summit, which, however, speedily extinguished—to be succeeded by others on the firing of the next rocket.

"These facts induced me to separate the ignes fatui from the luminous meteors, and to free them from all connexion with electricity. They are of a chemical nature, and become inflamed on coming in contact with the atmosphere, owing to the nature of their constitution.

"I think it highly probable that the fires that sometimes break out in forests are caused by these lights."

It is I think fairly evident that observations such as these confirm the popular pseudo-scientific explanation of the theoretical causes of the Will-o'-the-Wisp, but they do not at all agree with the accounts given above in support of the insect origin of this mysterious light; in fact it is clear that they relate to a phenomenon totally different in nature, though confused under the same name. It is to be noted that all these occurrences took place in Germany; there is no reason why similar exhibitions should not be found in this country, but I do not know of any such accounts, though iron-impregnated marshes are not uncommon.

Yet another explanation is offered by Mr. R. J. W. Purdy, in the *Transactions of the Norfolk and Norwich Naturalists' Society*, vol. viii. (ante), p. 547. The light was first seen on February 3rd, 1907, moving horizontally backwards and forwards over a distance of several hundred yards. It rose in the air to the height of forty feet or more, then descended again, and went through the same evolution many times. The light was slightly reddish in the centre, and resembled a carriage lamp, for which it was at first mistaken. It was observed for about twenty minutes, but the narrator was quite at a loss to ascertain its cause.

On December 1st of the same year, and many subsequent dates, it was seen again, and observed to alight on the ground and disappear in a plantation. Seen within a few yards it had two intensely bright spots on its head, and was uttering the quickly repeated 'Chuck, Chuck' of the White Owl.

The author expresses the belief that most of the tales respecting "Will-o'-the-Wisp," "Corpse Candles," and "Lantern-Men," are the result of occasional luminosity assumed by birds of nocturnal habits that frequently fly over marshy ground in search of prey. This luminosity is probably accounted for by the feathers being smeared with putrescent matter from the hollow trees or other cavities in which the birds pass the day.

Though not truly in any way connected with the Will-o'-the-Wisp as we understand it, this account illustrates the way in which any abnormal and apparently inexplicable moving light is at once assumed to be an exhibition of this phenomenon.

So far most of the accounts quoted above relate to observations recorded a century or so ago, thus supporting the *Oxford Dictionary* in its statement that 'formerly it seems to have been a common phenomenon, but is now exceedingly rare.' But about six years ago, some correspondence appeared in the *Observer* on this subject. It was initiated by a letter from a Dr. Herbert Snow* asking whether there is any real foundation for the superstition popularly denominated Will-o'-the-Wisp, also whether the belief still persists in tangible form, or has been exploded by education. The writer then refers to Brewer's *Guide to Science*, of his young days, which stated that the Jack-o'-Lantern was produced by phosphoretted hydrogen given off by decomposing matter in the marshes. He adds that he believes modern science no longer proffers this explanation.

It will be of interest to examine some of the replies to this letter and see how they accord with the theories we have already considered.

A Lymington correspondent says "I am well acquainted with a man who used to work for me, and who used to tell me about Jack-o'-Lantern quite thirty years ago; he was accustomed to be in the Forest all night. He found that the months of October and November, when the nights, for the time of year, were rather warm, were the times the lights were most frequent. About a mile from

* *Observer*, December 19th, 1915.

that part of the Forest called Boldrewood, the man informs me this week, Jack-o'-Lantern would be seen arising off the bogs about eleven o'clock. When he and his companion first saw them there were two; they took them for two men each carrying a lantern. The lights passed some twenty yards distant from them. They kept their eyes on these strange apparitions, but not a single sound passed through the wood. This man afterwards saw many of these queer sights in other parts of the Forest."

Here it is evident that the lights were more or less constant, so cannot have been due to the ignition of phosphoretted hydrogen; they were evidently not Ghost Swifts; but there seems to be nothing in the account inconsistent with their being due to swarms of luminous gnats; or they may have been caused by luminous birds.

Another correspondent relates his experience in the island of North Uist in the month of October, 1911, when 'flighting' for duck in a large bog. "In appearance the Will-o'-the-Wisp resembles the light of a lantern being waved to and fro, never still, in sweeps of from 50 to 60 yards."

This account apparently is closely akin to that of the luminous owl.

Another says "Having been brought up in the Fens I have seen Jack-o'-Lantern jumping hundreds of nights, and can describe it as a large bluey-green ball in appearance that bounds like a football after a big kick."

Here again explanation afforded by the swarms of luminous gnats appears best to accord with the description given.

Other replies were either too vague for proper examination or merely urge the marsh gas theory as being correct, without however giving details of actual observations.

Thus, though not sufficiently numerous for general deductions to be based upon them, these later accounts afford some confirmation of theory of the occasional luminescence of dancing swarms of gnats, but not one of them records any appearance to which our Ghost Swift theory can be applied. Possibly this is due to the latter being more commonly recognised nowadays for what it really is, in other words that the superstition popularly denominated Will-o'-the-Wisp has been more or less, as Dr. Snow suggests, exploded by education.

We have now considered the four principal phenomena that have been claimed as giving rise to the popular legend of the Will-o'-the-Wisp, but "as we have seen" each of them is distinct in itself

and it is their confusion under one name that has caused the considerable degree of mystery that has become attached to it. The luminous owl is quite a simple phenomenon in itself, and apart from its moving luminescence has none of the features characteristic of the Ignis Fatuus. The dancing swarm of midges that have become luminous owing to pathological causes is a nearer approach to our ideal, though its motions are very different from those of the popular conception.

We also see that the popular explanation of the mystery, *viz* :— the spontaneous ignition of marsh gas evolved from decaying organic matter, though supported by definite scientific observations relates not to the Will-o'-the-Wisp, but to a very different phenomenon that should be designated by a different name, such as 'Marsh Lights' or 'Marsh Fires.' If we ask how it is that this explanation is now so widely received at the expense of the older and once very popular theory of the insect origin of the light, I can only suggest that it is because of its scientific foundation in contrast with the unsatisfactory and unconvincing nature of the evidence for the latter, and consequently, since it was the only explanation in the field that was in any way satisfactory, the fact that phenomena of very different character were involved has continued to be overlooked.

That the Ghost Swift Moth is the true source of the popular legend of the Will-o'-the-Will is in my opinion practically certain, since it is the *only* simple and natural solution of the luminous insect theory. It is of course possible that the mystery of the luminous insect may not be so simple as I contend, that it *may* depend on some rare instance of an insect becoming luminous owing to pathological causes, but the probabilities against such a supposition are immense. At the same time that the simplicity of the Ghost Swift theory is a very strong point in its favour, in some ways this very simplicity militates against it, for if that be the true explanation of the Will-o'-the-Wisp how is it that it has not been proved to be so beyond question long ago? Probably because the testimony of a few sturdy countrymen, who had convinced themselves that it was nothing but a fly, a "Moggy-long-legs," was insufficient to outweigh the very circumstantial evidence of the marsh gas explanation that appealed so much more forcefully to the theoretical scientist; and because with the spread of the study of entomology the Ghost Moth has become more generally known for

what it is, and its association with the Will-o'-the-Wisp either not recognised or ridiculed.

Now, ladies and gentlemen, it only remains for me to express once more my deep appreciation of the honour you have done me in adding my name to the list of names famous in the annals of Natural History that forms our list of Past Presidents. Allow me to thank you very sincerely, and especially the officers and Council who have so warmly supported me during my two years of office. In some respects they have been rather heavy years, but with their sage counsel and advice, and the heartiness with which they have thrown themselves into the work that has had to be done, we have, I think, managed to keep fairly well abreast of the flood.

It is now my pleasant duty to offer a very hearty welcome to my successor in office, Mr. E. J. Bunnett. In your new President you have chosen a man with a wide range of interests and attainments in Natural History subjects; and I feel that under his Presidency the Society can look forward with confidence to a continuation of its fifty years of prosperity.

It is with very great regret that I find that I am not able to be with you to-night, and have to fall back once more upon the kindly offices of friends in the reading of this address. The reading of another person's paper is not one of the easiest or most satisfactory of undertakings; and to take advantage of a temporary epidemic seems rather a mean way of shuffling off my final duties on to other people's shoulders. The position in fact may perhaps be paraphrased somewhat as follows:—

It seems a shame, the Chairman wrote,
To play them such a trick,
After they've brought me on so far
And helped through thin and thick.
The Audience said nothing but
"We don't believe he's sick."

ABSTRACT OF PROCEEDINGS.

FEBRUARY 10th, 1921.

President, K. G. Blair, B.Sc., F.E.S., in the Chair.

Mr. Hugh Main exhibited a contrivance he was trying in his breeding pots to keep the earth damp and at the same time to avoid staleness and mould. It consisted of a sheet of glass inserted in his glass vessel dividing it vertically into two chambers, one of which contained the earth for the burrow and pupation hollow, while the other chamber contained only sand which was kept moist. The influence of the moist sand would be exerted at the bottom and sides of the partition.

Mr. Robert Adkin exhibited a specimen of *Pieris brassicae* in which the black tips of the forewings were radiated by yellow streaks on the veins; it was taken at Eastbourne on August 17th, 1920, and was similar to the form taken on the same spot on August 5th, 1917, which was also exhibited together with a typical specimen for comparison (*Proc. S. L. E. and N. H. S.*, 1917, p. 64). He said that so far as he was aware, only one other specimen of this form was known, the one taken by Mr. F. G. Whittle at Southend in July, 1900—(*Proc. S. L. E. and N. H. S.*, 1918, p. 58).

Mr. Hy. J. Turner exhibited a short series of *Selidosema plumaria* (*ericetaria*) from Co. Tyrone, Ireland, including a curious dark streaked form of the male, which he had received from Mr. T. Greer of Stewartstown. It was a recurrent form and apparently a step towards the melanic form described by his correspondent in 1919 in the *Ent. Record*, vol. xxxi., p. 74, and named *fumosa*. He was naming this form as *intermedia-fumosa*.

He also showed a hybrid (?) *Zygaena* (*filipendulae-lonicerae*) sent to him by Mr. Greer and captured at Tamnamore, Co. Tyrone, where the two species were found flying together on the same ground. The specimen had more the shape of *lonicerae* with antennæ of the same. It was of the general shape of this species too, but was six spotted. The black margin of the hindwings was between the two species in width, and the suffusion in and around

the spots on the underside was only very partial, there being none in typical *lonicerae* and a very smooth and full suffusion in the *filipendulae*.

Mr. B. S. Williams exhibited a very brilliant male form of *Polyommatus icarus* ab.*clara*, from Cornwall, with var. *clara* male from Ireland and a typical male from England for comparison.

Mr. H. Leeds exhibited a box of the undersides of female *P. icarus* showing no fewer than 130 named forms as worked out by means of J. W. Tutt's *British Lepidoptera*.

Mr. K. G. Blair exhibited the bark-boring Scolytid beetles, *Xyleborus dispar* and *X. saxeseni* from Kidderminster, with sections of plum-tree showing the course of their burrows. He also showed *Heliocopris* sp. from Siam, including the beetle and its dung-ball cut open to show the egg-cavity; sent to him by Mr. E. J. Godfrey.

FEBRUARY 24th, 1921.

Mr. W. S. Bristowe, Ashford House, Cobham, Surrey, and Mr. Hy. Ruggles, 146, Southfield Road, Bedford Park, W. 4., were elected members.

Lantern slides were exhibited as follows:—

Mr. A. E. Tonge, a series illustrating the Noctuid type of egg.

Mr. Dennis, slides illustrative of an Oribatid mite.

Mr. Bunnett, slides of the fish parasite *Argulus*, species of *Protura*, and the rasp of the field-cricket.

Mr. Step, a series of slides of Crustacea including some of the devices of Spider Crabs for disguise.

Mr. Main, a set of slides to show the simplicity and advantages of this method of showing results of study and of observations.

Other exhibits were then taken.

Mr. Leeds exhibited a very long series of undersides of the male of *Polyommatus icarus*, each identified as a named form listed by the late J. W. Tutt in his *British Lepidoptera*.

Mr. Hy. J. Turner exhibited a bred series of the beautiful pale-green *Morpho laertes* with a coloured photograph of the larvæ grouped naturally and resembling a flower-head; he also showed three perfect specimens of the huge Noctuid *Thysania agrippina*, of which one measured eleven inches in expanse. The whole were sent from Sao-Paulo, Brazil, by our member Mr. Lindeman, who reported that he had seen no fewer than eight of these large moths with outspread wings on one tree.

Mr. Hy. Moore exhibited the Hemipteron *Plataspis vermicellaris* from Nairobi, Central Africa.

Mr. Buckstone exhibited specimens of the aquatic coleopteron *Helophorus aquaticus* which he had observed flying in abundance only a few feet from the ground. He also reported that he had recently found pupæ of *Abraxas grossulariata* out of doors.

MARCH 10th, 1921.

Mr. Jas. Bates, of Hornsey, and Major T. M. Cottam, of Twickenham, were elected members of the Society.

The meeting was directed chiefly to exhibitions of the Genus *Zygaena*.

Mr. Hy. J. Turner exhibited a large number of species and local races from the Palæarctic Region, extending from the British Islands to Japan, from Siberia to the Himalayas and Algeria.

Mr. G. Talbot, on behalf of J. J. Joicey, Esq., exhibited—

1. Forms of Palæarctic *Zygaenae*, illustrating some rare and little known species and showing the variation in *Z. ephialtes*, L., *Z. fraxini*, Men., *Z. carniolica*, Scop., and *Z. transalpina*, Esp.

2. Variation in British *Zygaenae* as shown in *Z. trifolii*, Esp., and *Z. filipendulae*, L., including the black and yellow form, and the form with confluent spots in both species; also a bred specimen of *Z. filipendulae*, with an additional hindwing.

Mr. A. W. Mera exhibited his drawer of British *Zygaenidae* pointing out the different British races of the *Z. loniceræ* and *Z. purpuralis* (*minos*), and referred to a form which the late J. W. Tutt believed to be a six-spotted form of *Z. trifolii*.

Mr. B. W. Adkin exhibited his collection of British *Zygaena* and referred to the races of *Z. filipendulae* in which the sixth spot was more or less evanescent, and remarked upon the amount of diversity in the races of *Z. trifolii*.

Mr. Leeds exhibited a box of aberrations of the British Zygaenids.

Mr. A. E. Tonge exhibited short series of *Z. trifolii* and *Z. filipendulae* showing confluence of spots, three *Z. filipendulae* in which the sixth spot is very inconspicuous, two of which from Reigate have a narrow margin on the hindwing and the other from Eastbourne has a very much broader margin.

Mr. Garrett exhibited short series of the British species includ-

ing *Z. hippocrepidis*, Steph., from N. Wales and Co. Clare, and a yellow *Z. filipendulae* from N. Kent.

Mr. T. H. Grosvenor read the following notes on his exhibit:—

"The *Z. filipendulae* exhibited principally come from the North Downs, showing various minor forms of variation, a common form being a ♂ with spot six reduced in size and with the border of secondaries considerably broader than normal; this may be found on the chalk hills in July, and corresponds exactly with the marsh form occurring in June. A feature of *Z. hippocrepidis*, Steph., is said to be a green nervure running through spot six; this feature is also conspicuous in those specimens taken in July. The ♀ is not found with spot six reduced, in fact this spot is generally the most developed. It is impossible for this small-spotted form to be a hybrid, as *Z. trifolii* does not occur in the district. The typical ground colour of the primaries is dark blue in the ♂ and bronze green in the ♀, but these may be reversed, although such variation may be looked upon as a rare form. The result of breeding between 2,000 to 3,000 during the past season produced 1 ♂ bronze green and 2 ♀ blue; but one ♂ had the left primary blue, and the right bronze green. A similar ♀ was found, but in this case the left primary is bronzy blue and the right steel blue; this may have been the result of some injury, as the left secondary is perceptibly smaller than the right. Confluent forms in this species are of rare occurrence. Pathological and teratological forms are abundant, and probably the two ♀s shown come under this group, having the scaling thin and the red colour of the typical form replaced by a pinkish colour.

"In *Z. trifolii*, the commonest form of variation is confluence, especially in the ♀; there is also considerable variation in the breadth of border. This species was taken flying in company with *Z. hippocrepidis*, Steph., or *Z. filipendulae*, and on one or two occasions in past years cross pairings have been found. Last season the pair exhibited were found paired, and produced a large number of fertile ova, which in due course hatched and are at present just starting to feed.

"There was also a specimen with a minute sixth spot and with normal border to secondaries. This might possibly be the result of a cross pairing, or *Z. trifolii* with a sixth spot, or *Z. hippocrepidis*, Steph., with the spot very much reduced, in fact it very much resembles a ♂ *Z. filipendulae* shown by Mr. Tonge taken at Reigate.

Perhaps breeding the larvæ from the cross-pairing may decide what this form really is."

Mr. A. A. W. Buckstone exhibited very long series of various races of British Zygaenids including hybrids and a large number of specimens showing variations in the spotting.

Mr. Barnett exhibited a small series of the British species.

Mr. B. S. Williams exhibited an asymmetrical *Vanessa io*, the R. wing being 24·5 mm. in length, the L. wing 34 mm.; an aberration of *Polyommatus icarus* in which the forms *parripuncta*, *discreta* and *icarinus* were combined; an ab. *postico-apicalis* of the same species, and a curiously brown-suffused underside of a female of the same species with tawny lunules, from Scotland.

Mr. A. E. Tonge exhibited a living *Amphidasis strataria* he had just taken at Reigate.

Mr. Newman reported that he had been at Bournemouth from February 10th to 16th, the Blackthorn was in full bloom on the 12th, and on that day he saw a specimen of *Xylocampa areola* (*lithorhiza*).

MARCH 24th, 1921.

Mr. L. W. Newman exhibited living larvæ of *Rumicia phlaeas* collected wild in the morning of this day. Both forms of the larvæ were found, those feeding on the large leaf sorrel, *Rumex acetosa*, being all green like the leaves, while those feeding on the small leaf sorrel *R. acetosella*, were green and red like the leaves and stems. He also reported the capture at Bexley of a unicolorous black female of *Lycia* (*Biston*) *hirtaria*.

Mr. Main exhibited a specimen of *Blaps mucronata*, the "cellar beetle," which Mr. Blair said fed upon rotting vegetation.

Mr. B. S. Williams exhibited a short series of selected specimens of *Coenonympha pamphilus* including three pale ones from Scotland, a large female from Swanage, a dark male underside, and a male with heavy borders and black interneural spots on margins of hind wings.

Major Cottam exhibited *Phryxus livornica* from Southbourne, a melanic form of *Mimas tiliae* with a silvery form of the same species, and the form *costorata* of *Xanthorhoë fluctuata* from his own garden at Twickenham.

Mr. Grosvenor reported the occurrence of *Pieris rapae* at Redhill on March 20th, and stated that the larvæ of *Zygaena trifolii* had

stirred and were changing their skins. These larvæ moulted immediately before hibernation, the bright green colour being replaced by straw colour, and they moulted again in spring before commencing to feed, their colour becoming again green. In this species a certain percentage always go through a second winter, especially when an early spring has called them up and this is succeeded by a cold spell, when they go into retirement until the following spring.

Mr. Hy. J. Turner exhibited a male and a female of the race *hibernica* of *Euchloë cardamines* from Co. Tyrone, Ireland; it was characterised by being somewhat smaller than the type, the more strongly marked ends of the wing nervures, and in the female the strong suffusion of the hindwing with yellow. The female exhibited was of the form ab. *caulostieta* in which the discoidal spot was very large and branched, extending along the costal area of the forewing upperside. Another example was ab. *citronea* in which the basal portion of the forewing below was suffused with yellow.

Mr. Turner also showed three forms of the South African Pierid butterfly *Eronia cleodora*, the type form with narrow black margins, the form *dilatata* with broad black margins and paler yellow below, and the intermediate form *exria* with still paler underside, with marginal band of medium width.

Mr. Farmer reported the abundance of *Abraxas grossulariata* larvæ which were feeding and pupating at the present time.

Mr. B. S. Williams recorded the unusual occurrence of *Pachys* (*Amphidasis*) *strataria* (*prodromaria*) at Finchley. Mr. Tonge said that the species usually rested high up on the trunks. Several members noted that in the afternoon the species might be found low down, probably just emerged.

APRIL 14th, 1921.

Miss L. E. Cheeseman, F.E.S., read a short paper entitled "The Parasite of *Sirex gigas*, *Rhyssa persuasoria*," and illustrated it with lantern slides. (See page 1.)

Mr. Edwards exhibited specimens of *Rhyssa persuasoria* from the British Isles and the continent.

Mr. Hugh Main exhibited some beetle (*Geotrupes* sp.) larvæ found in a manure heap and described their movements and the economy of the beetle. He also suggested that in this species

stridulation was effected by the friction of one leg crossing another.

Mr. Newman showed a branch of Hawthorn in full bloom from Bexley; and reported *Triphaena pronuba* at sallow on March 21st, *Callophrys rubi* on April 10th, and the common occurrence of *Euchloë cardamines*, all much before their normal time of appearance.

Mr. K. G. Blair exhibited living larvæ of a common Fire-fly of the Eastern United States of America, *Photuris pennsylvanica*, and referred to its habits.

Mr. Main, on behalf of Mr. Enefer, exhibited the larvæ of the red mite *Trombidium* which was common in gardens and in confinement fed on meat, flies, worms, etc., etc. If hungry they even fed upon one another.

Mr. Bunnett exhibited the beetle *Callidium variabile*, which had emerged from an oak plank.

APRIL 28th, 1921.

Mr. H. L. Dalton, of Reading, was elected a member.

The Rev. J. Waterston, B.D., B.Sc., F.E.S., gave an address on "The Natural History of Macedonia," illustrated with lantern slides and many specimens.

Dr. Forbes also exhibited lantern slides of Macedonia and remarked upon them.

In proposing a vote of thanks Major Cottam gave additional reminiscences and showed a number of coloured sketches of the scenery.

A large number of insects, other than Lepidoptera, were exhibited by Mr. Waterston, and commented on by himself and by Mr. K. G. Blair.

Mr. Blair exhibited a collection of Lepidoptera sent by our member Mr. G. B. Pearson from California with notes on each species; also living specimens of the Coccid *Phenacoccus aceris*, Signoret, from the bark of Spanish Chestnut and Beech. The species had not previously been recorded from the latter tree. They were met with at Oxshott. The Californian Lepidoptera were as follows:—

Papilio rutulus, Lucas. An ab. in which the black mark across the end of hindwing cell on upperside is absent. This mark though frequently much reduced is seldom quite absent. The venation of

left forewing is also aberrant, there being an additional short transverse vein joining veins 6 and 7 at about their middle, thus forming an additional small closed cell to the forewing. A West Coast species—Vancouver—California. *P. glaucus* which is a very closely allied form is confined to the Eastern area.

Papilio zelicaon, Lucas. Usually known by Boisduval's name *zolicaon*. A typically West Coast species, little given to variation. A mountain and lowland species.

Meganostoma eurydice, Bdv. The sexes very dissimilar—the female showing very clearly the close relationship to our *Gonepteryx rhamni*. The male is called the "Flying Pansy" and also the "Californian Dog-face." A rare form of the female shows traces of the dark border of the male.

Anthocharis sara, Lucas. It was not known to what particular named form these specimens belong, the confusion of names is so great in this group. Long series with accurate data as to date, place, altitude and season are much to be desired.

Pieris protodice, Bdv. Both of the winter form *vernalis*, Edw.

Pieris rapae, L. Said to have been introduced to the States about 1860, it was first caught in California in 1883. The females are very small and dark.

Colias eurytheme, Bdv. A pair of the spring and early summer form, *keewaydin*, Edw., and 1 male and 2 females of true *eurytheme* form, *i.e.*, the winter form usually known as *ariadne*. This point has only recently been cleared up by reference to the types in Oberthur's collection.

Dione ranillae, Linn. A common Central and tropical S. American butterfly occurring also in the W. Indies. It is said to have been first introduced into California about 1885, and since then to have become almost a pest, the larvæ feeding on the passion vine.

Argynnis semiramis, Edw. A very local insect, possibly only a race of the much more widely distributed *A. coronis*, Behr.

Melitaea chalcedon, Dbl., and Hew. One of the American representatives of the *aurinia* group. Said to be one of the commonest butterflies of S. California. Certainly one of the first to be described.

Pyrameis carye, Hb. In the States confined to the western areas, but having a wide range southwards and extending even to the Falkland Isles.

Limenitis bredowii race *californica*, Btlr. A mountain butterfly

confined to the S.W. States and Mexico. Frequently placed in the allied genus *Adelpha* (*Heterochroa*) to the species of which it bears a strong superficial resemblance.

Lemonias virgulti, Behr. Said to be locally abundant. Closely allied to our *Hamearis* (*Nemeobius*) *lucina*.

Rusticus (*Lycaena*) *acmon*, Westw. and Dbl. Very common and variable. Only males.

R. (*Lycaena*) *enoptes*, Bdv. A solitary female. The red marginal marks on hindwing underside are further from the margin than in the female of *acmon*.

Nomiades (*Lycaena*) *xerces* f. *antiacis*, Bdv. Said to be very abundant in the spring.

Brephidium exilis, Bdv. Not represented in the British Museum. It is sometimes referred to as the smallest butterfly in the world, but there are several species which run it very close whilst Ceylon examples of *Chilades pulli* beat it easily.

Leptotes marina, Reak. A common insect throughout California and Mexico.

Incisalia (*Thecla*) *iroides*, Bdv. A common spring butterfly in S. California. Ranges along the whole of the west coast.

Thecla aralona, Wright. Not represented in the British Museum. A very rare insect confined to the island of Catalina and only described shortly before the war.

Callophrys dumetorum, Bdv. The American "Green-Hairstreak," though it may not go by that name in the States.

Uranotes (*Thecla*) *melinus*, Hbn. A very common and widespread insect, often a nuisance on hops.

Hesperiidae.

Thanaos funeralis, Scud. Two males, one female.

Hylephila phylaeus, Drury. A very widespread insect, extending as far as the Argentine.

Ochlodes sylvanoides, Bdv. Known for years as *agricola* until Oberthür published figures of Boisduval's types. Was received as *phylaeus*. One male.

Hesperia syrichtus, Fb. Very common. A specimen of the female of this was exhibited at one of the Society's meetings recently, having been taken on Ranmore Common.

Phryganidia californica, Packard. Two males of this Dioptid moth. It is a very distinct species there being no other species known quite like it.

MAY 12th, 1921.

Mr. Stanley Edwards, F.L.S., Vice-president, in the Chair.

Mr. L. N. Staniland, of Muswell Hill, was elected a member.

Professor Cockerell, who came as a visitor, exhibited numerous fossil insects from the Mid-Tertiary strata of the Isle of Wight; also a series of drawings of new species of fossil flies which he was describing in the *Annals and Magazine of Natural History*.

Mr. Lyle exhibited some cocoons of the Braconid *Meteorus albiditarsus*, a parasite on *Bupalus piniperda*, and a skein of silk which he had wound from two of their cocoons. He also exhibited a section of a large stem of the common laurel in which was a natural discoloration in the form of a butterfly with spread wings, and referred to the legendary accounts of butterflies getting into the heart of a tree and being there embedded and subsequently producing an impression as exhibited. Mr. Step remarked that the discoloration was probably caused by a fungus attack and that the shape was purely accidental.

Mr. Step exhibited the nests of *Sceliphron madraspatanus*, the Mud-dauber Wasp, from Calcutta. These had been built in his daughter's callers' card-box, the entrance to which was a slit a quarter of an inch wide. Through this narrow opening the females had conveyed all their mud and the large hairy spiders with which the cells were provisioned. Half a dozen wasps emerged from the cells during the voyage home.

Mr. Robert Adkin exhibited a portion of a wallflower (*Cheiranthus*) from his garden at Eastbourne, in which the flowers were imperfect in that the petals were absent. In other respects the flowers appeared to be complete, but the normal erect position of the sepals gave them the appearance of being unexpanded. The whole plant was similarly affected.

Mr. Barnett exhibited several examples of the natter-jack toad (*Bufo calamita*) from South Spain.

Mr. S. R. Ashby exhibited the collection of British Earwigs, Cockroaches, Grasshoppers, Locusts and Crickets formed by the late Curator, Mr. W. West.

Mr. C. L. Withycombe exhibited a small scorpion (*Buthus occitanus*) from the South of France, a young stage of the South European Mantis (*M. religiosa*), and some Weevils found on thistles, all sent to him by Mr. H. Main from Provence. He also exhibited

a specimen of *Sinodendron cylindricum* (Col.), from a decaying beech tree in Epping Forest.

Mr. A. W. Dennis exhibited the "apple moss" *Bartramia pomiformis*, from Dorking.

Mr. H. Moore exhibited an exotic homopteron, *Ptyelus flavescens*, F., and contributed the following note:—

"There is a 'Cuckoo-spit' found in E. Africa, which on account of its large size and copious secretion of fluid, and its habit of congregating in considerable numbers on certain trees, gives it a somewhat uncommon interest. We are chiefly indebted to Mr. S. L. Hinde, who sent specimens to Prof. Poulton some years ago (1906), who published the details in the *Transactions of the Ent. Soc. Lond.*, for most of what we know of them. Mr. Hinde says, every branch of a tree 40 ft. high was covered with them—that there was a continuous drip like rain under the tree, from their secretions, and that when within 6-10 ft. of the insects they looked like flowers and fruit or buds. When alive the insects are yellow, which however quickly fades, and relaxing for setting does not improve them. The specimens exhibited came from the Nairobi district. He also showed a specimen of *Gonyglus gongyloides* from Ceylon."

Mr. O. R. Goodman exhibited *Timarcha violaceo-nigra*, the small "bloody-nose" beetle, which he had taken on the sheep-leas, Horsley, on May 8th, when it was abundant; and also reported the occurrence of the lizard, *Lacerta vivipara*, on the same ground.

Mr. Coxhead exhibited a series of sketches of galls with, in numerous cases, drawings of the insect producer of the same.

Mr. Turner showed three specimens of the very large dragonfly *Mecistogaster caeruleata* from Central America. It is one of the largest species measuring nearly six inches in expanse of wings.

Mr. Grosvenor exhibited a large number of bird-skins he had obtained while stationed in India in 1917-18, mainly from the Punjab. The exhibit included the Hornbill which plastered up the female whilst sitting on her eggs in the hollow of a tree, the Blue Kingfisher, an abundant bird round the ponds, the House Crow, a bird much too friendly to the household, in crowds everywhere, the Bank Mynah which always followed the Great Grey Shrike which was a migrant to England, the Wintail Swallow which built its nest in the wells for water, the Rock Parraket which, although a frequenter of trees, built its nest in buildings, the Copper-smith whose note resembled the sound from a small anvil when struck,

and also the Weaver Bird and its nest made of elephant grass, of which hundreds often hang from one tree.

MAY 21st, 1921.

FIELD MEETING—OXSHOTT.

Conductor, W. J LUCAS, B.A., F.E.S.

The route taken was from Claygate Station through the covers east of the railway, where the party resolved itself into sections going by devious routes to the devasted region west of Oxshott station and thence to the Black pond, as much of it as remains not overgrown. Subsequently the party reassembled for tea at Oxshott village after a very pleasant ramble. But few captures were made and no reports were forthcoming.

MAY 26th, 1921.

Mr. STANLEY EDWARDS, F.L.S., etc., Vice-president, in the Chair.

Mr. G. T. Lyle, of Cambridge, was elected a member.

Mr. Farmer exhibited a specimen of *Rumicia phlaeas* from Riddlesdown with an area of pale straw colour on the left forewing; also a *Callophrys rubi* with the right forewing blotched with a patch of buff colour, from the same place.

Mr. Neave exhibited two pupæ of *Strymon pruni* from N. Huntingdon and the ova of *Leptosia sinapis*.

Mr. Simms exhibited the ova of *Cupido minimus*; also the beetle *Cryptocephalus aureola*, taken from buttercups on the slopes of the S. Downs, near Eastbourne, on May 19th.

Mr. Goodman exhibited *Ematurga atomaria* captured on May 1st at St. Martha's Hill, Guildford, including some unusually dark suffused forms. He also showed *Anarta myrtilli* taken on the same date.

Mr. Bunnett exhibited the Coleopteron *Hedobia imperialis* taken at Coulsdon.

In remarks on the season it was noted that *Rumicia phlaeas* was very common in a corner of Redhill Common and other places; *Eulype hastata* had been taken at Holmsley and Horsley, and *Homaris fuciformis* at the latter place; while *Celastrina argiolus* was very

scarce in most localities, and many species were early in appearance.

JUNE 4th, 1921.

FIELD MEETING—EASTBOURNE.

Conductor, R. ADKIN, F.E.S.

At the kind invitation of Mr. and Mrs. R. Adkin a number of members went down to Eastbourne for a whole day field-meeting. After a ramble in the garden of our hosts and an ample lunch the party took their way along the lower cliff path westward from Meads, collecting on the rough weedy slopes, until Cow Gap was reached, where the steep cliff path was taken and a climb of some hundreds of feet brought them to the upper slopes. There the party spread out over the extensive pasture land finally coming together again in the late afternoon for a very welcome meat tea kindly provided by our hosts at their residence, "Hodeslea," at Meads, a place of some historic interest, the house having been built and the garden laid out by the late Prof. Huxley who there spent the last years of his life. The feature of the afternoon's collecting was the unusual abundance of *Cupido minimus*, it being met with in considerable numbers practically all over the district traversed, while *Agriades thetis* (*bellargus*) was fairly plentiful in its more restricted haunts. Larvæ of *Sesia ichneumoniformis* were taken in the roots of *Anthyllis vulneraria*; and many other species common to the neighbourhood were also taken.

JUNE 9th, 1921.

Mr. A. W. Dennis exhibited stereo-photographs of the Mosses *Mnium hornum* and *Bartramia pomiformis*.

Mr. A. A. W. Buckstone exhibited series of *Colias croceus* (*edusa*) with the black border of the forewings encroaching upon the inner margin, with typical forms for comparison.

Dr. G. S. Robertson exhibited ab. *cæca* of *Aphantopus hyperantus* and *Xylophasia monoglypha*, both from the Lake District; *Spilosoma menthastri*, five specimens bred from ova found on blackthorn at Horsley, showing considerable variation in spots tending to run together, in one specimen only a few spots were present; *Tiliacea*

aurago, pale forms from Box-Hill and darker forms from Torquay; *Hesperia malvae* var. *lavaterae* from Bude and *Polyommatus icarus*, a female approaching ab. *caerulea* from Tintagel.

Mr. K. G. Blair exhibited living specimens of the Phasmid, *Bacillus gallicus*, Charp.; young larvæ of *Thais rumina* and of *Papilio podalirius*; the 12-spotted asparagus beetle, *Crioceris 12-punctata*; pupa of a glow-worm, *Lampyris* sp., and called attention to the pupæ of the ♀s which showed well-developed vestigial elytra; females of *Epichnopteryx* sp. of a genus formerly included with the *Psychidae* but now placed as a separate family *Epichnopterigidae*; the larvæ have no case and are somewhat Zygaenid in form. He contributed the following note: "The ♀ *Epichnopteryx* is a naked degenerate creature and never completely casts the pupal skin. This remains attached over the ventral surface, including the very much reduced legs. The head is distinct but soft, with all the appendages vestigial. She emerges from the cocoon, the pupal envelope remaining inside and the ventral, except at the posterior end, contracted, but the tail is turned upwards. Towards evening she frequently withdraws again within the cocoon. The cocoon of the ♂ is much smaller, the insect itself being a small black active little moth. A crippled ♂ placed with some ♀♀ that had been out several days, at once became very excited and soon paired up with one of them. One female without pairing commenced to produce a string of yellow ova, but these shrivelled up in a few days."

Mr. O. R. Goodman exhibited *Hemerophila abruptaria* and its melanic form ab. *fuscata*, taken in April at Clerkenwell, near the original locality of its discovery.

Mr. F. M. Carr exhibited the larvæ of *Ptilophora plumigera*.

Mr. Enefer exhibited the neat spherical cocoon and the pupæ of the Ant-lion *Myrmeleon formicarius* exhibited in the larval stage at a previous meeting.

Mr. T. H. Grosvenor exhibited living *Trochilium crabroniformis*, and a Zygaenid hybrid obtained from a pairing of *Z. trifolii* and *Z. hippocrepidis*, Steph.

JUNE 23rd, 1921.

EXHIBITION OF ORDERS OTHER THAN LEPIDOPTERA.

Mr. Hugh Main exhibited a number of items obtained by him in the South of France, including Natterjack toads (*Bufo calamita*)

found under stones. Field crickets, *Gryllus campestris*, which were located by their sound, and induced to leave their holes in the bank by inserting a straw. Small scorpions (*Buthus occitanus*) which were found in numbers under stones and which consumed the bodies of flies. A trap-door spider which could be located by noticing the movements of closing the door of its burrow. The well known harvesting ant (*Aphenogaster* sp.) of the Riviera. The larvæ of a species of *Ascalaphus* which were very sluggish in their movements. The larva of the Neuropteron *Palpares* sp., which was found resting under sand, but not in burrows, and which when disturbed rapidly worked its way tail first under the sand again. The Wolf spider *Lycosa narbonensis*. A living specimen of *Plebeius argyrognomon*, and of *Melitaea didyma* with its variegated pupa case.

Mr. G. W. Coxhead exhibited the leaves of ash extensively galled by the small dipteron *Perrisia fraxini*, Kieffer.

Mr. K. G. Blair exhibited the "Stick Insects" *Bacillus gallicus*, Charp., from S. France, and pointed out their short antennæ, in contrast to *Carausius morosus*, Br., from India, with long antennæ. The larvæ of the Ant-lions, *Palpares* and *Ascalaphus*, from S. France, and described their method of capturing prey. The larvæ of *Papilio podalirius* from S. France, in their second instar, from ova. *Arima brevipennis* (Galerucid beetle) bred from larvæ from S. France. *Lampyris lusitanica*, Mots., ♂ ♀, bred from larvæ from S. France, previously exhibited as pupæ. *Photuris pennsylranica*, DeG., ♂ ♂, bred from larvæ from Washington, U.S.A. Both sexes have wings and the male shows a flashy light.

Mr. H. Moore showed a pupa of *Sphinx ligustri* with dipterous parasites which had all emerged from one hole as larvæ and pupated outside. It was suggested that the parent had laid eggs in the already dead pupa.

Mr. Enefer exhibited the larvæ of the "ladybird" *Coccinella bipunctata*, the larvæ of an *Anthrenus* species with bands of coloured hairs, which feeds on dried up vegetation, and the grain weevil *Calandra granaria*; and read notes on their respective habits.

Mr. Withycombe exhibited a living specimen of *Geometra papilionaria*; the larvæ of the Scorpion-fly, which he found fed readily on dead insects; and stated that *Panorpa germanicus* laid about 20 ova in a bunch while *P. communis* laid more than 30.

Mr. Dennis exhibited a stereo-photograph of *Primula scotica*, a very local plant found only in the North of Scotland.

Mr. F. B. Carr exhibited the living larvæ of *Bithys quercus*, *Xanthorhoë montanata*, *Cidaria suffumata*, *Xanthorhoë sociata* and *Tephrosia consonaria*.

JUNE 25th, 1921.

FIELD MEETING—CHALFONT ROAD.

Conductor, F. B. CARR.

This was another whole day meeting. The party went by train to Chalfont Road Station and thence to the extensive woodland on the slope of the Chess Valley. The special quest of the day was to obtain *Asthena blomeri* and *Abraxas sylvata* (*ulmata*). The former was obtained by the more active while the latter allowed itself to be acquired more easily. Messrs. Ashby and Tonge obtained specimens of *Stauropus fagi*. Later in the day the party found their way to the wooded slopes and fields south-west of the railway and gradually reached the residence of Mr. T. W. Hall, at Chorley Wood, who had kindly invited them to take tea in his pleasant grounds. In this beautiful retreat a pleasant hour or two was spent before return was made to town.

JULY 14th, 1921.

Mr. G. S. Baker, of 7, Fawcett St., W. Prompton, was elected a member.

There was a short discussion on *Xanthorhoë rivata* and *X. alternata* (*sociata*).

Mr. Hy. J. Turner introduced the discussion with the following notes on the nomenclature, differentiation and variation.

I. Nomenclature and Variation :—

1. *Cidaria rivata*, Hb., 409 (*sylvaticata*, Haw., 332).
2. *Cidaria alternata*, Müller. (*alchemillata*, Schiff., Hb. 370 ; *sociata*, Brk. v. 432 ; *subtristata*, Haw., 332 ; *contristata*, Don.,).

ab. *degenerata*, Haw., 333 ab. (*kurzi*, Hirschke,).
[Narrow median band, broken.]

ab. *cingulata*, Tengstr. *Ac. Fenn.* I., 32.
[Dark hindwing : abdomen dark.]

ab. *obscurata*, Sth. *Ent.*, xxi., 27, fig. Isle of Lewis.
[General darkening of lighter areas.]
race *islandica*, Prout. Seitz., iv., 258. Iceland.
race *dubiosata*, Alph. *Hor. Ross.*, xvii., 216. Thian Shan.

3. *Cidaria supergressa*, Btlr. *Ill. Het.*, iii., 55, pl. 54, f. 11. Japan.

A small group of three species very much alike.

II. Differentiation of *X. rivata* from *X. alternata* (*sociata*).

The following points of difference of *rivata* were noted.

Generally larger and single-brooded in nature (*alternata* is double-brooded). More glossy wing. The post-median white band (especially on hindwing) broader and scarcely bisected by a dark line. Distal area less uniformly darkened, and more mixed with blue-grey. Basal area of hindwing more white mixed both above and below. Hindwings beneath with a brown band proximally to the sub-terminal band and always interrupted between the 3rd and 1st median vein. (In *alternata* this is always *un*broken). Median band extremely narrowed and broken.

Mr. A. A. W. Buckstone exhibited short series from numerous localities, and called attention to a darker form of *alternata* (*sociata*) which appeared somewhat later than the general emergence of the first generation, which last took place at the end of June and in early July.

Mr. Mera exhibited series of the two species and contributed the following note :—

"I have always found *rivata* to be the less liable to variation of the two species, and it may usually be distinguished by its larger size and generally higher colour. Also, it is a single brooded species occurring usually in early July. *Sociata* on the other hand is double-brooded, and in S. Devon I have bred a third brood. My specimens from S. Devon are of a distinctly browner ground colour than I have usually found them. The specimens from the Isle of Lewis are quite a distinct race, losing somewhat the strong band across the wing, the darker portions of the wing very much absorbing what is usually white.

"The time of appearance is hardly a reliable guide as to which species is taken, as the broods of *sociata* undoubtedly overlap one another, and only a few nights ago I took a worn specimen of *sociata* in Epping Forest."

Mr. Enefer exhibited the egg of a *Chrysopa* species on the top of a gall on a sycamore leaf, and another egg the stalk of which was

placed on a previously laid egg. He also showed specimens of the pine weevil, *Hylobius abietis*, just now abundant in many parts of the South of England. The beetles clung very tightly when touched.

Mr. H. Moore exhibited an Ant-lion *Myrmeleon*, which he had bred from a larva he had received from the S. of France, sent him by Mr. Hugh Main. He noted that during the night the larva travelled on the surface, which it did not appear to do during the day time. Mr. Blair confirmed this observation and said that he had further found that the larva would creep up a rough surface.

Mr. Moore also exhibited a form of *Anosia berenice* from Florida, U.S.A., which on the underside showed a strongly emphasised V-mark outside the end of the cell of the forewing.

Mr. Priske exhibited the winged form of the hemipteron *Velia currens*, which was considered scarce in that state.

Mr. Hugh Main showed some young field crickets which had just hatched. At first they were white in colour, but soon became black. The eggs were laid in groups in the ground disposed vertically.

Mr. K. G. Blair exhibited a living female with ova of the fire-fly, *Phengodes laticollis*, from Washington, and read notes on the life-history sent to him by Mr. Barker.

Mr. Hy. J. Turner exhibited further species of Lepidoptera sent to him by Mr. G. B. Pearson, from Pasadena, California, including a long series of the extremely small "blue" *Brephidium exilis*, a series of the rare *Thecla avalona* from Catalina Islands, a series of the beautiful *Meganostoma eurydice* from Mt. San Bernardina, the extremely brilliant metallic blue (*Lycaena*) *sonorensis* from the desert land, etc.

After a short statement and discussion the following resolution was proposed on the motion of Mr. E. Step, seconded by the President, and carried unanimously.

"That this meeting of the South London Entomological and Natural History Society, having learned that a scheme is on foot to alienate a considerable portion of Esher Common from public enjoyment by leasing it to a Golf Club Syndicate, desires to express its strong opposition to such a scheme, which it believes to be antagonistic to the general good and conceived solely in the interests of a class already well catered for in the vicinity."

JULY 28th, 1921.

Mr. Edwards exhibited a small general collection of insects made at Digne in April, 1897.

Mr. Main exhibited a specimen of *Gryllus campestris* in its 2nd ecdysis; puparia of a Tsetse-fly (*Glossina*) from S. Africa; ova of the "Katydid" Locust (*Pterophila concavus*) from N. America, and a young trap-door spider (*Atypus affinis*) from Epping Forest.

Mr. Ashby showed the *Coccinellidae* collected by the late Mr. Ashdown, consisting of 2,220 specimens, which were now being added to the Society's collection.

Mr. O. R. Goodman exhibited a nest of the wasp *Polistes gallicus*, and larvæ of *Hyles* (*Deilephila*) *euphorbiae* from the Dauphiné Alps.

Mr. Farmer remarked on a notice he had seen in the *Daily Chronicle* of the appearance of the Large Copper at Limpsfield. Mr. Edwards stated that Captain Purefoy had been rearing a number of *Chrysophanus rutilus* in Kent; it was perhaps an escape from his cages.

A vote of thanks to Mr. Ashby for arranging the *Coccinellidae* was proposed by Mr. Step, seconded by Mr. Edwards, and carried *nem. con.* The Secretary read two letters from the Kent and Surrey Footpaths and Commons Preservation Society, re the Society's resolution passed at a previous meeting against a golf course being made on Esher Common.

AUGUST 11th, 1921.

Mr. Stanley Edwards exhibited apples much infested with the mussel scale (*Mytilaspis pomorum*), which is a great pest in many places.

Mr. Blenkarn exhibited the following Coleoptera, *Lebia cyanocephala* from Box Hill; *Dianous coerulescens* from the Mole at Box Hill; *Melanophila acuminata* from Crowthorne on July 3rd, where it occurred in numbers on actually burning pine-stumps; *Liparus germanus* taken by Mr. C. A. W. Duffield on Hogweed in Kent in June; *Cassida fastuosa* on *Senecio jacobaea* at Box Hill in April and May; and *Bythinus glabratus* taken at Box Hill in a nest of *Lasius flavus* in April. He also showed a specimen of *Aromia moschata* taken in the London district, where it had been but rarely observed in late years.

Mr. Ashby exhibited a specimen of *Stauropus fagi* and examples

of *Asthena blomeri* taken in the Chalfont Woods during the Field Meeting on July 25th.

Mr. T. H. Grosvenor exhibited six males of *Agriades thetis* of six quite distinct shades of blue, one of which showed a considerable number of irregularly scattered black scales on the disc of the wings, a form not noted previously; also a series of very blue females, some of which were the ab. *ceronus*, a form rarely taken in Britain.

Mr. K. G. Blair exhibited a living *Papilio podalirius*, bred from an ovum found in the S. of France. He also shewed a specimen of the Orthopteron, *Gryllus bipunctatus*, taken in the docks and probably of African origin; and pointed out that it differed from the common field-cricket, *G. campestris*, in having its wings perfect and not aborted.

Mr. Withycombe exhibited stereoscopic photos of the cylindrical eggs of a Hemipteron, of the Tineid *Harpipteryx xylostella*, and of the cocoon of the Neuropteron *Hemerobius subnebulosus*.

Mr. Tonge exhibited a specimen of *Pararge aegeria* bred from an egg laid by a female captured at Chalfont Road on June 25th, probably an example of the third brood. The life-cycle was completed in about six weeks.

Mr. O. R. Goodman exhibited series of two distinct races of *Erebia tyndarus*, one a large, darkly coloured race taken by himself at La Grave in the Swiss Alps this year, and the other taken by the late Mr. A. E. Gibbs in the Engadine, representing a smaller, paler, and thinner scaled race.

Mr. Goodman reported that he had been to the New Forest, where collecting was quite disappointing. Everything was worn and scarce, and of the butterflies he only saw *Gonepteryx rhamni*, *Dryas paphia*, *Hipparchia semele*, *Epinephele tithonus* and *Adopaea flava*.

AUGUST 25th, 1921.

Mr. Stanley Edwards exhibited the black "cherry-aphis" (*Myzus cerasi*) which had occurred near Blackheath; also the green-house "white-fly" *Aleurodes vaporariorum*, which had been attacking tomatoes grown under glass. It had been suggested that fumigation with hydrocyanic acid, a powerful poison, was effective, but to avoid any deleterious residue, any good insecticide

would suffice if the spraying were done frequently. He suggested soft soap solution of 1 lb. to 10 gallons of water. Mr. Step said that he had met with the same species abundantly on garden mint in the open.

Mr. T. L. Barnett exhibited a series of *Hipparchia semele*, including some unusually dark forms from Horsham, and several of a very light banded form from the N. Downs; and said that the heath form was usually dark. He also showed a nice dark suffused *Argynnis cydippe*, a male *Polyommatus icarus* wanting the lower two spots of the submarginal row on the underside of the forewing; a dark *Rumicia phlaeas* and two *Coenonympha pamphilus*, one very marked in depth of colour and the other unusually pale.

Mr. Hy. J. Turner exhibited the following items sent to him from Sao Paulo, Brazil, by Mr. F. Lindeman.

1. A cocoon of *Rothschildia aurota* from which had emerged, three hours after it was received by post, a large female. The moth should have emerged earlier in the year, but had lain over the winter (southern). A male of the same species emerged the following day, but from an autumn (southern) larva. They had not paired, and probably would not do so, as the female had already laid a number of eggs; these were of a chalky whiteness. The cocoon was spun between the leaves of a *Citrus* and hung by a strong silken pedicel from a twig. A female was exhibited for illustration.

2. A chrysalis of the S. Brazilian form of *Papilio thoas*; and called attention to the remarkable likeness it bore to a rotten and crumbling stick while still preserving the general Papilionine shape. Unfortunately, like most of the contents of the parcel, it had been crushed in the post and was dead.

3. A pupa of *Eacles magnifica*; and pointed out the rough file-like outer surface. The "teeth" were placed in patches on face, head and thorax, along the vein coverings of the wings and on both margins of all the abdominal segments. This also had come to grief in the post. Several cocoons of *Hyperchiria* had shared the same fate, but a cocoon of another species of *Rothschildia* had dropped out of the crushed parcel and was found in the postman's bag a day or two later, apparently uninjured.

Mr. A. W. Dennis exhibited *Juncus effusus* var. *spiralis*, from the Chelsea physic garden, of which some of the stems grow spirally, with both left-handed and right-handed twist; also the rare *Scirpus Holoschoenus* from the N. Devon coast.

Mr. C. L. Withycombe exhibited a female of *Ascalaphus*

ottomanus (*lacteus*) sent to him from Digne by Mr. Goodman. Its previously known range was from Dalmatia to the Black Sea, and it was unknown from France, hitherto. He also showed two other species for comparison, *A. longicornis* and *A. libelluloides*.

Mr. Coxhead exhibited a twig of dogwood (*Cornus sanguinea*) galled by *Oligotrophus* (*Hormomyia*) *corni* (Dipt.).

Mr. Enefer exhibited living specimens of *Hipparchia semele*, the weevil, *Apion miniatum*, on dock, the shield-bug, *Syromastes marginatus* and the ova of a lace-wing fly.

Mr. Main exhibited in his subterrarium the larva of the beetle *Necrophorus interruptus* bred from an egg laid by a female caught in a trap set in Woodford. It was expected that it would lie over the winter and pupate in the next season.

Mr. Goodman exhibited the following species of European "coppers"—*Heodes virgaureae*, males and females, from the Engadine and S. France, *H. hippothoë* with var. *eurybia*, from the same localities, *Chrysophanus dispar*, var. *rutilus*, ♀ from S. France; and a British *C. dispar* from an old collection.

Mr. Coppeard exhibited an aberration of *Arctia caja* in which the spaces of the forewing between the chocolate banding were of a beautiful pinky-white flush. He had bred six similar aberrations from wild larvæ.

SEPTEMBER 8th, 1921.

Mr. H. Moore exhibited a nest of the wasp *Vespa germanica* taken at Mid-Comp Farm, Borough Green, Kent, on September 1st, 1921. He had counted to date 1,052 dead wasps, including 1 ♀ and 6 ♂ ♂, while another 100 or 200 were still in the nest. There were seven or more tiers of comb, with a number of closed cells, probably containing several dozen pupæ still alive and a few perfect insects.

Mr. Hy. J. Turner exhibited males and females of two of the many forms of the gorgeous green *Ornithoptera priamus*, viz., race *hecuba* from Key Island and race *poseidon* from N. Queensland. He also showed about a dozen species and racial forms of the Pierid genus *Delias*, most of which had white as the preponderant colour on the upper sides, while the undersides were most striking and brilliant in design and colour. New Guinea appeared to be the central portion of the area of distribution of the species, and most of the forms came from there.

Mr. T. H. L. Grosvenor exhibited the following Zygænid forms;—

1. Six of the progeny of ova laid by a ♀ *Z. trifolii*, taken *in cop.* in 1920, with a ♂ of *Z. hippocrepidis*. Of the 14 specimens bred, the ♀s resembled the ♀ parent, 50 per cent of the ♂s were like the ♀, and 50 per cent had a smaller sixth spot.

2. Three *Z. trifolii* ab. *nigricans*?; two ab. *obscura*; one white example; one with spot 4 missing on the left forewing; ♂ found pairing with a ♀ *Z. filipendulae*, with the genital organs mounted; three very large examples 35 mm.; four very small 18 mm.; six with a minute sixth spot; several teratological examples; four with extremely wide border to hindwings; and several confluent forms.

3. *Z. filipendulae* of large size 36 mm.; a small form 20 mm.; confluent forms; a very pale form; one with hindwing rayed with black; and several fine yellow forms.

Major Cottam exhibited some light chalk forms of *Plebeius aegon* from N. Kent; a *Spilosoma menthastri*, bred, in which the outer half of all the wings was quite without markings (an unusual form); a very pale-coloured *Hypocrita jacobaeae*, light brown or pale red; a dingy form of *Melitaea aurinia*; and *Euchloë cardamines* with very yellow hindwings.

Mr. Enefer exhibited the cup-lichen *Cladonia pyxidata* and the golden lichen *Physcia parietina* both from Cornwall; the larva of a fly, *Syrphus* sp. feeding on *Aphis destructor*; and the garden spider *Epeira diadema*, and read a note on the last.

Mr. Goodman exhibited a small specimen of the Smooth Snake, *Coronella laevis*, from Studland, and its principal prey the Sand lizard (*Lacerta agilis*) from Parkstone, Dorset.

Mr. Syms exhibited the beetles, *Chrysomela graminis*, from Yorkshire, and *C. banksi*, from the Isle of Wight.

Mr. K. G. Blair exhibited the living larva of the sawfly, *Eriocampa ovata*, and called attention to the waxy secretion attending its actions; and also a living grasshopper *Leptophyes punctatissima*, a subapterous species found on the leaves of trees.

Reports were made that *Acronicta psi* had been observed on May 1st, *Agriades coridon* on July 3rd, *A. thetis* on April 30th, and the second brood on August 3rd, *Polyommatus icarus* on September 3rd, *Amorpha populi*, second brood in the 3rd week of July; a fourth brood of *Rumicia phlaeas* was now out; *Colias hyale* had been seen on the S. E. coast; *Issoria lathonia* had been taken in Kent, and *Colias croceus* (*edusa*) was very rare this season.

A discussion on Immigration took place, and it was generally agreed that with butterflies this took place against the wind.

SEPTEMBER 22nd, 1921.

Exhibition of Lantern-slides.

Mr. Hugh Main exhibited slides of the life-history of the oil-beetle, *Meloë proscarabaeus*, which he found in abundance in Epping Forest and at Polegate, Sussex. The males have curiously angled antennæ, the female has large elytra. The larva is a parasite on the bee *Anthophora*. The female scratched a cavity in the ground and the next morning commenced laying. A slide showed a vertical section of the cavity with a mass of bright yellow ova. Each female deposited several batches of ova, the later ones being less in size. About Whitsun he had found large balls of these larvæ on grass heads, which often broke up and fell, but the individuals soon crawled up again, and reformed a ball. The bees were not noticed at that time, but at Easter frequented the sallow in some number. The beetle larvæ are very active, jumping on any insect which approaches, even on a brush presented to it. Those who are unsuccessful die. The feet of the larvæ have three hooks, hence they were formerly called, "triungulins," bee-lice. The larva which succeeds in landing on the back of a female bee is carried to the nest and jumps on the ovum resting on the food (honey) stored for the bees offspring. The ovum is consumed in the course of a week and then the larva moults to a legless grub, which from its raft attacks and consumes the honey. When this is accomplished the larva moults to a pseudo-chrysalis, a hard case with no wing-cases. At the next moult a definite beetle pupa is produced and finally the beetle emerges. This is supposed to take place in the autumn, but the beetle remains in the cocoon until the following spring entices it out.

The *Anthophora* also has a bee-parasite, a species of *Melecta*, which makes no cells itself but appropriates the cell of the *Anthophora* when it is fully supplied with a store of food.

Mr. C. L. Withycombe exhibited slides showing the structure, habit, growth, and development of the Bladderwort (*Utricularia*) which was very common in all the dykes in fen-land. The bladders are not bouys, as first thought, but traps to capture prey, which consisted of minute crustaceans and larvæ. The bladders were

constructed and acted like an eel trap. Considerable pressure could be exerted by the collar, spring door and inward-pointing bristles. One day he found a small tadpole with its head in one bladder and its tail drawn into another. After touching the bladder the suction was inevitable and all withdrawal prevented. So far as he knew there was no digestive fluid and no reactive substance to aid the decay which took place. There were always concavities in the outer wall of the bladders when inactive, which at once responded to a stimulus on the very sensitive bristle and became convex, causing the object to be drawn in. After action the bladder would not again be sensitive for at least 24 hours. The seedling of the plant develops only one cotyledon and the plant dies down at the end of summer. The plant itself has no root, but slight root-hairs exist on the green globule which is the first stage in spring. Stomata also exist in plenty on the upper surfaces of a young plant, but none on a fully developed one. The upper surfaces appear as if waxed. The seedling has a rosette of thread-like leaves, with a great resemblance to the butterwort (*Pinguicula*) seedling, which also has only one cotyledon developed.

He also showed slides of *Pinguicula* sp. which grew in the northern portions of this Island. The leaves of this plant had a number of mushroom-shaped glands which were very much visited by small insects. He had in a few hours taken 101 specimens of Psocids on one plant. The next day that plant was avoided, but others were equally attractive. The edge of the leaves curls over slowly and covers up the glands with the flies attached to them. If shreds of meat are presented to these glands the response is much quicker. More fluid is secreted, which is more acid, and attacks the flesh of the victim, which is absorbed, and subsequently the leaf uncurls and the debris, no longer held by a sticky fluid, is blown away.

He also illustrated the pollination of several species of British orchids which were mainly attended by moths with long mouth tubes which were inserted in the spurs of the flowers, where moisture was sucked through the walls.

Mr. G. T. Lyle exhibited slides of ova of Lepidoptera, stages in the life-history of other insects, emergences of Lepidoptera, etc.

Mr. Lucas exhibited slides of *Lycium barbarum* the "tea-tree," shepherd's-purse, Turkey-oak, woody night-shade, deadly night-shade, arbutus, clematis, arum, privet, burdock, agrimony, snap-

dragon, *Rosa arvensis*, blackberry, etc.; and described the methods of seed-distribution of these plants.

He also showed the "thin sideways" shape of the cockroach and centipede, a form affording facilities of hiding away in crevices; two phases of the eclipse of the moon; a common earwig with no forceps developed; a cocoon of *Hemerobius quadrifasciata*; an *Acalaphus* larva, and a young larva of *Chrysopa perla*.

He added a few slides of the former appearance of the Black Pond at Oxshott and contrasted recent photographs of the same area, and called attention to the vast development of *Molinia cerulaea* the moor grass, with which much of the former woodland was now covered.

Mr. A. W. Dennis exhibited slides of the ova of a *Cimex*.

Mr. E. J. Bunnett exhibited slides of *Clematis vitalba* to contrast back and front lighting; eggs of moth, probably *Triphaena pronuba* laid on a cotton thread; egg cocoons of Fairy lamp Spider, *Agroeca brunnea*; egg mass of frog to compare with the egg rope of the toad; *Bryobia speciosa* (a mite); *Ptilinus pectinicornis*, ♂ and ♀ showing the beautifully pectinated antennæ of the ♂; *Raphidia maculata*, a "Snake fly"; larva and pupa-case of *Eurrhypara urticata* with Parasitic diptera and eggs; corner of the eye of *Eristalis:* Wing of Earwig; and larvæ of *Eriocampa limacina*, the Pear-Slug sawfly.

OCTOBER 13th, 1921.

Mr. A. W. Vesterling, 107, Castle Street, Battersea, London, S.W. 11, was elected a member.

Mr. C. D. Soar gave a lecture on the "Hydracarina or Water-mites," and illustrated it with a large number of lantern slides of various species, their structural details and life-history, together with the coloured drawings he had prepared for a monograph of the group. (See page 3.)

Mr. Grosvenor exhibited a series of the chief species of the genus *Zygaena* in the Palæarctic area.

Mr. Blenkarn exhibited the scarce weevil *Epipolaeus caliginosus*, which he had found under stones on the Dover cliffs, on September 3rd, 1921.

Mr. Newman exhibited a series of *Rumicia phlaeas* captured in July and August, including ab. *obsoleta*, ab. *eleus*, a golden shaded

form, and some with very small spots. He also reported that his son had seen a specimen of *Euvanessa antiopa* at rest with wings open on a gate in Hurst Road, Bexley, on September 19th.

Messrs. O. R. and A. de B. Goodman exhibited series of *Nordmannia* (*Thecla*) *ilicis* with var. *cerri*, from Digne, June, 1921, showing enlarged orange patch on upperside of forewing in both sexes; together with var. *aesculi*, from L'Esterel, June, 1921, showing absence of white line on underside forewing; also *Klugia* (*Thecla*) *spini*, two from Digne, June, 1921, showing straight white line underside hindwing, and one from L'Esterel, June, 1921, showing concave white line underside hindwing; together with one from St. Martin Vèsubie, July, 1921, typical female, and two striking aberrations showing greater widening of white line on underside of hindwing, from same locality.

OCTOBER 27th, 1921.

Mr. J. A. Vernon, "Lynmouth," Reigate, Surrey, was elected a member.

Mr. Hugh Main exhibited a female scorpion, *Scorpio europaeus*, with her family clustered over her body. The parent was taken last May at Hyéres, and had since been kept in solitary confinement and fed on flies and other insects. In the afternoon of October 14th two young were observed resting on the back of the mother and their number gradually increased during the evening till about two dozen could be seen. They were all white at first, except for the black eyes on the middle of the cephalo-thorax and those on each side of its anterior border. They were only very slowly showing any darkening which was commencing on the posterior border of each abdominal segment. The tail was carried curved over the back and not held flat, in the same horizontal plane as the body, as is so frequently found in the case of the adult creature. The mother fasted for about ten days after the birth of the young, but has since commenced to feed again. The young very rarely move about, usually resting motionless. The parent walks around at night without disturbing her family.

Mr. Grosvenor had seen the Asiatic species in N. India carry its young in the same way in the autumn, and in the spring he had noticed their young in the same motionless condition, suggesting that they had remained with their mother the whole winter. They were still white in colour.

Mr. A. A. W. Buckstone showed a long series of *Ematurga atomaria* from the following southern localities, W. Wickham, and Otford, in Kent; Wanborough, Oxshott, Horsley, Betchworth, Gomshall, Ranmore and Peaslake, in Surrey; Wendover in Bucks; and Epping Forest, Essex; with the form var. *unicolorata* from Burnley in Lancashire. Several of the Gomshall species approached var. *unicolorata*, and this form is also taken at Horsley. Those from Otford are of an extremely pale yellow with only slight indications of the usual transverse lines. It was stated that the Lancashire dark form was taken at a considerable elevation.

Mr. Barnett exhibited the larvæ of *Arctia villica* from Reigate; and a long series of very variable forms of *Rumicia phlaeas*, including a straw-coloured example.

Captain Crocker exhibited long series of *Malacosoma neustria*, the results of two pairings from Oxford. The first set were all light with an unusually narrow band, while the second consisted of mixed light and dark forms. He also showed a very long series of aberrations of *Rumicia phlaeas* taken during the past season, including a very large ab. *alba*, the pure white form, ab. *ignita* a rich fiery red, a brassy form ab. *intermedia*, ab. *obliterata* forms with the spots reduced in size to almost obsolescence, ab. *caeruleopunctata*, ab. *radiata* with the hindwing marginal band broken into blotches, ab. *juncea* with the spots of forewing united to form an irregular band, a form with greatly enlarged spots ab. *magnipuncta*, some approaching var. *turcicus* often called *eleus* in error, other dark forms which have been called ab. *suffusa*; others with wide border to forewings, narrow border to forewing, hindwing almost wholly black; forms with albinistic patches, others with sagittate spots on forewings, one with a light disc in the hindwing (a very rare form), with the hindwing band streaked into the disc of the wing; females having the dark costa (usually a male character), narrow and wide marginal bands in the hindwings; also aberrations of the underside.

Mr. O. R. Goodman exhibited the dark form ab. *navarina* of *Melitaea athalia* and a form of *Polyommatus escheri* both from St. Martin Vèsubie, France.

Mr. Dennis exhibited photographs of the Bed-bug, *Cimex lectularius* to compare with a photograph of the tropical *C. rotundatus*; and pointed out that the latter had more conspicuous sculpturing.

Mr. Hy. J. Turner read the following extract from a letter

received from Mr. G. B. Pearson in Pasadena, California, and at the same time exhibited a small specimen of *Echinocactus wislizeni* obtained by Mr. Pearson in the Colorado Desert.

"I have paid, thanks to my friends, several visits to the deserts, both the Mohave, 130 miles away north and to Palm Springs, Colorado, 108 miles south. There I have seen *Cereus giganteus* the 'giant' cactus 50 ft. tall and have not seen one small one. This is the cactus with great stumpy limbs covered with spines and branching out at all angles with great 'bushy-shaped' shoots that give such a weird appearance. In one district near Rosamond, we passed through thousands of them scattered all over the desert. There is another which the author of *Desert Trails* calls the 'vilest of the vile.' I have verified that remark, time and again, by rushing into them when one's eye is glued while pursuing a 'fly', and it has taken time and patience to dig out the fish-hook like thorns that have penetrated even my boots sometimes, let alone got through my leggings. The 'barrel' cactus of which I send a photo stands 5 to 6 ft. high."

NOVEMBER 10th, 1921.

The Rev. R. E. E. Frampton, M.A., Halstead Rectory, Sevenoaks, Kent, and Dr. H. D. Smart, Shelley, Huddersfield, were elected members.

Mr. Laurence Chubb, of the "Commons and Footpaths Preservation Society," gave a lecture on the work of the Society illustrating it with a large number of lantern slides. [See page 7.]

NOVEMBER 24th, 1921.

THE ANNUAL EXHIBITION.

Prof. Poulton exhibited a set of *Papilio dardanus*, Brown, from the high Kikuyu Escarpment (6,500-9,000 ft.) near Nairobi, and from Nairobi itself (5,500 ft.), and explained the results obtained by submission to ultra-violet light, by Dr. Cockayne's method. The pale yellow of the males fluoresced with wonderful brilliancy, but no pigment of the fully developed mimetic females was fluorescent. The localities mentioned above are, however, very rich in primitive forms of female, intermediate between the male and the completed mimic, and these gave the following results :—

(1) The *trimeni* female transitional toward the *hippocoon* and *hippocoonides* females, respectively mimicking *Amauris niavius* and its eastern race *dominicanus*. The pale yellow was fluorescent at both elevations.

(2) The *lamborni* female, transitional toward the *trophonissa* (West) and *trophonius* (East) females, mimicking *Danaida chrysippus*. Here, too, the pale yellow was fluorescent at both elevations.

(3) A primitive form of the E. and S.E. African *cenea* female, mimicking *Amauris echeria* and *albimaculata* in the same region. The pale yellow of two out of three of the primitive females from the high Escarpment fluoresced, but not one of the three from Nairobi. Comparing the two sets of three carefully, it was clear that the females from the lower elevations were a shade darker than the two which fluoresced. Their yellow pigment had evidently taken a definite step towards the still darker pigment of the mimic, and, in so doing, had become chemically changed, as shown by the different reaction to ultra-violet rays.

It is interesting to note that the pale yellow pigment ceases to fluoresce when it brightens into white (as in *hippocoon*) no less than when it darkens into orange-brown (*trophonius*) or ochreous (*cenea*).

The utilization and transformation of the pigment of a non-mimetic male by its mimetic females could hardly receive a more beautiful or convincing demonstration than this, afforded by Dr. Cockayne's method.

Lord Rothschild exhibited a series of *Papilio machaon*, and the allied species to illustrate the various geographical races, including in most cases both the spring and the summer emergences, and some preserved larvæ :—

The typical form of *P. machaon* was shown in a long series from many localities in Central and Southern Europe, from Asia Minor, the Urals, the Caucasus, Turkestan and S. and Central Siberia; and special attention was drawn to the entirely black aberration from Gissen in Germany. In the race *brittanicus* from the Fen and Broad districts attention was drawn to the unique yellow, bandless aberration. Of the race *saharae* from S. Algeria preserved larvæ were shown, and it was pointed out that the black bands were broken up into spots as in the larvæ of *P. hospiton*. Other races exhibited were *mauretanica* from Tunis and Algeria, *maxima* from Morocco, *ussuriensis* from the Amur and N. China, *montanus* from Kuku-Nor and the N. Chinese Mts., *asiatica* from N.W. India and Cashmere, *ladakensis* from Cashmere, *sikkimensis*, a single-brooded

race from Khamba Yong, *rerityi* from Burma and Yunnan, *chinensis* from China, *hippocrates*, a race remarkable for its large size and dark colour from Japan, *kamtschadalus* from Kamschatka, an unnamed race from Arctic Siberia, and *aliaska* from Alaska Territory. It was stated that the last three races were extremely rare. From Corsica and Sardinia the allied species *P. hospiton* was shown, with its larva which is so similar to the larva of the *saharae* race of *P. machaon*. The other allied species shown were *P. zelicaon* from California, *P. bairdi* from Colorado with its racial forms *brucei* from Colorado, *oregonia* from Oregon and *nitra* from Alberta. It was stated that the forms of *P. bairdi* were connecting links between *P. machaon* and *P. polyxenes*; typical *bairdi* resembling the *asterius* form of *P. polyxenes* while the form *brucei* resembles a large *machaon*; and the *hollandi* form of *bairdi* from Arizona is a complete mixture of the characters of *P. machaon* and *P. polyxenes* race *asterius*. *P. indra* from N. California and its race *pergamus* from S. California. *P. polyxenes* from Cuba with its races, *asterius* from the United States, Mexico and Guatemala, *brevicauda* from Newfoundland, *stabilis* from Costa Rica (yellow bands broad), and *americus*, from the Andes of Ecuador, Columbia and Venezuela, with its two dimorphic forms, narrow and broad banded. Attention was drawn to a unique aberration of the race *asterius*, in which the underside of one hindwing resembled the famous ab. *calverlyi*. The two forms of *P. nitra* which occur alongside *P. bairdi* and *P. zelicaon* must be considered as a distinct species for the present.

Mr. H. A Leeds exhibited a large number of aberrations of British Lepidoptera, taken during the past season, including *Agriades coridon* ab. *pallida*, ab. *obsoleta*, etc.; *Polyommatus icarus*, ab. *glomerata-subobsoleta* (each wing with 3 spots only and close together, basal, discoidal and submedian), a pale pearly blue form, etc.; *Epinephele jurtina* two xanthic aberrations, one having quite two thirds of the wing area strongly whitish; *Melanargia galathea* ab. *procida* forms, etc.; *Hesperia malvae* ab. with extended white markings; *Pararge megera* with an extra spot on the forewings; *Aricia medon* with additional spots between the submedian and discoidal; *Rumicia phlaeas* ab. *ignita*, ab. *parvipuncta*, ab. *obliterata*, an aberration with hindwings very strongly suffused with brassy colour, the dark pattern (usually obliterated by the ordinary black scaling) shewing distinctly, and many combinations of named aberrations of the species.

Mr. C. Nicholson exhibited *Sirex gigas* from Aberdeen, two of

three examples captured in a timber-yard in 1921; the dipterons *Physocephala rufipes*, bred from a nest of the bee *Bombus lucorum*, and *Chrysochlamys cuprea* taken on a Convolvulus flower at Seer Green, Bucks; the beetles *Deleaster dichrous* from Hale End at light, *Megacronus inclinans* on an old log, near Monk Wood, Epping, *Trichius fasciatus* boxed on a flower of *Heracleum giganteum* in Stepney, and others.

Major Cottam exhibited a series of *Psilura monacha* varying from almost snowy white to the smoky black var. *eremita*, and several series of *Bryophila muralis* from various districts.

Mr. A. W. Mera exhibited an example of *Pieris brassicae* ♀ in which a dusting of black scales joined up the two black spots on the forewing, bred in May, 1921; an asymmetrical *Pyrameis atalanta* with bleached wing, bred from a Northumberland larva where the insect has been particularly abundant this year; and suffused forms of *Rumicia phlaeas* taken and bred in August, with typical specimens of the May emergence, all from Crawley Down, Sussex, 1921; and pointed out that the suffused forms of *R. phlaeas* seem to predominate in the August emergence.

Mr. Percy M. Bright exhibited a grand series of upper and underside aberrations of *Melitaea athalia*; and a series of male *Agriades coridon* upperside, including many very remarkable aberrations.

Mr. Harold B. Williams exhibited a drawer of *Rumicia phlaeas*, the result of several seasons' special attention to the species, including series of abs. *radiata*, *obliterata*, and other forms. Special attention was directed to the following:—

1. ab. *alba*, Tutt.—Two specimens of this form were shown, together with abs. *schmidtii* and *intermedia*, and a long series of specimens having portions of one or more wings showing the coloration of one or other of these forms. These specimens are regarded by Tutt as pathological and as distinct from ab. *alba*, etc. Microscopical examination of the entire series by Dr. E. A. Cockayne has shown the colour variation to be due to a scale defect, which is identical in its nature in every specimen. It is probable that this defect is hereditary; 7 specimens were exhibited which were bred from one Wimbledon ♀ (normal).

2. ab. *eleus*. Fb.—This form and ab. *suffusa*, Tutt, appear to occur in Britain only in abnormally hot summers, when the intermediate forms (*initia*, Tutt, etc.) are also more abundant than usual.

The series of these forms exhibited were taken, with few exceptions, in 1911 and 1921, the latter season having provided three fine specimens of ab. *eleus*. The 1911 specimens include examples of ab. *suffusa*, but extreme *eleus* is not represented from that season.

Mr. Douglas H. Pearson exhibited the following species from the Eastern Pyrenees taken in 1921.—*Melitaea phoebe* mostly like Swiss forms, with one ab. *occitanica* and one with a black band on the underside. *Pararge aegeria* a very light ♀, *Scolitantides orion* var. *ornata*, *Melanargia lachesis*, some without eyespots, others well furnished, and one yellow form ab. *canigulensis*. An *eleus* form of *Rumicia phlaeas*. A variable series of *Lycaena arion* with ab. *unicolor*. Pale forms of *Melitaea dictynna*. Large and varied forms of *M. athalia*. *M. cinxia* very darkly marked and one with black blotches filling the central light band. *Libythea celtis*, *Epinephele ida*, and *Ereres alcetas*. From Dorset he exhibited an example of the very rare ab. *unipuncta* of *Plebeius aegon*, of which one was recorded from Witherslack in 1902 and another from Bradenburg in 1904.

Mr. E. Step exhibited a series of 51 photographs representing 47 species of the larger British Crustacea, chiefly from the Cornish coast.

Mr. Robert Adkin exhibited an aberration of *Rumicia* (*Chrysophanus*) *phlaeas* in which the black marginal band of the left forewing was so broadened as to absorb the submarginal row of black spots, thus covering fully one third of the area of the wing, the other three wings were normal. The specimen was captured on the Parade at Eastbourne on May 1st, 1921.

He also exhibited, on behalf of Mr. Lachlan Gibb, a short series of *Zygaena achilleae* which that gentleman brought back from a trip in Argyllshire during the past summer.

Mr. Adkin also exhibited a male *Epinephele tithonus* var. *mincki*, and a female of the var. *subalbida*, both taken in the Isle of Wight in July last.

Dr. E. A. Cockayne exhibited an aberration of *Pyrameis atalanta* with a larval head, bred at Alton Barnes in August, 1920.

Mr. H. E. Garrett exhibited a very light coloured specimen of *Aglais urticae* taken at Hendon in 1909, and a yellow aberration of *R. phlaeas*, with another suffused specimen captured at Bexley in May, 1921.

Mr. T. H. L. Grosvenor exhibited many species of the genus

Zygaena with a large number of races and aberrational forms of the British representatives of the genus, including a doubtful species flying with *Z. tutti* and *Z. trifolii*, probably a hybrid, the series of *Z. tutti* taken by the late J. W. Tutt at Chattenden Woods in 1892, the hybrids bred from the wild pairing of *Z. tutti* and *Z. trifolii*, most of the species of the genus found in other European and Eastern countries particularly from Italy, etc.

The following aberrations of British Rhopalocera were also shown by Mr. Grosvenor:—*Pieris napi*, yellow forms from Ireland; *Brenthis euphrosyne*, irregularly marked aberration from Sussex; *B. selene* with median row of spots missing; *Coenonympha pamphilus*, various forms from Surrey; *Aricia medon (astrarche)*, ♀ with white spot as in race *artaxerxes*, with underside forms of ab. *obsoleta* and ab. *striata* from Surrey; *Polyommatus icarus* various forms from Surrey; *Agriades thetis*, various forms and colour variations from Surrey; *A. coridon*, various forms of females from Hertfordshire.

Mr. B. W. Adkin exhibited two drawers containing many varieties of *Agriades thetis* (*bellargus*), and a selection of Rhopalocera taken by himself in 1921, including two *Hesperia malvae* var. *taras*, a pale variety of *Nisoniades tages*, light and dark varieties of *Thymelicus palaemon*, two varieties of *Eumicia* (*Chrysophanus*) *phlaeas*, a fine blotched variety of *Brenthis selene* and lightly and heavily marked forms of *B. euphrosyne*.

Mr. Sydney Abbott exhibited a suffused black form of *Dryas paphia* from the New Forest.

Mr. J. Seabrook exhibited the pink Boll-worm moth, *Platyedra gossypiella*, and larva; another Boll-worm moth, *Earias insulana*: with the parasites of the above, *Pimpla roborata* and *Chelonella sulcata*; a Solitary Wasp, *Eumenes maxillosa*; the formerly common Lebeck beetle *Xystrocera globosa*: and the orthopteron *Sphodromantis bioculata* eating *Mantis religiosa*.

Mr. H. Moore exhibited the *tibullus* race of *Papilio dardanus* from Africa.

Mr. K. G. Blair exhibited:—

1. *Papilio machaon*, with the usual red markings of the anal angle wanting, the ground colour of an abnormally deep yellow, and the blue spots much reduced; from St. Malo.

2. *Rusina tenebrosa* a black form. There is no similar form in the British Museum, though one is figured in Barrett; taken in the Isle of Man, June, 1921.

3. *Crambus* sp.? Allied to *C. pascuellus*, of which it is perhaps

a variety, but the white dart-like streak along the middle of the wing extends practically up to the transverse sub-terminal line. The costal markings also are somewhat differently disposed. The specimens cannot be matched in the British Museum. Tring, June, 1904.

Rev. E. S. Frampton exhibited two boxes containing 132 specimens of *Peronea hastiana*, bred from E. Kent larvæ, and 44 from the Lancashire coast. (The latter bred by Mr. Mansbridge.)

The E. Kent specimens, allowing for uncertainty in the naming of some of the forms, produced :—

V. *suberistana*, including the doubtful *sponsana*, *striana* and *aquilana*, 68 ; type, 10 ; v. *autumnana*, 23 ; v. *centrorittana*, including 2 compound, 12 ; v. *mayrana*, including 1 compound, 4 ; v. *albistriana*, 2 ; v. *byringerana*, 4 ; v. unnamed with large costal blotch, 5 ; v. *divisana*, *combustana*, *radiana*, *leucophaeana*, 1 each.

Of those lent by Mr. H. C. Hayward, of Royston, the specimens from E. Kent bred from the same locality at the same time, there are *striana* 5, (*suberistana* in the B.M.), *mayrana* 6, *autumnana* 3, type 5, *aquilana* 6, *centrorittana* 5, *suberistana* 2, with traces of the "vitta" 2, *aquilana* with the thorax dark 2, *mayerana* + *albistriana* 1, *divisiana* 1, *striana* + *autumnana* 1, *byringerana* 1, *sponsana* 2 (=*suberistana* in B.M.).

Mr. J. Riches exhibited a very varied series of *Abraxas grossulariata* bred from wild larvæ taken on the Common Euonymus in North London this year. [The Common Euonymus should be our native *E. europaeus* ; but I presume *E. japonicus* of gardens is meant.—E. Step.]

Mr. Wm. Southey exhibited a varied series of *Boarmia gemmaria*, bred from wild larvæ taken in N. London on various plants, chiefly on *Euonymus*, and for the most part bred in 1921.

Mr. A. E. Tonge exhibited *Rumicia phlaeas*. A varied series including pale and dark forms, striate, upper and underside, and one with cream spot on left forewing.

Polyommatus icarus. ♀s with white hindwing margin without blue scaling, very blue ♂s with black dots on hindwing margin, without black margin to all wings, a midget, obsolete and lanceolate undersides.

Coenonympha pamphilus. Assymetrical, left forewing blind, right forewing typical.

Hesperia malvae ab. *taras*.

Boarmia repandata. A black form bred from wild collected Surrey larva.

Dryas paphia. ♂ s with silvery spots on all wings and on right side only. Female type and var. with apical spots coalesced and black edge of hindwing absent.

Pyrameis cardui. Type and pale var., inner angle of left hindwing pale blotched.

Epinephele jurtina. ♂ with symmetrical white blotch on each wing.

Agriades thetis. ♀ s, 1st brood very blue, Surrey.

Gnophos obscuraria. Banded and other forms from Folkestone.

Agriades coridon. Series from Royston, 1921, including ab. *inaequalis*, ab. *semi-syngrapha* (one with brown fringes), and obsolete and striate undersides.

Mr. G. Talbot, on behalf of Mr. J. J. Joicey, exhibited the following Lepidoptera, chiefly from Dutch New Guinea:—

1. Species of the genus *Delias* recently received from the Weyland Mountains district of Dutch New Guinea, and collected by the brothers Pratt. Five species are distinct from any hitherto known and three others have relatives in other parts of New Guinea. Two new races of described forms were also shewn.

Delias persephone, Stdgr., with its mimic *Huphina abnormis*, Wall., were taken together. *D. persephone* was found commonly in Waigou on a previous expedition, but no example of the *Huphina* was taken.

A series of *Delias aruna*, Bdv., showing transitions in both sexes to the race *irma*, Früh., with black hindwing.

2. *Troides meridionalis*, Rths., *T. paradisea*, Stgr., and *T. tithonus*, de Haan., from the same locality, all the specimens being females. In the absence of males it is not certain whether the Weyland Mountains forms differ from those elsewhere. The *tithonus* form appears to be the same as one we described from the Arfak. The *meridionalis* differs slightly from the typical form, a specimen of which was shown for comparison. The *paradisea* seems typical, but further north in the Arfak the female of this species takes the form of *meridionalis*.

3. A gynandromorph of *Danaida schenki* race *periphas*, Früh. The left side is male with a slight trace of female element in cellule 3 of the forewing. The right side is female, but the male element is seen in the yellowish coloration of the markings. The genitalia show the presence of the male organs, including the hair-pencil.

This section is, therefore, predominantly male in character. Gynandromorphs are rare in this group of Danaines, and we are not aware of any other recorded case.

4. Two new forms of the Satyrine genus *Pieridiopsis*. This curious genus is known only from the high mountains of New Guinea.

5. A new species of the genus *Morphopsis*, distinct from any known hitherto. It was found in the dark jungle resting on trees head downwards. Another species (*ula*) of this genus was seen flying north at 6.30 p.m. for three evenings in succession, and one was finally caught at this hour on the third day. Only one was seen each evening.

6. Mimicry between an Agaristid moth (*Immetalia longipalpus*, Kirby), and an Erycinid butterfly (*Praetaxila* sp. nov.). This example of resemblance is the first of its kind known where the male of one resembles the female of the other and the female of one resembles the male of the other. The Agaristid is common and widely distributed. Both were caught flying together.

All the forms shown were obtained in the Weyland Mountains at an elevation of from 3,500 to 6,000 feet, from November to February.

7. *Papilio cacicus* race *inca*, R. and J., from Peru, with two of its rare female forms, *nais*, R. and J., and a red form which differs from the typical *zaddachi* form. This red form of *cacicus* bears a remarkable resemblance to *euterpinus*, G. and S., which also occurs in North Peru.

Mr. Percy Richards exhibited a drawer of *Rumicia phlaeas* containing bred and caught specimens from Bexley and the neighbourhood, including some very extreme forms, ab. *striata*, several approaching ab. *alba*, and several ab. *schmidtii* (all bred). A series of *Agriades coridon*, including a Royston specimen, a female with male blue scales suffusing the whole of the wings. An aberration of *Aglais urticae* without the two discal spots (ab. *ichnusa*?). A fine *Euchloë cardamines* with the orange blotches very smoky. An underside of *Brenthis euphrosyne* in which the spots on the submarginal area of the forewing were missing. A varied series of *Epinephele jurtina*. Dark and light forms of *Argynnis aglaia*. *Colias hyale* taken at Eynesford this year. *Aricia medon* with white blotches on the margins. Light and dark *Pararge megera*. *Plebeius aegon* in varied series from Eynesford.

Mr. W. J. Kaye exhibited two groups of butterflies captured on two days in two different places in Venezuela.

1. At San Esteban Valley, Venezuela (500 ft.). December 21st, 1920.

Morpho achilles f. *peleides.*	*Heliconius antiochus.*	*Papilio arcas*, ♂ and ♀.
Heliconius anticus.	*H. doris.*	*P. anchises* f. *osgris*, ♂ and ♀.
Eueides isabella f. *huebneri.*		
Aprotopos aedesia.	*Ceratinia lycaste*, *Pteronymia.*	*Archonias teresa.*
Hirsutis furia	*C. cuclea*, *Eresia carme*, ♂ and ♀.	*Pythonides lotus.*
Mechanitis dorysstus, ♂ and ♀.	*Epithomia alpho*, *Callizona alceste.* *Protogonia lilops*, *Chlosyne narva.*	*Lymnas iarbas.*
Ceratinia fraterna.	*Dismorphia amphione*, *Leucidia brephos.* *Pyrrhybris malenka*, *Pieris buniae*	
		Eriphia tractipennis. *Cyanopepla submacula).*

2. At El Encanto, Venezuela. December 16th, 1920.

Pteronymia starkei (Ith.).	*Aprotopos aedesia* (Ith.).	
Leucothyris phemonoe (Ith.).	*Heliconius numata* f. *metalitis* (Hel.).	
Ithomia (Ith.).	*H. clysonimus* (Hel.).	
Ceratinia lycaste (Ith.).	*Callicore clymena* (Nym.). *C. metiscus* (Nym.).	*Adelpha irmina.* A Satyrid.
Sphaenogona xanthochlora (Pier.).	*Polyniphis dumenilii* (Lyc.).	
Dismorphia crisia f. *medora* (Pier.).	Arctiid.	*Papilio anchesis* f. *osgris* ♀.
Emesis mandana (Eryc.).	*Lauron partita* (Hyps.).	
Nymphidium kadeni (Eryc.).		

Mr. L. W. Newman exhibited a long series of *Melitaea athalia* from E. Kent, showing considerable variation. A long series of

extremely dark-banded forms of *Ennomos quercinaria*, and some melanic forms from Regent's Park, together with a pair of extremely light forms from the Chiltern Hills. A bred series of *Leucania vitellina* from a female taken in N. Cornwall, in September, 1920. A specimen of *Papilio machaon*, taken in Whittlesea Mere on July 23rd, 1819, in perfect condition, and of very good coloration considering its age. A fine silvered variety of *Brenthis selene* from Sussex. *Hamearis lucina* with the usual tawny markings replaced by ochreous. A remarkable specimen of *Rumicia phlaeas* with the hindwings coppery, and showing the usually suppressed black spots.

Prof. Poulton called attention to the fact that *R. phlaeas* of the same facies as the coppery hindwinged example just exhibited, had recently been recognised coming from Central Africa.

Mr. Hammond exhibited an extremely dark specimen of the *callunae* form of *Lasiocampa quercus*, the band being absent.

Mr. A. A. W. Buckstone exhibited a series of *Vanessa io* bred last July from full fed larvæ taken at Headley, Surrey, on June 25th. It was pointed out that there was a dark shade, and in some specimens even a black spot, in the centre of the forewing. It was suggested that these aberrations had been caused by the extremes of temperature to which the larvæ were undoubtedly subjected. During mid-June the days were abnormally warm and the nights exceptionally cold, several degrees of frost being recorded on five successive nights. Forty-two specimens emerged, only twelve of which were typical *V. io*.

Mr. Buckstone also exhibited living larvæ of *Pararge megera*, and stated that on several occasions ants were observed running over and about a number of these larvæ which were confined in a cage. He suggested that they may have been endeavouring to obtain a substance from the protuberances situated on the anal segments of the larvæ.

He also showed a series of *Boarmia consortaria* varying in colour from dirty yellow to dark smoky grey. They were bred from ova obtained from a moth captured at Wimbledon, in May, 1920, which was somewhat similar in appearance to a specimen now exhibited. Emergence took place during last February, the pupæ having been forced and subjected to considerable variation of temperature. More usual forms were shown for comparison.

Mr. A. P. Pickett exhibited a large number of aberrations of *Agriades coridon* obtained by him during the last season.

Mr. O. R. Goodman exhibited six cases containing typical speci-

mens and varieties of the species taken by himself and Mr. A. de B. Goodman, during a holiday in June and July spent in the Riviera, at Digne, at St. Martin Vèsubie, and at La Grave. Of a total of 139 species of Rhopalocera captured 114 were exhibited, including *Papilio alexanor*, *Parnassius delius*, *Pieris mannii*, *P. callidice*, *Gonepteryx cleopatra*, *Charaxes jasius*, *Libythea celtis*, *Melitaea cynthia*, *M. phoebe*, *Brenthis daphne*, var. *cleodoxa* of *Argynnis cydippe*, *Satyrus cordula*, *Erebia pharte*, *E. erias*, *Melanargia syllius*, *Lacosopis roboris*, *Thecla spini*, *Syntarucus telicanus*, *Polyommatus anteros*, *P. escheri*, *P. hylas*, *P. admetus*, *Lycaena alcon*, etc.

Mr. Bedwell exhibited his series of British beetles of the genus *Bembidium*.

Mr. F. W. Edwards exhibited photographs of a curious new form of the Diptera in which the wings showed an increase in the number of veins normal to the group. (See "Proc. Ent. Soc. Lond.," 1921, p. lxxxix.)

Mr. Enefer exhibited a number of mounted specimens of seeds, and referred to the various natural agencies for their distribution.

Several drawers from the Society's cabinets were on view.

DECEMBER 8th, 1921.

Mr. H. Worsley-Wood, of Acton, was elected a member.

Mr. Robert Adkin exhibited a short series of *Diaphora mendica* from Co. Cork, and of a form from Co. Tyrone, Ireland. He said that the form with the white, slightly spotted male, represented by the Co. Cork series, was known as var. *rustica*; but it would be seen that in the specimens from Co. Tyrone not only were the males of a whitish grey colour and somewhat more spotted than in the Cork form, but that the veins of the wings were indicated by black-grey streaks, and in the females this character is even more pronounced. Thus we have an insect, which in both sexes has all the wings pale grey, normally spotted with black and the veins dark grey. It appears to be a well-defined local race, for which he proposed the name var. *venosa*.

Mr. L. N. Staniland exhibited large specimens of the galls formed on the roots and branches of wild crab-apple trees in North London by the woolly aphis, *Schizoneura lanigera*. The largest specimens were probably five years old.

Mr. R. Adkin said that it had been asserted that this species also

attacked elm as well as the garden apples. Theobald states that the winged form leaves the apple in the autumn for the shoots of elm, from which winged forms go to the apple again in the spring.

Mr. B. Adkin exhibited a box of mixed specimens of *Brenthis selene* and *B. euphrosyne*, and enquired what was the upperside differentiation, if any existed. He also showed various forms of *Cosmotriche potatoria*, including a female of a general light coloration, but with a dark cloud along the costa.

Mr. H. Moore exhibited a short series of an African Pierid, from the Karura Forest, Nairobi, which he doubtfully referred to the winter form of *Teracolus puniceus*, Butler.

Note.—Since the meeting Mr. N. D. Riley has kindly referred to the series in the National Collection, and writes, "the species of *Teracolus* you exhibited is *T. hetaera*, Gerst. Aurivillius treats this as being distinct from *puniceus*, Butler, but our series shows this view to be incorrect; *puniceus* must be regarded as a synonym of *hetaera*. The form figured in Seitz as *foliaceus*, Butler, is a typical *hetaera*. If you want to retain the name *puniceus* it should be employed for the dry season form, which is less heavily marked, and often pinkish below. Seasonal variation is very marked in this species."

Mr. Blenkarn exhibited the beetles *Pentarthrum huttoni*, dug out from wood in an old stable at Killarney, and *Lissodema cursor*, found under bark at Ranmore Common on August 1st. Both localities were new for the species.

Mr. Dennis exhibited the oak "spangle" gall, *Neuroterus numismatis*.

Mr. E. J. Bunnett exhibited the black form of *Amphidasis betularia* var. *doubledayaria*, and an intermediate form obtained in the S.E. district of London. He also showed a photograph of the recent eclipse of the sun.

Mr. R. Adkin read the following report of the Society's Delegate to the Conference of Corresponding Societies of the British Association for the advancement of Science:—

The meeting of the British Association, held at Edinburgh from September 7th to 14th, 1921, was in every way a great success, the membership being the largest for many years and the subjects under discussion for the most part of unusual interest. Naturally the greater part of my attention was devoted to "Section D.—Zoology," which was presided over by Prof. E. S. Goodrich, F.R.S., who took for his address "Some

Problems in Evolution," an illuminating paper, which every one of our members who takes any real interest in Natural History should read carefully. Dr. F. A. E. Crew dilated upon "The Mechanism of Sex-reversal in Frogs," Prof. J. Cossar Ewart on "The Structure, Development, and Origin of Feathers," Prof. D. M. S. Watson on "Dry Land and the Origin of the Bony Vertebrates," Dr. John Rennison, "Acarine Disease in Hive Bees," to mention only a few of the many interesting subjects that were discussed. A feature of the gathering was the number of "Joint Meetings," thus "Forest Insect Problems" were discussed by members of Zoological and Botanical Sections; "Instinctive Behaviour" by those of the Zoological and Psychological; "The Age of the Earth" by the Zoologists, the Physicists, and so forth, thus giving the opportunity for discussion of the subjects from many points of view.

The various institutions of the City did everything possible for the entertainment of the members of the Association. The Lord Provost, Magistrates and Council of Edinburgh held a reception at the Royal Scottish Museum, where the members were cordially received, and an opportunity given them of viewing the many treasures housed in the Museum buildings. A Garden Party was held at the Zoological Park, the property of the Zoological Society of Scotland, where ample time was allowed for inspecting the collections, many of the species of mammals and birds, housed under wonderfully natural conditions, showing to great advantage. Indeed, practically every scientific society in Edinburgh threw open its doors to the members of the Association during the meeting, and cordially welcomed all those who visited them. An item not officially mentioned was the Botanical Gardens, where I spent a pleasant and instructive afternoon among the ample and beautifully arranged rock gardens.

But the particular business on which you sent me to Edinburgh was to represent you at the Conference of Delegates of Corresponding Societies. Two meetings were held, and I was able to be present at both of them. The President of the Conference Sir Richard Gregory (Editor of "Nature"), gave as his address, "The Message of Science," of which I append a copy, in the hope that one and all of you will in turn read it with interest and benefit. The subjects brought forward for discussion were "Science and Citizenship," which was debated from many points of view; and "Regional Surveys," the objects of which were very fully explained, and the following resolution was passed :—

"That this meeting of Delegates of the Corresponding Societies of the British Association approves the movement of regional survey, of which the examples have been exhibited and explained, and towards the promotion and initiation of such surveys they invite a further exhibition at next year's meeting (at Hull) with discussion towards methods of presentment, etc.

"It also desires to aid co-operation among Scientific Societies, educational institutions, public libraries, museums, etc., with civic societies and municipalities, or otherwise towards the preparation of surveys, and their due preservation and exhibition, for educational, general and municipal purposes."

The following have undertaken to give information:—Mrs. Fraser Davies, Le Play House, 65, Belgrave Road, S.W. 1; Prof. Fleure, University College of Wales, Aberystwyth; Prof. Geddes, Department of Sociology and Civics, University of Bombay; Miss Ritchie, Outlook Tower, Edinburgh.

It was also resolved—

"1. That the Council be asked to represent to the Postmaster-General the very heavy burden which the postage of their publications and notices entails upon the Scientific Societies, and to request him to alleviate it at the earliest possible moment."

This was referred to the Committee of Recommendations, and by them to the Conjoint Board of Scientific Societies.

"2. That the Council be asked to consider what action should be taken to reduce the cost of publications of Scientific Societies." But on being referred in due course to the Committee of Recommendations no action was taken by them.

A further proposal was brought forward to the effect "That Corresponding Societies should pay an annual subscription of £1 10s., which would entitle them to send a delegate to the Conference for whom hospitality could be asked." This was strongly opposed on the ground that it was an attempt to make Corresponding Societies pay their delegate's subscription and make a request which was a charity that no one attending required. The motion was not voted upon, but was ultimately referred to the Corresponding Societies' Committee for consideration at a future meeting; the matter, therefore, may or may not come up again at some future time. I hope later on to present the Association's official publication to the Society.

JANUARY 12*th*, 1922.

Mr. E. J. Bunnett, M.A., F.E.S., Vice-president, in the chair.

The deaths of Dr. T. A. Chapman, F.R.S., Mr. J. Jäger, and Mr. R. Woolacot were announced.

Messrs. A. S. Buckhurst, of Souldern Road, W., W. H. Bell, of Wood Green, L. E. Couchman, of Hampstead, and Colonel R. A. Rattray, of Tonbridge, were elected members.

Mr. A. A. W. Buckstone exhibited *Heliophobus hispidus*, from Torquay and Dorset, pointing out that the extension of the narrow pale submarginal line in the general dark form of the race from Torquay, wiping out the usual dark marginal line, helped to accentuate by comparison the paleness of the race from Dorset. This pale form never occurred at Torquay. He also showed an extremely dark aberration of *Ortholitha plumbaria*, from Headley.

Mr. C. L. Withycombe exhibited larvæ of the Dipteron *Taeniorhynchus* (*Mansonia*) *rickardi*, living and dead, with photographs showing the way in which they attach themselves by their siphons to a root of *Typha angustifolia* to obtain a supply of air, a position they retain the whole winter. He pointed out the barb on the siphon which made it difficult for the larva to withdraw it. He stated that the curious tail fin was used to drive in the siphon. These larvæ were taken in Epping Forest on the submerged roots of *T. angustifolia*, about a dozen being obtained from half a dozen roots. The larvæ were described for the first time in Europe by C. Wesenberg Lund, in Denmark, in 1918. In the "Ent. Mo. Mag.," in 1919, Mr. F. W. Edwards described larvæ taken in England. The pupa of the European species has apparently not yet been described.

Mr. Main said that numerous beetle larvæ were known to tap roots in this way.

Mr. Bunnett stated that the larvæ of *Donacia* sps. had a similar habit.

Mr. H. J. Turner exhibited the following interesting aberrations sent to him by Mr. Thomas Greer, of Stewartstown, Co. Tyrone, Ireland:—

Euchloë cardamines.—(1) ♂ ab. *marginata*, (2) ♂ with orange blotches streaked with dark scales, (3) ♂ ab. *minor*, (4) ♂ very large, (5) ♀ ab. *radiata*, (6) ♀ with orange streaks above and below.

Melitaea aurinia.— ♀ of a dull, obscure coloration.

Pararge megera.—(1) ♂ with apical ocellus reduced to a small dot, (2) ♂ with double apical ocellus.

Polyommatus icarus.—(1) ♂ with faint red marginal blotches on the upperside margin of the posterior wing, the underside being var. *icarinus*, (2) a gynandromorph right side ♂, left side ♀, (3) ♀ with the marginal red blotches extended to form a band.

Mr. A. de B. Goodman exhibited a series of *Coenonympha tiphon*, the typical form from Britain, race *philoxenus* from Britain, and race *isis* from La Grave, Dauphiné.

Mr. Turner read a letter from our member Mr. G. B. Pearson, in California, in which he reported observing in his garden in Pasadena, on December 9th, "one *Euranessa antiopa*, one *Pyrameis cardui*, two *Terias nicippe*, one *Pieris rapae*, one *Colias protodice*, one *Hesperia tessellata*, one *Colias eurytheme*, a few bees, also grasshoppers, a hummingbird, a few linnets (Californian), two mockingbirds, hollyhocks, antirrhinums, petunias, portulacas, verbena, sweet peas, stocks, sunflowers, nasturtiums, candytuft, and roses, everywhere just coming into full bloom. Dahlias succumbed to a frost a few days ago. We have not had any rain now for about two months, the hose is in constant use, and even with that I cannot prevent my lawn being scorched. For an easterner these are really glorious days, a brilliant sun in an Italian blue sky, ad infinitum apparently."

JANUARY 26th, 1922.

ANNUAL MEETING.

Mr. Stanley Edwards, F.L.S., Vice-President, in the chair.

The Meeting received and adopted the Report of the Council, the statement of the Treasurer and the Balance Sheet. The Chairman declared that the following members were elected to serve as the Officers and Council for the ensuing year:—*President*, E. J. Bunnett, M.A., F.E.S.; *Vice-Presidents*, K. G. Blair, B.Sc., F.E.S., and N. D. Riley, F.E.S., F.Z.S.; *Treasurer*, A. E. Tonge, F.E.S.; *Librarian*, A. W. Dods; *Curator*, S. R. Ashby, F.E.S.; *Assistant Curator*, T. L. Barnett; *Editor of Proceedings*, H. J. Turner, F.E.S.; *Hon. Secretaries*, Stanley Edwards, F.L.S., F.E.S., and Hy. J. Turner, F.E.S.; *Recorder*, L. E. Dunster; *Hon. Lanternist*, A. W. Dennis; *Council*, T. L. Barnett, A. A. W. Buckstone, L. E. Dunster,

O. R. Goodman, F.E.S., T. H. L. Grosvenor, F.E.S., H. A. Leeds, G. S. Robertson, M.D., E. Step, F.L.S., and E. Syms.

In the absence of the retiring President through illness, the Secretary read the general portion of the Annual Address, and Mr. N. D. Riley read the main portion entitled "Will-o'-the Wisp." (See p. 9.)

The new President, Mr. E. J. Bunnett, M.A., F.E.S., was then inducted to the chair.

Votes of thanks were passed to the retiring President, Council, Officers, and Auditors.

Ordinary Meeting.

Mr. E. J. Bunnett, M.A., F.E.S., President, in the chair.

Major C. E. Lyles, 6, Hyde Park Mansions, and Mr. J. H. Adkin, Whitecliffe Road, Purley, were elected members.

Mr. C. Cranfurd exhibited a specimen of *Aglais urticae* taken at Pickett's Hole, Ranmore, having two parallel pale straw-coloured widish streaks extending from the exterior of the dark basal shading to the fifth and sixth black marginal lunules of each hindwing upperside. This peculiar aberrational marking was in no way due to direct injury, as the normal scaling was quite perfectly developed over the whole area of the striping, but was deficient of all pigment.

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SOCIETY

1922-23

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1891 Hamm, A. H., F.E.S., 22, Southfields Road, Oxford. *l.*

1906 Hammond, L. F., Letchmere, Olden Lane, Purley. *l.*

1903 Hare, E. J., F.E.S., 4, New Square, Lincoln's Inn, W.C. 2. *l.*

1911 Harris, P. F., 13, Crawford Gardens, Cliftonville, Margate. *l.*

1920 Harvey, S. W., 28, Hillmore Grove, Sydenham, S.E. 26. *mi.*

1913 Haynes, E. B., 25, Denmark Avenue, Wimbledon, S.W. 19. *l.*

1923 Hayward, Capt. K. J., F.E.S., 492, High Road, Chiswick, W. 4. *l.*

1920 Hemming, A. F., F.Z.S., F.E.S., Treasury Chambers, Whitehall, S.W. 1, and 9, Victoria Grove, W. 8. *l.*

1922 Hobson, A. D., 16, Parliament Hill Mansions, Highgate Road, N.W. 5. *l.*

1920 Hodgson, S. B., 3, Bassett Road, N. Kensington, W. 10.

Year of Election.

1919 Humphreys, J. A., 29, Shirlock Road, Hampstead, N.W. 3. *l.*

1914 Jackson, W. H., F.E.S., "Pengama," 14, Woodcote Valley Road, Purley. *l.*

1922 Jobling, Boris, 52, Charleville Road, W. Kensington, W. 14.

1923 Johnstone, J. F., "Barringtons," Rayleigh, Essex. *l.*

1918 Johnstone, D. C., F.E.S., Brooklands, Rayleigh, Essex. *l.*

1920 Joicey, J. J., F.L.S., F.E.S., F.R.G.S., etc., The Hill, Witley, Surrey. *l.*

1920 Jump, A. C., 108, Trinity Road, Wandsworth Common, S.W.17.

1898 Kaye, W. J., F.E.S., Caracas, Ditton Hill, Surbiton, Surrey. *l, S. American l.*

1900 Kemp, S. W., B.A., Indian Museum, Calcutta. *l, c.*

1910 Kidner, A. R., The Oaks, Station Road, Sidcup, Kent. *l.*

1922 Leechman, C. B., 117, Whytecliffe Road, Purley, Surrey. *l.*

1914 Leeds, H. A., *Council*, 2, Pendcroft Road, Knebworth, Herts. *l.*

1919 Leman, G. C., F.E.S., Wynyard, 152, West Hill, Putney Heath, S.W. 15. *c.*

1919 Leman, G. B. C., F.E.S., Wynyard, 152, West Hill, Putney Heath, S.W. 15. *c.*

1922 Liles, Major C. E., 6, Hyde Park Mansions, N.W. 1. *l.*

1920 Lindeman, F., c/o Rio de Janeiro Tramway Light and Power Co., Caixa Postal 571, Rio de Janeiro, Brazil. *l.*

1922 Lock, A. K. (Miss), F.Z.S., 77, Grove Hill Road, Denmark Park, S.E. 5. *l.*

1896 Lucas, W. J., B.A., F.E.S., 28, Knight's Park, Kingston-on-Thames. *Brit. o., odonata, n, m, h.*

1921 Lyle, G. T., F.E.S., Briarfield, Stump Cross, Shibden, Halifax. *h.*

1892 Main, H., B.SC., F.E.S., F.Z.S., Almondale, 55, Buckingham Road, S. Woodford, E. 18. *l, nat. phot., col.*

1921 Mann, G. B. H., The Ingle Nook, Ashtead, Surrey.

1922 Mann, F. G., B.SC., A.I.C., Chemical Laboratories, Pembroke Street, Cambridge. *l.*

1889 Mansbridge, W., F.E.S., Dunraven, Church Rd., Wavertree, Liverpool. *l, c., etc.*

1922 Maples, Major S., Monkswood, Huntingdon. *l.*

1916 Mason, G. W., 99, Seaford Road, Ealing, W.5. *l.*

1922 Massee, A. M., Park Place, The Common, Sevenoaks, Kent. *l.*

1922 Meech, E., 119, Kempton Road, East Ham, E. 6. *l.*

1885 Mera, A. W., 5, Park Villas, Loughton, Essex. *l.*

YEAR OF ELECTION.

1881 MILES, W. H., F.E.S., Grosvenor House, Calcutta. Post Box 126. *mi, b.*

1889 MOORE, H., F.E.S., 12, Lower Road, Rotherhithe, S.E.16. *l, h, d, e l, e h, e d, mi.*

1910 MORFORD, D. R., 16, Spencer Road, Cottenham Park, Wimbledon, S.W. 20. *l.*

1911 MORICE, The Rev. F. D., M.A., F.E.S., Brunswick, Mt. Hermon, Woking. (*Life Member.*) *h.*

1920 MORISON, G. D., 100, Fielding Rd., Bedford Park, W. 4. *ec. ent.*

1920 MORRELL, H. A., Heathdene, Wordsworth Rd., Wallington, Surrey. *l.*

1923 MUNROE, J. W., D.SC., F.E.S., Green Lawn, Kew Road, Richmond, Surrey.

1923 MUTCH, J. P., "Mayfield," Church Road, Bexley Heath. *l.*

1923 NASH, W. G., "Clavering House," Bedford. *l.*

1906 NEWMAN, L. W., F.E.S., Salisbury Road, Bexley, Kent. *l.*

1918 NIMMY, E. W., F.E.S., 15, George Street, Mansion House, E.C. 4. *l.*

1911 PAGE, H. E., F.E.S., Bertrose, Gellatly Road, New Cross, S.E. 14. *l.*

1923 PARKER, F. A., 205, Lauderdale Mansions, Maida Vale, W.9. *l.*

1915 PEARSON, G. B., 812, Stevenson Avenue, Pasadena, California, U.S.A. *l.*

1908 PENNINGTON, F., Oxford Mansions, Oxford Circus, W. 1. *l.*

1887 PORRITT, G. T., F.L.S., F.E.S., Elm Lea, Dalton, Huddersfield. *l, n.*

1912 POULTON, PROF. E. B., D.SC., M.A., F.R.S., F.L.S., F.G.S., F.Z.S., F.E.S., Wykeham House, Oxford. (*Hon. Member.*)

1897 PREST, E. E. B., 1 and 2, Chiswell Street, E.C. 1. *l.*

1919 PRESTON, N. C., 32, Dancer Road, Fulham, S.W. 6. *l.*

1904 PRISKE, R. A. R., F.E.S., 9, Melbourne Avenue, W. Ealing, W. 5. *l, m.*

1919 QUILTER, H. J., Fir Cottage, Kiln Road, Prestwood, Great Missenden. *l, c, d, mi.*

1922 RAIT-SMITH, W., F.E.S., Birkby House, Bickley Park, Kent. *l.*

1922 RATTRAY, Col. R. H., 68, Dry Hill Park Road, Tonbridge, Kent. *l.*

1902 RAYWARD, A. L., F.E.S., c/o T. N. Rayward, The Glen, Wroxall, nr. Bristol, and 16, Churchill Road, Boscombe, Bournemouth. *l.*

YEAR OF ELECTION.

1887 RICE, D. J., 8, Grove Mansions, North Side, Clapham Common, S.W. 4. *orn.*

1920 RICHARDSON, A. W., F.E.S., 28, Avenue Road, Southall, Middlesex. *l.*

1902 RILEY, Capt. N. D., F.E.S., F.Z.S., *President*, 5, Brook Gardens, Beverley Road, Barnes, S.W. 13. *l.*

1919 ROBERTS, J. G., 1, Segary Villas, Hadley Road, New Barnet.

1910 ROBERTSON, G. S., M.D., Bronllys, 72, Thurlow Park Road, Dulwich, S.E. 21. *l.*

1922 ROBERTSON, W. J., M.R.C.S., L.R.C.P., F.Z.S., 69, Bedford Road, S.W. 4. *l.*

1911 ROBINSON, Lady MAUD, F.E.S., Worksop Manor, Notts. *l, n.*

1920 ROTHSCHILD, The Right Hon. LORD, D.SC., F.R.S., F.L.S., F.Z.S., F.E.S., Tring, Herts. *l.* (*Life Member.*)

1887 ROUTLEDGE, G. B., F.E.S., Tarn Lodge, Heads Nook, Carlisle. *l, c.*

1890 ROWNTREE, J. H., Scalby Nabs, Scarborough, Yorks. *l.*

1921 RUGGLES, Hy., 146a, Southfield Road, Bedford Park, W. 4.

1915 RUSSELL, S. G. C., F.E.S., Roedean, The Avenue, Andover Junction, Hants. *l.*

1908 STAUBYN, Capt. J. S., F.E.S., Sayescourt Hotel, 2, Inverness Terrace, Bayswater, W. 2.

1914 SCHMASSMANN, W., F.E.S., Beulah Lodge, London Road, Enfield, N. *l.*

1910 SCORER, A. G., Hillcrest, Chilworth, Guildford. *l.*

1922 SEABROOK, Lieut. J. C., F.E.S., 8, West Warwick Place, Belgravia, S.W. 1. *l.*

1911 SENNETT, Lieut. NOËL S., (R.N.V.R.), F.E.S., 43, Pembroke Square, Kensington, W. 8. *c.*

1910 SHELDON, W. G., F.Z.S., F.E.S., "West Watch," Limpsfield, Surrey. *l.*

1898 SICH, ALF., F.E.S., Corney House, Chiswick, W. 4. *l.*

1920 SIMMS, F. H., The Farlands, Stourbridge.

1920 SIMMS, H. M., B.SC., F.E.S., The Farlands, Stourbridge.

1903 SMALLMAN, R. S., F.E.S., Eliot Lodge, Albemarle Road, Beckenham, Kent. *l, c.*

1921 SMART, Major, H. D., R.A.M.C., M.D., D.SC., F.E.S., Shelley, Huddersfield. *l.*

1908 SMITH, B. H., B.A., F.E.S., Frant Court, Frant, nr. Tunbridge Wells. *l.*

Year of Election.

1922 Seth-Smith, D. W., 34, Elsworthy Road, N.W. 3. *l.*

1920 Smith, S. Gordon, F.E.S., F.L.S., Estyn, Boughton, Chester. *l.*

1890 Smith, William, 13, St. Mirren Street, Paisley. *l.*

1882 South, R., F.E.S., 4, Mapesbury Court, Shoot-up-Hill, Brondesbury, N.W.2. *l, c.*

1908 Sperring, C. W., 8, Eastcombe Avenue, Charlton, S.E. 7. *l.*

1920 Stafford, A. E., 98, Cowley Road, Mortlake, S.W. 14.

1921 Staniland, L. N., F.E.S., Trewint, Coppett's Road, Muswell Hill, N. 10. *ec. ent.*

1872 Step, E., F.L.S., 158, Dora Road, Wimbledon Park, S.W. 19. *b, m, er*; *Insects, all Orders.*

1916 Stewart, H. M., M.A., M.D., 123, Thurlow Park Road, Dulwich, S.E. 21. *l.*

1922 Stokes, C. H. H., 107, Queen's Road, Upper Norwood, S.E. 19. *ent. bot.*

1923 Stolzle, G. A. W., 15, Benson Road, Forest Hill, S.E. 23. *l.*

1923 Stolzle, R. W., 15, Benson Road, Forest Hill, S.E. 23. *c.*

1910 Stoneham, Capt. H. F., F.E.S., M.B.O.U., 4th Battn. King's Rifles, Bomba, Uganda, B. E. Africa. *l.*

1911 Stowell, E. A. C., B.A., Eggars Grammar School, Alton, Hants.

1920 Swift, R., Cilmory, Knoll Road, Bexley. *l.*

1916 Syms, E. E., F.E.S., *Council*, 22, Woodlands Avenue, Wanstead, E. *l.*

1920 Talbot, G., F.E.S., The Hill Museum, Witley. *l.*

1922 Tams, W. H. T., F.E.S., 19, Sulivan Road, Hurlingham, S.W. 6. *l.*

1891 Tarbat, Rev. J. E., M.A., The Vicarage, Fareham, Hants. *l, ool.*

1913 Tatchell, L., F.E.S., Swanage, Dorset. *l.*

1902 Tonge, A. E., F.E.S., *Hon. Treasurer*, Aincroft, Grammar School Hill, Reigate. *l.*

1887 Turner, H. J., F.E.S., *Hon. Editor*, 98, Drakefell Road, New Cross, S.E. 14. *l, c, n, he, b.*

1922 Vallins, F. T., 372, Sherrard Road, Manor Park, E.12. *l.*

1921 Vernon, J. A., Lynmouth, Reigate, Surrey. *l.*

1921 Vesterling, A. W., 107, Castle Street, Battersea, S.W. 11. *l.*

1889 Wainwright, C. J., F.E.S., "Daylesford," Handsworth Wood, Birmingham. *l, d.*

1911 Wakely, L. D., 11, Crescent Road, Wimbledon Common, S.W. 19. *l.*

Year of Election.

1880 Walker, Comm. J. J., M.A., F.L.S., F.E.S., "Aorangi," Lonsdale Road, Summertown, Oxford. *l, c.*

1920 Watson, D., "Stewart House," 27, Overcliffe, Gravesend.

1922 Watson, E. B., F.E.S., Winthorpe Grange, Newark, Notts. *l.*

1911 Wells, H. O., Inchiquin, Lynwood Avenue, Epsom. *l.*

1922 West, A. G., Clive Road, West Dulwich, S.E. 21. *l.*

1920 West, W., 29, Cranfield Road, Brockley, S.E.

1911 Wheeler, The Rev. G., M.A., F.Z.S., F.E.S., "Ellesmere," Gratwicke Road, Worthing. *l.*

1920 Wightman, A. J., 35, Talbot Terrace, Lewes, Sussex. *l.*

1914 Williams, B. S., St. Genny's, Kingscroft Road, Harpenden. *l, c, hem.*

1912 Williams, C. B., M.A., F.E.S., Ministry of Agriculture, Cairo, Egypt. *l, ec. ent.*

1923 Windsor, P. H., Fern Hill, Horley, Surrey. *l.*

1920 Withycombe, C. L., M.Sc., F.E.S., *Council*, 12, Prospect Hill, Walthamstow, E. 17. *l, b, n, mi.*

1918 Wood, H., Albert Villa, Kennington, near Ashford, Kent. *l.*

1921 Worsley-Wood, H., 31, Agate Road, Hammersmith, W. 6. *l.*

1920 Young, G. W., F.R.M.S., 20, Grange Road, Barnes, S.W. 13.

Members will greatly oblige by informing the Hon. Sec. of any errors in, additions to, or alterations required in the above Addresses and descriptions.

Additions.

1921 Baker, G. S., 7, Fawcett Road, W. Brompton, London, S.W.10. *l.*

1923 Freeman, C. A., 54-5, Coleman Street, E.C.2. *l.*

1923 Holding, A., 95, Kyverdale Road, Stoke Newington, N.16. *l.*

1923 Jacobs, S. N. A., 5, Exbury Road, Catford Hill, S.E.6. *micro. lep.*

1923 Windsor, F. S., Oatlands Cottage, Horley, Surrey. *l.*

THE SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

STATEMENT OF ACCOUNTS FOR THE YEAR 1921.

REVENUE ACCOUNT.

Expenditure.	£	s.	d.	£	s.	d.
To Rent	25	0	0			
,, Fire Insurance	1	6	6			
,, Attendance	2	10	0			
,, British Oxygen Co...	1	14	3			
,, Lantern limes		4	6			
,, Hire of chairs	1	6	0			
,, Subscriptions :—				32	1	3
South-Eastern Union of S. Societies		15	0			
Footpaths Preservation Society..		10	6			
,, Postages, Stationery & sundries :—				1	5	6
Secretaries	9	10	0			
Treasurer		17	6			
				10	7	6
,, Jubilee Supper account				31	17	6
,, Entrance fees to Suspense a/c ..				2	17	6
,, Vote to Publication Fund				38	0	0
,, Credit Balance				13	2	8
				£129	11	11

Income.	£	s.	d.	£	s.	d.
By Credit Balance brought forward				8	11	5
,, Subscriptions :—						
Current	60	7	6			
Advance	14	18	9			
Arrears	6	10	0			
				81	15	6
,, Entrance fees				2	17	6
,, Dividends				4	0	0
,, Jubilee Supper				32	7	6
				£129	11	11

ENTRANCE FEES AND LIFE-MEMBERSHIP SUBSCRIPTIONS ACCOUNT.

	£	s.	d.
To Purchase of £40 National War Bond, 4th Series, 1929, at 103	41	10	10
,, Credit Balance	26	8	3
	£67	19	1

	£	s.	d.	£	s.	d.
By Credit Balance brought forward				47	16	0
Sale of Duplicate Lantern Screen	1	0	0			
Exhibition Cases	5	5	0			
Books (Ashdown bequest) ..	11	0	7			
				17	5	7
,, Entrance fees, 1922				2	17	6
				£67	19	1

LIBRARY FUND.

	£ s. d.		£ s. d.
To Andrews—Binding	1 18 6	By Credit Balance brought forward	11 2
,, Postages, Returns, etc.	9 4	,, Fines	3 4
,, Credit Balance	18 0	,, Sale of Proceedings	2 11 4
	£3 5 10		£3 5 10

PUBLICATION FUND.

	£ s. d.		£ s. d.
To printing Transactions	51 18 4	By Balance brought forward	16 10
,, Balance	16 0	,, Donations	13 17 6
		,, Vote from General Fund	38 0 0
	£52 14 4		£52 14 4

BALANCE SHEET.

Liabilities.	£ s. d.		*Assets.*		£ s. d.
To Balance, being excess of assets over liabilities ..	148 4 11	By Credit balances—			
		,, General Fund		13 2 8	
		,, Suspense a/c..		26 8 3	
		,, Library Fund		18 0	
		,, Publication Fund		16 0	
		,, Investments at Cost :—			41 4 11
		£100 of 5% National War Bonds	.. ..		99 10 0
		,, Subscriptions in arrear :—			
		Good		3 10 0	
		Doubtful	9 10 0	4 0 0	7 10 0
	£148 4 11				£148 4 11

Audited, Examined and found correct, this 13*th January*, 1923.

EDWARD STEP,
T. W. HALL, } *Auditors.*

REPORT OF THE COUNCIL, 1922.

THE Council, in presenting the fifty-first Annual Report, is pleased to be able to state that the Society is in a more satisfactory condition than it has been for many years, as the membership is now 211, made up as follows :—184 Full Members, 17 Country, 4 Honorary, and 6 Life. The Council regrets to say that there have been five deaths. Lachlan Gibb, A. Horne, H. Rowland-Brown, V. R. Perkins, and G. Storey.

Lachlan Gibb joined the Society in 1884, and although his frequent visits to Montreal on account of business made his attendance somewhat irregular, he had always taken a very keen interest in the Society's work, and was a regular contributor to the publication fund. In his will he bequeathed £200 to the funds of the Society.

A. Horne, who joined the Society in 1889, died last September, aged 60; living in Aberdeenshire prevented him from attending our meetings. He had a collection remarkable for the length of the series of varieties of individual species of British Lepidoptera.

H. Rowland-Brown, who joined the Society in 1904, died after a long illness from heart complaint, much missed by all who knew him; he was Secretary of the Entomological Society of London for eleven years; his knowledge of European Rhopalocera was great, and he wrote a book on them illustrated with plates.

V. R. Perkins joined the Society in 1880; living for many years in Gloucestershire prevented him from attending the meetings, but while he was resident in London he was very regular in attendance, and a Past President.

Gilbert Storey joined in 1913, going shortly after to Cairo, to the Dept. of Agriculture as Economic Entomologist.

The Council have to regret the resignations of Messrs. C. S. Baker, Major P. A. Cardew, W. P. Colhoun, C. N. Freeman, E. M. Gibb, A. Holding, and L. Robinson.

This year being the 50th anniversary of the Society, your Council decided that the fact should be celebrated by the election of Mr. G. C. Champion, A.L.S., F.E.S., one of the founders of the Society in 1872, as an Honorary Member, and also by a Pocket-box Exhibition and supper, which was held on October 19th, at the Holborn Restaurant. In the absence of the President and of Mr. Step, the oldest member of the Society, who was away on business, Mr. R.

Adkin, the member of next longest standing, presided. Seventy-five members and former members and their friends sat down, including Mr. G. C. Champion.

Those present were much indebted to Mr. Percy Richards for undertaking the musical arrangements.

A Special Exhibition of Orders other than Lepidoptera was held on September 14th, with more exhibits than on previous occasions.

The Annual Exhibition was held on November 23rd, between 180 and 190 being present, the highest number yet recorded.

The Lantern has been used on several occasions, Mr. Dennis proving a very efficient hon. lanternist.

The following Papers have been read before the Society :—

1. "Spiders of Oxshott," by Mr. W. S. Bristowe.
2. "Symbiosis of Fungi with the Fertilisation of Orchids," by Mr. J. Ramsbottom.
3. "British Coccids," by Mr. E. E. Green, F.E.S.
4. "Lepidopterous Enemies of Man," by Mr. R. Adkin, F.E.S.
5. "Birds' Nests of India," by Col. R. H. Rattray.
6. "*Diacrisia mendica* its History and its Varieties," by Mr. R. Adkin, F.E.S.
7. "The 2nd Maxillae of the Odonata, more especially the Mask of the Naiad Stage," by Mr. W. J. Lucas, B.A., F.E.S.
8. "Notes on the *Zygaenidae*," by Mr. T. H. L. Grosvenor, F.E.S.
9. "The Geological History of Insects," by Mr. G. W. Young, F.R.M.S.

Lantern slides were shown on most of these occasions.

The Honorary Curator reports that during the past year additions to the Society's Collections have been made by Messrs. R. Adkin, Rev. C. R. N. Burrows, F. W. Enefer, T. H. L. Grosvenor, L. N. Staniland, and Miss Dunster. Mr. K. G. Blair has very kindly named and arranged the Society's Collection of Neuroptera, consisting of specimens presented by Messrs. C. A. Briggs, W. T. Ashdown, T. B. Farmer, and Stanley W. Kemp. He also added several specimens not represented.

The Honorary Librarian reports that members have again fully appreciated the library by the frequency of their consultation. A number of surplus and duplicate books have been disposed of.

Field meetings were held at Ranmore Common, Horsley, Eastbourne (a whole day outing, when Mr. R. Adkin conducted and

entertained the party at his house at Meads), and a Fungus Foray and Larvae-beating outing at Ockham and Wisley.

Messrs. Stanley Edwards and H. J. Turner were your Delegates at the Congress of the South-Eastern Union of Scientific Societies, held at Southampton in June.

The volume of Proceedings for 1921-22, published during the past year, consists of xvi. and 104 pages.

The following is a list of the additions to the Library during the year, by exchange unless otherwise stated.

Books.

"North American Gulls"; "King Snakes"; "Foramifera of Philippine Islands"; "The Tertiary Spiders of North America"; "A Monograph of the existing Crinoids"; "Foraminifera of the Atlantic Ocean"; "Catalogue of the Collection of Gems in the U.S. National Museum"; "Manual of the American Shipworms"; "The Decapod Crustacea of Bermuda: Macrura"; "Trees and Shrubs of Mexico" (the United States National Museum); "Genitalia of the British *Tortricidae*," by Messrs. Pierce and Metcalf, from Mr. R. Adkin.

Magazines and Periodicals.

"Entomologist"; "Entomological News"; "Entomologist's Monthly Magazine"; "Irish Naturalist"; "Canadian Entomologist"; "Essex Naturalist"; "Entomologische Mitteilungen": "Philippine Journal of Science"; "List of Additions to the U.S. National Herbarium"; "Notula Entomologica"; "Bulletin of the Société éntomologique de France"; "Entomologish Tidskrift," Stockholm.

Reports and Transactions of Societies.

Proceedings and Transactions of the Croydon Science Society; Transactions and Proceedings of the Perthshire Society of Natural Science; Report of the Conference of the Delegates of Corresponding Societies of the British Association; Annual Report of the Smithsonian Institute, 1920 and 1921; Report of the Progress of the U.S. National Museum; The London Naturalist; Bulletin of the Hill Museum, Pt. I., from J. J. Joicey; Annual Report of the Haslemere Science Society; Proceedings of the Bournemouth Natural Science Society; The Hastings and E. Sussex Naturalist; The South-Eastern Naturalist (S.E.U.S.S.); Chicago Field Meet-

ings of Natural History; Bolletins R. Scuola d'Agricoltura, Portici, Italy; Proceedings of the I. of Wight Natural History and Science Society; Proceedings of the Hampshire Field Club; Annales de la Société entomologique de France; Proceedings of the U.S. National Musum, vols. 58 and 59; Transactions of the Leicester Literary and Philosophical Society.

Pamphlets and Separata.

"Five years of Bionomics of S. African Insects," by Prof. E. B. Poulton, F.R.S. (Author); "An 18th Century Naturalist, Dru Drury," by Prof. T. D. A. Cockerell, F.E.S. (Author); "Fossil Arthropods," by Prof. Cockerell (Author); "Orchid Mycorrhiza," by J. Ramsbottom (Author); "Considerations sur l'Etre," 2 pts., by Prof. Janet (Author); "Handbook to Horniman's Museum (L.C.C.); "A Study in Variation," by H. Gilmore (Author); "Fossil Insecta," 7 parts, by Prof. Cockerell (Author); "List of Haslemere Birds"; "Papilio polytes in India," by Prof. E. B. Poulton, F.R.S. (Author); "Fossil Arthropoda in the British Museum," by Prof. Cockerell (Author); "Fossil Homoptera in the Isle of Wight," by Prof. Cockerell (Author); "Colorado numerous Publications," by Prof. J. D. A. Cockerell (Author).

TREASURER'S REPORT, 1922.

The accounts for the year ending December 31st, 1922, show, I am glad to say, a further advance in the relation of regular income to regular expenditure, which is very gratifying, although the actual increase is covered by the reduction in the cost of printing the Proceedings, as a drop of £5 in our income from the sales of proceedings neutralises the advance of £5 shown under the head of current subscriptions and dividends.

We are still over £20 a year short of being in a self-supporting condition, the difference being made up by donations to the Publication Fund, £13 17s. 6d., and subscriptions paid in advance £14 18s., but I hope that, before I present another balance sheet, we shall have received the very handsome bequest of £200, made to the Society under the will of our late member, Mr. Lachlan Gibb, which should, when invested, bring in an annual income of £10, and reduce our shortage by one half.

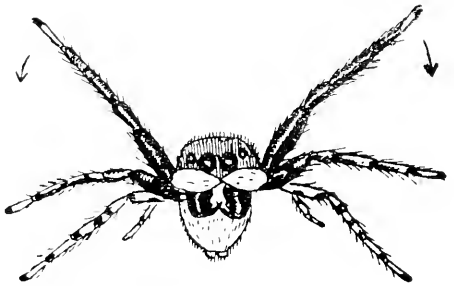
More subscriptions have been paid in advance than was the case last year, but I am sorry to say that there has been no improvement in the matter of arrears, as an even larger number of current subscriptions are still outstanding, and I should like to remind the 28 members, who are responsible for these, of the announcement I made last year in regard to payments through banks, in order to relieve me from extra work entailed by their forgetfulness. I have a number of Banker's payment forms by me, and shall be glad to supply them on application.

During the year a further sum of £40 has been invested in 5% National War Bonds on behalf of the Society, making a total of £100 in all, and these are worth at to-day's price a trifle more than the cost. Further sales of apparatus and duplicate books, received under the Ashdown bequest, have brought in £16, and entrance fees £2 17s. 6d., which has enabled us to carry forward a balance of over £26 to the credit of suspense account, which will be available for further investment.

The balance sheet shows the position of the Society to be increasingly strong, and that our excess over liabilities is increased by £25 compared with 1921. Many thanks are due to those members who have so kindly assisted the publication fund with donations, and to the Officers and Council for their continued assistance during the past year.

The items shown in the various accounts are as follows, having been carefully gone through and passed as correct by your auditors, Messrs. T. W. Hall and E. Step.

1



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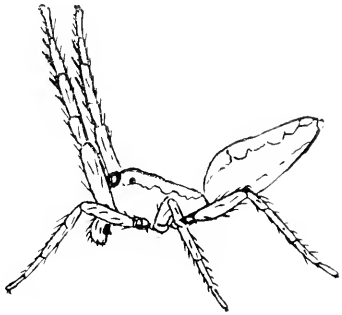

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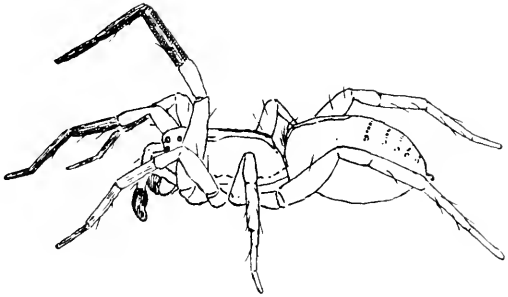
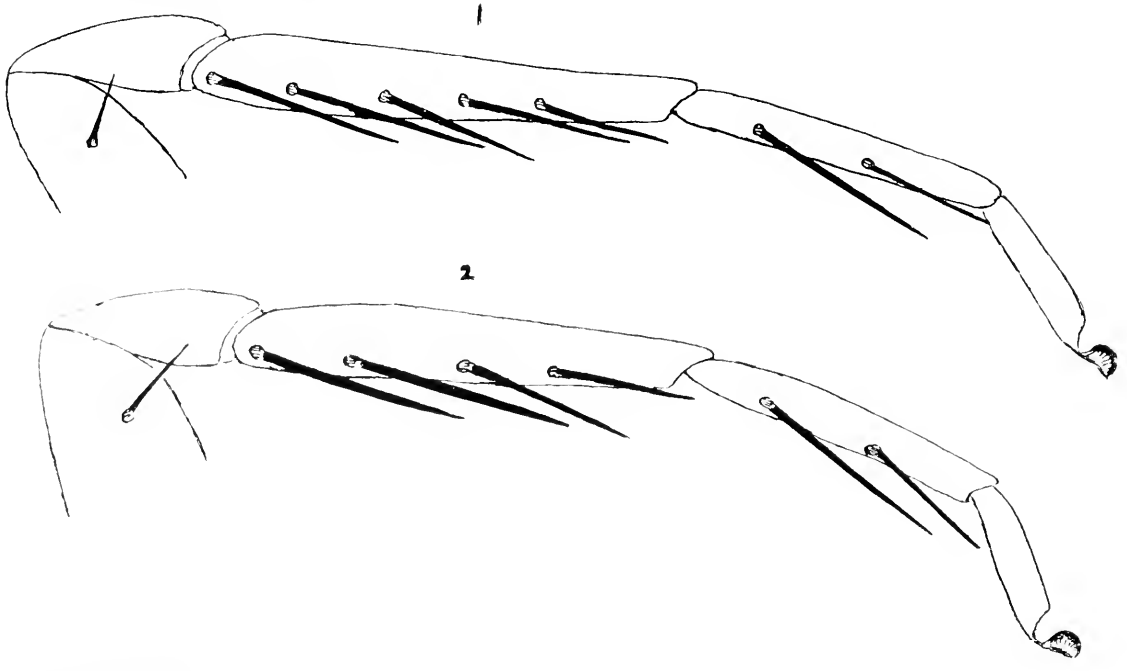


W. S. Bristowe, del.

1 & 2. EUOPHRYS FRONTALIS.
Male going through mesmeric movements before female.

3. MARPESSA MUSCOSA.
Male raises his front legs and body and rapidly skips from side to side.

4. TROCHOSA RURICOLA.
Male raises first one quivering leg and then the other.



W. S. Bristowe, del.

1. OONOPS DOMESTICUS. Tibia 1st leg, 5 spines. New to Britain.
2. OONOPS PULCHER. Tibia 1st leg, 4 spines.

Spiders Found in the Neighbourhood of Oxshott.

By W. S. Bristowe.—*Read March 23rd*, 1922.

I should perhaps start by saying that I do not intend to confine myself entirely to the spiders of Oxshott for two very good reasons. One is that I have never collected there with the idea of drawing up a list, so that many common species occurring there have not been noted, the other reason is that collections have been made in neighbouring places, and in many cases there is no reason why these spiders should not turn up at Oxshott as well. Apart from this a very good reason for including a list of Surrey spiders at the end of this paper is the fact that only one list, and that a very incomplete one, has ever been published.* Of the 244 species here given 50 have not been recorded previously, I believe, from the county, and one is new to Britain, the male sex being new to science. More hunting is sure to add considerably to this list.

It is unfortunate that some of the most forbidding members of the group should so tactlessly enter our bed-rooms at night uninvited (*Tegenaria*), for this is one of the chief grounds for the hatred of spiders. It is also unfortunate that the more beautiful forms are hard to find unless sought for in the right way, as the average person judges the whole group by the conspicuous and unpleasant species. By beating gorse at Oxshott, or elsewhere for instance, we may get several spiders not easily collected in any other way. Besides some fat *Epeiridae* (the family to which the round-webbed Garden-Spider belongs), and "Money-Spiders," included in the family *Theridiidae*, there are certain to be some *Xysticidae* (Crab-Spiders)—*Philodromus aureolus*, a rapid mover, *Xysticus cristatus*, and *X. pini*, stouter and more pompous in movement —we may find a large bright yellow crab-spider. This is *Misumena vatia*, the flower-spider. It sits in flowers usually of the same colour as itself and preys on insects which come to visit the flower. This is one of the many good examples of "Protective Resemblance" in spiders. *Micrommata virescens*, one of our finest species, is bright green, and very hard to see in the grass, amongst which it roams. I have found this at Wellington College, Berkshire, and it should turn up in the Woking-

* *Victoria History of the Counties of England. Spiders* by O. P. Cambridge.

Bagshot direction if hunted for. *Epeira gibbosa* is a humpy black spider, which sits on pine twigs at Oxshott, and looks very much like a little wooden lump. *Epeira cucurbitina* is green, and sits amongst the green pine needles. The light mottled markings of *Trochosa picta* make it almost invisible on the sandy paths where it hunts its prey. The grey body of the jumping spider, *Marpessa muscosa*, is very inconspicuous on the pine trunks. There is the rare and bold *Salticus formicarius*, which very much resembles the ants with which it lives. Then there are other small spiders which inhabit ants' nests and which do not resemble ants. The ants seem to tolerate them, and in return the spiders get protection. Protection from what? We probably do not often think of spiders having enemies, yet they have vast numbers of very terrible foes. Ants destroy large numbers, so any spiders which can make peace with them do well. Solitary wasps account for large numbers. *Psammochares viaticus* is a common red and black bodied wasp at Oxshott, and on sunny days it may be seen busily hunting for spiders. *Trochosa terricola* is its special prey. This is a large grey-brown wolf-spider. Occasionally *Tarantula barbipes* and *Trochosa picta* are taken instead. The paralysed spiders are buried together with an egg of the wasp, which soon hatches and feeds on the fresh meat provided. Other and perhaps even more terrible enemies of the spiders are ichneumons. Many content themselves with laying their eggs in the spider's egg cocoons, but some bolder ones go so far as to lay an egg on the body of the spider itself, in the small of the back as it were, just where the victim cannot reach it. [1.] The spider goes about as usual for some time, though it does not moult again, but finally, just before the ichneumon larva pupates, the spider dies. There are many other formidable enemies, but the ones mentioned above will serve to show what a great advantage a spider which resembles its surroundings has over one which does not. If *Trochosa picta* was as conspicuous as *Trochosa terricola* the wasp *Psammochares viaticus* would probably attack it as often as the latter, but as things are it is a very rare occurrence.

By pulling up heather growing on banks at Oxshott we may be able to see an earthy tube, about two inches in length, lying along the surface. If we dig around this it will be found to extend down into the ground to a distance of perhaps six or more inches, and inside it, at the bottom, a spider will be found of a very peculiar shape. It has short plump legs, and on examination it will be found to have large jaws working downwards instead of horizontally as in the case of other spiders. It does, in fact, belong to an entirely different group to any other British spider. It belongs to the group which includes all the large hairy tropical spiders and Trap-Door Spiders. The burrow of our spider merely consists of a closed silken tube, which it never leaves. In habits it is nocturnal, and when an insect walks over the exposed surface it transfixes it with

its powerful jaws and hauls it through the tube, returning to repair it later. As the spider does not leave its nest it will appear at first to have a very small hunting ground—merely two inches of tube lying along the ground—but two aiding factors must be mentioned. Branch tubes are sometimes formed, thus increasing the hunting area. It will be found that many of these keep below the surface, which at first sight would appear to make them useless, but when one finds one of them eating a worm our opinion changes. To what extent this habit goes on we do not yet know. Another factor to be taken into account is the richness of the fauna under the heather on these banks. There are large numbers of insects and several other kinds of spiders. *Peponocranium ludicrum* is a little yellow spider with a very queer projecting lump on its head in the male sex. *Tapinopa longidens* makes a little shiny web across depressions in the ground. *Macrargus rufus* is a black-bodied spider with a red cephalothorax. *Trochosa terricola*, the large wolf-spider, which is hunted by the solitary wasp. Two species of *Euophrys* (Jumping-spiders) (one of which I have not found in the adult state, so cannot definitely record—probably *E. petrensis*), and many other species, all occur under heather.

The water-spider is found in the Black Pool at Oxshott, and around its borders several spiders of interest occur. There are three species of *Pirata* (Wolf-spiders). The largest one, *P. piscatoria*, makes a silken tube, open at each end, going down into moss by the water's edge, and if disturbed it can escape from the bottom by diving into the water and climbing along water plants below the surface. So the water-spider is not the only member of the group which can brave the water. *Dolomedes fimbriatus*, the so-called Raft-spider, is another semi-aquatic form. This chocolate-brown species is the largest British spider, and it should turn up in marshy places in Surrey, as I have taken it not very far away in Berkshire. Seeing all these spiders capable of taking down air with them under water, caught by the hairs of the body and legs, made me wonder whether they were specially adapted, or whether it was merely a matter of trial, so I collected various land spiders and pushed them under the surface. I found that they automatically took air down with them entangled in the hairs of their body. I went further with a young *Tegenaria* (House-spider). I kept on pushing it under until a larger bubble than usual was caught, and then I held it under. It walked about, and did not seem to be any the worse for two or three hours, by which time the bubble had been used up. So the semi-aquatic and aquatic spiders must first have experimented, possibly diving from an enemy as the Lycosids do now, and having found the life a success kept to it. A point of interest is that a spider like *Tegenaria* is helpless if thrown on the water, and can live much longer if pushed right under.

Spiders are very short-sighted, though most of them possess eight

eyes. There are two kinds—white or nocturnal eyes, black or diurnal. One small group only possesses six, and it is to this group that a spider, which I am now recording for the first time, belongs. There is a small brick-red spider, to be found under heaps of tiles at Cobham, called *Oonops pulcher*. It is fairly common in England, and has been recorded wrongly from the continent. In houses at Cobham I have collected several individuals of a closely allied species, adults occurring of both sexes in the autumn and through the winter on the walls at night. This has turned out to be *Oonops domesticus*, a female of which was once found in a Paris bookshop. The best methods of distinguishing the two species are by the difference in habitat and the number of spines on the front legs.

Tibia of *O. pulcher* has 4 spines.

Tibia of *O. domesticus* has 5 spines.

We have mentioned representatives of the family *Xysticidae* (Crab-spiders). Our admiration should centre around the males of this group, for, although they are smaller than their bad-tempered spouses, they do not stand any nonsense but seize the latter roughly by a leg with their jaws. Then, in one species at any rate (*Xysticus cristatus*), the male actually ties her to the ground with silken threads before mating with her. I hope soon to publish a paper dealing with this subject; but I might mention here, without attempting to explain it, a queer movement of the leg spines. When the palpal bulb is expanded these stand out at right angles to the leg, returning to their normal position along it on the collapse of the bulb.

The *Lycosidae* (Wolf-spiders) live by hunting, so their eyes have become developed, and, as though in consequence, the males are smartly decked out, and they show off their charms to the female before mating. Taking *Trochosa ruricola* as an example, we find that some of the joints in his front legs are enlarged and jet black in colour, and these he takes very good care to show to the female, raising and waving them alternately in front of her in a very queer manner.

In the family *Salticidae* (Jumping-spiders) sight, and with it male decorations, is increased. So is the quality of dances. The male of *Marpessa muscosa* raises his fine front legs and his abdomen, and in this attitude does a rapid two-step, first to one side and then to the other. In *Euophrys frontalis* he seems to charm his wife by mesmerism. His large bright eyes are on a dark background, and he moves his light yellow palps up and down in front of them. At the same time he slowly raises his fine pair of black legs and then lowers them sharply to the ground again.

In conclusion, I should like to say that I feel sure this list of spiders will be greatly swelled if collections are made in various parts of the county; and it is my hope that this paper may at any rate attract a little attention to this very neglected group. Per-

sonally, I have always been interested in spiders ever since my sporting instincts developed at the age of four, and I used to hold gruesome combats, but I should like here to express my great gratitude to Dr. A. Randell Jackson, who did much to set me on a scientific basis, and has always shown me the utmost kindness in identifying spiders. Those which I believe to be recorded from Surrey for the first time are marked *.

Most of my collecting has been done at Oxshott, Cobham, Bookham, Ripley, Horsley, and Box Hill. These are abbreviated thus: Ox., Cob., Book., Rip., Hors.

Spiders with O.P.C. after them are included on the authority of the late Rev. O. P. Cambridge. Those with F.P.S. on that of F. P. Smith.

Pseudo-scorpions and Harvest spiders are usually connected in lists with spiders, so, as there are not a great number, I append lists of these beasts as well.

Fam. Theraphosidae.

Atypus affinis, Eich.—So-called Trap-Door Spider, Ox., Rip.

Fam. Dysderidae.—6 eyes, nocturnal, enclosed in silken cells.

Dysdera cambridgii, Th.—Under heather, Ox., Rip.
,, *crocota*, C.L.K.—Under stones, Hors., Cob.
Harpactes homberyii, Scop.—Under bark, Cob., Box Hill. Under heather, Rip.
Segestria senoculata, Linn.—Under bark, Ox.
**Oonops pulcher*, Templ.—Under heap of tiles, Cob.
* ,, *domesticus*. Dal.—Indoors at night, Cob. This species is new to Britain; identified by Dr. A. Randell Jackson.
Ischnothyreus velox, Jackson.—Kew (Dr. Jackson)
Diblemma donisthorpei, Camb.—Kew (O.P.C.) } Imported.

Fam. Drassidae.

Drassodes lapidosus, Walck.—Under tiles, stones, bark, etc., Cob.
,, *troglodytes*, C.L.K.—Woking (O.P.C.).
,, *sylvestris*, Bl.—Woking (O.P.C.).
,, *macer*, Thor.—Kew (O.P.C.).
Prosthesima latreillii, C.L.K.—Under stones, Box Hill.
,, *nigrita*, Fabr.—Richmond (O.P.C.).
Scotophoeus blackwallii, Th.—In houses, Cob.
Micaria pulicaria, Sund.—Under stones. Sometimes runs with ants. [2.] Cob.
Clubiona terrestris, Westr.—Cob.
,, *comta*, C.L.K.—Beaten, Ox., Book., Box Hill.
,, *trivialis*, L.K.—Heather, Ox., Rip.
,, *pallidula*, Clerck.

Clubiona holosericea, De Geer.—Dead reeds, gateposts, Ox., Cob.
,, *brevipes*, Bl.—Under bark, Cob., Hors., Book.
,, *corticalis*, Walck.-Bl.—Under bark, Ox., Cob., Box Hill.
,, *diversa*, Cambr.—Cob.
,, *lutescens*, Westr.—Cob., Box Hill.
,, *reclusa*, Cambr.—Beaten, Box Hill. Under bark, Cob.
,, *neglecta*, Cambr.—Kew (O.P.C.).
* ,, *grisea*, L.K.—Book.
Chiracanthium carnifex, Fabr.—Curled leaves, Ox., Ranmore Common.
* ,, *lapidicolens*, Sim.—Hors.
Zora maculata, Bl.—Under heather, Ox., Rip.
Anyphoena accentuata, Walck.—Beaten, Book., Box Hill.
Agroeca brunnea, Bl.—Rip.
,, *celans*, Bl.—Sanderstead (F.P.S.).
,, *gracilipes*, Bl.—Shirley (F.P.S.).

Fam. Dictynidae.

Dictyna arundinacea, Linn.—Ox.
,, *pusilla*, Westr.—Ox., Box Hill.
,, *uncinata*, Westr.—Book., Hors.
,, *latens*, Fabr.—Book., Hors.
,, *viridissima*, Walck.—Box Hill (Dr. Jackson).
Protadia subnigra, Cambr.—Croydon (F.P.S.).
**Lethia humilis*, Bl.—Beaten, Cob., Box Hill.
Amaurobius ferox, Walck.—Indoors, Cob., Rly. Arch, Surbiton.
,, *similis*, Bl.—Cracks in walls, Cob.
,, *fenestralis*, Str.—Under bark, Ox.

Fam. Agelenidae.

Coelotes terrestris, Wid.—Under stones or in banks, Ox., Cob.
,, *atropos*, Walck. ?—Hors. (F.P.S.).
Argyroneta aquatica, Latr.—Water-spider, Ox.
Tegenaria atrica, C.L.K.—Banks, Box Hill.
,, *derhamii*, Scop.—Outhouses, Cob.
,, *parietina*, Fourcr.—Houses.
,, *sylvestris*.—Banks near Cob.
Tetrilus arietinus, Thor.—*Formica rufa* nests, Ox. (Donisthorpe).
Cicurina cinerea, Panz.—Under a tub, Cob.
Textrix denticulata, Oliv.—Hors. (F.P.S.).
Agelena labyrinthica, Clerck.—Gorse, grass, Ox., Book.
Antistea elegans, C.L.K.—Damp ground, Rip., Ox.
Cryphoeca diversa, Thor.—*Lasius fuliginosus* nests, Ox.
Hahnia helveola, Sim.—Under heather and moss, Ox.

Fam. Pholcidae.

Pholcus phalangioides, Fuess. ?—Wimbledon (F.P.S.).

Fam. Theridiidae.

Episinus truncatus, Walck.—Hors.

**Theridion tormosum*, Clerck.—Ox.

,, *sisyphium*, Clerck.—Box Hill, Book., Hors.

,, *denticulatum*, Walck.—Walls, Ox., Cob.

,, *varians*, Hahn.—Box Hill, Book., Ox.

* ,, *tinctum*, Walck.—Box Hill, Book., Ox.

,, *simile*, C.L.K.—Beaten, Cob.

,, *bimaculatum*, Linn.—Hors.

,, *riparium*, Bl.—(O.P.C.)

,, *blackwallii*, Cambr.—(O.P.C.)

,, *pallens*, Bl.—Bushes, Ox., Cob., Box Hill.

* ,, *rittatum*, C.L.K.—Beaten, Box Hill, Book, Cob.

,, *tepidariorum*, C.L.K.—Hothouses, Cob.

,, *lineatum*, Clerck.—Cob.

,, *pictum*, Hahn.—Hors. (F.P.S.).

,, *aulicum*, C.L.K.—Woking (F.P.S.).

Steatoda bipunctata, Linn.—Disused rooms, Cob., Book.

Crustulina guttata, Wid.—Under heather, Ox.

Tapinopa longidens, Wid.—Under herbage, Ox., Box Hill.

Bolyphantes buccolentus, Clerck.—River Wandle (O.P.C.).

Drapetisca socialis, Sund.—Pine trunks, Ox.

Stemonyphantes lineata, Linn.—Under heather, Ox.

Linyphia triangularis, Clerck.—Gorse, Ox., Cob., Rip.

,, *montana*, Clerck.—Cob.

,, *pusilla*, Sund.—Ox., Box Hill, Book., Rip.

,, *clathrata*, Sund.—Low herbage, Cob., Ox., Rip.

,, *peltata*, Wid.—Ox., Box Hill.

,, *hortensis*, Sund.—Wimbledon (O.P.C.).

Labulla thoracica, Wid.—Cob.

Leptyphantes minutus, Bl.—Ox.; indoors, Cob., Hors.

,, *tenuis*, Bl.—Under herbage and stones, Ox., Cob.

* ,, *zimmermannii*, Bertk.—Ox.

,, *leprosus*, Ohl.—Indoors and out, Cob., Hors.

* ,, *ericaeus*, Bl.—Ox.

,, *nebulosus*, Sund.—Under herbage and stones, Ox., Cob.

* ,, *mengii*, Kulcz.—Heather, Ox.

,, *blackwallii*, Kulcz.—Carshalton (O.P.C.).

Bathyphantes dorsalis, Wid.—Beaten, Cob.

,, *concolor*, Wid.—Stones, Cob.

,, *gracilis*, Bl.—Roots of herbage, Ox., Cob., Hors.

* ,, *setiger*, F.O.P.C.—Damp moss, Ox.

,, *nigrinus*, Westr.—Dead leaves, Cob.

,, *pullatus*, Cambr.—R. Wandle (O.P.C.),

Bathyphantes parvulus, Westr.—R. Wandle (O.P.C.).
„ *explicata*, Cambr.—Kew (O.P.C.).
Porrhomma pygmaeum, Bl.—Beaten at Book.
„ *microphthalmum*, Cambr.—Caught during flood, Cob.
**Tmeticus affinis*, Bl.—Rushes, Cob.
* „ *graminicolus*, Bl.—Box Hill.
Gongylidium rufipes, Sund.—Beaten, Book.
„ *apicatum*, Bl.—S. Norwood, Carshalton (F.P.S.).
**Gongylidiellum vivum*, Cambr.—Under heather, Ox.
Erigone dentipalpis, Wid.—Roots, Ox., Cob., Box Hill, Rip.
„ *atra*, Bl.—Swept at Ox.
Wideria antica, Wid.—Hors.
Entelecera acuminata, Wid.—Ox.
* „ *erythropus*, Westr.—Rhubarb pot, Cob.
Diplocephalus cristatus, Bl.—Roots, Cob., Ox.
* „ *beckii*, Cambr.—Cob., Book.
* „ *fuscipes*, Bl.—Herbage, Ox., Cob.
* „ *permixtus*, Cambr.—Ox.
Thyreosthenius biovatus, Cambr.—Nest of Wood Ant, Ox.
Enidia cornuta, Bl.—Cob., Book, Box Hill.
„ *bituberculata*, Wid.—Rushes, Hors.
Neriene rubens, Bl.—Heather, Ox., Cob.
„ *rubella*, Bl.—Beaten, Ox., Box Hill.
**Oedothorax retusus*, Westr.—Box Hill.
* „ *agrestis*, Bl.—Cob.
* „ *fuscus*, Bl.—Roots, Cob., Book.
„ *gibbosus*, Bl.—R. Wandle (F.P.S.).
„ *tuberosus*, Bl.—R. Wandle (F.P.S.).
Troxochrus scabriculus, Westr.—Croydon (F.P.S.).
Pholcomma gibbum, Westr.—Wimbledon (O.P.C.).
Centromerus bicolor, Bl.—Roots, Cob.
* „ *concinnus*, Thor.—Heather, Ox.
**Dicymbium nigrum*, Bl.—Beaten, Cob.
Saaristia frontata, Bl.—Box Hill.
**Hypselistes jacksonii*, Cambr.—Reeds, Ox.
Trachygnatha dentata, Wid.—Damp places, Ox.
**Pepouocranium ludicrum*, Cambr.—Gorse and heather, Ox.
Micryphantes rurestris, C.L.K.—Herbage, Ox., Cob.
* „ *mollis*, Cambr.—Swept, Ox., Cob.
Rhabdorica diluta, Cambr.—Hors.
Walckenaera acuminata, Bl.—Under stones, Cob., Ox.
Robertus lividus, Bl.—Carshalton (O.P.C.).
Maso sundevalii, Westr.—Carshalton (O.P.C.).
Hilaira uncata, O.P.C.—Hors. (O.P.C.).
Enoplognatha thoracica, Hahn.—Wimbledon (O.P.C.).
Micronета viaria, Bl.—Wimbledon (O.P.C.). [3.]

Cornicularia cuspidata, Bl.—Hors. (O.P.C.).
„ *unicornis*, O.P.C.—R. Wandle (O.P.C.).
Macrargus rufus, Wid.—Heather, Ox., Hors.
**Dismodicus bifrons*, Bl.—
**Styloctetor penicillatus*, Westr.—
**Tapinocyba praecox*, Cambr.—Swept, Ox., Rip.
Melos bicolor, Camb.—Kew (O.P.C.). } Imported with
Corinna praestans, Camb.—Kew (O.P.C.). } plants.

Fam. Mimetidae.
Ero thoracica, Wid.—Ox.
* „ *tuberculata*, Degeer.—Ox. Unmistakable cocoon.

Fam. Uloboridae.
Hyptiotes paradoxus, C.L.K.—Box Hill (A. R. Jackson). Spring snare-spider.

Fam. Epeiridae.
Tetragnatha extensa, Linn.—Near water, Cob., Book.
„ *solandrii*, Scop.—Near water, Cob., Book.
* „ *obtusa*, C.L.K.—Affinity for water not so marked. Box Hill.
„ *nigrita*, Zendl.—Kew (O.P.C.).
Pachygnatha degeerii, Sund.—Under herbage, Cob., Hors.
„ *clerckii*, Sund.—Under herbage, Cob., Box Hill, Hors.
Meta segmentata, Clerck.—Bushes, Ox., Cob., Book.
„ *merianae*, Scop.—
Cyclosa conica, Pallas.—Heather, yew, etc., Ox., Cob., Box Hill.
Zilla x-notata, Clerck.—Window frames, Cob.
„ *atrica*, C.L.K.—Bushes, Book., Cob., Ox.
**Mangora acalypha*, Walck.—Heather, Ox.
Epeira diademata, Clerck.—The garden spider, Ox., Cob., &c.
„ *umbratica*, Clerck.—Under bark, Cob., Ox.
* „ *gibbosa*, Walck.—Gorse, pine, Ox., Box Hill.
* „ *sclopetaria*, Clerck.—On bridges, Cob.
„ *cornuta*, Clerck.—Rushes, Cob.
„ *quadrata*; Clerck.—Grass, Book., Box Hill.
„ *cucurbitina*, Clerck.—Bushes, Cob., Ox., Box Hill.
„ *redii*, Scop.—Heather, Ox.
„ *triguttata*, Fabr.—Bushes, Cob., Box Hill.
* „ *sturmii*.—Ox., Cob.
„ *marmorea*, Clerck.—Hors. (O.P.C.).
„ *adianta*, Walck.—Woking, Bagshot (O.P.C.).

Fam. Thomisidae. (Crab-spiders.)
Misumena vatia, Clerck.—Gorse, flowers, Ox., Cob.
Diaea dorsata, Fabr.—Bushes, Box Hill, Cob.
Xysticus cristatus, Clerck.—Ground, bushes, flowers, Ox., Cob., etc.

**Xysticus kochii*, Thor.—Ox.
,, *pini*, Hahn.—Gorse, Ox.
* ,, *lanio*, C.L.K.—Ox., Book.
,, *luctuosus*, Bl.—Hors.
,, *erraticus*, Bl.—Under Stones, Ripley.
,, *ulmi*, Hahn.—Wimbledon (O.P.C.).
Oxyptila atomaria, Panz.—Ground, Hors., Rip.
* ,, *sanctuaria*, Cambr. —Wall of houses, Cob.
,, *trux*, Bl.—Hors. (O.P.C.).
,, *praticola*, C.L.K.—Hors. (O.P.C.).
,, *simplex*, O.P.C.—Wimbledon (O.P.C.).
,, *scabricula*, West.—Sand pits, Woking, Chobham (O.P.C.).
Philodromus dispar, Walck.—Ox., Box Hill, Rip.
,, *aureolus*, C.R.—Gorse, trees, etc., Ox., Box Hill.
,, *elegans*, Bl.—Gorse, Ox.
* ,, *cespiticollis*, Walck.—Gorse, Ox.
* ,, *rufus*, Walck.—Exact locality lost.
Thanatus strictus, C.L.K.— R. Wandle (O.P.C.).
Tibellus oblongus, Walck.—Grass, Cob., Book.

Fam. Pisauridae.
Pisaura mirabilis, Clerck.—Grass, heather, Ox., Cob., Rip.

Fam. Lycosidae.
**Pirata piscatoria*, Clerck.—Marsh, Ox.
,, *piraticus*, Clerck.—Marsh, Ox.
,, *hygrophilus*, Thor.—Marsh, Ox.
,, *latitans*, Bl.—R. Wandle (O.P.C.).
Trochosa ruricola, Degeer.—Under stones, Cob., Book.
,, *terricola*, Thor.—Under heather or stones, Ox.
,, *picta*, Hahn.—Sandy paths, Ox.
Tarentula pulverulenta, Clerck.—Heath, Rip.
* ,, *cuneata*, Clk.—Heath, Rip.
* ,, *barbipes*, Walck.—Heath, Ox., Rip.
Lycosa amentata, Clerck.—Cob., Ox., Rip.
* ,, *annulata*, Thor.—Heath, Rip.
,, *nigriceps*, Thor.—Damper situations, Rip., Ox.
,, *pullata*, Clerck.—Heath, Rip., Hors.
,, *lugubris*, Walck.—Hors., Rip.
,, *palustris*, Linn.—Wimbledon (O.P.C.).

Fam. Salticidae. (Jumping Spiders.)
Salticus scenicus, Clerck.—Walls, Cob., Book.
* ,, *cingulatus*, Panz.—Posts and trunks, Cob.
,, *affinatus*, Cambr.—Tree, Richmond (O.P.C.).
Heliophanus cupreus, Walck.—Swept, Rip.
* ,, *flavipes*, C.L.K.—Under stones, Hors.
Marpessa muscosa, Clerck.—Pine trunks, Ox., Cob.
**Ballus depressus*, Walck.—Beaten, Box Hill.

Sitticus pubescens, Fab.—Tarred fence, Cob.
Neon reticulatus, Bl.—Under heather.
Evarcha falcata, Bl.—Low undergrowth, Hors., Rip.
Euophrys frontalis, Walck.—Under heather or stones, Ox., Box Hill.
,, *aequipes*, Cambr.—Richmond (O.P.C.).
**Aelurillus v-insignitus*, Clerk.—Heath, Rip.
Myrmarachne formicarius, Walck.—Wood Ants (Donisthorpe), Ox. ?
Hasarius adansonii, And.— } Kew (O.P.C.). Probably
,, *nicholsonii*, Cambr.— } imported.
Bianor aenescens, Sim.—Swept at Headley (Dr. A. R. Jackson).

Order Phalangidea. (Harvest Spiders.)

Sclerosoma quadridentatum, Cuvier.—Hors., under stones.
Liobunum rotundum, Labr.—Wimbledon (O.P.C.).
* ,, *blackwallii*, Meade.—Cob., Book.
Phalangium opilio, Linn.—Cob., Rip.
,, *parietinum*, Degeer.—Wimbledon, Hors. (O.P.C.).
**Mitopus morio*, Fabr.—Beaten, Ox., Book.
Oligolphus agrestis, Meade.—Under heather, Ox.
,, *tridens*, C.L.K.—Cob.
* ,, *hansenii*, Cambr.—Beaten, Book., Box Hill.
,, *spinosus*, Bosc.—Kew (O.P.C.).
Nemastoma lugubre, O.F.M.—Cob.
**Platybunus corniger*, Herm.—Heather.

Order Chernetidea. (False Scorpions.)

Chthonius rayi, L.K.—Under stones, Cob.
,, *tenuis*, L.K.—Box Hill.
Chelifer scorpioides, Herm.—Weybridge (F.P.S.).
**Chernes nodosus*, Schr.—On a fly's leg, Cob.
**Chiridium museorum*, Leach.—Window, Cob.

[1.] page 2. All families are attacked. I have bred *Polysphincta pallipes*, Hlgr. (*Acrodactyla degener*, Hol.), from *Theridion cinctum*.

[2.] page 5. For Myrmecophilous Spiders see Donisthorpe, *Zoologist*, November, 1908, etc.

page 5. After *Micaria pulicaria* insert—"*Phrurolithus festivus*, C.K., With ants (Donisthorpe), Ox., Woking.

[3.] page 8. To *Microneta varia* add "Ox., with ants (Donisthorpe)," and insert "*Microneta innotabilis*, Cambr. Ox., with ants (Donisthorpe)."

A Brief Review of the Indigenous Coccidae of the British Islands.

By E. Ernest Green, F.E.S., F.Z.S.—*Read April 27th*, 1922.

It is not my intention to give a detailed account of our British *Coccidae*. Such an account is already available in Newstead's admirable Monograph, in two volumes, published by the Ray Society. My present object is, rather, to attract the attention of our field naturalists to this interesting but relatively neglected family of insects. That the subject is by no means exhausted is evidenced by the fact that, within the past eight years, I have been able to add approximately thirty species to the British list, more than half of which were new to science.

Newstead's "Monograph of the British *Coccidae*" describes 90 distinct species, to which there have since been added another 37, so that the list now stands at 127. Rather more than half of these (to be exact, 67) have been found only in glass-houses and must be regarded as aliens introduced with foreign plants. In the present paper I propose to ignore these aliens and to review (very briefly) the superficial characters of such species as are to be found in the open.

But, first, I will attempt to explain to you how you may recognize a Coccid when you have found it. This is not quite so simple as, at first sight, it might appear to be. To the uninitiated, the employment of a compound microscope will be necessary for the purpose.

It would be difficult to mention any single superficial character that would be applicable to all the different subfamilies and genera of *Coccidae*. Their external forms and appearance are so diverse that they would never be supposed to bear any close relationship to each other. What, for instance, could be more different than *Aspidiotus hederae*—a minute, limbless, yellow speck, covered by a separate scale, and *Orthezia urticae*—an active species with conspicuous cushions and lamellae of compact white wax. But discussion of the various modifications of form must be deferred until we come to a consideration of the individual species.

Coccidae may be distinguished from their nearest allies (the *Aphididae* and *Aleurodidae*) by the following characters:—

The females are invariably apterous. The body is not sharply

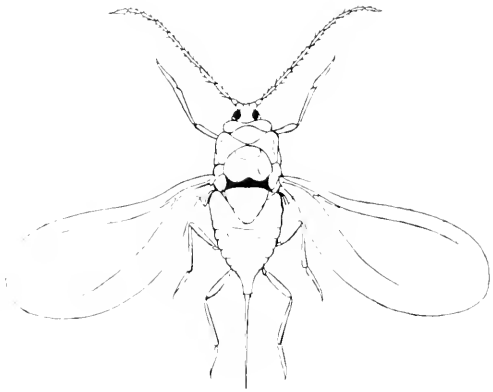


Fig 1

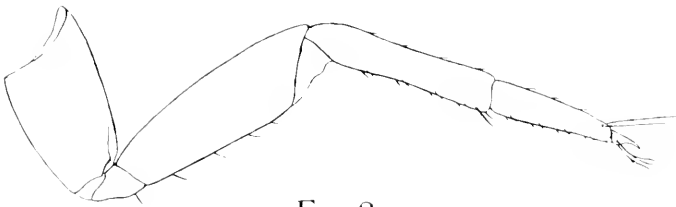


Fig 2

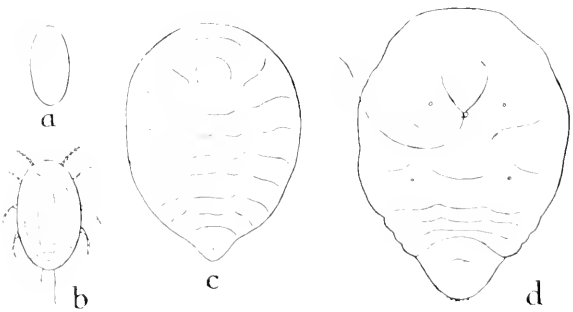


Fig 3

E. E. Green. del.

Proc. S.L.E. & N.H. Soc. PLATE III.

Fig. 1. *Aspidiotus zonatus*, adult male, ×75.

,, 2. Leg of *Lecanium hesperidum*, ×220.

,, 3. Stages of a female Diaspid:—(*a*) egg; (*b*) newly hatched larva; (*c*) nymph, dorsal view; (*d*) adult female, ventral view. All considerably enlarged.

Proc. S.L.E. & N.H. Soc. PLATE IV.

Fig. 4. (*a*) *Aspidiotus hederae*, female scale, ×15; (*b*) male scale, ×16; (*c*) *Diaspis rosae*, female scale, ×15; (*d*) male scale, × about 30; (*e*) *Lepidosaphes ulmi*, male scale, ×25; (*f*) female scale, × about 30; (*g*) *Chionaspis salicis*, male scale, ×32; (*h*) female scale, ×18.

Fig. 5. (*a*) *Lecanium hesperidum*, ×12; (*b*) *Lecanium persicae*, ×4; (*c*) *Pulvinaria vitis*, female and ovisac, ×4; (*d*) male puparium, ×16.

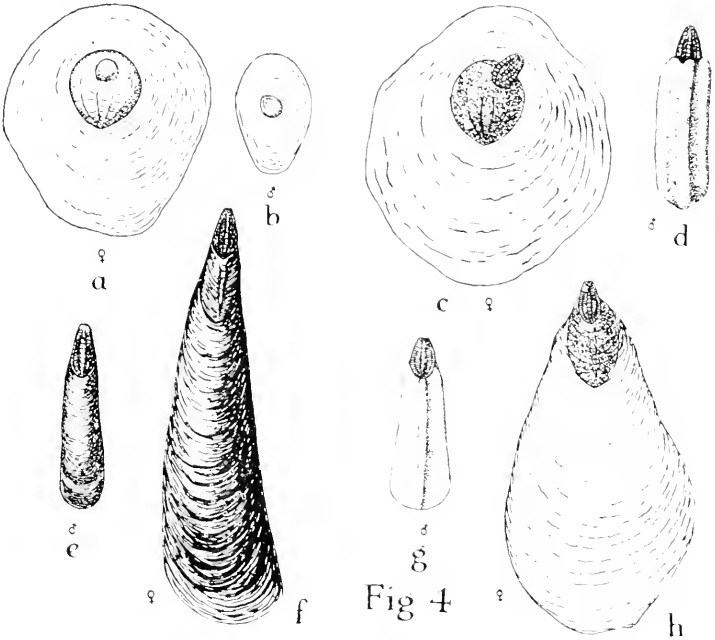


Fig 4

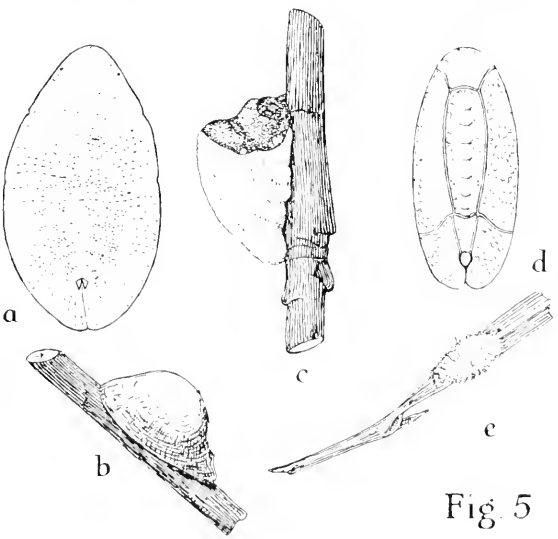


Fig 5

E. E. Green, del.

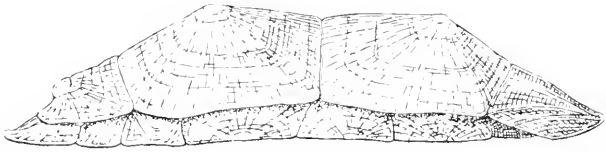
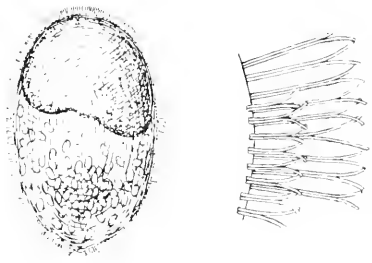
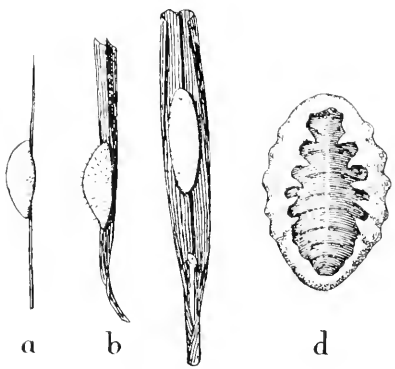


Fig 6



a b

Fig. 7



a b c d

Fig. 8

E. E. Green, del.

Proc. S.L.E. & N.H. Soc. PLATE V.

Fig. 6. *Parafairmairia gracilis*, ×15.

,, 7. (*a*) *Asterolecanium bambusae*, ×15; (*b*) fringe, ×150.

,, 8. (*a*) *Eriococcus inermis*, ×3; (*b*) *Eriococcus greeni*, ×3; (*c*) *Eriococcus insignis*, ×3; (*d*) *Gossyparia spuria*, ×9;

Proc. S.L.E. & N.H. Soc. PLATE VI.

Fig. 9. (*a*) *Kermes variegatus*, × about 2; (*b*) *Kermes quercus*, ×2½.

,, 10. *Phenacoccus aceris*, adult male, ×20.

,, 11. (*a*) *Orthezia cataphracta*, ×12; (*b*) *Ortheziola vejdovskyi*, ×about 16.

a b

Fig 9

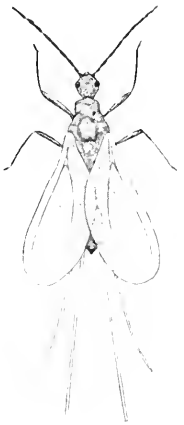
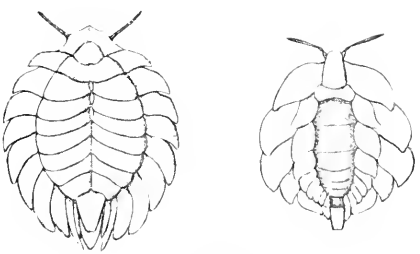


Fig 10



a Fig 11 b

E. E. Green, del.

divided into the three usual divisions—head, thorax, and abdomen. In fact, it is often difficult exactly to determine the line of division between these parts. The eyes, when present, are simple, never compound. The external mouth parts consist of a short tubular labium functioning as a guide for the four long slender filaments which represent the maxillae and mandibles.

The adult males may be apterous or provided with a single pair of wings, usually supplemented by a pair of hooked halteres which engage with the wings (fig. 1). The alate condition is by far the more usual. The wings have two simple nervures only. The head is more or less clearly differentiated from the rest of the body, but is devoid of any vestige of mouth parts. The eyes may be either compound or simple (usually the latter).

In both sexes the limbs (when present) terminate in a single claw and the tarsi are, normally, one jointed (fig. 2).

The females pass through from four to five stages, and the males from five to six, *viz.*:—*Female.* Egg: 1st stage nymph (or larva): 2nd stage nymph: [3rd stage nymph]: adult. *Male.* Egg: 1st stage nymph: [2nd stage nymph]: pre-pupa; pupa; adult. (The stage included in square brackets is the one that is suppressed in the degenerate forms in which the number of moults is restricted. A few species are ovoviparous, in which case the egg stage is passed within the body of the parent insect).

Coccidae are to be found in every conceivable situation; on the foliage, stems and roots of plants. There are many gall-making species, but none of these have been recorded from the British Isles.

It will be convenient to adopt the arrangement given in Newstead's Monograph, commencing with the subfamily *Diaspinae*. Four genera only come within our category. They all agree with each other, and are distinguished from members of other subfamilies, in the possession of a separate covering scale composed partly of cast skins (exuviae) of the previous moults, supplemented by a secretionary appendix. The females undergo three moults only; the first, from the egg stage (fig. 3 *a*), disclosing the young larva; the second disclosing the nymph; the third, the adult insect. The males undergo an additional moult, a pre-pupal and a pupal stage being interposed between the larval and adult stages. The adult female is without either limbs or antennae, and the anal orifice is without a setiferous ring. The larva (3 *b*), as in all *Coccidae*, is active, possessing well developed limbs and antennae; but, having once settled down to feed it remains on the same spot for the "term of its natural life." After the next moult it loses its limbs (3 *c*), remaining attached to the plant by the rostral filaments only. It is, at first, completely covered by the larval exuviae; but, as the nymph increases in size, this covering becomes inadequate and is supplemented by an extension (the appendix) secreted from special organs on the compound terminal segment (the pygidium) of the body.

Similarly, at the next moult, the adult female (3 *d*) is sufficiently protected, for a time, by the exuviae of the previous two stages. Accompanying the subsequent growth of the insect the covering is completed by a further extension of the secretionary appendix. The eggs are deposited beneath this composite scale. The adult male (fig. 1) is provided with four large ocelli, two on the upper and two on the undersurface of the head. Its abdomen ends in a long, slender point, the penial sheath. There are no caudal filaments. The four genera of *Diaspinae*, represented in this country, are *Aspidiotus*, *Lepidosaphes* (=*Mytilaspis*), *Diaspis*, and *Chionaspis*. They may be distinguished by the following characters of the covering scales:—

Aspidiotus.—Scale of female (fig. 4 *a*) more or less circular; the larval and nymphal exuviae superimposed and completely surrounded by the secretionary appendix. Scale of male similarly constructed, but including the larval exuviae only (fig. 4 *b*).

Lepidosaphes.—Scale of female (fig. 4 *f*) elongate, mussel-shaped; the larval and nymphal exuviae overlapping, situated at or beyond the anterior extremity of the secretionary appendix. Male scale similarly constructed (fig. 4 *e*).

Diaspis.—Scale of female (fig. 4 *c*) more or less circular; the exuviae usually overlapping, surrounded by the secretionary appendix. Male scale (fig. 4 *d*) of a different character; elongate and more or less distinctly tricarinate, the larval exuviae situated at the anterior extremity.

Chionaspis.—Scale of female (fig. 4 *h*) elongate or pyriform; the exuviae overlapping, situated at or beyond the anterior extremity of the secretionary appendix. Male scale (fig. 4 *g*) elongate, tricarinate.

We have five species of *Aspidiotus* occurring in the open:—

A. ostreaeformis, Curtis. The so-called "oyster-shell scale," on the stems and branches of birch, horse-chestnut, poplar, apple, plum, and various fruit trees. Scale very inconspicuous, blackish or dull brown, assimilated in colour to the bark upon which it rests, often with the superficial fibres of the bark incorporated into the surface of the scale.

A. bavaricus, Lindinger. On *Calluna vulgaris* and *Erica cinerea*. Scale brown, of the exact tint of the bark of the heather.

A. zonatus, Frauenfeldt. On oak. Scale dull greyish ochreous, on the terminal branches of the tree. Male scales pale, translucent ochreous; on the undersurface of the leaves.

A. britannicus, Newstead. On holly and box. Male and female scales brown or brownish ochreous: on the twigs and foliage.

A. hederae (Vallot). On *Aucuba*. Scale conspicuous, white, the exuviae pale yellow; on both surfaces of the foliage. This is an alien that has, within recent years, adapted itself to our

climate. I have records of considerable damage to Aucuba plants in Devonshire and the Isle of Wight.

The genus *Diaspis* provides two species only:—

D. rosae (Bouché). On cultivated and wild roses and on brambles (*Rubus* spp.). Female scale conspicuous, white, exuviae reddish. Male scales white, strongly tricarinate. Often very abundant on the stems of cultivated roses, especially those in sheltered positions, against walls, etc.

D. carueli, Targ. On *Juniperus* sp. (Royal Gardens, Kew) and upon a variety of *Cupressus lawsoniana* (in a nursery garden at Ottershaw, Surrey). Scale inconspicuous, whitish, concealed amongst the crowded leaflets of the plant. Though the species has not yet been recorded from the wild *Juniperus communis*, it very probably occurs upon our native plant. The inconspicuous chaff-like scales are so well concealed that they might be overlooked very easily.

The genus *Chionaspis* is represented by a single species:—

C. salicis (Linn.). Principally on sallow, willow, and ash, but occurring, not uncommonly, upon alder, broom, dogwood, lilac, elm, and several other trees. Scale of female white, but often obscured by a superficial deposit of algae from the bark of the trees to which it is attached. The tricarinate male scales are sometimes clustered so thickly upon the stems as to give the tree the appearance of having been whitewashed.

The genus *Lepidosaphes*, which has precedence of the better known name *Mytilaspis*, is similarly represented by the single species—

L. ulmi (Linn.). A pest of orchard and other trees, well known to gardeners and fruit growers as the "mussel scale," and generally referred to, in text books, by the name of *Mytilaspis pomorum*. Its popular name is a good description of its appearance, for the scale is really very like a miniature mussel shell, of a reddish brown colour.

L. ulmi-candidus, Newstead, is a variety with a milk white scale, occurring on *Crataegus*.

We now come to the subfamily *Lecaniinae* with numerous genera, of which nine occur wild in this country. They are of very diverse appearance, but may be distinguished by the following characters. Females with the posterior extremity more or less deeply cleft, with a definite setiferous anal ring; anal orifice covered dorsally by a pair of triangular hinged plates. Adult males with from four to eight ocelli; halteres often wanting; penial sheath moderately long and slender; usually with a pair of long caudal filaments. The male

pupa is covered by a characteristic puparium, usually composed of translucent wax, and symmetrically divided into definite plates (fig. 5 *d*). Limbs and antennae generally present in all stages of the female insect, but sometimes vestigial or (rarely) absent in the adult.

Genus *Lecanium*. Adult female naked. Most of our British species are strongly convex and the skin of the dorsum becomes densely chitinous and rigid, to form a protective covering for the eggs. Seven species come within our category.

L. persicae (Fab.) (fig. 5 *b*). This is one of our commonest species and infests a large number of garden and wild plants, amongst which may be mentioned peach, rose, *Cotoneaster*, *Robinia*, *Ribes*, broom, hawthorn, etc. The adult female is of a reddish brown colour, strongly convex, slightly longer than broad, with rugose sides, from 3 mm. to 5 mm. in diameter. The old females are mere shells, covering a mass of pale pink eggs. They are sometimes densely crowded upon the stems and branches of plants grown in sheltered situations, such as peach and rose trees trained against a wall. Newstead distinguishes two forms—typical *persicae* and var. *sarothamni*; but I must confess that I find it difficult to separate them. There is, however, a question whether typical *persicae* occurs in this country. If a varietal name is necessary, it seems to me that *robiniae* of Douglas has preference over *sarothamni* of the same author.

L. persicae-crudum. I have described, under this name, a form that was found infesting the foliage of a species of *Aralia* that was growing permanently in the open air. It is distinguished by its more depressed form and paler colour. The mature females are never so densely chitinized as in the type.

L. capreae (Linn.). This species also has a wide range of host plants. It occurs more commonly upon apple, hawthorn, hazel, horse chestnut, and elm. It is of a sub-spherical form, the sides often projecting beyond the base. It is usually of a paler shade of brown than is the preceding species.

L. bituberculatum, Targ. Confined to the hawthorn (*Crataegus oxyacanthae*). It is often very abundant upon the smaller branches of old hawthorn hedges. Though one of the largest of our British species it is so well "camouflaged" by a variegated pattern of black, white, brown, crimson, and olivaceous tints, that it is extremely difficult to detect, especially as it usually takes up a position at the base of a thorn or a bud. It is of a strongly convex form and is well characterised by the presence of two prominent, rounded knobs on the dorsum.

L. transrittatum, Green. A rare species, recorded from birch only.

It is relatively small and almost spherical in form. Living examples are black, with conspicuous, broken bands of white.

L. ciliatum, Douglas. Confined to the oak. Adult female approximately circular, moderately convex; olivaceous brown, appearing greyish from a thin covering of white powdery secretion. It is more particularly characterised by the presence of a fringe of delicate white filaments.

L. zebrinum, Green. On the smaller stems and branches of birch and aspen, more commonly on the young trees. Somewhat resembling *ciliatum*, but more highly convex and without a marginal fringe. The mature living insect is strongly banded with black on a paler ground, but the pattern is more or less masked by a thin coating of powdery secretion.

L. hesperidum (Linn.) (fig. 5 *a*). This is, primarily, a greenhouse pest; but is occasionally to be found on ivy, myrtle, and holly in the open. It differs from all our other British species in its form, which is flattish and elongate ovate, and in the fact that it remains relatively soft throughout its life. This condition is accompanied by an ovoviviparous habit, in which there is no necessity for a protective covering for eggs. The typical form is of a greenish yellow or orange-yellow colour, minutely specked with darker spots. The variety *alienum* of Douglas (probably equivalent to *lauri*, Sign.) is of a duller, brownish olivaceous tint, closely speckled with darker spots. This variety is not uncommon upon the foliage of the bay (*Laurus nobilis*).

The genus *Pulvinaria* differs from *Lecanium* principally in the presence of a conspicuous ovisac, which is extruded from beneath the posterior extremity of the insect.

Pulvinaria vitis (Linn.) (fig. 5 *c*, *d*). On hawthorn, birch, alder, sallow and various species of *Ribes*. It takes its special name from the fact that it is a recognised pest of the grape vine. The dull brown insect is rendered conspicuous by the snowy white, strongly convex ovisac, which is an accompaniment of the final stage of the female. The small, glassy, male puparia (fig. 5 *d*) are sometimes crowded together on the young twigs of the plant.

In the genus *Lichtensia* the mature female is almost completely enclosed within a closely felted ovisac, only a small portion of the thorax being exposed.

L. viburni, Signoret. On foliage and young stems of ivy and Laurustinus. The former is the more usual host plant in this country. In the earlier stages it looks like a flat, greenish *Lecanium*, and is then very inconspicuous; but after

the completion of the snowy white ovisac, it is readily noticeable.

The genus *Luzulaspis* (=*Signoretia*) might be described as a very narrow and elongate form of *Lichtensia*, the ovisac covering all but the anterior extremity of the insect. There are, however, structural characters to justify the separation of the two genera.

L. luzulae, Dufour. On the foliage of the wood-rush (*Luzula campestris*). The elongate, narrow, snowy white ovisacs are sometimes conspicuous objects on rough pasture land.

The genus *Exaeretopus* is distinguished from other genera of the *Lecaniinae* by the presence of a deep fold across the middle of the tarsi of the front limbs, giving that segment the appearance of being 2-jointed.

E. longicornis, Green. On *Carex ovalis*; on the upper surface, near the base of the leaves. Adult female orange-yellow, at first resembling an elongate, flattish *Lecanium*; but, subsequently, almost completely concealed by a closely felted, cylindrical, white ovisac.

Lecanopsis. It would be difficult to characterise this genus briefly and concisely. I will content myself with a reference to our only British species.

L. formicarum, Newstead. Early stages on the roots of grasses; the nymph enclosed in a brittle, glassy test. The young adult females ascend the grass stems; but, after fertilisation, descend to the surface of the ground, where they construct loose, woolly ovisacs, filled with rose-red eggs, under moss and débris at the base of the tufts of grass. They are most frequently associated with the grass *Festuca ovina*. The insect itself is of a yellowish or reddish colour. The nymphal stage was originally regarded as belonging to a distinct species—*L. brevicornis*. The regular association of this insect with ants is doubtful, though occasional individuals have been taken in the nests of ants.

In the genus *Eriopeltis* the mature female is completely enclosed within a felted sac. The legs and antennae are atrophied.

E. festucae (Fonscolombe) (fig. 5 *c*). On grasses of the genus *Festuca*. This is probably the most conspicuous of all our British Coccids. The large, white, strongly convex ovisac may attain a length of 7 mm. It is of a loose woolly texture and has many erect, projecting filaments, which give it a markedly shaggy appearance. The contained insect is of a pallid ochreous colour, the surface roughened like shagreen owing to the presence of numerous conical spines.

In the genus *Parafairmairia* the adult female insect is covered with a glassy test divided into symmetrically disposed polygonal plates.

P. gracilis, Green (fig. 6). On various grasses and sedges. Test of mature female elongate, narrow, acutely pointed at both extremities, laterally compressed, the dorsal plates forming a sharp keel.

Physokermes is a very abnormal genus, quite unlike any other in the subfamily. The species are characterised by the complete absence of limbs and antennae in the adult stage, by their spherical form, and by the presence of two large brood pouches in the cavity of the body.

Ph. abietis (Geoffroy). On the spruce fir (*Abies excelsa*). Although a relatively large insect, in its mature stage, it is extraordinarily inconspicuous, owing to its resemblance to the unopened leaf buds of the plant. The young larvae take up a position, head downwards, beneath the bud scales at the base of the young shoots, and hibernate in that situation. After moulting twice, in the following spring, the adult female expands until its hind body is protruded beyond the scales, and finally assumes a more or less spherical form. Its colour—chestnut brown—simulates the unopened leaf buds. The male of this species is unknown.

In the subfamily *Asterolecaniinae* we find species enclosed within a horny or waxy test; often with a marginal fringe of paired filaments, which arise from figure of eight-shaped pores on the body of the insect.

The typical genus *Asterolecanium* (fig. 7) is the only one that is represented in our islands. The covering test is horny and translucent; usually with a conspicuous marginal fringe of glassy filaments.

A. variolosum (Ratzeburg). On the smaller branches and twigs of oak; occupying shallow pits in the cortex. The test is of a greenish colour, a darker patch at one extremity indicating the position of the sublying insect. The marginal fringe is often incomplete or imperfect.

A. thesii (Douglas). On *Thesium humifusum*. Test yellowish. In addition to a marginal fringe there is a longitudinal series of tufted filaments on the dorsum.

Of the subfamily *Eriococcinae* it is difficult to give any single character that is common to all the genera included in the group. The adult females usually have a pair of prominent, spiniferous (often densely chitinous) lobes at the posterior extremity of the

body; but these are wanting in several anomalous genera that have been assigned to this subfamily. The antennae (when present) have never more than seven joints, and the terminal joint is relatively short.

The typical genus, *Eriococcus*, is characterised by the mature female insect being completely enclosed within a closely felted sac. The posterior lobes of the body are well developed, and conical spines are usually present on at least some part of the body.

E. devoniensis (Green). On *Erica tetralix*, causing distortion and convolution of the stems at the point of attachment. Sac white, subglobular. Insect orange-yellow; the dorsum thickly set with stout spines.

E. insignis, Newstead (fig. 8 *c*). On grasses. Sac white; elongate, narrow; surface relatively smooth. Body of insect with a continuous marginal fringe of spines.

E. greeni, Newstead (fig. 8 *b*). On grasses. The sacs, which are often attached to dead bracken and fallen leaves, are usually more ovate than those of *insignis* and, in fresh examples, exhibit numerous erect filaments. Dorsum of the insect with numerous spines.

E. pseudinsignis, Green. On grasses. Sac pale ochreous, elongate. Body of insect with scattered spines on the frons and median area of thorax in addition to the marginal fringe of spines.

E. glyceriae, Green. On the underground stems and rhizomes of *Glyceria maritima*. Sac whitish; broadly ovate. Colour of insect rose-red. Spines few, confined to the margins of the abdominal segments.

E. inermis, Green (fig. 8 *a*). On *Festuca ovina*. Sac small, hammock-shaped, creamy-white; surface smooth. Body of insect devoid of spines, except on the posterior lobes.

E. placidus, Green. On *Brachypodium sylvaticum*. Sac relatively large; ochreous or whitish; surface woolly. Body of insect without spines, except on the frons and posterior lobes.

The genus *Gossyparia* differs from *Eriococcus* in the covering sac being incomplete, leaving the greater part of the dorsum of the insect exposed. Posterior lobes strongly developed.

G. spuria (Modeer) (fig. 8 *d*). On the stems and branches of various species of *Ulmus*. At present recorded only from a few nursery gardens. Insect chocolate-brown, lying within what might be described as a fringed calyx of whitish felted secretion.

In the genus *Fonscolombia* the mature female is enclosed within a cylindrical ovisac. Body without prominent lobes or spines.

F. fraxini (Kaltenbach). In crevices of the bark on the stems and branches of ash trees. Ovisac white, elongate, often contorted. Female insect brick-red. Male apterous.

In the genus *Cryptococcus* the mature females are practically apodous, the anterior and mid limbs are wanting, while the hinder pair are vestigial.

C. fagi (Bärensprung), On the stems and branches of beech trees. The mature females are enveloped in a loosely felted white sac. Insect honey-yellow. This is the notorious Beech Coccus.

Kermes is a very anomalous genus, in which the adult females are naked and gall-like. In some of the species well developed limbs are present; in others the limbs are vestigial. The body is without a trace of the usual posterior lobes.

K. variegatus (Gmelin) (fig. 9 *a*). On the small twigs of oak, where they may well be mistaken for small Cynipid galls. This habit may possibly account for the apparent rarity of the insect, for there is only one British record (Bleane Woods, Herne, Kent). It was taken, on a single occasion only, by the late C. O. Waterhouse. The mature female is spherical; smooth and shining; ochreous or brownish yellow, marbled with dark brown or blackish bands. The antennae and limbs are fully developed, in this species, but can be of little use to the adult insect.

K. quercûs (Linn.) (fig. 9 *b*). In crevices of the bark and amongst the crowded adventitious buds on the stems of oak trees. The mature female is of shape of a grape seed; the anterior extremity (which is buried in a crevice) narrowed; the hind body swollen. Colour yellowish brown to reddish brown, inconspicuously banded with black. Antennae and limbs vestigial.

The subfamily *Dactylopiinae* contains the so-called "Mealy-Bugs," of which we have three genera occurring in this country.

The genus *Phenacoccus* is distinguished by the presence of nine joints in the antennae of the adult females. The claws usually have a denticle on their inner edge. The males have four caudal filaments (fig. 10).

P. aceris (Signoret). More commonly on gorse; but occurring also on various trees, including maple, oak, elm, apple, and plum. Mature female pale green, thinly dusted with white mealy secretion. Ovisac white, large and conspicuous.

The genus *Pseudococcus* contains species in which the antennae

of the female are 7- or 8-jointed. The claw is usually without a denticle. The male carries two caudal filaments only.

Ps. gahani, Green. On *Ribes sanguinolenta*, *Ceanothus* sp., *Laburnum*, and upon sprouting potato tubers. A somewhat troublesome pest in the garden. Adult female purplish grey, thickly coated with white meal. Margin of the body with a fringe of short, white, waxy tassels, the four hindermost tassels much longer than the others.

Ps. hibernicus (Newstead). Recorded, by Prof. Newstead, from "the crowns of various grasses and of the sea-pink (*Armeria vulgaris*)." I have taken the species under the loose bark of fallen branches of oak lying on grass in pasture land. The insects had apparently crept into this shelter for the purpose of oviposition and had constructed their ovisacs there. Mature females purplish grey, thinly dusted with mealy powder; posterior extremity with four short waxy tassels.

Ps. newsteadi, Green. Under the bud scales and in crevices of the bark of beech trees. Mature female pale brownish ochreous; dorsum thickly and evenly dusted with mealy powder; abdominal segments with short waxy tassels.

Ps. paludinus, Green. On the foliage of various herbaceous plants. The early adult females weave tent-like shelters in the angles of the more prominent veins on the undersurface of the leaves. Adult female brownish pink, masked by a thin coating of white mealy power. Posterior extremity with four short waxy tassels.

Ps. pulverarius (Newstead). Concealed between the leaf-sheath and the flowering stems of various grasses. Mature female narrow and elongate; pinkish purple; posterior extremity with one (or two) pairs of short waxy tassels.

Ps. sphagni, Green. In nests of the ant *Formica picea*, and amongst the sphagnum moss surrounding the nests. Adult female pinkish, thinly dusted with mealy secretion. No waxy tassels were observed on the material examined; but, from the position and character of the ceriferous organs on the insect, it is probable that fresh examples would exhibit short tassels on the frontal and posterior margins.

Ps. walkeri (Newstead). On various grasses. The insects take up their position on the upper surface of the blades of the grass. At the slightest disturbance they detach themselves and fall to the ground where they quickly creep into shelter. Mature female densely covered with mealy secretion. This species is recognisable by the unusually long and stout waxy processes, which project forwards from the anterior and backwards from the posterior extremity.

I have recently discovered a large species of *Pseudococcus* that

lives between the leaf sheath and the flowering stems of the reed *Phalaris arundinacea*. This species will be described, elsewhere, under the name *Ps. phalaridis*.

The genus *Ripersia* includes a number of small species, mostly subterranean, many of which inhabit the nests of, or are associated with, ants. Their characters are so obscure that it would be useless to attempt to distinguish them by their superficial appearance. They are mostly to be found at the roots of plants and are often exposed by turning over large stones. The males are unknown. The following species have been recorded from the British Isles :—*europaea*, Newstead, *subterranea*, Newstead, *donisthorpei*, Newstead, *formicarii*, Newstead, *tomlinii*, Newstead, *halophila* (Hardy), and *scirpi*, Green. The last species occupies the crowns of the small rush—*Scirpus caespitosus*.

Between the *Orthezliinae* and the foregoing subfamilies there is a wide gap. In all the previous genera spiracles (in two pairs) are present on the thorax only. In the *Orthezliinae* and following subfamilies abdominal spiracles also are present. With the *Orthezliinae*, also, we arrive at genera in which the males are provided with compound eyes. The female insects are active in all stages. The dorsum is more or less covered with compact and waxy lamellae, and there is a marginal fringe of similar processes which increase in length towards the posterior extremity, where they coalesce to form a covering to the ovisac. This ovisac is firmly attached to the body and is carried about by the insect, the young larvae emerging through an aperture at its hinder extremity. Males with compound eyes and a caudal tuft of delicate filaments resembling spun glass.

In the genus *Orthezia* we have adult females with 8- or 9-jointed antennae, and tarsi distinctly divided from the tibiae.

O. cataphracta (Shaw) (fig. 11 *a*). Under moss. Dorsal lamellae of the adult female flat, dense, plate-like, in two series. Legs and antennae reddish brown. More common in Scotland and the northern counties of England.

O. urticae (Linn.). On *Stellaria holostea*, *Teucrium scorodonia*, *Artemisia* and various other plants. Dorsal lamellae of adult female prominent, more or less erect, in four series. Legs and antennae dark brown. The sharply cut white lamellae give the insect the appearance of being modelled in plaster of paris.

The genus *Newsteadia* is characterised by the females having seven joints only in the antennae. The tarsi and tibiae are fused together, without any recognisable division.

N. floccosa (De Geer). Under moss. Dorsal lamellae of adult female looser and more flocculent than those of our two

species of *Orthezia*; prominent; in two series. Legs and antennae pale brownish ochreous.

In the genus *Ortheziola* the antennae of the adult female have four joints only, and the prominent, tubular eye is fused to the basal joint. The tibiae and tarsi are in one piece, without recognisable division.

O. vejdovskyi, Sulc. (fig. 11 *b*). Under moss and logs of wood. The median dorsal area of the adult female is naked, without lamellae.

Genera of the subfamily *Margarodinae* are peculiar in containing species of which the females undergo a quiescent, encysted, nymphal stage, interposed between the active larval and adult stages. Another peculiarity of the species in this section is that the adult females are without functional mouth parts. In some of the genera the mouth parts have disappeared altogether; in others they are vestigial. In the encysted nymphal stages the mouth parts are present and functional, but limbs and antennae are entirely wanting. The males may have compound eyes and a caudal tuft of silky filaments, or simple eyes and a single pair of simple caudal filaments. The typical genus (*Margarodes*) includes the "Ground Pearls," so called from the nacreous test that encloses the encysted nymph; but this genus has not been recorded from the British Isles. Our sole representative of the subfamily is a species of the genus *Steingelia*, *viz.*:—

S. gorodetskia, Nassonow. On the stems of birch trees. Mature female elongate, narrow; of a dark slaty grey colour; subsequently secreting a conspicuous white ovisac. For the purpose of oviposition the insect prefers to secrete itself either between matted fallen leaves or in the dead and hollow stems of bracken at the base of the tree. The nymph of this species still awaits discovery. The male has a circle of ocelli surrounding the head, and a single pair of long, slender waxy caudal filaments. The species was originally discovered in Russia. England is the only other country from which it has been recorded.

I have now reviewed all the indigenous species that, up to the present time, have been recorded from the British Isles; but I feel confident that many others remain to reward a diligent search (or rather searcher). Our pines, for instance, should produce several species of the genera *Leucaspis* and *Aspidiotus* which infest this tree on the continent of Europe. At present, not a single Coccid has been described from *Pinus sylvestris* in this country, though immature examples of an undescribed species have recently been discovered by an enterprising member of this Society. It is hoped that this interesting species will be worked out in the course of the

coming summer. Then, neither of the genera *Aclerda* or *Antonina* is, as yet, represented on our British list. Both *Aclerda subterranea* and *Antonina purpurea* occur, upon grasses, in France.

Our larger reeds (*Phragmites* and *Phalaris*) are likely to repay careful search, for species secreted between the leaf sheaths and flowering stems. And all the various grasses and rushes deserve careful attention. It is by no means improbable that some species of the interesting genus *Margarodes* may be (literally) turned up upon the roots of grasses or other herbaceous plants.

It should be noted that, though I have been talking of the *Coccidae* of the "British Isles," nearly all of our records relate to England alone, and to quite small areas of that. The distribution of species in Scotland and Ireland is practically unknown,

Finally, I may say that I shall be delighted to assist any of our members who may be inclined to take up the study of these interesting insects, and to determine any species that they may care to submit to me.

The Lepidopterous Enemies of Man. With special reference to species that occur in Britain.

By Robert Adkin, F.E.S.—*Read May 25th*, 1922.

When primitive man roamed the earth clad in the skins of beasts, which he wore to a finish and then discarded, and for his sustenance took such fruits of the earth as he might gather, as his needs required them, probably the only insect enemies that troubled him were those that bit his body. But as man became civilised he began to grow crops and to store their proceeds; until at the present time he grows his crops in dense masses and stores the fruits of his husbandry in great bulk in barns and warehouses; and as to clothing, whether his garments be of woven cloth or of the furs of animals, he probably wears them for but a short period and then lays them aside for a considerable time for his future use. All this creates conditions favourable to the attacks of his insect enemies and they have not been slow to take advantage of them, until at the present time the losses caused by their agency are very great, much greater indeed than anyone, who had not studied the question very carefully, could imagine.

Some idea, however, may be gathered of the loss caused by the depredations of insects, from the writings of two recent authors, who from carefully prepared statistics put the actual annual damage to the crops and stores of the United States of America alone, the one at 2,266,000,000[1] and the other at 2,015,000,000[2] dollars, that is somewhere round about five hundred million pounds sterling. Now I do not suggest that we in Britain (and it is to species occurring in this country that I propose to confine my attention) suffer to anything like so great an extent. We do not grow our crops on so large a scale, and our climate is not so suitable for the rapid multiplication of insect pests, and although, so far as I am aware, no very definite estimate has been made of the damage that we actually do suffer, we may rest assured that it is very great and that unless we are continually taking means to check it, it will inevitably become greater and still greater.

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[1] Sanderson and Peairs, "Insect Pests of Farm, Garden and Orchard," New York, 1921.

[2] Fernald, "Applied Entomology," New York, 1921.

Fortunately the gravity of the subject has not been over-looked, even in this country, and we have had for many years past many ardent workers, both professional and amateur, devoting their attention to working out the life-histories of our insect pests and devising methods for combating their ravages, it therefore behoves us, one and all, to take advantage of the information that they so willingly give us of the result of their labours, to keep in check our insect enemies. A few fruit trees, a little garden patch, even an allotment, if left to run wild for a few years, may become a nursery for all sorts of noxious insects and thus in due course become the means of infecting a whole neighbourhood with them.

All orders of insects contribute their quota to this wholesale destruction, and although the Lepidoptera (butterflies and moths), the group that we are now considering, are by no means the chief offenders, they do a very considerable amount of damage to our crops, in our warehouses, even in our homes; turn which way we will we seem never to be free from their ravages. Not that the perfect insect, the actual butterfly or moth does any damage, the construction of its mouth-parts is unsuitable for attack upon any hard substance, the more or less lengthy proboscis with which it is furnished being suitable only for feeding upon the nectar of flowers and similar more or less liquid forms of diet. Indeed in the imago stage they are a real benefit, in that by their method of feeding they assist in the fertilization of flowers. But it is in the larval (or caterpillar) stage, the only stage in which real growth is attained, that they cause damage. The larval mouth is furnished with hard chitinous mandibles, so hard that no vegetable substance appears to be proof against their attack, fruit, roots, even the hard wood of trees, grain, fur, feathers, cloth and numerous other substances all come within their diet and are liable to damage from their attack.

Anyone who has grown a patch of cabbages must in some years have gazed askance at rows of skeletons, where nice healthy cabbages ought to have stood, plants of which nothing but the mid-ribs and larger veins alone remained, the whole of the soft tissues of the leaves having been gnawn away. This is the work of the larva of *Pieris brassicae*, L. The butterfly lays its eggs on the leaves of the cabbages, little yellowish upright eggs sprinkled all over the leaves; in a few days they hatch and the little larvae commence to feed upon the cuticle of the leaf their depredations for a time being hardly noticeable, but suddenly, after several changes of skin, they develop marvellous appetites and the reduction of a fine healthy cabbage to a mere skeleton is the work of but a few days. If our cabbage patch happened to be a small one we might have saved the situation by hand-picking the eggs before they hatched, but once the larvae are out they are not easy to deal with, for in their younger stages they are not readily seen, and when large enough to be easily noticeable they have already committed the bulk of the damage.

Birds do not appear to be fond of these larvae, indeed there is reason to believe that they are distasteful to them and thus protected. But they have a very deadly enemy in a tiny four-winged fly. You have no doubt noticed under the coping of walls and on fences near cabbage gardens in autumn, especially in seasons when the butterfly has been unusually abundant, the remains of a larva surrounded by a bunch of little pale yellow cocoons. These are the work of this fly, a Hymenopteron known by the name of *Apanteles glomeratus*, L. The parent fly stabs the young lepidopterous larva with its ovipositor and pushes its eggs under the larval skin, these shortly hatch and the fly-larvae feed up inside the lepidopterous larva, but without touching any vital part until it is full-fed and has just hung itself up for pupation. The fly-larvae are also full-fed at this time, they then kill their victim and eat their way out through its skin and spin their cocoons all around it. That we owe a very great deal to this little parasitic fly in keeping down the attacks of the butterfly larvae on our cabbages will be gathered from the fact that in 1917, a year when the butterfly was exceedingly abundant, from many thousands of larvae collected in various parts of the country, only between 1 and 2 per cent reached maturity, all the others being killed by the attacks of the fly.

No other butterfly can be regarded as anything like so serious a pest. *P. rapae*, L. (Small Garden White), it is true, may occasionally strip our Tropeolums of their leaves, but even so the damage is of no material importance and it seldom causes serious trouble in the kitchen garden.

Note.—Since this paper was in manuscript one of the rare occasions when *P. rapae* was really harmful occurred. The imagines of the summer emergence were far more abundant than usual and in the autumn the cabbage plants in our gardens were badly eaten by larvae, an examination of which showed that from eighty to ninety per cent. of them were *P. rapae*.

The Sphinges although of great size are not a very harmful group. At rare intervals one hears that potato plants are being stripped by *Manduca atropos*, L. (Death's Head Hawk Moth), but in such cases it is generally more fright on the part of the observer at the size of the enemy than any real harm that it does, for the species never occurs in dangerous numbers in this country.

As illustrating how easily people may be frightened by size, some years ago a frantic letter was received from a large apple grower in Herefordshire to the effect that some huge caterpillars had descended upon his orchards like a flock of locusts and were devouring all his trees. Naturally we felt interested and wrote off at once asking him to send us a good sample of the caterpillars so that when we knew what they were we might be able to help him.

After a few days we received a small tin containing eight larvae of *Lasiocampa quercifolia*, L. (Lappet Moth), great fearsome looking creatures it is true, with a note saying that he had had his trees searched but that was all he could find. Needless to say that his crop was not materially damaged by them.

And this makes one see, as you will no doubt gather as we go along, that it is not the big things that we easily see that are our greatest enemies, but the little creatures that are not easily noticed that do us the greatest amount of harm.

But there is one small family formerly included in this Sphingid group, the *Aegeriidae* (Clearwings), of which less than a dozen occur in this country, that we cannot help regarding as harmful. The imagines are of small size and their larvae are all internal feeders, forming their burrows under the bark or in the hard wood of trees or, in the roots of plants. One of them *Aegeria tipuliformis*, Cl. (the Currant Clear-wing), feeds, as its name implies, in currant bushes, mining the stems and branches, and will, if left to breed unchecked for a few years, completely ruin the trees. The moth is very fond of feeding at the blossom of privet and such like shrubs in the afternoon sunshine, and where these have been growing near an old currant garden, I have known forty or fifty of the moths taken in the course of an hour, thus considerably reducing the stock; but the surest way of combating their ravages is to cut off all dead or sickly branches from the bushes as soon as they show leaf in the spring.

Ae. myopiformis, Bkh. (Red-belted Clear-wing), burrows under the bark of apple, pear and some other *Pyrus*, and is sometimes sufficently common in old and neglected orchards to detrimentally affect the trees. *Ae. formiciformis*, Esp. (Red-tipped Clear-wing), affects osiers, and when unusually numerous may seriously damage a whole crop, its burrows in their stems rendering them useless for basket work and similar purposes. The other species feed in oak, birch, elder, guelder-rose and such like trees, or in the roots of *Anthyllis*, *Rumex* and *Armeria* and may be regarded as harmless.

The next large group, following the order to which we are most of us accustomed, is the Bombyces (which includes the "ermines," "swifts," "eggars" and so forth). They are for the most part very innocent creatures, but some three or four of them can hardly be regarded as our friends. *Cossus cossus*, L. (Goat Moth), has a larva, which when full-fed measures nearly four inches in length; it burrows in the solid wood of trees and spends three years in reaching maturity. Although it will feed upon many trees it appears to be most fond of willows and poplars, and I have known both these trees killed outright by its attacks. *Zeuzera pyrina*, L. (*aesculi*, L.,) (Leopard Moth), is also a tree-boring species and sometimes has taken to apple and pear trees, but is seldom so common as to be a serious menace. The white males of *Hepialus humuli*, L. (Ghost), are familiar objects as they hover over the grass fields on a

calm June evening. The female, a larger, yellow insect, scatters her eggs broadcast over the grass, and when they hatch, the young larvae descend to the roots of the grass on which they feed, and pastures may sometimes suffer damage by their ravages. *Clisiocampa neustria*, L. (The Lackey), was and may again become a serious orchard pest. The larvae when young, and indeed until they are nearly full-fed, are gregarious, living in a common web, from which they sally forth and devour the surrounding foliage; an apple tree with its branches stripped by them was at one time no uncommon sight. The species however advertises its presence so well that it is our own fault if we let it at any time get the upper hand. The grey-brown eggs are laid in summer in clusters around the tree twigs, and when the leaves fall in autumn may be easily seen and removed. The webs formed by the larvae, although not very conspicuous, are not difficult to detect if sought for, and the handsome blue-headed larva when full-fed is an object not easily overlooked, thus during all these stages it is easily seen and may be destroyed.

Nygmia phaeorrhoea, Don., which we have so long erroneously called *Euproctis chrysorrhoea* (the Brown-tail), is a pure white moth of about an inch and a half in expanse and has a large anal tuft of silky brown hairs. Like the last named species its larvae are gregarious during the greater part of their life and live chiefly on blackthorn, on which plant their winter "nests" are conspicuous objects, and with their enlargement as spring advances even more so. The species is of fitful occurrence in this country, sometimes for a few years being practically, if not completely, absent, then it begins to be found again and for a series of years may become more and more common until it reaches a state of great abundance. At such a time it soon consumes all the food that the bushes on which it has wintered afford, it then sallies forth in search of fresh sustenance and on its way consumes practically anything that it comes across; hawthorn, bramble, even sea-buckthorn are consumed. I have seen acres where every bush has been stripped by them.[3] It is said that apple orchards have suffered by its depredations and it is quite conceivable, that at a time of its abundance as just described, it might be the cause of very serious injury to them. *Leucoma chrysorrhaea*, L., = *similis*, Fues, = *auriflua*, Fab. (The Gold-tail), is very similar in appearance but has a bright yellow, instead of brown, anal tuft. The larvae may do some damage in orchards by gnawing the buds of the trees in the early spring, and I have found them in the autumn before hibernation feeding in companies on the skin of the apple fruit while still on the tree, thus causing it to be useless for keeping.[4]

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[3] "Proc. South London Ent. Nat. Hist. Soc.," 1907., p 12.
[4] "Entomologist.," 1917., p. 279.

The Noctuae (Owl-Moths) do not trouble us much. It is true that some few species cause annoyance by their persistent attacks upon our bedding plants; thus *Plusia gamma*, L. (Silver Y), *Agrotis exclamationis*, L. (Heart and Dart), *Mamestra persicariae*, L. (Dot), and *Barathra brassicae*, L. (Cabbage), all delight in riddling our geranium leaves; the last named also loves to secrete its fat body in a succulent cabbage, more often than not getting thus served up at table. *Euplexia lucipara*, L. (Small Angle-shades), also has a most wicked habit of stripping one side of our choicest fern fronds and if we are unfortunate enough to get a good supply of these little green caterpillars into the fern house, the appearance of its contents may soon be considerably spoiled. But a greater pest is *Agrotis segetum*, Schiff. (The Turnip Moth). Fortunately the turnip is not its only food, as it feeds indiscriminately on the roots of species of *Brassica Rumex* and *Chrysanthemum*, but when it does take to the roots of turnips in our gardens or fields it soon utterly ruins them for table purposes. In ordinary course turnips are dug before the larvae come to maturity, and as a natural consequence the insects are then killed, so that without infection from some outside source a succession of attacks are unlikely.

Yet one other species of this group should be mentioned; I refer to *Charaeas graminis*, L. (The Antler Moth). It is not generally a very common species in the south-east of England, although even here it is fairly plentiful in some years, but in the West, Midlands and North it is generally to be met with in fair numbers. The larva feeds on the leaves of various grasses and has a predilection for hill-side pastures and heath lands, and at irregular intervals becomes so extraordinarily abundant as to absolutely strip them of every blade of grass. The last visitation occurred so recently as 1917, and in a report of it we are told, "The area affected extended to some sixty miles, in Cumberland, Westmorland, Lancashire, Derbyshire, Cheshire and Yorkshire. The larvae were in millions. In nearly all cases the trouble originated on the grassy parts of the moorlands and hillsides, and when every vestige of grass was eaten off in such situations, the larvae migrated to the lower slopes, crossing roads, etc., in prodigious numbers to find more food. In the Penistone district the roads were so infested that it is reported that the parish steam roller was brought out to crush them; and in some localities the sheep-feeding districts were so bared of grass by the larvae that the sheep had to be removed, nothing having been left for them to eat!"[5] During the past century similar visitations are recorded as having taken place in various parts of this country in 1827, 1881, 1884, 1885, 1897, 1902 and then in 1917; we also have a yet older record for Sweden, where in

[5] Porritt. "Ent. Mo. Mag," 1917, p. 176.

1741 and again in 1748 the ravages were so vast as to be a national calamity. Many suggestions have been put forward to account for these occurrences, such as the absence of birds, especially lapwings, prolonged periods of severe weather, which prevented birds getting at the larvae, and so forth, but none of them appear to offer a satisfactory explanation.

The Geometers (Loopers) although not as a group harmful, contain among their numbers one or two decidedly noxious species. *Cheimatobia brumata*, L. (Winter Moth), as everyone knows, is the bane of the fruit grower. The moth, or rather the male, for the female is for all practical purposes wingless, flies in November and December, and the eggs are deposited during those months on all sorts of trees, including apple and pear. They hatch in April just as the trees are coming into leaf, and at once begin to feed indiscriminately on leaf or blossom, and as they protect themselves by spinning the leaves together, they are very difficult to get at, once they have commenced to feed. When they are full-fed they descend to the ground for pupation. Now, although the female cannot fly it can run, and as soon as it comes out of the pupa it runs up the stems of the trees, where it is sought by the male and pairing takes place. To prevent this and thus check the attacks of the resultant larvae, bands covered with "tanglefoot" or some other sticky material are fastened around the stems of the trees a short distance above the ground, so that as the females attempt to ascend they may be caught by the sticky bands and thus prevented from doing any further damage. That this method is always completely effective, however, appears to be open to some doubt, for Mr. Durrant informs me that he has often seen male and female *in côp.*, the male flying up to the high branches of the trees, with the female in tow as passenger, thus evading the sticky bands. *Hybernia defoliaria*, Cl. (Mottled Umber), another winter species of somewhat larger size, which also has a wingless female, sometimes ably assists *C. brumata* in its work of destruction, and as its life-history is similar its prevention needs similar treatment.

Abraxas grossulariata, L. (Magpie), is sometimes sufficiently common on currant-bushes to strip them of their leaves, thus impoverishing the plant and thereby lessening its capabilities of cropping freely in the year after the attack. The larvae are full-fed in June and are then easily seen, somewhat brilliantly coloured creatures in white, black and yellow, looping along the twigs or the edges of the leaves. They are not beloved of birds, but are liable to the attacks of the same parasitic fly as those of *Pieris brassicae*, L., and some others; the only really efficient means of dealing with them is by picking them off the bushes by hand and destroying them. *Thamnonoma vanaria*, L. (V. Moth), which has a mottled greyish larva of somewhat smaller size, also attacks gooseberries and currants in a similar way, and may be dealt with in a like manner.

The Pyrales (Pearls) include at least one granary pest. *Pyralis farinalis*, L. (Meal Moth), is a pretty little yellow and dull purple species that one often sees sitting about on the windows and walls of granaries, stables, stores, and even of our houses. The larva feeds in a silken tube, which it spins along some solid substance, such as a wall or even a corn sack, anywhere against its food, so that it can reach out and devour the grain, bran, meal or other cereal produce on which it feeds. Several of its near relations were at one time credited with similar destructive propensities, but recent investigations seem to show that they are rather to be regarded as scavengers. Thus *P. glaucinalis*, L., also suspected of a liking for cereals, appears to prefer dead leaves, decayed thatch, etc. *P. costalis*, Fab. (Yellow Fringe), that brilliant little bright purple and yellow species sometimes to be seen in numbers on our house walls, is perhaps not quite so innocent, as it undoubtedly has a liking for old hay and clover stacks to which, if sufficiently numerous, it may do a certain amount of damage by webbing the material together with its silken threads.

Aglossa pinguinalis, L. (The Tabby), a much larger, dull grey-brown creature, long had the credit of devouring greasy horse-clothes, but it has been found that the larva instead of devouring the horse's clothing, really feeds upon the crumbs that fall from his table. It spins a tough silken tube, in which it lives, along any little crevice in wall or floor and eats any corn refuse, bran, grass seeds or such like substances as may come in its way.

The Phycids contain most of our warehouse pests; many, if not all of them, have probably been introduced into this country in the course of commerce. Be that as it may, some of them have obtained a firm hold in our stores. Take for example *Ephestia kühniella*, Z. (The Mediterranean Flour Moth). This species was unknown to science until about the year 1877, when a Dr. Kühn, of Halle, Germany, sent some larvae and moths that he had found in a mill in that town, to Prof. Zeller, who named them after the captor. In 1887 the moth was reared from larvae found in wheaten flour at Stoney Stratford, but the origin of the flour from which they were reared was not known.

In June of the same year I received a number of larvae from sacks of American flour stored in one of the London docks along side a number of sacks imported from Trieste, which it was found were badly infested, and from which it was believed the larvae had spread. I reared several generations and found that not only did they thrive on wheaten flour but that rice would satisfy them; indeed so tenacious of life were they that eggs placed in a pillbox with some half-dozen grains of rice enabled a couple of moths to come to maturity. So rapidly did the species spread that within a very few years of its introduction there was hardly a warehouse where flour was stored, or a mill in the country, where it was not

to be found, and in many of them it was simply swarming. The larva lives in a flimsy silken tube which it constructs on beams and in odd corners where the flour settles, and when the flour is stored in sacks the tubes are placed just against the inside of the material of which the sack is constructed, the damage to the flour being caused by these silken tubes becoming mixed with it and thus making it stringy and unfit for human food.

To deal with such a formidable enemy might well seem a hopeless task, especially as it appeared to have no set time for coming to maturity, brood succeeding brood, the length of time occupied in feeding up depending simply upon the temperature of the building in which it was situated. But after many experiments, such as fumigation of buildings and so forth, had been tried with more or less satisfactory results, it was found that nothing was so successful as strict cleanliness. By frequently sweeping down all beams, walls, floors, etc., and destroying all sweepings, and by not allowing used sacks to accumulate without thorough cleansing, the pest has been got well in hand and stringy flour is much less frequently met with now than it was a few years ago. It is also kept in check by an Ichneumon and a Braconid which are parasitic upon its larvae.

The other members of the genus feed chiefly on dried fruits, and it is quite probable that when you unwittingly eat "that maggoty fig" you are devouring one of them. Thus *E. calidella*, Gn. (=*ficella*, Dougl.), has been bred from figs, currants, raisins, almonds, and even cork; *E. ficulella*, Barr., from figs, cotton-seed cake, and oil cake; *E. cahiritella*, Z. (=*passuella*, Barr.), from various dried fruits, locust-beans, cotton-seed-cake, malt, and even chocolate; and *E. elutella*, Hb. (=*semirufa*, Hw., =*roxburghii*, Gregson), from almost any dried vegetable substance, including the before mentioned as well as corn, dog biscuits, nuts, capsicum, and turkey-rhubarb, and there is reason to believe that at times it feeds in multitudes on the seed of grasses in hay-ricks. The nearly allied *Plodia interpunctella*, Hb., also feeds on similar substances, as well as on dried walnuts, carraway-seeds, and yeast-cakes, and is not above devouring dried insects, while *Myelois ceratoniae*, Z. (=*pryerella*, Vaughan), thrives on locust-beans, dried figs, almonds, chestnuts, etc. All these species damage the substances on which they feed, not only by what they actually eat and the frass that they leave behind, but also by the amount of silky material spun by them in their efforts at concealment. They are none of them always very common in this country, but where goods are stored for a long time they may easily become so.

The Gallerias are a small group of rather obscure species, of which five only occur in this country, all of them more or less destructive in their habits. Of these *Meliphora grisella*, Fab. (=*alvearia*, Fab.), known, I believe, as the "Hive Moth," may be seen

of an evening buzzing around the hives of honey bees, frequently hovering in the entrance, and there is little doubt that it enters the hives and deposits its eggs on the comb. At any rate we do know that the larva feeds upon the wax, and is at times so abundant that it completely riddles the comb, and the bees have been known to desert hives where the attack has been particularly bad. It seems to prefer old comb, of which the wax is more solid than that which is newly made. As exemplifying the extent to which this species will infest a hive, I well remember a piece of comb, some three to four inches square, being exhibited at one of our meetings to illustrate the manner in which the creature fed. After the meeting, as no one seemed to want it, the piece of comb was put in a drawer, and I suppose forgotten, until some weeks afterwards, when on opening the drawer we were met by a perfect cloud of moths, many of which must have been out for many days, and were considerably knocked about by their flutterings, in their vain attempt to escape, but others were quite fresh and provided many of us with excellent series. In the days of the straw skep this moth must have been a real menace to the bee-keeper, but with the frame hive and present day methods its chances of doing serious harm are much reduced.

Aphomia sociella, L., affects humble-bees' nests, apparently when young feeding on the refuse that such nests contain, but when this is all consumed they attack the comb and often thus destroy the brood. They have been found in wasps' nests, but in that case it is the papery material of which the nest is made that forms their pabulum, and thus the brood is not destroyed. When the larvae are full-fed in August or September, they leave the nest and spin exceedingly tough cocoons in any material that they can pack them in tightly, or even in a compact mass on the ground. I have had a bundle of sticks, each measuring about a foot long and about as thick as one's finger, the whole having a circumference of perhaps a foot, stuffed so full of these exceedingly tough cocoons that no ordinary strength that one might exert would separate them. The larva lives securely in this retreat until the following May, when it turns to a pupa and the moth appears in June.

Galleria mellonella, L., is another hive feeder, but as it feeds almost entirely on old combs, *i.e.*, those of the previous year, it is not likely to do much harm. *Melissoblaptes bipunctanus*, Z., was fo many years confused with a nearly allied species, *M. anellus*, Schiff., and there is very little reliable information as to its larval habits, but from the situations in which I have taken the moth, and its habits, I incline to the view that it may be a wasp-nest feeder. Be that as it may, it is not sufficiently common in this country to be a menace. The remaining species, *Corcyra cephalonica*, Stainton, has totally different habits, being, like the Ephestias, a warehouse pest, and has been reared from dried currants, biscuits, and rice.

The Tortrices are a large group of rather small species, and some few of them, either by reason of their vast numbers, or their methods of feeding, are very real orchard or forestry pests. Even the most casual observer must have noticed, that in some years towards the end of May, when the oak trees ought to be in their full leaf, they are, over great tracts of country, as bare as in mid-winter. This is the work of the larvae of *Tortrix viridana*, L., sometimes ably assisted by the winter moths to which we have already referred. The brilliant little green moths fly about the oaks in June and July, and deposit their eggs in crevices of the stem and branches, where they remain until the following spring. Just as the leaf buds are beginning to expand, the tiny larva comes out of the egg and wanders along the branches and twigs until it finds a bud that is just expanding, in which it secretes itself and commences to feed. By the middle of May it has changed its skin for the third time and the leaves are fairly well opened. It now turns down the edge of one side of a leaf, and secures it by a few silken threads, thus making for itself a secure dwelling. Then it feeds rapidly, eating the other side of the leaf in which it dwells and those in its neighbourhood, and thus the devastation takes place.[6] The denudation of the trees of their leaves cripples their vitality, and if the attack is repeated for several years in succession may even lead to their death. I know of some trees in Tilgate Forest, where the attack has been very severe for several years past, that have been killed outright, the prime cause of their death evidently being the continued attentions of these larvae.

It will be evident that to deal with so vast an attack by artificial means would be a hopeless task, but fortunately Nature comes to our aid. Birds are very fond of these larvae and pupae and devour huge numbers of them. Even the much abused jay (*Garrulus glandarius*) is not averse to them, as is shown by some three dozen of the pupae being taken from the crop of one of them. A Hemipteron (bug) sucks the juices of the young larvae and thus destroys them, and they are also attacked by a considerable number of species of ichneumonid and other hymenopterous parasites (see "Ent. Mo. Mag.," 1922, page 56). Very wet weather just at a critical time is an even greater check to them.

A nearly allied species, *Tortrix pronubana*, was unknown in this country until 1905. In the following year larvae were found in some numbers on the south coast, and the species has since that time become more and more common and spread inland, and is now causing considerable trouble in some of the houses in Kew Gardens. In the Channel Islands, where it has been established for a much longer time, it has been known to cause damage in the grape houses, and it will be well that our market gardeners, especially

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[6] Sich, "Proc. South London Ent. and Nat. Hist. Soc.," 1915-16, p. 15.

those who "grow under glass," should be on their guard against this prolific species, for, should it establish itself in their houses, it might easily become a very serious pest. Its larva is polyphagous.

Several species of the genus *Rhyacionia* (*Retinia*) also are troublesome to the forester. We all know that the value in a pine tree is that it has a long, straight stem, so that it can be used for scaffold-poles, ladders, and such like purposes. This, however, seems to be just what these insects try, too often successfully, to prevent. *R. buoliana*, Schiff., a brilliant little red and yellow moth, flits about the pine trees on July evenings and deposits eggs on (probably) the buds, chiefly of the Scots' pine (*Pinus sylvestris*) and some other species. It is believed that the eggs soon hatch and that the young larvae enter a bud and there pass the winter. Be that as it may, we know that in spring the larvae enter a growing shoot, along which they burrow, eating out the soft part. Their presence may be detected by a resinous exudation, and later by the drooping of the shoot, which eventually dies. *R. pinicolana*, Doubleday, is a very similar species with almost identical habits, and *R. turionana*, Hb., a mottled brown species, has a similar economy. Now it will be apparent that if one of these larvae attacks a leading shoot, that is, the shoot at the top of the main stem, and the two last named species almost invariably do attack the leading shoot, and *buoliana* not infrequently does so, the growth of the tree will be diverted, either it will make two or three growths at angles to the main stem, or at least it will get a crook in it; in either case the tree becomes useless for its most valuable purposes.

The remaining members of the genus mostly feed in a somewhat similar manner; *R. resinella*, L., forms large resinous nodules for its habitation, but as they most frequently attack the lateral shoots, instead of the leading ones, their depredations are less harmful.

The genus *Cydia* (= *Carpocapsa*) contains one of our most troublesome orchard pests, *C. pomonella*, L., commonly known as the Codlin Moth, a pretty little grey and bronzy-brown species that flies around our apple trees on June evenings, just at the time when the young fruit has formed. It lays a single egg on a fruit, seldom more than one, and as a moth usually produces considerably over a hundred eggs, it will be seen what a number of fruits one moth may infect. The young larva on leaving the egg seeks the eye of the fruit, where it feeds for a few days and then burrows inwards, eventually reaching the core, in the neighbourhood of which it feeds up, and when full-fed tunnels to the side of the fruit and makes its exit. This may happen either while the apple hangs on the tree or after it has fallen; in either case, the larva on leaving the fruit crawls about until it finds some suitable place for making its cocoon, such as under loose bark on the stem of the tree, or any fairly well protected place where it may hide, and there it remains in its silken cocoon as a larva during the winter, not turning to a pupa until the following spring.

From this brief sketch of its life-history, it will be seen that although really a serious orchard pest it is not an easy species to control. Spraying with some insecticide may be effective if carried out at the right moment, but as the only vulnerable time for such treatment is during the few days while the young larvae are feeding in the eye of the fruit before boring into it, the chances of success are not great. Dressing the trunks of the trees with lime-sulphur may destroy some of the larvae during winter, and it is well to collect all affected fruit and to destroy it, especially when it can be secured before it falls from the tree. But probably the greatest check upon the species is the attention that it receives from the tits. These little birds are very fond of the larvae, and during the winter dig out large numbers from their hiding places and devour them.

The species was no doubt originally attached to the wild crab, and indeed I have seen a crab tree with far more affected fruits on it than sound ones, but it has taken very kindly to our garden varieties. It also attacks pears; I have bred it from walnuts, and it is said sometimes to infest plums, but of this I am very doubtful, it probably having been confused with another species to which I will refer later.

The other species of the genus prefer a harder pabulum; thus *C. splendana*, Hb., and *C. juliana*, Curt., naturally feed on acorns, *C. grossana*, Haw., and *C. nimbana*, H-S., on beech mast, but all of them are liable to attack walnuts and edible chestnuts, and may at times do a certain amount of damage to those crops.

Yet one other species of Tortrix is troublesome to our fruit growers. *Epinotia funebrana*, Tr., is naturally a sloe-feeder but is equally well at home with our garden and orchard plums and damsons, and it sometimes even attacks apricots. It is a most elusive species which although really all too common as a larva, is seldom seen in the perfect state; indeed, as one of our older writers, in describing its distribution, very tersely put it, "Scarce in the perfect state. The larva very frequent in plum pies," and I have no doubt that many of you have found the latter part of this statement to be quite true. As a consequence its life-history is only imperfectly known but it appears to be similar to that of *Cydia pomonella*. The moth is on the wing in June, and lays its eggs, probably, on the twigs of the plum trees or possibly on the fruit stalks. The young larvae enter the fruit and feed on the flesh around the stone, and when full-fed come out and spin their cocoons, probably under loose bark; in confinement they will bore into soft cork. It is generally thought that they remain as larvae until the spring and then turn to pupae, and judging by the behaviour of allied species, whose economy is well known, it is probable that this is the case. If this be so we have certainly another species also attacking our stone fruit. The larva of *E. funebrana* is described as "stout, sluggish, reddish in

colour," but I have found in an apricot a larva, somewhat elongate and of a slaty-green colour, feeding around the stone of the fruit, which spun its cocoon between the skin of the fruit and the earth on which it rested and certainly *turned to a pupa in the autumn*. Unfortunately the treatment it received in ascertaining these scanty details caused its death. Wilkinson tells us that he found larvae in plums, which did not agree with those of *E. funebrana*, but failed to rear them[7]. He describes them as "of a dirty drab colour"; but it is quite possible that they may have been the same species as the one I found, for the colour of these internal feeding larvae is seldom very strongly defined and difficult to describe with exactitude. Be that as it may, there is evidently here material for further investigation, and it behoves our friends who happen to reside in districts where plums are extensively grown, to keep a sharp look out for any unusual species, either as larvae or imagines, in the hope that by collective research this doubtful point may be cleared up.

The Tineid group, the last with which we have to deal, is a large assemblage of species of very diverse habits and size; they may all be regarded as small moths, but whereas the largest of them exceed an inch in wing expanse, the smallest are less than a quarter of that size. Among them are found several household species, *e.g.*, the "Clothes" Moths, as well as some of the most destructive pests of our gardens, farms, orchards, and forests, indeed for their size, it is wonderful what a lot of damage some of them can do.

Most of us, and I think this will particularly interest our lady members, have at some time in our lives been horrified, on shaking out last winter's furs, after their rest during the summer in the wardrobe, to see some of the hair fly away and to discover a small bare patch where it has left the skin, or to find some of the plumes of a feather boa floating gently across the room after similar treatment, or may be a series of holes down the front of our last summer's waistcoat: this is the work of one of these clothes-moths.

Tineola biselliella, Hummel, to which my friend Mr. Durrant has just given the English name of "*The* Clothes-Moth," is an inconspicuous little yellowish-ochreous moth of barely half an inch in wing expanse and of very retiring habits. One seldom sees it, for it loves to run swiftly about in the folds of clothing or anywhere where it is out of sight, and in such situations deposits its eggs. The larvae feed on hair, wool, cloth, etc., tunnelling along and spinning a certain amount of silk as they go. It is probable that the damage to the furs already referred to would be due to this species.

Tinea pellionella, L., "The Case-bearing Clothes-Moth" (Durrant),

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[7] Wilkinson, "British Tortrices," p.238.

is of about the same size and greyish-ochreous in colour and has very similar habits, but the larva feeds in a more decided case, which it carries about with it, and has a partiality for feathers, but will also eat hair, cloth, etc.

T. tapetzella, L., "The White-tip Clothes-Moth" (Durrant), is a slightly larger species measuring some three quarters of an inch in expanse, with a white head and almost black and white wings. It is more often seen about houses than the foregoing, possibly being more noticeable on account of its brighter colouring and larger size. The larva feeds on fur, woollen stuffs and so forth, and not infrequently makes its home in the stuffing of chairs and the like, as well as in clothes, where it often does a considerable amount of damage while quite hidden from sight.

T. pallescentella, Stainton, "The Large Pale Clothes-Moth" (Durrant) has been recognised as one of the clothes moths only recently, for it was little known in this country until the middle of the last century, and then only from an odd specimen or two taken in a Liverpool warehouse, where it was thought to have fed up on grain or rubbish-sweepings. My personal acquaintance with the species dates back some thirty years, when I took a moth on a warehouse window in the City of London, and I have since met with it, not infrequently in houses in London, Lewisham, Bristol and Eastbourne, so that it is evidently well distributed about the country. In 1912 a friend sent me some hare's hair (*i.e.*, hair cut from hare's skins) that had come from Brandon in Suffolk, and been stored for some time in a London warehouse, and which was a good deal matted together by the workings of some larvae. From this I reared quite a number of moths of this species. As therefore it is very evident that it thrives on animal substances, it is quite probable that it will be equally at home with the recognised clothes moths in our garments and furniture[8].

Monopis rusticella, Hb., easily recognised by its mottled bronzy-brown wings and yellow head, is another species that, although not generally included with the "clothes-moths," is not uncommon about our houses, and probably not infrequently joins its smaller brethren in their depredations. It feeds on animal substances, has been reared from birds-nests, where no doubt the larva had fed on the hair and feathers with which the nests were lined; also from dead animals including the dry carcase of a cat, the hair and possibly the outer surface of the skin in this case providing the pabulum. Why, then, should such things as the furs, furniture cushions and like kinds of animal produce that we have in our houses be less liable to its attack?

You will no doubt ask how are we to rid ourselves of these

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[8] "Proc. South London Ent. and Nat. Hist. Soc." 1913-14, p. 1.

insidious pests? It may as well be said at once that this we shall never do; we have created circumstances that are favourable to them and they are not likely to desert us; at best we can but mitigate their attacks. We may liberally besprinkle our clothes with camphor, naphthaline or other noxious drugs when we put them away, much to the annoyance of our friends' olfactory nerves when we take them into wear again, and think we are secure, but even this is open to doubt. But we may do much to mitigate their ravages, possibly prevent them, simply by continually worrying them. We have noted their secretive habits, their love of hiding themselves; in this lays our greatest defence. Never leave your clothes packed away for long periods; take them out, shake them, beat them, give them sun and air; you need then have little fear of the depredations of the clothes-moths.

There are two species to which I must refer while considering the household group, species that have raised perhaps more controversy as to whether they should be regarded as household pests or not, than any others.

Endrosis lactella, Schiff., (=*fenestrella*, Stainton), non Scop., "The White-shouldered House Moth" (Durrant). You have no doubt all frequently seen that pretty little mottled grey moth with a very white head, and in size about two thirds of an inch in expanse of its wings when it spreads them, sitting on the window, or found it drowned and floating in the milk jug. From these habits it has also been variously called the "Window-Moth" and the "Milk Moth." Or when you have seen it resting on the wall, I have no doubt you have said "kill that wretched clothes-moth." But it is not really a clothes moth, at any rate in the sense that it has anything to do with the species that we have already referred to under that name. It has none of their secretive habits, it advertises itself far too well, by its way of sitting about in full view in our houses and on tree-trunks in the woods, to claim any very close relationship with them. It is naturally a vegetable feeder, and in the wilds probably picks up a living on the bark of trees, seeds and thatch and any dry refuse that comes in its way, but in our houses it has acquired habits that are decidedly objectionable. I know of no definite record of its having attacked clothes, but it revels in almost any dry goods such as dried peas, etc., and to the entomologist it is a perfect pest; if it gets into his breeding cages it makes no bones of boring right through his pupae and killing them wholesale. It is also apparently capable of doing a good deal of damage as the following incident tends to show.

Many years ago I laid down some port wine in a cellar where the temperature was liable to more fluctuation than was thought to be good for the wine, and to overcome this the bottles were packed in sawdust which covered them up practically to the corks. After several years, during which the whole thing had remained untouched,

I noticed that the cellar was simply swarming with *E. lactella* and on examining the wine bottles, I found that the corks of many of them had been tunnelled by larvae and much of the wine spoiled. A closer inspection showed that in every case where the cork had been attacked, a quantity of sawdust was attached to it by apparently the remains of a silken gallery constructed round the small exposed part of the cork, and from which the boring had emanated, which exactly corresponded with this creature's method of feeding; moreover, although a careful search was made, no sign of any weevils was found. I think, therefore, that I am justified in attributing the damage to the ravages of *E. lactella*. It would have been an interesting experiment to have left things just as they were, to see if other wine corks were attacked in the same way, and thus to have made absolutely sure of the culprit, but the loss had been severe and so the cellar was cleaned out and all other bottle corks dipped in sealing-wax, thus preventing any possibility of further attack.

Borkhausenia (*Oecophora*) *pseudospretella*, Stainton, "The Brown House-Moth" (Durrant), is a somewhat larger and much more robust species, measuring little less than an inch across the expanded fore-wings, which are mottled grey-brown in colour with a couple of distinct black spots near the middle of each of them. It is of much more secretive habits than the last mentioned species, seldom sitting fully exposed when at rest but hiding in crevices, and if disturbed, running quickly to cover. The larva constructs a long, tough silken tube in which it lives, and disguises it by attaching any bits of the material in which it is feeding or other rubbish to it. It is a very general feeder, vegetable and animal food being apparently equally acceptable to it. It is an even greater terror to the entomologist than *E. lactella*, for not only will it devour the pupae in his breeding cages with avidity, but it will even destroy the specimens in his cabinets, and so carefully covers up its depredations, that a specimen which it has attacked may look quite natural until touched, when it will at once fall to pieces, the whole of the inside having been eaten, and nothing but a shell and the wings being left. It has been bred from dried peas, rice, skins, dried plants, etc. It has been known to cause much damage to heather sweeping-brooms in store, and I reared it from the same lot of hare's hair as *T. pallescentella* already referred to.

Its latest depredation that I have discovered was feeding on the leather of a book cover; the larva had constructed its tube inside the lower part of the back of the book and gnawn the lower edge of the cover. By the irony of fate the book attacked was Moses Harris's "Exposition of English Insects." Indeed, nothing seems to come amiss to it and on account of its methods of feeding, the damage caused is often much greater than the amount actually consumed

by it. It is indeed a dangerous species and one that at any rate should not be encouraged in our houses and warehouses.

The Hyponomeutas—commonly known as "Small Ermines"—form a compact genus, represented in this country by some six or seven species. Some of them are so much alike as to have led to a good deal of confusion, and whether we have the true apple species *H. malinella*, Z., or whether the hawthorn species has taken to the apple is uncertain. Be that as it may, the two species are so much alike both in their appearance and habits that for our present purpose the question is one of so little importance that it may be ignored, and we may assume, pending further information, that *H. padella*, L., the hawthorn feeder, is the species that also attacks our apple trees.

H. padella is a pretty little moth with whitish-grey wings sprinkled with minute round black dots and a white head, and measures about three-quarters of an inch in expanse. It is on the wing in July and August. It deposits its eggs in a little patch on the branches of the tree, and covers them with a glutinous substance, which soon becomes so near the colour of the branch that it is difficult to detect. The eggs soon hatch, and the tiny larvae shelter during the winter in the "tent" formed by the empty egg-shells and such debris as may have collected about them. In spring, as soon as the buds begin to open, the larvae ascend the twigs and feed on the blossoms and young leaves, and shortly commence to construct a web, in which the whole brood assembles, enlarging it from time to time as necessity requires, and devour the leaves of the tree. Thus not only is present damage caused by the blossom being eaten, but the vitality of the tree is impoverished by the loss of its leaves. No doubt many of the winter "tents" are destroyed by tits, and several species of ichneumons are parasitic on the larvae, but if we would be rid of the pest the only effectual method of dealing with it is to hand pick the trees and destroy the webs with the larvae in them.

H. cognatella, Hb. (=*euonymella*, Scop.), a slightly larger species measuring nearly an inch in expanse, has pearly-white wings with small but very distinct black dots. Its natural food is the spindle-tree (*Euonymus europaeus*), but it has taken only too kindly to the cultivated species of our gardens, often greatly disfiguring our hedges of *Euonymus japonicus* by its webs. Its economy is similar to that of *H. padella* and the remedy for its attacks the same.

H. evonymella, L. (=*padi*, Z.), feeds on bird cherry (*Prunus padus*), but I have no record of it having troubled our cultivated cherries.

Coleophora anatipennella, Hb., a little white species of just over half an inch in expanse, whose larva lives in a pistol-shaped case, which it carries about with it wherever it goes, is said to damage apple and cherry trees by feeding on the buds in spring.[9] Under natural

[9] P. J. Fryer, "Insect Pests and Fungus Diseases," p. 71.

conditions the larva feeds on apple, pear, blackthorn, etc., and no doubt the cultivated apple and cherry would not come amiss to it. It leaves the egg in autumn, feeds for a time on the leaves and then attaches itself probably to some woody part of the tree to pass the winter. With the advent of spring it becomes active again, and it is at this period of its life that it may do damage by feeding on the buds, and in cases where the species becomes very abundant the damage caused by it to our orchard and garden trees may be considerable.

Blastodacna hellerella, Dup. (=*atra*, var. γ, Haw.=*putripennella*, Zell.=*atra*, Meyrick), has also been credited with being destructive to apple trees.[10] This, however, appears to be an error due either to mis-identification or confusion of names. So far as is known *B. hellerella* confines its attention to hawthorn berries, but there is a nearly allied species that affects apple trees, *viz.*, *B. atra*, Haw. (=*vinolentella*, H.S.), which from its method of feeding is calculated to do considerable damage, when abundant, as its larva bores into the pith of the young shoots and is said to be more particularly addicted to attacking the young and tender trees and nursery stock. It is a slightly smaller species than *C. anatipennella*, and its wings are almost entirely blackish-grey, relieved only by a few whitish scales near the apex.

Lampronia rubiella, Bjerk., is a destructive little species with bronzy-brown wings, on which are four small yellowish-white marks on the costa and two larger ones on the inner margin, and it measures just under half an inch in expanse. It flies in June and lays its eggs in the flowers of raspberries. The young larvae feed for a time about the base of the fruit and then retire to some secure place, such as the stem of the canes, for hybernation. In spring they attack the buds, boring into them and then into the pith of the shoots, eventually killing them.[11] The species is fairly common throughout the South of England and in Ireland, and I have specimens from as far north as the shores of the Moray Firth. It is undoubtedly capable of doing a great amount of damage, but if we carefully destroy all old canes and stakes in autumn and dig the ground in winter, as we should do, it is unlikely that our raspberry crop will suffer much damage by it depredations.

Tinea capitella, Cl., attacks currants; it is slightly larger than the last mentioned species, and may be distinguished from it by its having a yellowish-white fascia near the base of the forewings, and two distinct rather large spots of the same colour, one on the costa and the other on the inner margin opposite to it. The moth is on the wing in (usually) the third week in May, and when about to

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[10] P. J. Fryer, "Insect Pests and Fungus Diseases," p. 151.
[11] Chapman, "Ent. Mo. Mag.," 1891, p. 169.

deposit an egg, sits on a currant berry, which it pierces with its ovipositor, and pushes the egg into it. The larva, when hatched, feeds on the seeds until about the end of June, when it bores its way out of the fruit and spins a small white cocoon among the dead scales about the buds and fruit spurs, in which it hibernates. In spring it comes out of its winter habitation, bores its way into the buds and also into the young shoots of the currant bushes.[12] Although hardly so common as *L. rubiella* it is fairly well distributed throughout England to as far north as Yorkshire, and is quite capable, in favourable circumstances, of becoming a serious currant bush pest.

Plutella maculipennis, Crt. (=*cruciferarum*, Z.), is probably familiar to you all as "The Diamond-back Moth." A narrow-winged species of some five-eighths of an inch in expanse, of a light grey-brown colour with an irregular whitish stripe along the inner margin of its wings, which, when they are folded, gives the appearance of a row of diamond-shaped marks along its back, hence its popular name. The eggs are deposited on various species of *Cruciferae*, usually on the backs of the leaves, on which the larvae feed. There are two, and possibly in warm seasons, more broods in the year; it will therefore be seen that the species has ample opportunity to multiply when circumstances are favourable. It is a generally distributed species throughout the country and always fairly common, but occasionally it becomes unusually abundant in some particular area; and then it is that harm arises, whole crops of turnips or green stuff being ruined by it. To deal with such a pest by artificial means is no easy matter, and various remedies that have been tried have proved only partially successful. Nature's own remedies, a parasitic fly and adverse meteorological conditions are probably our only real protection.

The Tineas also account for at least two granary pests. *Tinea granella*, L., a pretty little species of barely half an inch in expanse, with mottled grey-white and dark fuscous wings, has a larva that spins together several grains of corn and feeds upon them. *Sitotroga cerealella*, Olivier, is a slightly smaller species much resembling, when at rest, both in colour and size, a grain of wheat. It appears to have a rather remarkable life-history. It is said that the moth lays her eggs on the corn grains while they are still in the field, that the larva bores its way into one of them where it feeds on the contents of the grain and thus finds it way into the granary, where it completes its feeding, turns to a pupa, and eventually the moth escapes there. Although wheat appears to be its most favoured food it also attacks barley, rice and maize.[13]

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[12] Chapman, "Ent. Mo. Mag.," 1892, p. 297.
[13] Douglas, "Trans. Ent. Soc. Lond.," 1850-1, p. 107.

Coleophora laricella, Hb., is the smallest species with which we have yet had to deal; it measures but one-third of an inch in expanse and is of a uniform shining grey colour. The moth is on the wing in June and July, and the female deposits her eggs on the needles of the larch trees, one egg only on any one needle. The young larva tunnels in the larch needle, the end of which soon shrivels up. Out of this ruined portion of the needle it forms a case which it lines with silk and takes about with it to other needles, on which it also feeds, until it is ready for hibernation, when it attaches the case to a branch or to the stem of the tree, in some crevice where it passes the winter. In spring it returns to the needles on which it feeds up, enlarging the case from time to time as its growth requires. Towards the end of May it attaches the case firmly to a needle and turns to a pupa within it, and in due time the moth emerges.[14] It will no doubt seem incredible that such a minute creature can cause real harm to so great a tree as the larch, but it is a question, in this case, of numbers not size. In a badly infested plantation the moths occur in such countless myriads that their depredations upon the needles so impoverish the trees, that they soon become sickly and a prey for fungoid growths, aphids, bark beetles, and other pests that seldom attack healthy trees, and the work of destruction begun by these tiny moths is thus soon completed.

In concluding my remarks, a quotation from an address delivered by Dr. L. O. Howard to the American Association for the advancement of Science, at its meeting in December last, at Toronto, may not be out of place. He says, "Few people realise the critical situation which exists at the present time. Men and nations have always struggled among themselves—but there is a war, not among human beings, but between all humanity and certain forces that are arrayed against it. Man is the dominant type on this terrestrial body; he has overcome most opposing animate forces; he has subdued or turned to his own use nearly all kinds of living creatures. There still remain, however, the bacteria and protozoa that carry disease, and enormous forces of injurious insects which attack him from every point, and constitute to-day his greatest rival in the control of Nature. They threaten his life daily; they shorten his food supplies both in his crops while they are growing and in such supplies after they are harvested and stored, in his meat animals, in his comfort, in his clothing, in his habitations, and in countless other ways. In many ways they are better fitted for life on this earth than he is. They constitute a much older geological type, and it is a type which had persisted for countless years before he made his appearance, and this persistence has been due to characteristics which he does not

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[14] Collinge, "A Manual of Injurious Insects," p. 171.

possess and cannot acquire—rapidity of multiplication, power of concealment, a defensive armour, and many other factors. With all this in view it will be necessary for the human species to bring the great group of insects under control. We have ignored the insect group to a certain extent on account of the small size of its members, but their small size is one of the great elements of danger—is one of the great factors of their success in existence and multiplication."[15]

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[15] "Nature," vol. 109, p. 79.

Diacrisia mendica. Its History and its Variation.

By Robert Adkin, F.E.S.—*Read October 26th*, 1922.

The geographical distribution of *Diacrisia mendica* extends over a considerable portion of the Palæarctic region. Commencing in the west, we find it practically throughout Ireland, England and the southern two-thirds of Scotland, thence across Europe, except in the Polar regions and possibly the extreme south-east corner, just touching Asia Minor in the neighbourhood of Mount Olympus, and terminating, so far as we know at present, in Western Siberia at the slopes of the Altai Mountains.

History.

The species in its typical form is sufficiently well known to entomologists of the present day to need no description here, but to those of a couple of centuries ago it appears to have been one of some difficulty, chiefly on account of the disparity of the two sexes.

The earliest mention I know of the species dates back to 1702, when Jacob Petiver, in his "Gazophylacii Naturae et Artis," figures at Plate xliv., no. 8, an insect which fairly well represents a female *mendica*, and his description, "alba semidiaphana, guttulis paucis nigris," well describes this sex; he tells us that he is "obliged to Mr. Antrobus for this rare Gawse Moth," which seems to show that the insect was not very well known in this country at that early date, and that the male had not then been detected.

John Ray's "Historia Insectorum" was published posthumously in 1710, Ray having died some six years previously. At page 197, An. 97, 6, his description—A moth rather below medium size, wings and body white, a few black spots—clearly indicates the female of this species. Then, at page 200, 7, 8.—A moth rather below medium size, wholly dusky or dull cinereous, forewings broad, short, with three black spots on both—leaves no doubt that the male was also known to him, but it is evident that he was quite unaware that these two moths were the sexes of one species.

Between the years 1734 and 1742—Reaumur published his "Memoires pour servir à l'Histoire des Insectes," a fascinating book dealing with insect bionomics and life-histories. In vol. II. at page 60 he mentions some very hairy larvae that he had, and says "the fast walk of which has made us call it the hare." He

tells us that they made earthen cocoons, at the end of July and during the month of August, and turned to shining black chrysalids and that the moths emerged in the following spring. These appear to have included at least two species, one white, with black spots, the only difference between male and female being in "the beauty of the antennae," no doubt being referable to *D. lubricipeda*, L. (*menthastri*, Esp). Then he goes on to say, "But I have had, from these same caterpillars, male butterflies of which the whole upperside of the forewings was brownish mouse grey; their fore-legs and all round the head was the colour of dead leaves and the rest of the body was covered with white hairs mixed with a little grey. But the under side of the fore-wings and the two sides of the hindwings were grey. I should have had difficulty in accepting so grey a butterfly for the male of a female so white, if I had not seen him place himself on her as if to couple with her and remain in this position for more than sixteen hours without a break, and if later on I had not had several of these same butterflies which I bred from hare caterpillars which produce the white black-dotted females." This description appears to leave no doubt that he had both sexes of *D. mendica* and recognised them as such, but as he, in common with the before mentioned authors, assigned no names to the species that he dealt with, his work found little mention in the writings of the later systematists.

Thus we arrive at the time of Linnaeus, the first edition of his "Systema Naturae" having already been published in 1735, and succeeded by numerous other editions. The first edition of his "Fauna Suecica" appeared in 1746, and the tenth edition of the "Systema Naturae," the edition now recognised as the starting point by present day systematists, in 1758, but we find no mention of *mendica* in any of them.

In 1759 Clerck published his "Icones Insectorum," and on plate III., Fig. 5, gives a somewhat grotesque yet unmistakable representation of the male of our species and under it the name "Mendica," thus, for the first time connecting the species with a name.

In 1761 Linnaeus published the second edition of his "Fauna Suecica," and there we find at page 299, *mendica* placed in his omnibus genus *Bombyx* with the description "cinerea tota" and a reference to Clerck's figure, thus showing that the male only was referred to.

In the same year Poda in "Insecta Musei Graecensis" accurately describes the female but calls it *Bombyx lubricipeda* and was evidently unacquainted with the male (p. 87. No. 14).

In 1766 Hufnagel in the "Berlin Magazine" (II. (4), p. 424) concisely describes the male only under the name of *Bombyx murina*. And in the same year Moses Harris published in the "Aurelian" a really good figure of the female (pl. xxxv. m.) which he calls the "Seven Spot Ermine" and says (p. 75) "I received this moth with

many others, from a friend in Yorkshire, who informs me he took it in May, and that it is there very scarce, but in these more southern parts has never yet been discovered by anybody; therefore is esteemed as a great curiosity."

Then in 1767 came the twelfth edition of Linnaeus's "Systema Naturae," and in it we find *Bombyx mendica* with exactly the same description as in the "Fauna Suecica," ed. II., already referred to, thus showing that he was still conversant with the male only. In this connection a paper by Thomas Marsham in the "Transactions of the Linnean Society" (vol. i., p. 67, pl. i., 1791) is interesting. The title of the paper is "Observations on the Phalaena Bombyx Lubricipeda of Linneus and some other Moths allied to it," and with regard to *mendica* he says, "Linneus himself appears to have been unacquainted with the female *mendica*: the specimen of the male in his cabinet being a bad one, with the spots obliterated, he describes it, 'cinerea tota, femoribus luteis.' This however is not the case, for the male is spotted like the female. There is indeed a bad specimen of the female of this moth in his cabinet; but it is placed indiscriminately with *lubricipeda* and *erminea*." By the courtesy of Dr. Daydon Jackson I have recently had the advantage of inspecting Linnaeus' specimens. The male, as Marsham says, is a bad one, both as to condition and setting, and Linnaeus may well be forgiven for describing it as "cinerea tota," but it has his own label attached and the species is unmistakable. The female also is a poor specimen and has been removed from among the *lubricipeda* and placed alongside the male *mendica*, but bears no label.

Thus matters stood for nearly ten years when Schiffermüller and Denis published the "Systematisches Verzeichniss der Schmetterlinge," a work in which larval characters appear to be largely used as a basis of classification, and in which the group in which *mendica* is included is described as "Larvae Celeripedes" (quick-footed). Specific characters are not, as a rule, mentioned, but in a footnote to *mendica* we are told that Linnaeus knew only the cinereous male, the female is usually white (page 54). Thus it is evident that at this time (1776) both sexes were known and in 1783, Knoch ("Beiträge zur Insectengeschichte," iii., tab. 2, figs 5-12) figured both sexes of the imago together with the larva in various stages and pupa, and gives its full life-history.

One would have thought that the matter was thus definitely settled, yet in 1785 we find Fourcroy ("Entomologia Parisiensis," II., p. 270) under the name of *Phalaena punctata* (La Nervure picotée) describing a moth that can be nothing but the male *mendica*, but makes no mention of the female, that sex probably being still unknown to him.

But from about this period authors generally recognised the fact that the cinereous male with black spots and the sub-diaphanous white female also with black spots were the sexes of the one species.

Thus Esper ("Die Schmetterlinge," 1782, iii., pl. xlii) figures both sexes; as do Ernst and Engramelle ("Papillons D'Europe," 1785., iv., pl. clix.) Fabricius ("Entomologia Systematica," 1893, iii., p. 452, No. 139) describes the sexes as "Mas cinereo fuscus, faemina albida, punctis aliquot nigris," etc., and Panzer ("Deutschlands Insecten," 1797, xlvi., pl. 23 and 24) among the few Lepidopterons that he deigns to mention, figures both sexes, and although on separate plates tells us that they are the male and female of one species. Hübner too ("Europäischen Schmetterlinge," iii., probably 1802, pl. 34, figs 148 and 149) gives us fair representations of both sexes but is less happy in their delineation than he is in most of his species, but Donovan's delightful figures published at about the same date are all that can be desired ("British Insects," 1806, xi., pl. 388). From this time practically every author who includes illustrations in his work figures both sexes more or less successfully.

The generic position of *mendica* has been almost as troublesome to our systematists as was the disparity between the two sexes to our older authors. Linnaeus, of course, placed it in his great group of "tongueless" moths, Bombyx; and this arrangement was used by many authors. Thus we find Hufnagel (1766), Poda (1761), Esper (1785), Borkhausen (1790), Fabricius (1793), Panzer (1794), Hübner (Eur. Schmet., 1802, etc.), and Haworth (1803), all using Bombyx as their generic name for this species. But in 1810 Ochsenheimer published the volume of his "Die Schmetterlinge von Europa" dealing with the portion of Linnaeus's group in which our species occurs, dividing it into several genera and placed *mendica* along with *cribrum*, *russula*, *dominula*, *villica*, *caia*, *fuliginosa*, *menthastri*, *urticae*, *lubricipeda* and a number of other equally dissimilar non-British species in his genus *Euprepia* (*Euprepia*) (vol. i., pt. 3., pg. 351), and this name was used by Schott ("Schmetterlings Kalender," 1836) for the same species, by Dubois ("Lepidoptères de la Belgique," 1880) in a more restricted sense, and by some others.

In 1816 Hübner published the "Verzeichnis bekannter Schmetterlinge" in which he divided the larger groups into Stirps, Families and Genera. One genus he called *Diacrisia*, the only species which he placed in it being *russula*; to this I shall have to refer later. Another genus that he created was *Cycnia* in which *mendica* was included together with some five other species or supposed species, and in this generic determination he was followed by Curtis (Cat., 1837), Westwood (1843), and Walker (1855), but it did not come into general use.

Schrank had in the meantime founded the genus *Arctia* ("Fauna Boica," 1798), including in it *caja*, *hera*, *plantaginis*, *villica*, *dominula*, *fuliginosa*, *russula*, *menthastri*, *lubricipeda*, and *mendica*, and it was adopted by Meigen (1832), Koch (1848), and Edward Newman (1869); and Godart's *Chelonia* ("Histoire Naturelle des Lepidop-

tères de France," 1822) which contained practically the same species with the exception of *hera* and *dominula*, also found little favour as a suitable genus for *mendica*.

Then Stephens ("Illustrations of British Entomology," ii., 1828) took the matter in hand. He created the genus *Diaphora* expressly for *mendica* alone, and this was accepted by Wood (1839), Stainton (1857), Kirby ("Catalogue," 1892, and "Handbook," 1897), South ("Moths of the British Isles," 1907), and Seitz (1913). But he also founded the genus *Spilosoma*, placing in it *menthastri*, *urticae*, and *lubricipeda*. Herrich-Schaffer ("Systematische Bearbeitung der Schmet. von Eur.," 1845), put *mendica* in this genus, *Spilosoma*, along with the last mentioned three species and some others, taking *Diaphora* as a synonym, and this arrangement was accepted by the great majority of modern authors. But the matter was not yet settled.

When Meyrick published his "Handbook of British Lepidoptera," in 1895, he based his classification largely on venation, and one must assume that this decided him in taking Hubner's genus *Diacrisia* for *mendica*, *urticae*, *menthastri*, *lubricipeda*, and *russula*; Hampson ("Catalogue of the Arctiadae," 1901) also uses this classification. The association appears to be a natural one, and it is to be hoped may be found to be the correct solution of a much vexed question.

Variation.

Variation in *mendica* takes two very definite directions, in the one it is the colour of the male that is affected, in the other the black spotting of both sexes. In both cases the variation appears to be rather in the nature of local races than chance aberrations, for although occasionally aberrations do occur, they are apparently rare.

The best known local race is *rustica*, a form in which the male is creamy-white. It was first identified by Hübner, who twice figured it, "Sammlung Europaischer Schmetterlinge," plate 34, fig. 150, and "Beitrage zur Geschichte der Schmetterlinge," ii., iii., ii., fig. H., and at page 64 of this latter work he says, "I first found this moth in the Ukrane, and then also met with it in some other collections in Vienna. In size, shape, and markings it is difficult to separate from *mendica*, except that its colour is so much lighter, yet only in the male, the female is separated from it only by its wholly black antennae.* I have found no description of it, but from the above and the appended figure, this deficiency will doubtless be remedied."

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* Linnaeus, "Fauna Suec.," ed. ii., p. 299, no. 1127, says, "Antennae magis fuscae rachi alba." The Rev. F. D. Morice tells me that "rachi" is evidently from a Greek word signifying the backbone of an animal or the petiole of a leaf. The application in this case appears to be somewhat obscure, but may refer to a few white scales of the *mendica* female antenna, which do not appear to be present in *rustica*.

So far as we know this form occurs in Ireland, Hungary, Rumania, Armenia, Cilicia, and the Caucasus, all districts, be it noted, on the outskirts of the geographical range of the species, and Cockayne suggests that the light male may be the original form, and that the newer form with a dark male may have arisen somewhere in the centre of the area in which the species occurs and spread towards the outskirts ("Ent. Rec.," xxxi., 104).

Turati gives the name var. *binaghii* to specimens which he describes as of "a sandy colour, a bay, more or less clear, or non-smoky." Of which he says, "although supposedly a hybrid, or rather a mongrel of the *rustica* ♂ with the *mendica* ♀, is a product of natural selection." ("Atti. Mus. Milano," xlii., p. 39, pl. iii., f. 3-6), but unfortunately he does not tell us the exact locality whence he obtained his specimens.

We have been accustomed to believe that *rustica* is the only form occurring in Ireland, but this seems to be open to doubt, and indeed Kane in his "Catalogue of the Lepidoptera of Ireland," says, "We find, therefore, the var. *rustica*, though occurring in the extreme north and south of Ireland, is not the universal form." ("Entom.," xxvi., p. 344.) From which we must presume that the dark, typical male *mendica* occurs in the central districts, but this is a question that needs clearing up: perhaps some of our Irish friends can help us.

Be that as it may, if we breed from a pairing between a white Irish *rustica* male and a female of the same race, the male progeny are not all of the white form, but vary considerably in colour, some generally being darker and of quite a sandy-brownish tint = var. *binaghii*, and occasionally a few may be more or less a mixture of brown and white, but so far as I am aware the typical smoky-brown male never results from *rustica* parents. Is it possible that in such cases the stock from which we breed may, in some former generation, have been contaminated by the dark, typical race?

Another form, closely allied to var. *rustica*, and running in parallel light and dark gradations with it, has recently been named var. *renosa* ("Entom.," lv., p. 79). Its general tone of colour in the male is grey as compared with the yellowish-brown tone of *rustica*, and in both sexes the wing veins are often conspicuously darker than the ground colour. It was taken in Co. Tyrone, and has been bred to the second generation, its characteristics being preserved throughout.

Ernst and Engramelle ("Papillons de l'Europe," iv., p. 166, pl. clix., fig. 205f.), figure a specimen that is distinctly lighter in colour than the type, and of it say "fig. 205f. is a variety of the male drawn from the cabinet of Mr. Gerning. The colour is a good deal lighter than in the species, and in proportion more of a yellowish grey, it has black spots on its four wings. The underside has the same depth of colour as 205e. The female upper- and undersides

are quite white and much the same as in the species, it has three black spots on each of the upper and a single one on the underwings." Unfortunately, no locality is given, but I think the figure must be referable to one of the *binaghii* forms.

The black spotting of the wings varies very considerably, both in the type form and its colour varieties. I do not remember to have seen a specimen absolutely devoid of spots, but examples of both sexes in which the only marking is one small black dot in the centre of each forewing are not very uncommon (the female of this form has been named *depuncta* by Schultz), and from this every grade of spotting may be found up to heavily blotched specimens, both fore- and hindwings being affected. In the latter case the variation appears to be largely racial.

In this connection, Porritt ("Trans. Ent. Soc. of London," 1889, p. 441, pl. xiv.) describes and figures representatives of two broods that he reared from batches of ova found in the neighbourhood of Huddersfield, all the individuals of which, both males and females, are heavily blotched, in the more extreme examples taking a radiated form on the forewings, and forming practically a marginal band on the hindwings. Rebel ("Berge's Schmetterlingsbuch," 1910, p. 426. See also Barrett, ii., pl. 75, figs. 2b-2c) names the female of this form *fasciata*. Porritt tells us that the form was exceedingly local, being confined to about a hundred yards of a lane near Grimescar. *Mendicana* of Staudinger, described as "wings more or less streaked and blotched with fuscous, the terminal area sometimes suffused with fuscous," appears to be referable to this form.

Heavily spotted forms are not, however, confined to any particular locality, and may occasionally be found almost anywhere, and when bred from, a considerable number of the progeny usually follow the parents more or less closely. This seems to suggest that if a colony having this tendency gets separated it may gradually increase its intensity until *fasciata* forms are produced, as in the case cited by Porritt. I have heavily spotted forms from places as far apart as Yorkshire, Kent, and Hereford, including good radiated forms of the female from Kent and Co. Cork. These last may perhaps be regarded as chance aberrations, as apart from a local race; as may also forms that we occasionally find in which the chief spotting is in the form of a small blotch on the costa or inner margin or both, or it may be a streak along the costa, or, as in the case of var. *depuncta*, already referred to, is confined to a single spot on each of the fore-wings. Indeed, we find endless variations and combinations in the spotting, more particularly in the female, that appear to be quite casual.

Experimental Work.

A great deal of experimental work has from time to time been done in crossing the *rustica* race with the type. Standfuss found that by pairing the white male of the *rustica* race with typical

females, he obtained sandy-brown coloured males which Caradja named *standfussi*, but they appear to be identical with the wild *binaghii* form of Turati. I have myself obtained this same cross; the colour of the males differs little from the darkest coloured of the *rustica* race. Standfuss also paired females of *standfussi* with white *rustica* males and obtained white, much spotted males which Caradja named *inversa*. I do not propose to enter further into these experiments here, nor to detail the results of others in true hybridization with allied species that have been obtained, but those who are interested will find full accounts in Standfuss' "Handbuch der paläarktischen Gross-Schmetterlinge," p. 224, etc. Caradja, "Iris," viii., p. 82, xi., p. 397, etc. Rothschild "Nov. Zool.," xvii., p. 148. Oberthür "Études de Lep. Comparée," v., p. 52. Cockayne, "Ent. Rec.," xxxi., p. 101, and Onslow, "Journal of Genetics," xi., p. 277, etc. Var. *viertli*, Car.; var. *hilaris*, Car., and var. *beata*, Car., and others are names given to the forms resulting from these experiments in true hybridization and not from pairings between forms of the one species.

The *renosa* form also has been paired with the type; in this case the male being typical (Sussex) and the female *renosa*. The progeny followed much the same lines as in the *rustica* × *mendica* cross, being intermediate, but are a remarkable series. In the males the prevailing colour is a decided grey, varying individually in depth of shade from light to dark, the chief veins are indicated by pale streaks and the fringes in most of the individuals are of the same pale colour as the veins. The females closely follow the female parent. For this mongrel race I suggest the varietal name of *mistura* as appropriate. I have been fortunate in securing a pairing between moths of this cross and hope to be able to report the result of this second generation at some future time.

Gynandromorphism.

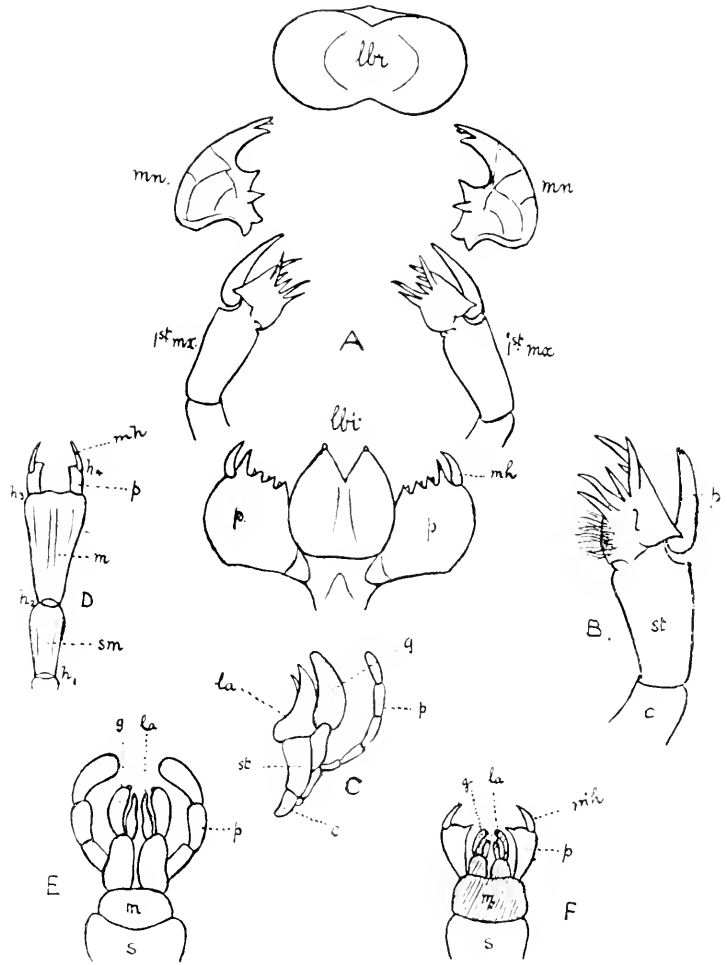
Gynandromorphism in the species, too, is a question that has led to some little confusion. So long ago as 1849 Wing wrote a paper on gynandromorphs that had come under his notice, and it was published in the "Transactions of the Entomological Society of London," vol. v., p. 119, and accompanied by a very beautifully executed coloured plate (No. xiv.). In it he says "Many instances have been recorded of insects that have exhibited the characters of both sexes, as well as in the colours and markings on the wings and body as in the form of different parts; and as a few specimens of these among the Lepidoptera have come to my knowledge, I have thought it desirable that accurate figures and descriptions of these specimens should be published. I have therefore drawn up short notices of their principal characters." On page 120 he says, "*Diaphora mendica* (Pl. xiv., fig 5). This specimen has the form of the wings, body and antennae of the male, but the colour and markings of the female. The male of this species, as

entomologists are aware, is dark ash colour, with black spots, while the female is cream colour, with similar markings, like the specimen figured. Taken by Mr. Nicholas Cooke, near Dublin, 1842." This description, it must be admitted, does very accurately describe what might be a gynandromorphic example of *mendica*, but on turning to plate xiv., figure 5, we find, not a gynandromorph, but one of the most beautifully executed representations of a male var .*rustica* that we have ever seen. There is no suggestion of the sub-diaphanous white of the female wings, but the well-clothed creamy-white of the male *rustica* wing is well illustrated. It is therefore very evident that this record was founded on an erroneous identification.

In 1868 Gregson recorded ("Entom.," iv., p. 11) that he had in his collection "one hermaphrodite *mendica* having male and female antennae, and of a light smoky colour throughout." It is unfortunate that all track of this specimen seems to have been lost. Gregson's collection passed into Sydney Webb's hands and was, I believe, incorporated with his own; but in the catalogue of sale of the Webb collection, no mention is made of this remarkable specimen. However, in Mosley's "Vars. of British Lep.," 1878-94, *Arctia*, plate i., three of Gregson's *mendica*, presumably his best forms, are figured, and no. 3 is a rather small, light, smoky specimen, but although one antenna is possibly slightly more slender than the other, both are clearly represented as pectinate. One wonders whether this may be the specimen referred to.

In 1896 Oskar Schultz, who seems to have made a speciality of collecting records of gynandromorphs, published in "Illustrierten Wochenschrift für Entomologie," vol i., p. 369 a list of species in which gynandromorphs had been noted, and in which *mendica* was erroneously included on Wing's record, and this he repeated in various continental publications during the succeeding few years. It is to be regretted that this erroneous record should have received such wide publication, but as in a subsequent list in which he summarises his five previous articles on gynandromorphs he omits *mendica*, it is to be presumed that he had detected the inaccuracy of Wing's identification.

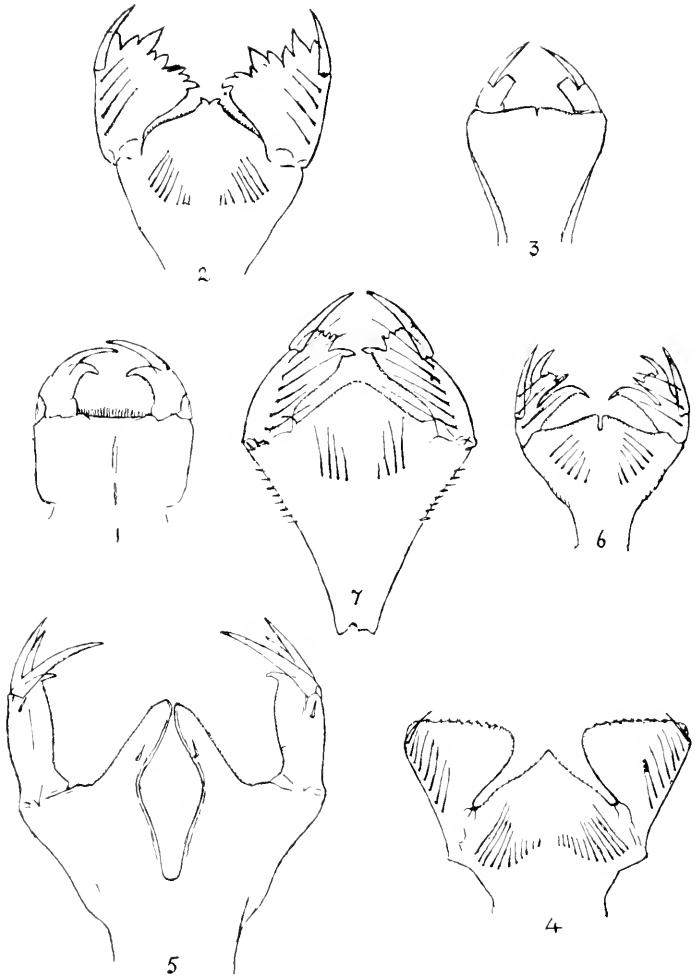
However, in 1909 Conrad B. Bocklet, Secretary of the Entomological Society of Coblenz, reported that Herr. Burscheid exhibited a somewhat worn, but tolerably good specimen, of a bilateral gynandromorph of *S. mendica*, caught at Coblenz. ("Int. Ent. Zeit." v., 3. p. 96, 1909). Schultz, referring to this specimen, tells us that the wings and antennae on left side are male and on the right side female and longer, and that the body has the colours of the two sexes sharply separated. ("Ent. Zeit.", 1911-2, p. 87.) This description suggests a very perfect gynandromorph, the sexes more sharply divided, indeed, than one usually finds in similar specimens of other species, and should it bear further critical examination, constitutes, so far as I am aware, the only true record of a gynandromorphic *mendica*.



A. Mouth-parts of imago of *Cordulegaster annulatus*, Latr. (×4·8).
B. First maxilla of *C. annulatus* (×7·2).
C. First maxilla of a grasshopper.
D. Mask of an Aeschnid dragonfly, shewing hinges.
E. Labium (second maxillae) of a Blattid.
F. Hypothetical arrangement of parts of labium of dragonfly naiad before fusion took place. The shaded part became mentum with ligula.

c, cardo ; *g*, galea ; h_1, h_2, h_3, h_4, hinges ; *l*, lacinia+galea ; *la*, lacinia ; *lbi*, labium ; *lbr*, labrum ; *m*, mentum ; *mh*, moveable hook ; *mn*, mandible ; *mx*, maxilla ; *p*, palpus ; *s*, submentum ; *st*, stipes.

(All the figures are diagrammatic, and unnecessary details, such as hairs, are omitted.)



TYPICAL LABIA OF BRITISH DRAGONFLY NAIADS.

Apical portion of—

1. *Gomphus vulgatissimus*, Linn. (×6).
2. *Cordulegaster annulatus*, Latr. (×4·5).
3. *Aeschna grandis*, Linn. (×3).
4. *Libellula quadrimaculata*, Linn. (×4·5).
5. *Calopteryx splendens*, Harris (×11·25).
6. *Lestes sponsa*, Hans. (×11·25).
7. *Erythromma naias*, Hans. (×12).

Labium (Second Maxillae) of the Paraneuroptera (Odonata).

By W. J. Lucas, B.A., F.E.S.—*Read November 9th*, 1922.

In view of the fact that a certain proportion of our members are not entomologists some apology is perhaps necessary for introducing a subject that does not come within their range of interest. To the entomologists I must apologise for bringing forward so many facts with which they are already well acquainted. Both, I hope, will pardon me.

At the present time it is fairly well agreed that the head of an insect is composed of seven segments (somites, arthromeres), whose division lines (sutures) are, however, none too easily made out. They are:—(1) the **Ocular,** bearing the eyes and ocelli; (2) **Antennal,** bearing the antennae; (3) **Second Antennal,** usually without appendages (but in *Campodea* and *Collembola* rudimentary appendages are present corresponding to the antennae in Crustacea); (4) **Mandibular,** bearing the mandibles; (5) **Maxillular,** with the maxillulae, when these appendages are present; (6) **First Maxillary,** bearing the first maxillae; (7) **Second Maxillary,** or **Labial,** with the second maxillae, or labium as they are more usually styled, at any rate in the Paraneuroptera.

	Segment or Somite.	Appendages.
1.	Ocular.	Eyes and Ocelli.
2.	Antennal.	Antennae.
3.	2nd Antennal.	(Present in *Campodea* and *Collembola*).
4.	Mandibular.	Mandibles.
5.	Maxillular.	(Maxillulae).
6.	1st Maxillary.	1st Maxillae.
7.	2nd Maxillary.	2nd Maxillae, or Labium.

Two types of insect mouth are readily apparent to every student of the Insecta:—(1) the *Mandibulate*, in which the four pairs of appendages just enumerated are as a rule quite clear, and (2) the *Suctorial*, in which usually they are not. *Campodea* and *Collembola* are to some extent intermediate between these two, the mandibles and maxillae being retracted; so that, while they can bite soft substances, they are able apparently to suck also. The mouth of *Campodea*, one of the most archaic of insects, might be assumed to have been a condition from which the two types branched off; but conclusions of this kind must not be too readily drawn, and at any rate they do not concern us now. Those interested will find the matter fully discussed in Lord Avebury's "Origin and Metamorphoses of Insects."

It is with the appendages of the seventh somite only that we have to do this evening. Before proceeding to consider that organ, however, it will be well to look at the whole of the mouth-parts for a moment. These are found on somites 4, 6, and 7 only, as far as the Paraneuroptera are concerned. On the fourth somite is the pair of strongly toothed horny mandibles; on the sixth the pair of first maxillae, also armed in part with six teeth; and on the seventh the united pair of second maxillae, or, as they are usually called, the labium, which covers the mouth ventrally. Dorsally it is closed by a flap (not an appendage of the same nature as the other six) called the labrum. The whole apparatus provides a fairly typical form of mandibulate, or biting, mouth of an archaic insect.

Possibly these mouth-parts will be more clearly understood if they are shewn dissected out. Pl. vii., fig. A, represents, somewhat diagrammatically, the mouth of an imago of *Cordulegaster annulatus*, Latr., hairs, etc, being omitted for clearness. If we first examine one of the First Maxillae, which are less modified than the second pair, we shall understand more easily the construction of the latter.

Essentially a maxilla consists of the cardo, stipes, lacinia, galea, and palpus (omitting one or two less important connecting parts, which do not concern us just now). These can be well seen in the maxillae of a still more archaic insect than a dragonfly (Pl. VII., fig. C.). In the maxilla of a dragon-fly, however, the lacinia and galea are fused and are usually spoken of as the inner lobe, while the palpus is of a simple nature (Pl. VII., fig. B.). Fusion of the same parts has also taken place in the labium, as of course might be expected, fusion in fact being the order of the day in that organ; and it is easy to see that a useful object is gained thereby—that of keeping the food within the mouth, to be passed on by the first maxillae for thorough crushing by the mandibles. So the two pairs of maxillae fulfil a somewhat similar function to that of the tongue in the vertebrates.

It seems perfectly clear that originally the second maxillae were less fused than they are in the dragonflies. A glance at the

diagrammatic labium of a cockroach confirms this (Pl. VII., fig. E); for a very primitive (I think I may say *most* primitive) form of labium occurs in the Orthoptera and Isoptera. This we may compare with the labium (also diagrammatic) of one of the large dragonflies (Pl. VII., fig. A, *lbi*). Although it is quite agreed that in the first maxillae the inner lobe is caused by the fusion of the galea and lacinia, in the case of the second maxillae this was once questioned; but the same view seems to be accepted now. Rambur and Hagen, advanced the opinion that the lateral lobe represents the palpus only, while the central part was the result of the fusion of galeae and laciniae. Gerstaecker, however, thought that the lateral lobe was made up of palpus and galea. Apart from the fact that non-parallel variation is scarcely to be expected in this case, there are various little indications, especially in the naiad stage and in imaginal Zygoptera, which tend to support the opinion of Rambur and Hagen. Pl. VII., fig. A, *lbi*, will serve to illustrate all the imaginal labia, if mention is made of one or two points of variation in the sub-families.

All the families and sub-families with British representatives, are shewn in the following table.

British Paraneuroptera.		
Sub-order.	Family.	Sub-Family.
Anisoptera.	Aeschnidae.	Gomphinae.
		Cordulegasterinae.
		Aeschninae.
	Libellulidae.	Corduliinae.
		Libellulinae.
Zygoptera.	Calopterygidae.	Calopteryginae.
	Lestidae.	Lestinae.
	Agrionidae.	Platycneminae.
		Agrioninae.

Although there is some amount of variation in the *imaginal* labium, yet in all cases the principal parts are easily recognisable—broad base, projecting median lobe (=ligula), squames supporting lateral lobes, moveable hook, and end hook. Some variations are:—In the Zygoptera and the old Anisoptera the ligula is prominent and

usually bifid (an archaic feature); in *Aeschninae* there is no median cleft but a line shewing the suture, and sometimes tubercles are present on each side of it; *Cordulegaster* has a set of supplementary teeth to the end hook (perhaps carried over from the naiad stage); in *Libellulidae*, the end hook has gone, the moveable hook is small or represented only by a chitinous spot, lateral lobes are greatly enlarged, median lobe is reduced to a small triangle above which the palpi meet in the middle line, making a T-shaped closed mouth.

But this evening I want especially to call attention to the highly remarkable and quite unique labium of the dragonfly in the naiad* stage.

Very aptly the naiad labium is called a "mask," because it completely (or else very nearly) covers the other mouth parts. The view in Pl. VII., fig. D, gives a very good idea of the shape and general appearance of the mask in a dragonfly of the Aeschnine type. It is in four parts—submentum, mentum with ligula, two palpi, and two moveable hooks. Consequently there are four hinges. These are worked by suitable muscles, except the moveable hooks which have none. The mask is extremely variable in shape, especially as regards the lateral lobes (palpi).

In the embryo before hatching the labium consists of a pair of three-jointed appendages, separate except at their extreme base. As the naiad grows up, it alters considerably. After hatching the tendencies are towards:—

(1) More complete fusion of parts.
(2) Repression of galea and lacinia.
(3) Growth and strengthening of moveable hook.
(4) Increase in the number of setae.
(5) Deeper cleft in *Calopteryx*.
(6) In *Anax* setae which are present at first are afterwards lost.

In the last stage before becoming an imago, the masks of the various families and sub-families differ greatly, though not much within the sub-families. One belonging to each will now be examined, notice being taken of signs that point to an archaic form. Masks may roughly be divided into (1) flat, and (2) spoon-shaped, the former being the more archaic.

1. **Gomphinae.** *Gomphus vulgatissimus*, Linn. (Pl. VIII., fig. 1).
(1) Short, squarish, flat *mentum*.
(2) *Setae* none.

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* Following Comstock in his "Introduction to Entomology" (Ithaca, 1920), I am restricting the term "nymph" to the immature instars of insects with *gradual* metamorphosis such as grasshoppers; adopting the term "naiad" for those with *incomplete* metamorphosis, such as dragonflies; and reserving "larva and pupa" for those with *complete* metamorphosis, such as butterflies and lacewings.

(3) *Median lobe* (ligula) usually not projecting, entire, and in our only species straight and fringed with hairs.
(4) *Palpi* rather simple.
(5) *Moveable hook* strong and well developed.

The flat surface and somewhat simple palpi are archaic.

2. **Cordulegasterinae.** *Cordulegaster annulatus*, Latr. (Pl. VIII., fig. 2).
(1) Spoon-shaped.
(2) Raptorial *setae*, both lateral and mental—in our only species four on the palpi, about sixteen on the mentum.
(3) *Median lobe* produced, and then cleft at the tip.
(4) On the distal margin of palpi, large interlocking teeth.
(5) *Moveable hook* reduced.

The cleft median lobe (ligula) is an archaic feature. In some respects this mask approaches the very spoon-shaped mask of the *Libellulidae*; but perhaps it is only a case of parallel development, as the two sub-families do not seem to be related.

3. **Aeschninae.** *Aeschna grandis*, Linn. (Pl. VIII., fig. 3).
(1) *Shape*, very long, narrowed towards the base.
(2) *Setae*, not present in full-grown naiads.
(3) *Median lobe* usually projecting a little, and sometimes having a slight median cleft.
(4) *Palpi* with straight distal margin, and slight end hook.
(5) *Moveable hook* strongly developed.

The *Brachytron* group may have two pairs of tubercles on the median lobe, which are perhaps remnants of galeae and laciniae. *Anax*, as a naiad, develops towards simplicity. Rudimentary setae on the palpi may be seen in the early stages of the naiad; but they disappear later. The *Aeschninae* are a fairly archaic type.

4. **Libellulidae.** *Libellula quadrimaculata*, Linn. (Pl. VIII., fig. 4).
(1) *Mentum* wide and somewhat triangular, *submentum* narrow.
(2) *Median lobe* projecting and triangular.
(3) *Palpi*, very large, sub-triangular, very much spoon-shaped.
(4) Lateral and mental raptorial *setae* present, the latter being sometimes in two series.
(5) *Moveable hook* small and slender.
(6) *Distal border* much developed.

The mask hides the face well, but is not so good a raptorial instrument. It perhaps acts as a spoon to catch small animals. In *Orthetrum cancellatum*, Linn., there is a raised central line, and on each side there are a number of small teeth with a small spinule between them.

5. **Calopterygidae.** *Calopteryx splendens*, Harris (Pl. VIII., fig. 5).

(1) Somewhat diamond-shaped.
(2) *Setae* none on mentum; about two on each palpus, but perhaps of little use.
(3) *Median lobe* very deeply cleft in the mature naiad, though less so in earlier stages. (Archaic.)
(4) *Palpi* slender; three teeth—the end hook and two between it and the moveable hook.
(5) *Moveable hook* well developed.

It has been suggested that the cleft may be of use to get rid of rejected remains of food (?).

6. **Lestinae.** *Lestes sponsa*, Hans. (Pl. VIII., fig. 6).
(1) *Shape* much as in *Agrionidae*.
(2) Raptorial *setae*—two on moveable hook, one on lateral lobe, a row of a few on mentum.
(3) *Median lobe* cleft.
(4) *Palpus* with large teeth of various shapes.
(5) *Moveable hook* well developed, bearing setae.

Teeth increase in size as naiad develops. Presence of setae on moveable hook is an important feature.

7. **Agrionidae.** *Erythromma naias*, Hans. (Pl. VIII., fig. 7).
(1) *Mask* lengthened, contracting basally; mentum short.
(2) Raptorial *setae*—lateral and mental.
(3) *Median lobe* prominent, triangular.
(4) *Palpus* having end-hook fairly developed.
(5) *Moveable hook* moderately developed.

HOMOLOGY OF THE PARTS OF THE DRAGONFLY LABIUM.

ARCHAIC.	NAIAD.	IMAGO.
Submentum (=cardines).	Submentum lengthened.	Submentum reduced.
Mentum (=stipites).	Mentum lengthened.	Mentum (with squamae).
Median lobes =ligula =subgalea.	Distal part of mentum =ligula.	Distal to mentum.
Galea } Lacinia }	Lost, or nearly so.	Lost, or nearly so.
palpus { Lateral lobes.	Lateral lobes developed.	Lateral lobes developed.
palpus { Moveable hook.	Moveable hook.	Small or lost.

As already mentioned the mask is an altogether unique structure in the Animal Kingdom. It is made suitable for the use to which it is put by the lengthening of the mentum and submentum, and the alteration of the tip of the palpus into a moveable hook. The mask appears at first sight to be an unwieldy implement, but it is capable of being worked with accuracy and great speed. It posseses much power, and it has been stated that if the naiad is held by the extreme tip, it can easily lift its body up to the support. The mask can be shot out so that its tip extends to some considerable distance in front of the head, and this lengthy grappling arm, combined with the sideways movement of the palpi (lateral lobes), and the assistance of their teeth, constitutes a formidable instrument for the capture of prey.

Should a tiny red worm or other apparently dainty morsel be sighted, the naiad creeps stealthily along by slow degrees, so as not to call the attention of the prey it hopes to catch; or perhaps just as frequently it waits till the prey of its own accord approaches sufficiently near. At any rate when within measurable distance, which, if one may judge from occasional false shots, it cannot always gauge with great accuracy, the naiad puts into action the powerful muscles by which the mask is operated, shoots it out with lightning speed, seizes the prey with the moveable hooks, and with equal speed brings back the mask with the prey in its grasp. Wriggle as it may the prey is helpless, and the action of the mask brings it in front of the mouth, where the first maxillae and mandibles soon make short work of it, struggle as it may and often does.

I am afraid I have brought forward a somewhat uninteresting subject, and I know I have treated it most inadequately. As a matter of fact our knowledge of the evolution of the remarkable dragonfly labium is none too complete; but we see clearly that the steps of the process by which natural selection (or some other method of adaptation) has evolved from an original pair of second maxillae, the strange yet very efficient odonate mask, are well worth investigation, even if the objective may be difficult of attainment.

Notes on the genus Zygaena.

By T. H. L. Grosvenor, F.E.S.—*Read December* 16*th*, 1922.

I must apologise for the obvious shortcomings of this paper. When invited to do something with reference to the Zygaenas, I had a faint hope that something of interest might be written, as I had at least 2,000 larvae, all bred from selected parents and carried to the second generation. Circumstances, however, have decided otherwise, for out of all those larvae I only bred about two dozen imagines, the remainder dying as pupae. Instead of the imagines developing they rotted, and the pupae were filled with a black fluid, so that one was unable when opening them to obtain the results, and, from a Mendelian point of view, all one can say is, that the black and yellow forms follow these lines. Confluence, which will be dealt with later, apparently does not follow any rule.

The result of pairing black and red, and yellow and red, always produces in the first generation 100% of the type; a pairing of these types produces a percentage of the aberration, but on this occasion the results obtained were too small to give any definite figures, and the only pairing obtained of black × black was infertile. Newman, who has bred the yellow form in large numbers, shows that this follows Mendelian lines, and he has obtained pairings, yellow × yellow, which produce 100% of yellow.

In regard to confluence, one is of opinion that this result is caused either by temperature or atmospheric conditions, with a greater or lesser tendency in various colonies to produce this form. One has on many occasions bred *Z. trifolii* from selected parents with the following results. A pairing of two of the most extreme confluent forms, in the first generation produced the type, *i.e.*, with spots 1 and 2 separate, 3 and 4 connected, and 5 free; there were also a few of the form *orobi*. The result of several pairings from these produced an overwhelming number of *orobi*, *i.e.*, with spots 3 and 4 disconnected, but not a confluent form was obtained. On the other hand confluent forms may be obtained from any pairing, generally in the first generation, the greatest number obtained from any one pairing was from a brood, type × black, which in the first generation produced about 27 typical and ab. *orobi*, and 11 showing varying degrees of confluence. From observations made over several years, confluence appears to be caused by similar conditions to those which produce blueness in the females of the *Lycaenidae*.

The range of the true Zygaenas is entirely Palaearctic, extending from Ireland in the west to Japan in the east, being found in the greatest numbers in Italy, Greece, and the shores of the Black Sea, then gradually decreasing in numbers until in the extreme east of their range the family is represented by one species only, *Z. niphona*. Their area north and south extends from Norway, Sweden, Russia, etc., to Palaearctic Africa, not being found south of the Atlas Mountains. The greatest numbers are found on the shores of the Mediterranean, gradually decreasing as one proceeds north, until in the extreme north of their area one species only is to be found, viz., *Z. exulans*, which in the most northern portion of its range is found at sea level. This species as its habitats approach warmer climates lives at higher altitudes, until in the south of Europe it is only found on the higher mountains. In the British Isles, situated as they are in the extreme west, the species are few in numbers, there being in all seven, viz., *filipendulae*, *trifolii*, *lonicerae*, *meliloti*, *exulans*, *minos*, and *achilleae*, with two forms which Tutt considered to be distinct, viz., *hippocrepidis* or *tutti* and *trifolii* race *palustris*.

The ova of all the species are very similar, being oval in shape and of a yellow or greenish colour, with a transparent portion at one end. These are laid in batches with several rows overlapping, and normally they number from 100 to 150. If, however, ova are laid by a virgin female their position is different, for then only a few ova are laid, seldom more than half a dozen, in a batch, and are never overlapped. The only variation that has come to my notice is with *scabiosae*, which lays a normal batch of eggs, but apparently covers them with some kind of secretion, much after the style of the Mantis. The eggs hatch in about ten to fifteen days. It is practically impossible to differentiate the larvae in their first stadium, but after the first change they begin to exhibit the characteristics of the Zygaenas. After feeding for eight to ten weeks they hibernate. The larva spins a pad of silk, after which it moults, the colour changing to a pale drab with a semi-transparent appearance. The change of skin is effected in a manner different from other larvae; the skin splitting the entire length of the body, and the edges curling over leave the larva entirely free. After resting for a period it walks away, leaving the skin quite perfect.

In the spring the larvae bask in the sun, and after a few days again cast their skins, the colour changing to the tints previous to hibernation. Tutt states that the larvae feed before this moult, but from my own observations I cannot agree with this statement, as I have never found the slightest trace of their feeding. It is at least the fact that if kept in a tin without any food they will successfully complete this operation. After feeding for a week or two a proportion of the larvae again change their skins, but instead of taking a step forward they hibernate for another winter, and in some cases this will happen two or three times. Thus they may on occasion live in the larval state for three years.

They very rarely emerge without hibernation. The species which most commonly do this are *transalpina* and *stoechadis*. Among the British species this has occurred in *trifolii*. Still, so-called second emergences in nature must be looked upon with doubt, as it occasionally happens that larvae that have commenced hibernation a second time, after a period of remaining torpid, will commence feeding and produce imagines several weeks after the species is normally over. This probably happens in nature far more frequently than actual second emergences.

As regards food plants: although the various species feed on a number of herbaceous leguminous plants, such as *Lotus*, *Hippocrepis*, etc., with the exception of two species so far as known, viz., *punctum* and *sarpedon*, which are stated to feed on *Eryngium*. Practically all will feed on *Lotus corniculatus* as a substitute. *Purpuralis*, however, prefers wild thyme, but will eat *Lotus* if nothing better offers. The larvae of the majority will hibernate comparatively easily; but those species whose habitat is the higher altitudes, which normally would spend the winter covered with snow, it seems practically impossible to hibernate successfully when they are taken away from their natural environment.

The most successful method of hibernation that I have found is, immediately the larvae cease feeding to put them in tins and keep them quite dry. A few pieces of virgin cork give the larvae a good foothold, and they will readily settle down. The greatest enemy is mould, and every particle of food must be removed. The greatest mortality takes place when the larvae come out of hibernation, and care should be taken to prevent them waking up too early in the season. For one reason, *Lotus* is difficult to obtain, and secondly, if feeding commences and cold weather intervenes they will almost certainly hibernate a second winter. When full fed the larva forms the well known boat-shaped cocoon: this is almost universal, but different species affect different positions. For example: *filipendulae* usually is to be found attached to the top of a grass culm, while the early brood of *trifolii* is most difficult to find, being generally attached to stones, or on the ground, where the cocoon most closely resembles its surroundings; the late brood generally pupates on rushes. Doubtless the method adopted agrees with the surrounding country. The early brood of *trifolii*, living on dry chalk hills, is able to fix its cocoon on the ground without undue moisture; but the late brood, living in marshes, if fixed to the ground would be almost under water. Neither of these cases is invariable, as I have found cocoons of the early brood affixed to a hawthorn bush quite eight feet from the ground, whilst I have found the *palustris* form almost on the ground. In the case of *filipendulae*, both types, the early form in marshes, and the late form on the chalk, construct their cocoons in a similar position; while *scabiosae* attaches its cocoon to trunks of trees.

When working the Zygaenids, one very often finds two species flying together, and pairing often takes place between distinct species; but in the majority of instances the resultant ova are infertile. Still there are records of hybrids having been successfully reared. The following species have been found in cop :—

filipendulae ♂ × *achilleae* ♀.
do. × *ephialtes*.
do. × *lonicerae*.
do. × *hippocrepidis* (? *transalpina*).
do. × *minos*.
do. × *trifolii*.

Hybrids were most successfully obtained by W. H. B. Fletcher, who obtained fertile crosses between *filipendulae* × *lonicerae* and *trifolii* × *lonicerae*; with the former, fertile ova were produced and successfully reared, but on these being paired only infertile ova were produced; as a result of the latter pairing, not only were the hybrids reared, but these on being paired produced fertile ova. On several occasions Fletcher obtained pairings between *filipendulae* × *trifolii*, but in every case the result was infertile; and he states that he doubts whether this cross would ever give fertile results. However, in 1920, I obtained three such pairings, with the result that two of these produced infertile ova, but those from the remaining pair were fertile. The latter I divided with Mr. Tonge and we were both successful in rearing imagines. Two pairings of these hybrids were obtained, but both were sterile. The hybrids produced were curious. It is usual in *trifolii* and in *filipendulae*, that when the former produces a six-spotted race it is always the female that first acquires the sixth spot, and it is not until this feature has become plentiful that one finds any males bearing the sixth spot. Although there has not been found in England a colony of *trifolii* showing this aberration, it has been noted on the Continent. In *filipendulae* it is always the male that first loses the sixth spot, and it is by no means rare, especially on the North Downs, to find *filipendulae* with this spot greatly reduced, although I have never actually found it absent. In the hybrids the result was the opposite, 50% of the males had the sixth spot developed in varying degrees, the remaining 50% were five-spotted; but in the females there is no trace of the sixth spot. On three or four occasions I have found on the same ground where the pairings were obtained, males with this sixth spot, which might possibly be wild hybrids. It is of course impossible to differentiate the females, as they are not to be distinguished from the true species. Cross pairings may be readily obtained between the early form of *filipendulae* and the late or true *filipendulae*, and as the emergence of these is extended it is always possible to obtain late examples of the early form, and early examples of the late form. These, if put together, will pair quite readily.

In regard to the early form of *filipendulae*, which Tutt considered

to be a distinct species: with all respect for Tutt's powers of observation, one cannot but consider that in this case he acted without properly considering the matter, as there is not the slightest doubt that these two forms are one and the same species, and certainly so in the colony from which he took the specimens that he named *hippocrepidis*. I have examined a number of specimens from his series, and they are a rather small race with the sixth spot weakly developed. If taken alone they might be thought to be a species in a genus where the species, although being quite distinct, show a marked superficial resemblance; but other colonies fail to show the characteristics noted by Tutt, although they correspond exactly to the true *filipendulae*. Furthermore, the larvae of both are identical; the appendages are not to be differentiated, and finally they pair readily, the result always proving fertile in the first and subsequent generations. It often happens in the localities where true *filipendulae* occurs that an odd specimen will emerge in May, and on the ground where *tutti* occurs it is sometimes possible to find belated examples a month or six weeks after the brood is over. If true *filipendulae* are fed on the succulent marsh form of *Lotus* they grow to a larger size before hibernation than if fed on *Lotus corniculatus*, feed for a shorter period after, and the imagines emerge several weeks before the proper time of emergence. This appears to be conclusive that *tutti* and *filipendulae* are one and the same species. In fairness to Tutt, one can only say that in *trifolii* the early form always appears on the chalk hills, and the late brood on marshy ground. Like *tutti* and *filipendulae*, *trifolii* and *palustris* will pair quite readily, but in this case the late form is very much larger, so that it is possible that in one case the more succulent food causes a more rapid growth, and in the other it causes, after a prolonged period in the larval state, a larger and heavier insect.

The Zygaenas show considerable variation, but the same general type of variation runs through the whole genus. First of all we have the various forms of colour: with one or two exceptions the normal colour of the forewings is green or blue-black with spots or bands of scarlet or crimson, and the hindwings of the same colour with a margin of blue-black in varying depths. It is of fairly frequent occurrence to find the crimson spots and hindwings changed to pink and the blue-black of the forewings slatey blue; this is generally accompanied by some degree of malformation, so that possibly this form may be the result of some injury to the pupa. The red colour on occasion changes to orange or lemon yellow: this form may occur anywhere, and is a recessive, and possibly if this was analysed from the Mendelian point of view, it would be found to be a red from which the factor for intense colour has been eliminated. In the other direction the normal colour may be intensified, becoming black through varying shades of brown; this also is a recessive, and probably is a red to which an additional factor

for intense colour has been added. The other colour variation is of the rarest occurrence, in fact I can find only one example. This is with the red spots and red of hindwing changed to silvery white, the darker portions of the wings and body being normal. It is difficult to account for this form, but perhaps the following may be suggestive. This aberration occurred on the same ground as the black ones, and one cannot but think that without the melanic form the white could not occur, and therefore is an aberrant form of an aberration. When a red loses the factor for intense colour the result is yellow, when a factor for additional colour is added to the normal red the result is brown or black; if in turn the factor for additional colour is eliminated from the melanic form, it seems reasonable to suppose that, owing to the change that has taken place in the pigment, the result would be white. I had hoped to test this theory by breeding from this white ♀, but it was impossible to obtain the pairing; the melanic form is lethargic, and it is extremely rare to see one on the wing even on the hottest day. Also it is quite different in its resting position from the type, which sits with its wings laid tightly along the body; whereas the melanic form sits with its wings spread, much after the manner of a Lycaenid sunning itself. The white one remained for over a week refusing to move, even if placed in the sun, and seemed quite devoid of sexual attraction. Males would walk over her without exhibiting any interest, although this was the only female in the cage, with at least a dozen males.

The next type of variation to be considered is in the spotting of the forewings, and in this respect the Zygaenas may be grouped as follows:—

With six spots as in *filipendulae*.
With five spots as in *loniceraе*.
With three blotches as in *cuvieri*.
With four spots with the 5th and 6th joined together as in *achilleae*.
With five spots and a lunular blotch as in *carniolica*.
And with the spots confluent as in *purpuralis*.

In the five- and six-spotted forms the spots may coalesce in the following manner: 1 and 2, 3 and 4, 5 and 6, or with any combination of these spots, and in extreme forms the confluence may extend over the whole surface of the forewings, as in *rubicundus*, an extremely local form found in Italy. Speaking generally, the variation of the group is limited, and the same type runs through the whole genus, and this feature, together with the slight difference between the various species, makes the family very complicated and the species difficult to differentiate, an examination of the genital organs giving little satisfaction owing to their similarity.

Again, a certain race of a species may vary in a certain direction to such an extent that it strongly resembles a distinct species, so that differentiation with any certainty is almost impossible. Instances

of this are seen in *trifolii*, *transalpina*, and *filipendulae*; the first named species has five spots, but local races have been found on the Continent which develop a sixth spot. *Transalpina* commonly shows two distinct forms with five and six spots, thus overlapping *filipendulae*, which occasionally develops a five-spotted form; when this happens in some of the smaller races they are very difficult to differentiate, although the brighter colour, and generally the position of the spots, allows one, after experience, to separate them with some degree of confidence. The same difficulty is shown in certain races of *purpuralis* and *achilleae*, especially in some of the forms from Asia Minor. In regard to confluence, it is curious that some species are particularly prone to this form of variation, as in the British species, *trifolii* and *lonicerae*; although undoubtedly very closely related, *trifolii* regularly produces confluent aberrations, and it is almost impossible to collect this species in any locality without getting this form; in some seasons it is so abundant that at least 50% show confluence in some degree, whereas with *lonicerae* confluence is of the greatest rarity, even such a minor form as the coalescence of spots 3 and 4 is difficult to obtain.

Teratological forms are abundant in this genus, examples having one or more wings reduced in size, or with the wings of unusual shape being especially frequent. Rarer divergent forms, such as an extra leg or wing, have been obtained. Dr. Chapman reported having taken a female *exulans* with extra wings; and Christy, *trifolii* (see "Entomologist," vol. 27, p. 253) with what may be described as three forewings and no hindwings. The absence of one or more wings is of frequent occurrence; and several instances have been recorded of imagines being taken with larval heads. This prevalence of congenital aberrations may perhaps be accounted for in a simple manner. The tenacity of life in the Zygaenas is well known, and the pupa being very soft, and without any great measure of protection from the cocoon, it is liable to sustain injuries that in many other species would prove fatal. In Zygaena the accidental crushing would not cause death, but some malformation would result. A pupa that has met with a casualty of this nature nearly always produces an imago with dark green or blue of the forewings changed to a slatey colour; this may be local, or may cover a considerable area. A pin prick on the wing cases of the pupa will produce an imago with a small round hole in the wing surrounded by this slatey blue colour.

As an example of the vitality of this genus, it is possible to open a pupa and extract the imago some time before it is due to emerge, and the insect will continue to live, but of course will not expand its wings or in any way develop. A female so treated will attract males, although I have never been successful in obtaining a pairing with examples so treated. This tenacity of life is conspicuous through the whole life-cycle, with perhaps the exception of the ova

stage, with which I have never experimented. A serious injury to the larva does not apparently cause it any great inconvenience. An incision, or the removal of one of the claspers, causing much bleeding, will be survived, and in the ensuing ecdysis will be completely healed; an injury such as this will retard growth and cause the subject to lag behind its fellows; it will finally succeed in pupating, but the cocoon will be a very poor structure, consisting of a single layer of silk without the lining, which causes the opaque finish so well known. An injury to the larva seems to cause an absolute lack of the fluid which supplies this finish; and the larva may even pupate without attempting to make a cocoon. The imago will duly emerge from an imperfect cocoon, but will be malformed; but in the case of a pupa that has had no cocoon, death is more likely to ensue. This want of a cocoon seems to be more or less fatal, for the removal of a perfectly healthy pupa from the cocoon will often be followed by death, although it will stand extremely rough treatment when in the cocoon. Death does not appear to be caused by the absence of protection, but by the insect not being in a position which enables it to emerge.

The vitality of the imago is extraordinary. Cyanide of Potassium is of very little use in killing the Zygaenas; and crushing the thorax is of no use at all. The poison they seem most susceptible to is chloroform, which causes stupefaction in less than a second, and if the moth is then put into a cyanide bottle death follows without recovery.

The only enemies of the Zygaenas seem to be Hymenopterous parasites, by which they are very frequently attacked; but they seem to enjoy absolute immunity from the attacks of birds. I have collected Zygaenas abundantly on a ground that was overrun with fowls. To test the matter I tried my own birds with the larvae of *trifolii*; the first one or two put in the fowl run were greedily attacked and killed, but on no occasion was one actually eaten; finally the fowls would not touch one. These birds had never seen a Zygaenid larva previously. I then tried with fowls in a pen, which had been running over the burnet ground alluded to previously, but these birds would not even look at them, although a Lycaenid larva thrown to them was instantly devoured. The objectionable feature of the *Zygaena* larvae seems to be small beads of an oily substance which are exuded by the larva immediately it is touched, apparently from several segments, but I have never been able to decide from where this actually is exuded. I have tried on several occasions to taste the fluid, but it is either tasteless or else the quantity is too small to allow its appreciation. A similar oily fluid is present in the imago in fairly large quantities, but instead of being colourless it is orange, and when a freshly emerged specimen is pinned this exudes freely from the wound, but the quantity decreases as the insect gets older—a very old and worn insect will have little or none.

That this fluid is volatile is shown by the fact that the insects when in the cabinet seldom, if ever, go greasy.

I conclude, as I commenced, by expressing my regret that I have not been able to deal with this interesting group in a better manner, for I had intended giving some notes on breeding, with special reference to Mendelian laws. Unfortunately, I promised that which circumstances would not permit me to fulfil.

ANNUAL ADDRESS TO THE MEMBERS

OF THE

South London Entomological and Natural History Society.

Read January 25th, 1923.

By E. J. Bunnett, M.A., F.E.S.

LADIES and GENTLEMEN, it is gratifying to hear from the Reports of the Council and Hon. Treasurer, that the Society is in so flourishing a condition, and the outlook for the future so hopeful.

It is particularly satisfactory to hear of records broken in several directions:—The present number of actual members (211) constituting a record; the attendance at the Annual Exhibition (180 to 190) another, and the present financial position of the Society a third. Besides the legacy of the late Lachlan Gibb, bequests from late members and gifts from others during the last year or two have resulted in valuable additions to our Library, Collections and Cabinets.

The manner in which the Society should celebrate its fiftieth Anniversary was determined by a general vote, and the universal approbation expressed by the seventy or more members who attended the supper at the Holborn Restaurant, on October 19th, bears testimony to the success of the course finally adopted. As an account of the Jubilee Celebration has been already presented in the Council's Report, further remarks upon the incidents of that occasion are superfluous. By common consent it was one of the most enjoyable meetings ever attended by members connected with this Society.

We regret to have to record the death, since our last Annual Meeting, of six of our members.

Lachlan Gibb, F.E.S., who joined the Society as a Life Member,

in 1884, passed away on the 1st of March, at the age of 68 years. His business interests in Montreal prevented his regular attendance at our meetings, but while at home in this country he usually attended both the field and ordinary meetings, and was a frequent contributor to the Publications Fund. His generous bequest to this Society of the sum of two hundred pounds is a substantial memorial to his sympathy with its work and undertakings.

Vincent Robert Perkins died on April 3rd, at the advanced age of 91 years, at his residence in Wotton-under-Edge, Gloucestershire. A naturalist with a wide range of interests, and an enthusiastic collector from his boyhood, he was, in his latter years chiefly attracted towards the Aculeate Hymenoptera, among which he added to the British list the species *Crabro gonager*. He was F.E.S. until within a few years of his decease, and a member with us from 1880 to 1921.

Gilbert Storey, F.E.S., who joined us in 1913, passed away at the early age of 31 years, in Egypt, on April 5th. An entomologist of great promise, he received an appointment in the Entomological Section of the Ministry of Agriculture in Egypt, and at the time of his decease was engaged as Technical Secretary to the Cotton Research Board.

Henry Rowland-Brown, M.A., F.E.S., who died May 3rd, was elected a member of this Society in 1904. His extensive knowledge of European butterflies was largely acquired during his frequent excursions to various continental countries. He will be well remembered by many of our members as one of the secretaries during many years of the Entomological Society of London.

Arthur Horne, who had been a member of this Society since 1889, died in September last, at the age of 60 years. The distance of his residence in Aberdeen from London prevented his attendance at our meetings. He possessed a collection of British Lepidoptera considered to be one of the finest in the country. It was remarkable for its varieties, and included long series of various individual species from all parts of the British Isles.

H. H. Druce, who died in Septe nber last, was also for a short time a member with us. Among the numerous monographs and papers from his pen, his work on the *Lycaenidae* remains preeminent. His fine collections were purchased by Mr. J. J. Joicey, and are now in the Hill Museum, Witley.

Among notable Entomologists of other societies deceased in the past year occurs the name of William Lucas Distant, who passed

away on the 4th of February. He was a contemporary of Bates and W. F. Kirby, a prolific writer on Exotic Insects from various parts of the world, and for more than twenty years was engaged in the arrangement of the Rhynchota, etc., at the Natural History Museum, South Kensington. Some of his more important publications were his "Insecta Transvaaliensia" and a "Monograph of the Oriental *Cicadidae*."

On April 12th the death occurred at Cairo of Arthur Bacot, Entomologist to the Lister Institute, whose researches into the causes of Trench fever, Plague, and Yellow fever, have been of immense value.

On the 27th of August, at his residence in the New Forest, David Sharp, M.A., M.B., F.R.S., departed this life at the advanced age of 82 years. An interesting account of the life and works of this great naturalist is given in the Obituary of the "Ent. Mo. Mag." for October, wherein he is referred to as "the doyen of British Coleopterists, one of the most distinguished Entomologists of our time, and whose name is a household word wherever our science is pursued." Perhaps his most important work was his contribution to the "Cambridge Natural History"—the section on "Insects," to which the greater part of two volumes is devoted, being from his pen. A number of members of this Society were personally acquainted with him, and his decease will long be felt as a deplorable loss to all interested in scientific entomology.

I have written here for the first time a short account of a fifteen months' sojourn in the land of "Our Lady of the Snows," and I request your kind forbearance if you should find the matter of more general than scientific interest.

My aim has been to convey, though in a feeble manner, some idea of what life in that great country is like from a naturalist's point of view. My intention was to include both Flora and Fauna in my sketch, but I found that the short time at my disposal this evening would make it necessary to omit the remarks on one or other of these kingdoms.

The botanical pages have therefore been excluded, on the supposition that they would most likely be of less interest than the rest to the majority of my fellow members. If on some future occasion the omitted portions should be likely to prove acceptable, I shall have much pleasure in offering them as a separate paper.

On the long railroad journey in mid-March of 1911, from Halifax to Winnipeg, which occupied three days and nights, the snow lay everywhere, deep and brilliant, the cold being intense. Through an occasional clear patch on the frost-covered double windows of the train, it was possible to survey the passing landscape. This was mostly devoid of trees, unattractive and monotonous, except during one beautiful moonlit night, while skirting the northern shores of Lake Superior. Here the scenery was magnificent; the snow-laden fir trees and the enchanting beauty of the thousand islets near the margins of the lake were too wonderful to be passed in sleep.

The venturesome traveller who leaves the warm train at a halting place in order to exercise his limbs, finds the fresh air and sunshine for the first few minutes extremely exhilarating, but the frost soon cuts like a knife, and produces sharp pain, like that of acute neuralgia, in the ears, nose, and cheekbones. If in his inexperience he ignores the cold, he may in the course of a very short time find himself in need of first-aid for frostbite! No Canadian defies this almost tangible enemy, and every precaution is taken both within doors and without to guard against it.

The house in which I spent the winter in Winnipeg was heated in the usual manner, by hot air circulating through every part of the building. Notwithstanding the comfortable temperature thus obtained night and day, and in spite of the double windows, I found it necessary in order to secure some daylight, to scrape off periodically from inside my bed-room window the frozen moisture accumulated from my breath. In this way I removed about once a week as much as half a washing basin full of the scraped ice. On one occasion I had the curiosity to measure the thickness of the congealed moisture at the lowest part of the windows inside a lecture hall. The distance of the steam-heating apparatus from this mass was fourteen inches, and the ice was four inches thick.

In the City Hospital, as I was informed by Dr. Monro, there were always a dozen or more patients in with frost-bite, some of whom would be minus an ear or a limb or two on their discharge. By the middle of November the great Red River, and its tributary the Assiniboine, which joins the former in Winnipeg, are frozen up, and these rivers are not open again till about the second week in April.

From temperature charts which I kept during my stay in Canada, the lowest point recorded by me was 36° below zero, but that night

elsewhere in the city 40° below zero was recorded, that is 72° of frost. From my charts I also note that the temperature from the end of October to the first week in April, with the exception of two days in this period of five months, never once rose above freezing point.

Every winter cold "snaps" occur, of duration from one to ten days, or even longer, the average temperature being about 15° below freezing point.

After remaining a few weeks in Winnipeg I continued my journey, on the Canadian Northern Railway, to the little town of Ethelbert, situated about two hundred miles north-west of the city; twenty miles north-west of Lake Dauphin, and about the same distance south-west of Lake Winnipegosis. For the first forty miles along this route across the prairie, the course of the Assiniboine River could occasionally be detected by the line of low trees bordering its banks. Elsewhere few objects of any kind were visible over the apparently boundless tracts of snow. From the middle of April to the end of July I dwelt in this part of the Gilbert Plains. The township consisted of about a score of frame-built houses, the majority of them situated in a single row parallel with the railroad track. The few scattered homesteads in the near neighbourhood were occupied by Galicians. The subsequent year was spent in Winnipeg, whose rapidly growing suburbs, however, offered fewer facilities for the collecting of plants and insects. The following notes and observations refer mostly to the natural history of this northern district.

The thaw was just commencing on my arrival in this little settlement. Before the ground was visible it was reported to me that the "crocus" had already made its appearance. On investigation, this, my first Canadian flower, proved to be the Pasque Flower, *Anemone patens* var. *nuttalliana*, a species very similar to our very local *A. pulsatilla*.

From that time the snow rapidly melted, and every day brought to light fresh forms in increasing variety. Later on, as the wilderness began to rejoice and blossom as the rose, there appeared such a wealth of beautiful things in this immense wild garden of Nature that it became impossible to collect more than a comparatively few of them. Accordingly I endeavoured to select chiefly such as were not included in the British flora and fauna.

Only a small proportion of the land in this swampy district had been cleared by settlers, who were, with but few exceptions,

Galicians. The only "roads" were mere clearings, leaving exposed the black soil, rich in humus to a considerable depth, and remarkably free from even the smallest stones. No hedges, no green grass, almost no roadside ditches or bridges over hollows and streams, the few exceptions being usually the competitive achievements of parliamentary candidates. In wet weather these roads were often impassable to pedestrians, and occasionally even to horses, when it would be necessary to make a detour of several miles before regaining the track.

One Sunday afternoon my friend Dr. C. C. Monro (who was in charge of a medical mission in Ethelbert, and whose grandfather was the Fraser from whom the river in British Columbia received its name), drove me in his buggy to give me an opportunity for inspecting a typical farm and homestead. The outward journey of six miles was delightfully pleasant, the ground dry and firm and the weather sunny.

During the afternoon, in this hospitable house, a terrific thunderstorm broke overhead, and the rain came down, as it frequently does there, in amazing torrents. On the homeward route most of the country was inundated, and in some parts the water reached the horse's belly and even flowed over the floor of the carriage.

The uniform flatness of these wide prairie and bush regions makes drainage extremely difficult; many a "quarter-section" of land such as this is entirely useless for cultivation. Naturally such swampy country abounds in frogs, and here were myriads of both the common species and the much larger and handsome Bull-frog, *Rana halesina*, whose body, without including the limbs, may attain a length of eight inches.

There are no "silent nights" in summer. The eternal croaking of millions of these batrachians makes night in their vicinity hideous. It was amusing to find in repeating the Chorus of Frogs —βρεκεκεκέξ κοάξ κοάξ—how naturally Aristophanes has imitated their cacophonous clamour. Sometimes I sat on a fallen trunk in view of their watery haunts. Startled by my approach all would have disappeared, and, except in the distance, not a sound could be heard. Presently one little head would appear above the surface, uttering the familiar note, then another, followed by numbers in quick succession, until after five minutes or so the concert would be again in full voice and the hubbub as great as ever. As I lay in bed in the frame building, dignified by the name of Hotel, I could still hear

the everlasting croaking, but then just far enough away to be not altogether unpleasant.

A more agreeable midnight sound was the frequent whistle of the Whip-poor-will, *Anthostomus vociferus*, which to my unaccustomed ears was delightful. Here again we have natural sounds reproduced with great fidelity in the name of this charming songster, especially when the words are loudly *whispered*. Incidentally I may add that many a time my nocturnal slumbers were disturbed by a wretched cow that came and lay on the ground exactly beneath my window. She was provided with a bell, hung round her neck, and in her unceasing efforts to drive away tormenting mosquitos, seemed never still for a moment. It is against the law for domestic animals to be allowed to stray in this way, but the local magistrates are sometimes themselves the worst offenders.

A small and usually shallow stream, the Fork River, takes its rise some ten miles from Ethelbert, flowing eastward into Lake Dauphin. In spring this is swollen by the melting snow, and abounds with fish, chiefly one known as the "sucker," which attains considerable size and a weight of several pounds.

Every small boy provides himself with a trident, roughly forged by the local blacksmith, and attached to a ten-foot pole. With this he skilfully spears the fish as they come down stream, and in this way provides his family with a very good breakfast. One evening three men called at the houses offering for sale their day's catch, which consisted of over a hundred fish, mostly "suckers." Half a mile from the town there was an old beaver-dam which still obstructed the course of the river with an accumulation of logs and branches, but this animal is becoming rarer, such as survive migrating further north.

Formerly the most characteristic animal of the prairie region was the buffalo, but chiefly on account of the enormous value of the "robe," as a complete hide is called, it has been hunted to extinction as a wild animal. There were several full grown buffaloes roaming over a strongly fenced portion of the Assiniboine Park, in the city of Winnipeg, but these, like the herds preserved in Yellowstone Park, in the United States and elsewhere, can no longer be considered *wild* animals. In fact one, feeding close to the wired fencing, actually approached within reach of a handful of grass which I offered it through the wide meshes of the fence. In the same city may be seen a magnificent stuffed specimen, in the Carnegie Library.

After the Buffalo the largest Canadian animal is the Moose, *Alces machlis*, but although still fairly numerous in Northern Manitoba, the advance of civilisation threatens its extirpation also. Both inside and outside many houses in Winnipeg and other towns of the Province, the enormous horns of this noble, and usually inoffensive animal, are displayed as trophies of the chase. One of a party of Winnipeg gentlemen, hunting in the White River district, brought down a fine specimen weighing eleven hundred pounds. The horns alone are very heavy, being solid, sometimes weighing as much as eighty pounds. The Moose is "protected" during part of the year, and at any time only a limited number are permitted to be shot by an individual hunter. Moose venison is excellent, as I can testify from experience, though my host up north would not have offered the dish at that season to certain officials in the city. It was with great regret that I had to decline, on account of ill-health, the invitation of an old trapper to accompany him in his buggy with my camera and his gun on a four days' Moose-hunt in the Blue Mountains—a "bluff" of low hills some twenty miles distant.

In the northern districts of Manitoba the bear and wolf are by no means uncommon. The former is the comparatively small and inoffensive American Black Bear, *Ursus americanus*. During my visit to the neighbourhood I was not so fortunate (or otherwise) as to catch sight of a living one, though there were certainly some about, for one was observed on the railway track within a mile of the town. Later on, at Christmas time, when bear-steak is an advertised item on the menu of the big hotels, I saw a fine specimen suspended by its hind legs, at a butcher's stall in Winnipeg market place. This still retained its splendid hide of jet-black hair. During my residence in the city, one was reported seen in the streets at night, and on another occasion timber-wolves ventured as far as some of the outlying houses in the suburbs.

The Timber-wolf or Grey wolf, *Canis occidentalis*, is a formidable beast, and is justly the creature most dreaded in the Province. At Ethelbert it was reported to be an occasional visitor during the winter months. I managed to secure a photograph of a couple of these savage animals, as they trotted unceasingly around their strongly wired enclosure in River Park, Winnipeg.

Far commoner was the little Prairie wolf, or Coyote, *Canis latrans*, which is but little larger than a fox, and whose howling so frequently rends the midnight air and sets all the dogs in its vicinity

howling. Time permits mention of only two other mammals—the Gopher and the Musk-rat, both characteristic of the Canadian fauna. The former is known as the *Thirteen Striped Ground Squirrel* (*Citellus tridecemlineatus*). This extremely pretty little creature was very common, and comparatively tame. It was a joy to remain quite still and watch them at the edge of a field. One would pop up suddenly out of its hole in the ground and sit on its haunches, very erect and vigilant, with its little paws folded on its white furry breast, in the very attitude of a tiny child repeating a lesson.

The Musk-rat, *Fiber zibethicus*, is a rodent of the size of a small rabbit. Like the Beaver, it has semi-webbed hind feet and a flattened scaly tail, very useful adaptations to its amphibious life. Musk-rats likewise resemble the Beavers in their gregarious habits and their highly developed skill in the construction of dome-shaped huts of interwoven reeds, etc., mingled with clay. It was amusing to watch the playful gambols of these little folk from the opposite margin of a small sheet of water situated within a few hundred yards of the town. Their beautiful soft fur was, and still is, in great demand; the skins at that time being worth to the captor from one to two dollars apiece. The cost of a fine Musk-rat coat in Bond Street is outside the precincts of Natural History!

One of the most beautiful birds was the Golden Oriole, *Oriolus galbula*, which was quite common in the north-west, its brilliant yellow plumage flashing like a golden sunbeam. Among others were the Blue-jay, Kingfisher, the Cedar Waxwing, *Ampelis cedrorum*, and a White-throated sparrow, *Zonotrichia albicollis*. The Black-throated Loon, *Urinator arcticus*, frequenting the lakes, is a clumsy bird as big as a goose. The Canadian Robin, *Merula migratoria*, does not belong to the same genus as our little friend, but is a red-breasted thrush, of the size of our own song-thrush. A pair of these birds constructed a nest on the naked beams supporting the railway bridge across the stream mentioned, over which the trains thundered twice daily. Four blue eggs were duly deposited in this nest, but before they were hatched the nest was destroyed by some mischievous youngsters. Without loss of time a second one was constructed in an exactly similar position, and within a yard or two of the site of the first. After two eggs were laid herein the nest met with the same fate as its predecessor.

In the bush, where I seldom ventured very far, having been warned against the danger of getting lost, I often heard a remark-

ably loud noise, as if some one was tapping a tree-trunk with an axe or hammer. After being informed that these sounds were made by the Drummer Partridge I soon became accustomed to them. This bird is the Ruffed Grouse, *Bonasa umbellatus* var. *togata*. The sounds are said to be produced by the bird beating a log or tree trunk with its wings.

Another closely allied member of the Grouse family, and of somewhat similar appearance, is the Prairie Hen, *Tympanuchus americanus*. In size it slightly exceeds that of an English pheasant, and being in great request as a table delicacy falls a frequent victim to the sportsman's gun. Once, having penetrated rather deeply into the dense undergrowth, I was startled to find myself almost treading upon a pair of these birds. The cock, displaying the handsome plumage of its outspread tail, resolutely stood its ground, while his mate speedily scuttled away with her brood. With apologies for my intrusion, and with all the dignity at my command, I discreetly beat a retreat.

Two species of Woodpecker were often seen and heard, both in the Ethelbert bush and in Winnipeg parks and gardens. One was the Great Spotted Woodpecker, and the other, I believe, the Hairy Woodpecker, *Dendrocopus villosus*. On one occasion, while walking by the river side in Assiniboine Park, I saw a young boy shoot down a bird with his air-gun. The heartless lad coolly walked off without even troubling to examine his victim. On searching the spot the bird proved to be a Spotted Woodpecker, and at my request Dr. Monro, who accompanied me, kindly dissected out its wonderful tongue. This retains the strap-like ligaments which, passing beneath the scalp, almost completely encircle the skull and extend beyond its base. The tip, as may be seen, is finely barbed, and the separate barbs again still more finely serrated.

In spring time thaw sets in about the middle of April, when the ground, after having been hidden throughout the Province by the accumulated snows of the preceding five months, again becomes visible. In an amazingly short time flowers and insects reappear, revived after their long sleep by the now genial rays of the sun. In collecting specimens I was principally occupied at the time with the Manitoban Flora. Incidentally I captured such insects as I could find time and opportunity to pursue, chiefly for the purpose of ascertaining what species occurred in the locality. Unfortunately, I kept no entomological memoranda. My remarks on the insects will

be confined to the specimens I have brought for exhibition this evening. Beginning with the Lepidoptera:—

Papilio turnus appeared to be plentiful in the open parts, flying fast over low shrubs and flowers.

Euchloë ausonides and *Pieris protodice* are respectively represented by the female only.

Colias christina ♂ is followed by a short series of *C. eurytheme*, including a ♀ with the costal portion of the forewings and the whole of the hindwings fuscous; both sexes of the lemon-coloured and smaller seasonal form, and a white ♀, var. *pallida*.

Danais archippus was abundant about Winnipeg. One sunny day I counted thirteen within the space of a few square yards in the middle of the road in Portage Avenue, the chief street of the city, where the trams are most frequent and the traffic is heavy. From the nature of the repast on which they were apparently feasting with much enjoyment, it was evident that a beautiful appearance is not always accompanied by habits of refinement.

Vanessa antiopa, the first butterfly I saw there on the wing, proved to be fairly numerous around Ethelbert as soon as the snow had all disappeared. In the following season I remember taking a specimen from a shop front in Winnipeg, where it is commonly known as the "Morning Cloak."

The two species of *Polygonia*, *P. interrogationis* and *P. satyrus*, are probably not common as a rule in Manitoba. I could have taken plenty of the latter in the more open parts of the bush, but it is most likely a very local species, and it may be doubted whether any entomologist had previously visited this somewhat remote district, only portions of which had at that time been surveyed by the Government. I think the cabinets at South Kensington do not contain a specimen of *P. satyrus* from the Dominion.

Basilarchia arthemis and *Pyrameis cardui* were not infrequent.

Of the three species of *Argynnis* taken, *A. cybele* appeared to be the most numerous, the others being *A. atlantis* and *A. lais*.

Three species of *Brenthis* include *B. frigga*, *B. bellona* and *B. myrina*.

Phyciodes tharos was moderately common. *P. hanhami*, of which I took two specimens, is of some special interest as being not well known. It was described as a new species in the "Canadian Entomologist" for 1904.

Erebia discoidalis was occasionally flying in the more open parts.

The Lycaenids include *L. couperi*, *L. scudderi*, *L. melissa*, *L. saepiolus*, and *L. argiolus* of the form *marginata*.

Also a pair taken in coitû of *Ereres comyntas*, and two species of *Heodes*, *H. heloides* and *H. hylla*.

The *Hesperiidae* are represented by two species of *Thanaos*, *T. icelus*, and *T. nacrius*; others of the family are *Cocceus pylades* and *Paratrygone hobomok*.

Of the 33 species exhibited, *antiopa*, *cardui*, and *argiolus* are the only ones occurring in Great Britain.

Of the few moths I submit to your kind inspection the two Sphingids may perhaps be found of some interest.

The first is a very dark and I believe not frequent form of *Pachysphinx modesta*, the type being considerably lighter and of brighter colour. The only two of this form in the British Museum were from the United States. The second is *Haemorrhagia thysbe* ab. *cimbyciformis*, a species which Mr. Tams informs me he never met with in the Province of Alberta.

Attacus polyphemus, and the two Catocalas, *C. unijuga* and *C. relicta* are well known characteristic North American species.

The beautiful silk-moth, *Callosamia promethea*, is, I believe, the largest Canadian insect. The photograph shows a female (n.s.) kindly lent me by Mr. W. Mitchell, of S. John's College, Wpg., who took it at Carmen, Man. The measure of this specimen across the wings is 14·2 cm.

Callimorpha lecontëi well merits its generic name, especially when resting with wings closed.

Cidaria (*Eulype*) *gothica* will no doubt be recognised as the North American representative of our *hastata*.

Rhodophora florida is a bush species, and *Ennomos autumnaria* is familiar as a British insect.

Sthenopis quadriguttatus, *Gonospileia cuspidea*, *Sabulodes lorata*, and *Xanthotype crocataria* complete the list.

I should like to take this opportunity of expressing my gratitude for the great kindness I received at the Natural History Museum in getting my specimens named, especially from Capt. Riley in identifying the butterflies, and from Mr. Tams the moths.

Gaudily coloured short-horned grasshoppers were very much in evidence. The few exhibited were captured in the vicinity of Winnipeg, and include the sexes of *Hippiscus apiculatus*, in which the basal area of the hindwings is crimson, and *Circotettix verruculatus*, where the similar area is of a lemon-yellow tint. The last

named is one of the locusts which have been observed in the act of cultivating their musical talent by stridulating, not during flight, but while at rest.

The delicate little gauze-winged *Oecanthus quadripustulatus*, Beut., is a near relative of the Italian cricket, *O. pellucens*, Scop., whose attractions and accomplishments have been immortalised in a particularly charming chapter in "The Life of the Grasshopper," by Henri Fabre. He praises "the purity of the note with its soft tremolo," and says, "I know no prettier or more limpid song."

Some of the North American Hemiptera-Heteroptera are of comparatively enormous size. Amongst such is the Giant Water Bug, *Benacus griseus*. In general appearance (except for its size) it closely resembles our Water Scorpion, *Nepa cinerea*, but the caudal appendages that characterise the *Nepidae*, in this family (the *Belostomatidae*), are retractile, and do not function as respiratory organs. Americans call this insect the "Electric Light Bug," on account of its propensity for making excursions away from its aquatic element towards any bright light. With regard to their depredations amongst the finny tribes, Howard observes: "The fish ponds in Washington, since the advent of the electric light, have become so greatly stocked with these bugs (*Belostomatidae*) that they are a serious detriment to fish raising." At certain seasons, in the streets of Winnipeg, scores of these creatures might be seen, after dusk, lying stunned or mutilated at the bases of the electric-light standards along the paved side walks—often half a dozen or more beneath a single light. I once picked up, in a few minutes, as many perfect specimens as I required, some of which are now before you. In the one set with expanded wings the width from tip to tip measures exactly ten centimetres.

The four species of Diptera are of interest on account of their relation with man.

Echinomyia algens is a member of the large and important family of the *Tachinidae*, which family Howard describes as "the most beneficial group of Diptera, with the possible exception of the *Syrphus* flies." The larvae of this family are all parasitic upon insects, chiefly caterpillars, of which they destroy enormous numbers, a fact only too well known to Lepidopterists, who occasionally, though all unwittingly, take great pains in rearing these flies.

The six British species of this genus do not inclue *algens*, but in Meade's List of British *Tachinidae*, *E. grossa* is described as "the

largest of the British Muscids," but is not common, and has been bred from cocoons of *Bombyx trifolii*.

The next two belong to a family of evil reputation, the *Tabanidae*, known popularly as "Horse-flies," "Gad-flies," etc.

Major E. E. Austin (who kindly named the Diptera for me) includes *Tabanus* and *Chrysops* among the "four principal genera in which occur the majority of the species that have hitherto attracted attention by reason of their blood-thirsty habits." He adds, "The blood-sucking females are persistent tormentors of human beings and domestic animals." One of these is *Chrysops carbonaria*, which, in common with most other members of the family, is capable of carrying the bacillus of anthrax. The other is *Tabanus affinis*—one of the worst offenders in Ethelbert—where it is known as the "Bull-dog." My specimens were all taken from window-panes inside dwelling houses. Its bite is sharp and painful, as may well be imagined from a microscopical examination of its mouth organs, which in structure and arrangement bear a striking resemblance to those of the flea. In both *Tabanus affinis* and *Pulex irritans* the principal surgical instruments are the blade-like triangular maxillae, which in *Tabanus* have their inner margins extremely finely serrated. This formidable tool in the case of the latter is, as I find by micrometer measurement, five and a half times larger than that of the flea. Add to this fact the advantage of power of flight, and it is no wonder horses and cattle are terrified by its attacks.

Anthrax alcyon is included in the family of the *Bombyliidae*, the larvae of which, like those of the *Tachinidae*, are also entomophagous. I do not remember seeing another, and as this species is represented in the Natural History Museum by a single specimen, it may perhaps not be very common.

The last insects to be mentioned shall be the mosquitoes. Up in the undrained bush these execrable pests existed in such numbers as to make life to a newcomer almost unendurable. In June and July their attacks were unceasing except during the hottest hours of sunshine and the early hours of morning. On walking out of doors it was a common custom for nearly everyone to pluck a leafy branch, usually of the choke-cherry, to be used as a switch or fan for driving off the mosquitoes. The necessity for keeping this in constant motion was extremely fatiguing, and largely detracted from the enjoyment of out-door life. If one desisted for a moment to examine a plant or insect, it would be at the cost of receiving fresh bites from the gnats. But for wearing snow-boots over others,

to protect the ankles, leather gloves, a handkerchief or netting over head and neck, coat-collar turned up and tobacco in full blast, I could never have obtained some of the plants now in my possession, especially those from the bogs. In such attire, with the thermometer at 80° in the shade, it can easily be understood that botanising was not in all respects a delightful occupation. On reaching the hotel, troubles were by no means at an end. In spite of my having barricaded, as I supposed, every possible means of ingress, I often spent hours before getting to sleep in vain endeavour to slay the last of the enemy in the room. A single flaw in the meshes of the doubly wired window frames was certain to be descried by the diabolical cunning of these little imps; moreover, a few always managed to effect an entrance into my bed-room with me, concealed about my clothes. When at length I succeeded in falling asleep it was only too often to be awakened by the "tinkle-tinkle." announcing the approach of that miserable cow bringing *her* little lot! In the evenings, a perforated pail, packed with damp leaves and twigs, was kept burning till bedtime, at the entrance to almost every house. This gave off a volume of pungent smoke and was called a "smudge." No device was so effectual in keeping out the mosquitoes. I have even seen a smudge attached to the extremity of the pole of an ox waggon, with the pail swinging to and fro between the heads of the oxen, and giving off a pillar of smoke that reminded one of the passage of the Israelites through the wilderness. On the window panes inside the unprotected dwellings, the mosquitos congregated in scores and hundreds. Many were frequently to be seen with bodies so distended with the blood of their victims that they had the appearance of little animated bottles of red ink!

The only specimen I brought home proves to be *Aedes* (*Ochlerotatus*) *punctor*, Kirby. As Isaac Walton philosophically observed, "Every misery that I miss is a mercy"; and not the least of the blessings accompanying life in our little island is its comparative freedom from the biting gnats.

In conclusion, bear with me while I endeavour to recall a typical evening stroll, after a day of glorious sunshine, in that great country, which I for one shall never see again.

I send a message to my good old friend the Postmaster, who lives in the four-roomed shack he erected long ago with his own hands, of rough-hewn logs. He will be ready as soon as his day's work is done. I put on a light rain cloak, as the evenings are always chilly, although the day may have been burning hot.

We stroll along the railroad track, walking tediously upon the sleepers. There is no danger! Only two trains pass each day, the one going northwards in the evening, and the same one returning the following morning. Even little children are accustomed to walk often several miles, barefooted in summer, along the track. Indeed it is the principal thoroughfare for pedestrians. We see no paths, no fences, nothing made by man, except the single line of the railroad, bounded on either side by the virgin bush. The wide margins are overgrown with low plants, lovely flowers, and curious shrubs. We go as far as the great solitary "hemlock" left standing on the broad clearing. We sit and rest here a few minutes while the daylight fades. Darkness falls swiftly, and we soon rise to retrace our steps turning our eyes heavenwards. There, high above, stretched across the starry sky, almost from horizon to horizon, depends a diaphanous curtain of soft and faintly emerald light. Like most delicate fabric of gossamer it hangs, as if caught up on unseen supports, placed at frequent intervals and at varying heights in the firmament, but throughout its length of nearly uniform width. Now the light increases in intensity, only to fade as speedily into obscurity. Never for a moment is it at rest. While one watches a patch here growing each second more bright, the remainder becomes fainter till it completely vanishes, only to break out again the next moment as brilliantly as ever. The amoeba is not more protean in its changes of form.

After a few minutes, all too brief, the glorious vision disappears. The silvery drapery, woven on celestial looms, is withdrawn by invisible hands into illimitable space. The display is over, and the constant stars alone remain to light us on our homeward way. On one occasion only I saw this magnificent phenomenon of the Aurora-borealis presented in all the colours of the rainbow.

Before quitting the chair I wish to offer my sincere thanks to the Council and Members for all the assistance and kindness I have received in my efforts to perform, to the best of my ability, the duties connected with this office. My best thanks are also due to the Council for their kind wish to nominate me for election as your President for a second year—an invitation which, mainly owing to my indifferent health, I regret I was unable to accept.

My final duty is the extremely pleasant one of uniting with you all in extending a hearty welcome to our new President, Capt. N. D. Riley, F.E.S., F.Z.S.

My successor is already well known not only amongst ourselves, he having been a member of this Society for the past fourteen years, but as a member of the Council of the Entomological Society of London, and as one of the able Editors of "The Entomologist," as well as the author of valuable contributions to that and other scientific journals.

But "good wine needs no bush"!

May the excellent reputation of the South London Entomological Society continue steadily to increase, and may the shadow of our new President never grow less!

ABSTRACT OF PROCEEDINGS.

FEBRUARY 9th, 1922.

The President, Mr. E. J. Bunnett, M.A., F.E.S., in the Chair.

Miss Alice K. Lock, 77, Grove Hill Road, S.E., was elected a member.

Mr. Robert Adkin exhibited a series of a second emergence of *Brenthis selene*. The specimens were taken in Abbot's Wood, Sussex, by Mr. E. P. Sharp, who found the species fairly commonly there at the end of July and early in August, 1921. The specimens showed little difference from those of the first emergence, except that they were slightly smaller.

Mr. A. A. W. Buckstone exhibited specimens of a large form of the same species, which is racial in the Isle of Arran, together with a short series of a small-formed race from Headley, and specimens of the type form from Ascot, for comparison. He also showed an example of *Taeniocampa*, which appeared to be intermediate between *T. munda* and *T. gracilis*. It was generally thought to be an aberrant form of *T. incerta*.

Mr. H. W. Andrews exhibited species of British *Anthomyiidae* (Dip.):—

1. *Hylephila sponsa*, Meig., said by Mr. J. E. Collin ("Trans. Ent. S. Lond.," 1920) to be rather uncommon, but which Mr. Andrews had met with not uncommonly.

2. The following species of *Limnophora*, which were dealt with by J. E. Collin in his consideration of the genus in the "Ent. Mo. Mag." for 1921, *viz.*, *L. marina*, Coll., *L. curata*, Coll., *L. aëria*, Fln., *L. ersurda*, Pand., and *L. scrupulosa*, Ztt.

Mr. H. Moore exhibited a species of *Galeodes*, taken in a bedroom at Three Anchor Bay, Cape Town. The family is distributed in a number of species in S.E. Europe, Africa, and Asia, and is usually placed between the spiders and the mites. Nocturnal in habit, their palpi have been enormously developed and look like

long and robust legs, while the first pair of legs have been modified into palpi, and instead of terminal claws, as found in the three pairs of true legs, end in a sort of cushion similar to the palpi proper, forming a second pair of feelers. Both cephalothorax and abdomen are segmented. All are more or less venomous, and will attack and kill small mammals, birds, lizards, locusts, and in some districts bite sleeping camels. The specimen exhibited was either infected with a nematode worm, or its last meal was off a worm, half an inch of it extending from its mouth.

Mr. Grosvenor remarked that a similar species was extraordinarily abundant in Northern India, where the soldiers were troubled considerably at night by them, as they crawled into their bedding, and the urticating hairs on their legs caused painful irritation.

Mr. Blenkarn exhibited *Cryptocephalus coryli* (Col.) from Mickleham with a spot developed on each elytron ; also an aberrant form of *Phyllodecta laticollis* from Killarney, December, 1921.

Mr. Hy. J. Turner, on behalf of Mr. Greer, of Stewartstown, Co. Tyrone, exhibited the following aberrations he had recently obtained :—*Euchloë cardamines* ♂ ab. *marginata* ; ♂ orange blotch streaked with black scales ; ♀ small form ; ♀ ab. *radiata* ; ♀ with faint orange streaks on forewings above and below. *Melitaea aurinia* ♀, a dull obscure form. *Pararge megera* ♂, with apical blotch reduced to a small dot ; ♂ with double apical ocelli. *Polyommatus icarus*, ♂ with faint red marginal spots on upper side of hindwings, below ab. *icarinus* ; ♂ ♀ gynandrous specimen ; ♀ marginal red spots extended and band-like.

Mr. Frohawk exhibited the following aberrations of British Rhopalocera :—*Aglais urticae*, a fine suffused var., costal markings suffused, the two normal small discal spots represented by one minute speck on each wing, hindwings dark and suffused, blue marginal lunules entirely absent on all wings ; captured Thundersley, Essex, May 9th, 1920.

Pieris napi, ♂ asymmetrical, central spot in right forewing almost missing, unusually large on left wing ; captured April 29th, 1920, Thundersley.

Argynnis paphia ♂, central markings much suffused, rest of markings greatly reduced ; captured New Forest, July 22nd, 1920.

Euchloë cardamines ♂ and ♀, both with central black dots in hindwings ; well defined and conspicuous in ♂ : bred March 19th, 1920, Purley, Surrey.

Pieris brassicae, series of 12 specimens with black spots in fore-

wings, forming a graduation from a mere speck to well developed spots; bred from wild pupae during the past ten years.

He also showed a fine pencil drawing by himself of a hybrid between a pheasant and black grouse, and pointed out the special characteristics.

Mr. Enefer exhibited the Dodder, *Cuscuta epithymum*, parasitic on gorse, and a section of the Mistletoe "sinker" in the branch of an apple tree; also an oak branch anastomosing with another at right angles.

FEBRUARY 23rd, 1922.

Mr. C. Cheeseman, 30, Clayton Road, Peckham, S.E., was elected a member.

LANTERN EVENING.

Mr. Hugh Main exhibited a series of slides to illustrate the results of colour photography of insects by the combination of a magnesium flashlight with the Paget process.

Mr. Main then read an extract from Fabre on the field-cricket, and illustrated his criticism of it by a series of photographic slides of its life-history, as demonstrated in his own terraria. He also showed photographic slides of the Wolf-spider, *Lycosa* sp., and of its life-history similarly observed.

Mr. Frisby exhibited slides showing the Serotine Bat, nest and eggs of the Little Grebe, the Wild Duck, and the Moorhen; British orchids in situ, etc.

The President exhibited slides of the liverwort (*Marchantia polymorpha*), showing remarkable proliferous growth when the thalli were rotting under water; several fairy-flies (*Mymaridae*) which oviposit in the ova of other insects, the beautiful tracheae of a beetle, etc.

Mr. Syms shewed slides of the ova of the butterflies *Bithys quercus*, *Ruralis betulae*, *Thecla w-album*, *Strymon pruni*, etc.

Mr. Tonge shewed a series of the ova of Geometrid species, including *Boarmia consortaria*, *Thera juniperata*, *Dysstroma truncata*, *Pachycnemia hippocastanaria*, *Anticlea badiata*, *Lobophora halterata*, *Ligdia adustata*, *Nyssia lapponaria*, etc.

Mr. Staniland exhibited four slides showing the galling of the trunk of a wild crab-tree in North London by the Woolly Aphis (*Eriosoma lanigera*). The galls were exceptionally large, and were

thickly encrusted with the Coccid (*Mytilaspis*), known as the "Mussel-scale." The slides showed the trunk at the present time (March, 1922), and during July, 1921, when the aphis and its wax were plainly visible. Galls from the smaller branches, and those of the root form were exhibited at a previous meeting.

Three slides illustrated points in the life-history of *Syrphus vitripennis*. The first showed the newly hatched larva, just over a millimetre long, to show the hatching spines. These spines point back and assist the larva in emerging, by preventing it from slipping back into the egg. They drop off within an hour after hatching.

The next slide was a curve to show the average number of aphids sucked during the larval period. The number rose from 20 the first day to 110 on the last day of feeding (16th day); a drop to 20 occurred on the day after the moult, *i.e.*, on the 8th day.

The third slide was of the first four anterior segments of the full-grown larva, to illustrate the mouthparts, spiracles, etc.

The final slide was of the underside of a specimen of *P. icarus*, taken at Fleet, in 1908; without spots on the margins.

Mr. Withycombe exhibited slides illustrating—

1. An ant apparently pinned by a thorn to the midrib of a leaf underside, which was found in some numbers by Dr. A. Moore in Ceylon. The real explanation is, that the ant on feeling ill from the attacks of a fungus, seizes a projecting midrib of a leaf and dies thus. The fungus then sends out its fruiting spike from the back of the ant's head and from the membrane of the neck, giving the appearance of a thorn.

2. The nest of *Osmia rufa* (Hym.) in a door lock, found by Mr. Hodson, F.Z.S., at Enfield. It contained over sixty cells in a mass, which was most unusual both as to number and arrangement.

3. A ♀ *Empusa pauperata* (Orth.) from S. France (sent by Mr. Goodman), and the egg mass laid by the same.

4. A series of slides illustrating the life-history of *Conwentzia psociformis* (*Coniopterygidae*, "mealy wings"), depicting the cocoons on a tree trunk, the emergence from the pupa, eggs, larvae, pupa, etc. He also showed two colour drawings of larvae of *Semidalis aleurodeformis* and *Coniopteryx pygmaea*.

MARCH 9th, 1922.

Mr. G. C. Champion, A.L.S., F.E.S., an original member of the Society, was elected an honorary member. Mr. L. C. Bushby, of

Bromley, Kent, and Mr. A. M. Massee, of Sevenoaks, were elected members.

Captain J. Ramsbottom, F.L.S., gave a lecture on "The Symbiosis of Fungi with the Fertilization of Orchids," and illustrated his remarks with lantern slides and diagrams.

The following is an abstract of his remarks.

"The lecturer began by remarking on the living together of different organisms, each benefitting from the association. This phenomenon is known as "Symbiosis." Examples were mentioned such as a lichen, association of fungus and alga; ginger beer plant (Californian Bees) yeast and bacteria; bacterial nodules on roots of peas, beans, and other leguminous plants. An exceedingly common example is the association of fungi with the roots of flowering plants. There are two types of fungus root or mycorhiza; one which is frequent in forest trees where the fungal hyphae occur as a mantle around the roots, and the other in such plants as heather and orchids, where the fungus mycelium is within the tissues of the root. The case of the orchid was then considered in detail and illustrated by lantern slides. It has long been known that orchid seeds are very difficult to germinate, in fact, they will not germinate in the usual way, but a certain amount of success is obtained by sowing them on the soil containing the parent plant. Bernard, a French observer, found that if the fungus was extracted from the roots of the orchid and grown in pure culture, and the seeds planted thereon, the majority of them germinated. This explained the previous failure. The fungus is necessary before germination can take place. The seed of orchids, unlike most plants, does not show a differentiated embryo or baby plant. The cells at one end of the seed are, however, usually larger than those at the other. When the seed is sown on the medium containing the fungus the threads of the latter pass into the larger cells. Development then proceeds. The small cells at the further end of the seed undergo rapid division and the growing point of the stem is laid down and leaves given off in succession. After a short time the growing point of the root appears and the young root absorbs its way through the swollen tissues, and finally becomes free, and in doing so misses the zone of tissue containing the fungus. It thus happens that the young root is at first quite free from the fungus, but after a short while becomes infected from the soil. A culture of the fungus and a flask containing an enormous number of orchid seedlings was exhibited. Slides showing the culture houses at Messrs. J. Charlesworth's

establishment at Hayward's Heath. were shown, and the lecturer paid a tribute to the memory of the late Mr. Charlesworth, who, without any scientific training, successfully applied the methods of the laboratory to the raising of orchids on a commercial scale, achieving remarkable results with *Odontoglossum* hybrids and bi- and trigeneric orchids."

MARCH 23rd, 1922.

The death was announced of Mr. Lachlan Gibb, F.E.S., a Life-Member, and during the past two years a member of the Council of the Society.

Mr. Goodman exhibited a fine aberration of *Argynnis aglaia*, in which the black blotches across the discal area of all four wings were enlarged and united to form a conspicuous and irregular band. It was captured last year at La Grave, in the Dauphiné Alps.

Mr. Grosvenor exhibited a short series of *Callophrys avis*, bred by the late Dr. Chapman in 1911, and presented by the Misses Chapman to the Society.

Mr. Hy. J. Turner exhibited specimens of the remarkable silver Satyrid, *Argyrophorus argenteus*, from Chili.

Mr. Jackson reported that he had seen a specimen of *Sesia stellatarum* in Moorgate Street.

Mr. W. S. Bristowe read a paper on the Spiders of Oxshott and neighbourhood. (See page 1.)

APRIL 13th, 1922.

Mr. A. A- W. Buckstone exhibited a series of strongly marked forms of *Brenthis euphrosyne*, taken on high ground at Horsley, Surrey, and stated that a considerable percentage of those taken had the black markings much pronounced, a variation which seemed to be almost absent in those taken in the valley much below. He suggested that possibly the individuals of the former race were subjected to greater extremes of temperature which had registered in this way. Single specimens of the same species, taken at Horsley and at Oxshott, had the ground colour of all the wings inclining to reddish. Two further examples had irregular xanthic blotches on the wings; one from Oxshott had the ground colour a rich red-

brown. Another from Oxshott had the underside of the hindwings almost of a red colour, devoid of markings.

He also exhibited a specimen of var. *obscura* of *Cleoceris viminalis*, from Yorks, together with the typical form and an intermediate.

Mr. Withycombe exhibited the following taken from pines by beating, at Oxshott, *viz.*, *Panolis piniperda*, larvae of *Ellopia prosapiaria* (*fasciaria*), an imago of *Chrysopa vulgaris*, and larvae of *C. prasina*, which feed on *Chermes laricis* (also exhibited).

Major Cottam reported that he had taken both *P. piniperda* and *Polyploca flavicornis* in mid-March, at Oxshott. It was stated that *P. piniperda* in some seasons came to sallow blossom, though in other years not one would be seen.

APRIL 27th, 1922.

Mr. K. G. Blair, B.Sc., F.E.S., Vice-President, in the Chair.

Messrs. A. D. Hobson, of Highgate; W. Rait Smith, F.E.S., of Bickley; and A. G. West, of W. Dulwich, were elected members.

Mr. E. E. Green, F.E.S., gave an account of "British *Coccidae*," with black-board sketches and numerous coloured figures of species and their depredations. (See page 12.)

Mr. Grosvenor exhibited a store box containing the displayed collection of the species of the genus *Endrosa* (*Setina*): *E. irrorella*, *E. roscida*, *E. kuhlweini*, *E. aurita*, with the named forms and local races from many localities, from the late Dr. Chapman's collections, and which were to be placed in the British Museum.

Mr. Step exhibited, on behalf of Lieut. G. E. Step, a living specimen of the Salamander (*Salamandra maculosa*), found under a heap of stones by the roadside in the Fôret de Boulogne, at Easter. Its discovery was due to the finding of a dead specimen with an incision in the abdomen, pointing to the probability that, in spite of its warning colours, it had been attacked by a raptorial bird which, however, had declined to make a meal of it. The occurrence of the species so far north was considered unusual.

MAY 11th, 1922.

Mr. C. B. Leechman, of Purley, was elected a member.

Mr. Hugh Main exhibited *Zerynthia* (*Thais*) *polyxena*, bred from a larva taken at Hyéres; and some wingless sand-beetles, *Pimelia*

angulata, belonging to the Tenebrionid Heteromera, from Egypt. The latter were feeding readily on ripe banana.

Mr. E. Step exhibited a large gall on sallow, from the dunes at Condette, France, from which a number of small Diptera (*Cecidomyia* sp.) had issued; also much smaller Hymenopterous inquilines. Specimens of both species were shown. Also larvae of *Cleora lichenaria*, from the same locality, where they were abundant on April 14th, feeding on the lichen *Ramalina calicaris*. Several of these had been parasitised, and three pure white cocoons appeared a few days later, from which the Hymenopteron exhibited had emerged since. One of the *Cleora* larvae had spun up (May 10th), utilising the lichen as covering.

Mr. H. Moore exhibited a number of species of Lepidoptera from New Zealand, which had been captured by Maori boys and sent to him. They included *Vanessa gonorilla*, *Chrysophanus salustius*, *Deilemera assimilata*, etc.

Mr. Robert Adkin exhibited specimens of the "Brown-tail Moth" and the "Gold-tail Moth" and read the following note:—

"For many years we have been calling the Brown-tail by the specific name of *chrysorrhoea* and the Gold-tail *auriflua* or *similis*, but it seems that in this we have been quite wrong. In recent conversation with Mr. J. H. Durrant, who has been spending a good deal of time on the correct naming of species, I learned that we should call the Gold-tail *chrysorrhoea*. This species appears to have been first described by Linnæus who distinctly says that the species to which he applied the name *chrysorrhoea* has the apex of the abdomen yellow bearded. ("Syst. Nat.," Ed. X., p. 502.) As subsequent authors appear to have wrongly applied that name to the Brown-tail it remained for someone to find a name for it, and this Donovan did, calling it *phaeorrhoea*. He figures both sexes with larva, etc., and says "abdomen bearded and fuscous at end." ("Don. Brit. Ins.," vol. xvi., p. 39, pl. 555.) The genera in which we have been accustomed to place these two species also appear to need revision, their brief synonymy being as follows:—

Brown-tail.

Nygmia, Hb. (= *Euproctes*, Hb., in error, Staud. = *Artaxa*, Walker.)

phaeorrhoea, Don., 1813 = *chrysorrhoea*, Staud., etc. (Non Lin.)

Gold-tail.

Leucoma, Hb., 1805 (= *Arctornis*, Germar, 1811 = *Euproc-*

tes, Hb., 1822 = *Porthesia*, Steph., 1828, and "Staud. Cat.").

chrysorrhoea, L., 1758 (= *similis*, Fues., 1775, "Staud. Cat." = *auriflua*, Schiff., 1775 = Fab., 1787)."

Mr. L. N. Staniland exhibited the Buprestid beetle, *Melanophila acuminata*, taken in a field at Walberswick, Suffolk, a species usually associated with pines which are either burning or have very recently suffered from the effects of fire; and on behalf of Mr. Massee the Curculionid beetle, *Anthonomus ciuctus*, from E. Malling, Kent, in December, 1921. This was a species new to Britain.

Mr. Blair, for Mr. Dods, exhibited the "stick-insect," *Carausius morosus*, of an unusual reddish-brown colour, instead of the normal dull grey brown.

Mr. Hy. J. Turner exhibited the striking Longicorn beetle, *Phoenicocerus dejeanii*, sent to him by our fellow member Mr. Lindeman from Rio de Janeiro, Brazil. The males are remarkable for the extraordinary development of the last ten apical joints of the antennae into long lamellae.

MAY 20th, 1922.

FIELD MEETING—RANMORE COMMON.

Conductor, HY. J. TURNER, F.E.S.

This was a whole day meeting. The way traversed was hitherto unknown to most members of the party. Train was taken to Bookham station, whence the western of the two roads leading southwards was followed. This lead by lanes and field-paths almost direct to the western end of Ranmore and introduced to those present some very promising collecting grounds on the northern slopes of the chalk hills. Insects were not abundant in numbers, although a considerable list of species was reported, including some sixteen species of Rhopalocera. Wild flowers were at their best and several places were noted as having the white form of the bluebell. The one or two members of the party who knew the birds by their note reported a few uncommon species, including the grasshopper warbler. The very welcome tea was obtained at the post office near the church, and the early evening was spent on the common and in the woods leading to Burford Bridge Station, whence the return home was made.

MAY 25th, 1922.

Mr. Step exhibited an abnormal blossom of Cowslip (*Primula veris*) and contributed the following note upon it:—"At the Field Meeting at Ranmore, on May 20th, Dr. Cockayne handed me an abnormal Cowslip flower he had gathered. It consisted of a large inflated calyx with eight lobes (instead of five), 12mm. in diameter with a length of 18mm. It was split at one part and one free edge was coloured with the full yellow of normal corollas. Within were two somewhat shrunken corollas which had no limb. They had been pronouncedly protandrous, for the anthers, which emerged from the mouth of the tube, were empty and brown. The position of the anthers indicated the "thrum-eyed" form of flower, in which normally the capitate stigma reaches only half way up the tube; but in this case the stigmas were protruded beyond the tube 4mm. and 5mm. respectively, though they were included well within the calyx and they had not been pollinated. The umbel of flowers was represented solely by this monstrous blossom."

He also exhibited pairs of the beetles, *Necrophorus vespillo*, L., and *Silpha thoracica*, L., taken at Ockham Common, in and around a dead toad.

On behalf of Mr. Coppeard, Mr. Step exhibited a remarkable and extreme example of fasciation in the common buttercup (*Ranunculus acris*) from Sidmouth, Devon. The united stems made an irregular riband quite two inches across. The flowers were normal.

Mr. Withycombe exhibited the asparagus beetle, *Crioceris asparagi*, which was now very abundant at Enfield on asparagus foliage.

Mr. Enefer exhibited some indelible ink which he had made from the petals of *Iris germanica*.

Mr. R. Adkin read a paper, "The Lepidopterous Enemies of Man." (See page 26.)

JUNE 8th, 1922.

Mr. Edwards exhibited fossil shark's teeth, *Oxyrhina*, from the English Red Crag, Walton, Suffolk, and remarked that the members of this genus were found both in the Cretaceous and Pleiocene periods.

Mr. E. Step exhibited a female of *Vespa germanica* that came into his study on May 30th. In appearance it was almost entirely black, the clypeus and the anterior pair of legs alone showing any yellow.

Apparently it had just emerged from hibernation, having spent the winter in some part of a chimney where it had got very evenly coated with a fine deposit of soot. The clogging of the spiracles, and consequent death of the insect, had been averted, doubtless, by the hibernating wasp's habit of folding her wings close to her sides. At first, viewed from above, she was entirely black; but as soon as boxed she began to clean her face, eyes, and forelegs, soon accumulating a little ball of soot in the process. Fearing that the cleansing might be completed, she was transferred to the cyanide bottle.

The exhibitor sought to impart a mild flavour of humour to his exhibit by introducing it as *Vespa carbonaria*, sp. nov.—an imposition that might have succeeded elsewhere.

Mr. Enefer reported the finding of three larvae of *Acronicta alni*, at Penzance, in August, 1921, from which he had bred one imago and an ichneumon, the third still remaining in the pupal stage. He added a short account of the life-history and distribution of the species in the British Isles.

Mr. Step reported that of the *Cleora lichenaria* larvae he exhibited at a previous meeting only one had developed an imago. The rest had extended their feeding two weeks beyond the larva which had pupated, and now all of them showed cocoons of ichneumons on their bodies.

Mr. Grosvenor referred to the fact that the larva of *Attacus atlas*, in India, when ichneumoned, similarly extended the period of its feeding.

Mr. Withycombe exhibited a specimen of the Neuropteron *Chrysopa dorsalis*, bred from a larva beaten from the pines at Oxshott, in 1921. The only known localities for the species were Oxshott (in 1900), Kings Lynn, and Colchester. He reported that the dragonfly, *Libellula depressa*, was ovipositing freely at Strawberry Hill, on June 7th. Many ova were extruded per minute. They have a gelatinous covering and appear to come off in a stream, but directly they touch an obstacle they come off singly and become attached. As they sink through the water they probably adhere to the leaves and stems of water plants. Mr. Blair remarked that *Chrysopa perla* seemed to him to be more common than usual this year.

Mr. Coulson reported the capture of a specimen of *Phryxus livornica* on a doorstep at Merton, Surrey, on May 15th.

Mr. Bunnett exhibited ova, larvae, and imagines of *Melasoma*

populi (Col.) from Oxshott, where the species was very common just now.

Mr. Preston exhibited butterflies from Macedonia, including *Pontia daplidice*, *Anthocharis crameri* (*belia*), *Leptosia sinapis*, etc.

Various reports of the occurrence of *Colias croceus* (*edusa*) were made. On the N. Downs seven specimens; in Huntingdonshire on June 6th; and elsewhere on May 25th and 28th.

JUNE 22nd, 1922.

Mr. Turner sent for exhibition, from Freshwater, Isle of Wight, a flower spike of *Orchis incarnata*, L., and one of the Buckbean (*Menyanthes trifoliata*, L.), both abundant in the marshes there. He also sent an entire plant of the Salt-marsh Arrow-grass (*Triglochin maritimum*, L.) in fruit. He reported that the Bee Orchis (*Ophrys apifera*, Huds.) was plentiful on the Downs towards the Needles, but with very short stems. Both our native species of Iris (*I. pseudacorus* and *I. foetidissima*) were flowering and abundant, the former in the marshes, the latter on the chalk slopes and in woody places. Respecting insects: he found the first brood of *Pararge aegeria* worn, the second brood just emerging; but *E. jurtina* was the only abundant species—more so even than *Crambi*. He had not met with *Zygaena trifolii*, but a chance acquaintance had reported the capture of six specimens.

Mr. Staniland exhibited specimens of the large Coleoptera *Petrognathus gigas* and *Archon centaurus* from the Gold Coast.

Mr. Withycombe exhibited the Neuroptera—(1) *Osmylus chrysops* (male) alive, and a spirit specimen of the larva, which has very long sucking jaws and is amphibious in habits, living on banks of streams among moss. (2) *Sialis lutaria* and a living larva of the same, which lives in mud at the bottom of the ponds. (3) *Ithone fusca* from Australia, and spirit specimen of the larva sent him by Dr. R. J. Tillyard. This larva is a blind, white grub, that lives in sandy soil, and feeds up on cockchafer larvae. (4) *Psychopsis leonina*, from Africa, and a spirit specimen of the larva of *P. elegans*, from Australia, also sent by Dr. Tillyard. This last larva lives under the bark of Eucalyptus trees, in a similar way to that of the Snake-fly (*Raphidia*) in this country. (5) *Stenosmylus excicus*, from New Zealand.

Mr. Buckhurst exhibited a specimen of *Hesperia malvae* ab. *taras*, taken at Effingham.

Mr. O. R. Goodman exhibited (1) an example of *Parnassius apollo* var. *provincialis*, taken in July, 1921, at St. Martin Vésubie. This race is densely scaled with white, all the black markings and spots being much more reduced than in the type. The marginal band of the hindwings is absent, and is much reduced in the forewings. It approaches in appearance to *Parnassius delius*, but without the red pupils in the black spots at the tip of the forewings. The stalk of the antenna is sparsely ringed with black. (2) An example of *Parnassius delius*, probably from Pontresina. The general colour is faint yellowish white, with the black markings smaller than in *apollo*, and without a marginal band to the hindwings. Two of the black spots at the tip of the forewing are pupilled in red. Stalk of the antenna markedly ringed in black. (3) An example of *Parnassius*, probably from Pontresina, which he considered might be a hybrid *apollo* × *delius*. All the wings were heavily scaled in black and with pronounced marginal bands to both wings, as in typical *apollo*. The three black spots at the tip of the forewings were all pupilled in red; also the spot on the hind margin. The antennae were almost identical with those of *delius*, and differed very much from those of *apollo*, both in marking and shape.

Mr. Syms exhibited a larva of *Euralis betulae*, spun up for pupation, and a full fed larva of the Coleopteron *Onthophagus vacca* in its cell.

JULY 13th, 1922.

Major Stuart Maples, of Monkswood, Huntingdon, and Messrs. Henry Candler, of Broad Eaves, Ashtead, and Eric Branston Watson, of Winthorpe Grange, Newark, were elected members.

Mr. Robert Adkin exhibited three specimens of *Grammesia trigrammica* (*trilinea*), from Abbot's Wood, where, he said, the species had been taken unusually commonly at sugar in June this year, and had shown considerable variation. Two of the specimens shown were dark grey in colour, having a decided melanic tendency, with indistinct, pale, transverse lines, while the third example was reddish brown, with darker red-brown lines.

Mr. A. A. W. Buckstone exhibited living larvae and pupae of *Pyrameis cardui*, and called attention to the variation of the pupae both in ground colour and in the colour of the spots. The ground colour varied from pale grey to blackish; the spots were silvery on

a few specimens but golden on the majority. The larvae were of the two forms, the light and the dark.

Miss A. K. Lock exhibited an aberration of *Brenthis euphrosyne*, taken on June 5th, at Worth, Sussex, with the ground colour of a uniform pale yellow, the spotting remaining normal.

Mr. Hugh Main exhibited the following items brought by him from the South of France. 1. The larvae of the ant-lion, *Palpares libelluloides*, and said that those obtained the previous year had failed to produce imagines. 2. Specimens of a Tenebrionid beetle, *Pimelia* sp. 3. Cases of the large Psychid, *Psyche villosella*, and a large number of young larvae which had emerged from one of them. These were very active in their own tiny cases. 4. The blackbellied spider, *Lycosa narbonensis*, described by Fabre, which with some care could be obtained from its burrows by enticing it with a small stick. 5. The spider, *Clotho durandi*, found under stones at Ste. Baume. He pointed out that the web of this last was a conspicuous affair supported by numerous "guy ropes," and consisted of two layers, between which the spider lay awaiting her prey. 6. The Myriapod, *Scutigera araneoides*, noted as the species of which Latreille ascertained the poisonous nature of the bite of this family. 7. The larva of the local butterfly, *Thais rumina*, of which the birthwort, *Aristolochia*, is the food plant. He also described the pit of the long maggot larva of the Dipteron, *Leptis vermilio*, which used that device for the capture of ants. He had succeeded in breeding one specimen. There were also innumerable small scorpions and active geckos to be found in the same neighbourhood.

Mr. Cheeseman exhibited the living larvae of *Attacus cynthia* and *Samia cecropia*, two large silk-spinning Saturniids. They feed readily on privet, and would also eat lilac.

JULY 15th, 1922.

FIELD MEETING—HORSLEY.

Conductor, F. B. CARR.

A very pleasant meeting was held over the ground well known to the S. London Society, and reported on at length on several previous occasions. The morning party traversed Clandon Downs and proceeded by Newlands Corner to Netley Heath, where they were met by the afternoon contingent.

Mr. Hugh Main exhibited the natterjack toad (*Bufo calamita*) from the South of France. It was remarked that formerly it was to be found in various parts of Surrey, but had not been met with in any numbers of late.

Mr. Step exhibited several species taken on the occasion of the Society's Field Meeting at Netley Heath, July 15th, including *Arpactus mystaceus* (Hym.); *Volucella pellucens*, *Calliphora erythrocephala*, *Myiatropa florea* (Dipt.); and *Strangalia armata* (Col.).

He also showed two living reptiles which Mr. O. R. Goodman had sent to him from Vernet-les-Bains, Pyrenees: a fine example of the Southern Smooth-snake (*Coronella girondica*, Daud.), and a small specimen of the Wall Lizard (*Lacerta muralis*, Merr.) with two tails. The *Coronella* is very like our rare native species, but rather more slender and a little longer. A striking identification mark is seen on the head, the black streaks from the angle of the mouth to the eye being continued across the prefrontal shields from eye to eye. In this example the black mark behind the head, which usually assumes some resemblance to the letter U, is asymmetrical. It is a native of the S. of France, Spain, Portugal, and Italy; and has been reported occasionally from the African side of the Mediterranean. Like the more northern species (*C. austriaca*) its food is said to be lizards, which it appears to hunt at night when these are at rest. It is exceedingly gentle and makes no attempt at biting. The scales are without any indication of a keel and perfectly smooth, so that it can glide backwards as easily as forwards.

Mr. Robert Adkin exhibited a short series of *Cupido minimus*, taken on the Downs near Eastbourne in May last. The specimens generally were of large size, and some much dusted with blue scaling. One underside had immaculate hindwings.

Mr. T. H. L. Grosvenor exhibited the burnet moths *Zygaena anthyllidis*, *Z. transalpina*, and *Z. scabiosae*, sent to him by Mr. O. R. Goodman from the Pyrenees.

Mr. F. B. Carr exhibited the larvae of *Nemoria viridata* from ova laid by a female from Witherslack, and larvae of *Bapta temerata*, beaten during the Field Meeting at Horsley, on July 15th.

Mr. Barnett exhibited series of *Brenthis euphrosyne* from S. Devon; and reported that he had taken *Ematurga atomaria* as late as June 22nd.

Mr. Hy. J. Turner exhibited a series of the race *alexandrina* of

Melitaea aurinia from Kisilsk, on the Ural River, in the S.E. Ural Mts. of Russia, together with other races for comparison, including *provincialis*, *hibernica*, *merope*, and others from Corsica and Bavaria. The Ural race was characterised by the submarginal band of the forewings not being costally margined by black, and by the abundant light yellow markings of the forewings.

Mr. Withycombe exhibited a living specimen of the large Staphylinid beetle, *Emus hirtus*, from the Pyrenees.

Mr. Bell exhibited larvae of *Cerura bifida*, *C. furcula*, and *Notodonta ziczac*, bred from ova found in the woods near Hatfield, in June, 1922. The ova of the *Cerura* moths are said to be invariably deposited on the upper surface of leaves, but these ova were on the undersides of the leaves; and on July 22nd he had found ova of *C. furcula* at High Beech, again on the underside of the leaves. He also showed a small larva of *Stauropus fagi*, beaten at Hatfield on July 7th. It was found on an isolated beech tree, and assiduous beating failed to obtain others. On the stems of sallow he had found ova which were studded with bristles and opened with a lid. These hatched, and the larvae obtained attacked and sucked dry the larva of one of the "hook-tip" moths. They were probably ova of a Hemipteron.

JULY 29th, 1922.

FIELD MEETING—EASTBOURNE.

Conductor, ROBERT ADKIN, F.E.S.

Sixteen members and friends, the majority of whom had travelled from Victoria by the 9.45 a.m. train, assembled at "Hodeslea" for an early lunch, which having been duly negotiated, they set out for a ramble along the lower slopes of the South Downs, towards Beachy Head. The weather was fine and an enjoyable afternoon was spent among the butterflies and moths that abound in those parts. Among the more notable species met with may be mentioned *Colias croceus* (*edusa*), of which some three or four specimens, the first of the descendants of the immigrants of the spring, were taken. *Agriades coridon* appeared to be only just coming out, several specimens secured being in very fresh condition; *Zygaena filipendulae* was found in countless thousands, but among the large numbers

examined only very few showed any unusual variation, the best forms being two or three in which the red markings tended to form longitudinal streaks. *Melanippe galiata* and *Eubolia bipunctaria*, with many Pyrales, flew up from the grass frequently, and of *Stenia punctalis*, which some years ago was a very abundant species in the neighbourhood, but which it was feared had disappeared from it, some half a dozen specimens were dislodged from the herbage. As the afternoon was drawing to a close the party wended their way back to "Hodeslea," where Mrs. Adkin had a substantial tea awaiting them, after which, and a little time spent in the garden, they made their way back to the station and took the 8.20 p.m. train for London.

AUGUST 10th, 1922.

Mr. D. W. Seth-Smith, of 34, Elsworth Road, N.W., was elected a member.

Mr. Tonge exhibited a specimen of *Malenydris* (*Larentia*) *salicata* bred from an ovum laid by a female captured last year at Langridge Fell. The larva fed on bedstraw.

Major Gillett exhibited a unique black-banded aberration of *Agrotis corticea*, with two specimens of *A. cinerea*, a light ♂ and a dark ♀ form; also two forms of *A. exclamationis*. They were all taken in his light trap.

Mr. Bunnett exhibited the larva and imago of *Ledra aurita* (Hemip.), and the English Cicada, *Centrotus cornutus*, both from Box Hill, and the latter also from Farningham. He also showed the scarce beetles, *Agrilus sinuatus* and *Rhinomacer attelaboides*, from Oxshott.

Dr. Robertson exhibited species of Lepidoptera he had taken at Grindelwald in early July, including *Pieris napi* var. *bryoniae*, *Albulina pheretes*, *Zygaena achilleae*, *Z. purpuralis*, *Acidalia immorata*, and *Crambus myellus*.

Mr. Robert Adkin exhibited a series of eighteen specimens of *Arctia villica*, reared from larvae picked up on the Parade at Eastbourne, between the middle of March and the end of April last. He said that for some years past he had been in the habit of taking any Arctiid larvae that he happened to see crawling about on the Parade, and from them he had usually bred either all *A. caja* or, as in the

case of 1921, about ten *A. caia* to one *A. villica*. This year he found in all about two dozen larvae, of which three or four died, two were killed by an *Apanteles* parasite, and the remainder produced only *A. villica*. Mr. Newman had informed him early in the year, that he had found larvae of *A. caia* exceedingly rare in such localities as he had worked for them, but that those of *A. villica* were unusually common; this appeared to agree exactly with his own experience as related above, and it would be interesting to know whether it also agreed with that of others in other localities.

Mr. Tonge noted that *Arctia villica* was common at Reigate and Deal.

Mr. Ham remarked on the scarcity of *Arctia caia* near Oxford this year, whereas it was generally common there.

Mr. Hy. J. Turner exhibited a series of species of the Bombycine genus *Automeris* (*Hyperchiria*) from North and South America; and contributed the following note:—

"The genus *Automeris* (*Hyperchiria*) is a characteristic feature of the forest regions of South America, particularly of Brazil, where a considerable number of the ninety named forms occur. Species of the genus are also found south to the Argentine and north to Central America and Mexico, one species, *A. io*, penetrating as far as the Eastern United States and Canada. All the species have the same general facies, shades of brown with a very conspicuous ocellus on the hindwing, generally with contrasted rings, and the forewings more or less obscurely lined or banded, with an ocellus on the underside only. A few species have bright yellow clouds on the hindwings. *A. io* is the only very strongly sexually dimorphic species, the forewings and most of the hindwing ground of the male being bright yellow. The larvae when young have very long spikes on the back, those near the head being branched. Each of the terminal points of these spikes is furnished with a rosette of fine spines around a very long central one."

Several species exhibited were sent over by Mr. F. Lindeman, from Cordova, San Paulo, and Rio.

Mr. Carr reported *Colias croceus* (*edusa*) at Oxshott, apparently freshly emerged. Other members had also met with the species.

Mr. Ham reported that *Polygonia c-album* continued not only to maintain itself around Oxford, but had appeared even in the city itself.

AUGUST 24th, 1922.

Mr. E. Step, F.L.S., in the Chair.

Mr. T. L. Barnett exhibited a long series of *Brenthis selene* from S. Devon, which showed two forms of the female in about equal proportions, one having the ground colour lighter than the other.

Mr. Withycombe exhibited the larva of the "Festoon" moth, *Limacodes testudo*, beaten from oak at Oxshott; also examples of the Pentatomid Hemipteron, *Acanthosoma interstinctum* (*griseum*), from the same locality.

Mr. Sims exhibited male and female specimens of the large earwig, *Labidura riparia*, from its Bournemouth locality. In captivity it burrows under the sand, and feeds readily on the larvae of beetles, scraps of fish and meat, bread, flies, etc. He had seen it carry a fly in its forceps. Mr. Main remarked that his specimens, when burrowing, scratched like a rabbit, throwing out the sand behind.

Mr. Main exhibited the spider, *Clotho durandi*, from the South of France, and read an extract from the "Life of the Spider," by Fabre. He showed a photograph of the spider in situ, (1) the web with debris of insects stretched out on the lower surface of a flat rock; (2) the web with surface layer removed; (3) the next layer partly removed, showing the spider and its egg mass; (4) the layer completely removed with the spider fully displayed.

Mr. Hy. J. Turner exhibited a number of exotic species of "whites," *Pieridae*, to show the extreme development of brilliant coloration with total, or almost total, suppression of the white on both surfaces. The species shown were *Appias nero*, ♂ and ♀, from Java (brilliant orange red), *Appias placidia*, from the Moluccas (uniform sooty brown on both sides), *Delias ninus*, from Borneo (black red, blue, and yellow), *Pareronia phocaea*, from Mindanao, and *P. tritaea*, from the Celebes (both black, brown, and green).

Mr. Robert Adkin exhibited pupae of *Papilio machaon*, and read the following note:—"In June last I received a dozen larvae of *P. machaon*, of Norfolk origin. Two of them died as larvae, and of the remaining ten, one spun up on the midrib of a garden carrot leaf which had been given them as food, another on the glass bottle that had contained the food-plant, and a third on a thin stick of a dark colour that had been placed in among the food-plant and was surrounded by it. All these three pupae were of the usual pale yellowish-green colour. The remaining seven larvae all attached themselves to dark-coloured sticks that had been stood up at an

angle with their tops resting against the sides of the cage, and away from the food-plant. The cage was simply a white deal box stood on end, the lid being replaced by green leno, which formed the front of the cage. All seven of the resulting pupae on the sticks were putty-coloured, with broad black stripes along the sides and underparts, and black all over the wing cases, giving the whole of the pupae a very dark appearance. Similar variation sometimes occurs in Pierid pupae; but he thought this was one of the most marked cases that had come to his notice."

Mr. H. Moore, on behalf of Mr. Enefer, exhibited a Longicorn beetle found in a case of Canadian produce at Unity Wharf, Dockhead. It was subsequently identified by Mr. K. G. Blair as *Stromatium asperulum*, White, a native of Cochin China. Mr. Enefer has made further enquiries, and he found that goods from China and the Straits are also received at the wharf, so that it can be safely concluded that its association with Canadian produce was accidental.

SEPTEMBER 14th, 1922.

Exhibition of Orders other than Lepidoptera.

Mr. Robert Adkin exhibited a large female specimen of *Sirex gigas*. It was taken in the garden of a cottage in Eastbourne, in July last, and when set measured 70mm. (= approximately $2\frac{3}{4}$ inches) in expanse.

Mr, W. J. Lucas made the following exhibits:—

Orthoptera.—A large brown example of *Mantis religiosa*, Linn., taken by Major J. J. Jacobs, in South of Spain, in 1911.

Neuroptera.—Four examples, ♂ ♂, ♀ ♀, of *Palpares libelluloides*, Linn., taken by Major J. J. Jacobs, the first at Sierra de Carbonera, on May 27th, 1912, the others at Algeciras on June 23rd, 1911.

Pairs of the three European species of *Nemoptera* for comparison —*N. bipennis*, Illiger, taken by Major J. J. Jacobs, at Sierra de Carbonera, on June 3rd, 1911. *N. coa*, Linn., taken at Corinth (Rev. F. D. Morice, he believed), May 15th, 1912. *N. sinuata*, Olivier, ♂ taken by P. J. Barraud, in Macedonia, June 6th, 1917; the ♀ probably from Syria.

Hymenoptera.—Two ♀ specimens of the scarce Hymenopteron, *Methoca ichneumonides*, Latr., taken by himself in the New Forest, one on August 27th, 1922, the other a few years ago.

Mr. H. W. Andrews exhibited the following species of Diptera:—

1. *Dioctria oelandica*, L., a species he had looked for years to find. It was taken in one corner of a field only, near Farningham. It could be easily recognised by the zigzag black markings across the forewings.

2. *Catabomba pyrastri*, L., ♀ var. *unicolor*, Curt., from Shoreham, Kent.

3. *Urophora cardui*, L., bred from thistle galls, found at Shoreham; parasites bred from the galls were also shown.

Mr. Hy. J. Turner exhibited the curious "flue-brush" beetle, *Rhina barbirostris*, from S. America.

Mr. F. J. Coulson exhibited (1) *Xylophasia monoglypha* var. *infuscata*, taken August 2nd, 1922, at Wimbledon Common; also a light brown form from Merton, Surrey.

2. *Boarmia gemmaria*, one ♂ and three ♀ ♀ of a blackish speckled form, bred in 1922, from ova of a wild female taken in 1921, at St. Leonards-on-Sea, Sussex. Examples of the normal form bred with the above specimens, and two var. *perfumaria* forms bred from Wandsworth Common larvae, were shown for comparison.

Mr. T. H. L. Grosvenor exhibited eggs of the following Raptores from Northern India:—

1. Pondichery Vulture. Found at the village of Jamsher, Jullandar District of Punjab. The nest is very large, instances have been known where the material used has weighed two to three cwt. One egg only is laid, and the nest is always placed at the top of the highest tree in the district.

2. White-backed Vulture. These birds are gregarious during nesting, several nests often being in one tree. They are placed at any height from the ground, and contain one egg, rarely two eggs.

3. Egyptian Vulture. The nest is usually placed at a height of 14 to 20 feet from the ground, generally on the main trunk, where the boughs commence to branch out. Two handsome red-mottled eggs are laid.

4. White-tailed Eagle. A common carrion feeder in the North Punjab. The nest is placed in a thorn bush about 15 to 20 feet from the ground, and two white eggs are laid.

Mr. Step exhibited living examples, male and female, of the Pyrenean Newt (*Molge pyrenaeus* = *asper*) which he had received from Mr. A. de B. Goodman, who had captured them in a stream on the Porte Gavarnie route at an elevation of 600 feet. Its distribution

is restricted to the Pyrenees, where, according to Gadow ("Cambridge Nat. Hist."), it prefers lakes which are fed during the whole of the summer with water from the melting glaciers.

Apart from colour, the Pyrenean Newt is much like our Crested or Warty Newt (*M. cristata*), the skin being rough with closely set warts, and the tail thick and powerful, flattened slightly from the sides. Viewed from above, it will be seen that the muzzle, instead of being rounded is truncate, the tip between the nostrils being quite straight. Of the present pair the female is the larger, her total length being $5\frac{1}{4}$ inches, whilst that of the male is only $4\frac{1}{2}$ inches; and there is a difference in the proportions of tail and body, that of the male being slightly less than half his length, and that of the female slightly exceeding the length of head and body.

The general colour of the male is a greenish yellow-brown, darker on the upper parts, where there is a distinct, though interrupted, yellow vertebral line from behind the head; the underside with a broad longitudinal band of dull yellow bordered with dark spots, the tail with an orange keel and cloaca dull grey. The colour of the female is darker, more approaching olive above, but orange below—the cloaca reddish (Gadow says "bright red"). The vertebral line is only slightly indicated, and chiefly along the tail.

Mr. C. L. Withycombe exhibited the following species of Orthoptera:—*Empusa egena*, Charp., and *Oedipoda germanica*, Latr., from the S. of France, 1921, with *Psophus stridulus*, L., from the Pyrenees, in 1922. The two last have red hindwings. He also showed a Mantid from the Straits Settlements, with a short prothorax and ill-developed forelegs, which are in the Mantids usually strong and raptorial.

Mr. Enefer exhibited the following Coleoptera taken by him at Mürren, in Switzerland, during August, 1922:—

Clerus apivorus, *Strangalia quadrifasciata*, both feeding on cow-parsley; *Carabus arvensis*, the spotted pine-weevil, *Liparus germanus*, the two last on fir-logs; also a living *Carabus auratus*.

He also showed the yellow crab-spider, *Thomisus onustus*, one of the wolf-spiders, *Lycosa* and two fine ♂ banded orb-spiders, *Epeira fasciata* taken near Clarens, Lake of Geneva, and communicated the following note of his observations:—

"Taken on May 16th, both fed fairly well upon flies and small moths, but after the 19th the larger of the two refused food until the 27th, when it accepted a fragment of a fly. During the interval it became greatly reduced in size, and I was very pleased to find that

a large cocoon had been formed, about the size and very much like a large gooseberry. The cocoon was attached firmly to the side of my collecting box by silken cords, and it was most interesting to watch the elaboration of the beautiful covering of webbing, that ultimately closed the aperture at the top."

Mr. Hugh Main exhibited one of the wolf-spiders, *Lycosa picta*, sent to him by Mr. Bristowe, from Oxshott, and also the tubes of silk spun in the sand. Also a crab-spider from S. France, and referred to Fabre's description of the young spiders spinning a fine silk thread, and being carried while attached to it for a long distance by the currents of air. They soon assumed the colour of the flowers frequented by them. On the flower heads the full grown spider caught bees, while the young first began by capturing any minute insects which settled on the flower head. He next showed a *Scarabaeus* beetle, from Cyprus; and the native cockroach, *Ectobius panzeri*, from the New Forest.

Mr. Cheeseman exhibited a striated form of *Polyommatus icarus*, from Surrey.

Mr. B. S. Williams exhibited the following Coleoptera from the Harpenden district, taken in 1921-2:—*Panagaeus bipustulatus*, a local species, *Cassida hemisphaerica*, *Stilicus subtilis*, *Quedius othinienis* (*talparum*), *Aleochara spadicea*, the two last from moles' nests, *Megarthrus denticollis*, *Antherophagus nigricornis*, and *A. pallens*.

Mr. G. E. Frisby exhibited the following Hymenoptera:—*Ammophila luffii*, described by the late Mr. Edward Saunders, in 1903, from specimens taken in the summer of that year, in Jersey, and its very close ally *Ammophila hirsuta*. *Bembex rostrata*, from St. Ouen's Bay, Jersey.

Also specimens of both British species of *Sapyga*, the common *S. 5-punctata*, and the very much rarer *S. clavicornis*, the latter until recently being only known from the records of Shuckard and Smith. Now known from several localities; those exhibited being taken this summer near Hastings, with one specimen from Wrotham, Kent.

Mr. Stanton exhibited some Coleoptera of economic importance and read the following notes:—"*Bruchus rufimanus* and *B. affinis*. —For some years Coleopterists have called a large *Bruchus*, introduced into Britain on beans from Mediterranean regions by the name *Bruchus affinis*. In conversation Mr. Blair has suggested that the name *Bruchus affinis* should be applied to quite a different species, and on this understanding it seems necessary to discover whether the *Bruchus affinis* of English collectors is merely a large

southern form of *Bruchus rufimanus* or a distinct species. It may be mentioned that a preliminary examination at the Pathological Laboratory would seem to suggest that *rufimanus* and the Mediterranean species are distinct, but further specimens are still required to settle the point satisfactorily. In general appearance the Mediterranean insect is larger, more robust, and usually more distinctly marked than *B. rufimanus*, but no constant character is yet available to distinguish them. The characters given in Fowler's "Coleoptera of the British Isle," do not appear to be constant. From the information at present available the Mediterranean form does not appear to be reproduced in England, or ever to be found in English grown seed."

"*Bruchus obtectus*.—A species of doubtful origin but now almost cosmopolitan, extending from tropical to temperate regions. Frequently introduced into Britain in French bean seed. Existing information seems to show that the insect cannot stand the English winter in the open, though it undoubtedly breeds in seed stores. In its life-history *Bruchus obtectus* differs from all indigenous species in the fact that it can breed on dried beans. In America it is a well-known pest, and is there the chief bean-beetle.

"*Anthonomus cinctus*.—*Anthonomus cinctus*, of Koller, was first recorded as British by Mr. Harwood, in the "Entomologist's Monthly Magazine" for October, 1921, from a specimen he had obtained the previous August in Kent. The insect had, however, in the spring of the same year been bred by Mr. F. R. Petherbridge, of Cambridge, from larvae found by him in Norfolk. These larvae were feeding in the unexpanded truss or leaf buds of apple. In the present year further specimens have been obtained from the Norfolk locality, where the beetle is doing appreciable damage. *Anthonomus cinctus* is well known on the Continent, where, however, it is a pest of pears rather than of apples. It is not yet possible, of course, to say whether the new species will prove of the same economic importance in Great Britain as the Apple Blossom Weevil. It is also difficult to suggest whether the insect is a recent importation or an undetected resident. In this connection it would be of assistance if Coleopterists would be on the look out for the beetle and record any discoveries. The insect appears to be more easily taken in the larval than in the adult stage.

Mr. Stanley A. Blenkarn exhibited four drawers of British Coleoptera, containing species of *Bembidium* and other ground beetles, many species of water-beetles and of *Chrysomelidae*, including

the rare *Bembidium nigricorne*, a series from Yorkshire, the local species *B. stephensi* from Charlton, *B. ephippium* from Pett Level, *Limnaeum nigropiceus* from Ventnor, *Lebia cyanocephala* from Box Hill, etc.

Mr. A. E. Tonge exhibited five larvae of *Sphinx ligustri*, from S. Cornwall, of identical parentage, but showing wide variation in the intensity of the purple stripes on the sides. In the more extreme forms these were expanded into wide blotches.

On behalf of the Society the Ashdown collections of *Coccinellidae* and Odonata were exhibited.

The President exhibited a specimen of the dog-stinkhorn, *Mutinus caninus*, much less common than the common stinkhorn. Mr. Lucas remarked that he had found a number of the beetle *Silpha thoracica* feeding on the caps of stinkhorns.

Mr. Barnett reported that Mr. Coppeard had met with both *Phryxus livornica* and *Agrius convolvuli* in S. Devon. Mr. Tonge had observed the crab-spider attacking Lepidoptera. Mr. Withycombe said that he had met with the spider *Epeira fasciata* in Great Britain. There were numerous reports of the occurrence of *Colias croceus* (*edusa*).

SEPTEMBER 23rd, 1922.

FIELD MEETING—EFFINGHAM AND OCKHAM COMMON.

Conductor, HY. J. TURNER, F.E.S.

This Field Meeting was held on ground well known to members of the Society, and reported on on several previous occasions. Nominally larvae-beating was to be the object; this, however, was found not very productive, no special captures being made.

Mr. C. L. Withycombe reported that the following Neuropteroid insects were taken by Messrs. Blair, Lucas, Step, Syms, and himself.

Beating was carried out in the pinewoods mainly, the following insects being captured. *Chrysopa vulgaris*, several specimens, all green; *Hemerobius stigma*, one female and several larvae; the scarcity of species of *Hemerobius* was very noticeable as *H. stigma*, especially, is usually more or less common all the year round; *Coniopteryx pygmaea*, over thirty specimens, all ♀ ♀ (C.L.W.); *Conwentzia psociformis*, one ♂ (E.E.S.); larvae of *Raphidia notata* and *R. maculicollis* were found sparingly under pine bark, two being

found on the outside of the trunks, killed by *Empusa lampyridarum* (E.S. and E.E.S.). A few Psocids were taken: *Lachesilla pedicularia* (C.L.W.), *Ectopsocus briggsi* (K.G.B.), *Elipsocus westwoodi* and *Stenopsocus cruciatus* (K.G.B. and C.L.W.).

Near the great pond, on birch bushes, the May-flies *Cloeon simile* (K.G.B. and C.L.W.) and *Heptagenia sulphurea* (K.G.B.) were obtained; also two Caddis-flies, *Oecitis ochracea* and *Mystacides quadrifasciata* (K.G.B.). From the same small birches a full fed larva of *Acronicta leporina* was beaten (C.L.W.).

Among the plants noted:—*Helrella crispa*, *Epipactis latifolia* (in bloom), *Calla palustris*, *Eriophorum polystachion* (Cotton grass).

SEPTEMBER 28th, 1922.

Mr. Edwards exhibited the fungus *Pleurotus revolutus*, found at Blackheath on the trunk of a felled poplar.

Mr. Sperring exhibited further specimens of the dark race of *Brenthis euphrosyne* from Lincolnshire, taken this year.

On behalf of Mr. Coppeard he also exhibited a dark suffused aberration of the same species from S. Devon, a specimen of *Aphantopus hyperantus*, in which the R. hindwing had a partial double row of eye-spots, an *Epinephele jurtina* with additional dots on the forewings, and another partially xanthic.

Captain W. Crocker exhibited a series of aberrations of *Agriades coridon*, taken this year at Royston, including ab. *obsoleta* ♂ and ♀, ab. *striata*, ab. *roystonensis*, ab. *semisyngrapha* closely approaching ab. *syngrapha*, females streaked with ♂ colour, brown suffused females, ab. *marginalis* ♂s, asymmetrical specimens, ab. *caerulea*, etc.

Mr. N. D. Riley exhibited for Mr. Hirst, a specimen of Fabre's "Banded Epeira" (*Agriope bruennichi*), the first to be found in England. It was taken at Rye, Sussex, by Mr. Frank Sladen, early this year. He also showed specimens of the Gorse Red Spider (*Tetranychus lintearius*, Dufour), one of the spinning mites. There were large numbers on the web, which was found in Devonshire.

Mr. B. S. Williams exhibited the following Pentatomids from the Harpenden district:—*Acanthosoma tristriatum*, *Sehirus bicolor*, *Eysacoris melanocephalus*, and *Podops inuncta*.

Colonel R. H. Rattray shewed a series of lantern slides from his

own photographs of Indian birds' nests. The following is a summary of his remarks.

The country is very varied, and the conditions under which the photographs were taken were often most difficult. In the plains the heat was often so intense that it was impossible to place one's hand on the sand; in the hills on the other hand it was cold, and the country was frequently covered by forests and dense undergrowth. The Thrushes and warblers were first dealt with; the nest of the Great Indian Reed Warbler (*Acrocephalus stentoreus*) being built in dense reed beds, which can only be approached in a narrow punt, owing to the depth of mud and water. The Paddy-field Reed Warbler (*A. agricola*) builds its nest slung between the stems of a reed growing on the floating islands of peat and weeds, a most inaccessible locality, and rarely approached. The Short-billed Minivet (*Pericrocotus brevirostris*), a most brilliant bird, the male clothed in vivid scarlet and black, makes a most beautiful little nest, carefully covered with cobwebs and lichens, and attached to the ends of the boughs of the tallest trees. A slide was shown of the only authentic nest of the European Golden Oriole in the Indian limits. Passing on to the Flycatchers—to photograph the nest of the White-browed Fantail (*Rhipidura albifrontata*) in the intense heat of May, ice has to be used to prevent the film melting off the plate. Among the Redstarts the Plumbeous Redstart (*Rhyacornis fuliginosus*) is the only one found in the Himalayas (up to 13,000 ft), where it builds in small hollows near water. The Common Weaver-bird (*Ploceus baya*) is very like our Sparrow, and it builds in large companies, which suspend their nests from the outermost twigs of the boughs of trees. On one occasion he had climbed out to a nest, which overhung the water, when the bough broke, dropping him into the stream. When he laid the nest on the ground a very poisonous snake wriggled out. These nests are wonderful structures, the strips of grass are passed through backwards and forwards and the rough edges hold together, preventing the structure being dragged to pieces. The Finches and Larks were next dealt with. A sub-species of our British Nightjar, of a lighter colour, occurs at about 7,000 ft. in the Himalayas, and has similar habits and precisely similar eggs. Our common Moorhen has also quite similar habits in India, except that it frequents larger stretches of water. The nests of several waders were shown, including a slide of the Pheasant-tailed Jacana (*Hydrophasianus chirurgus*), a bird with very long toes, which runs with ease on the leaves of water plants in the larger

lakes of the country. Its nest is a mass of floating rubbish, the eggs often touching the water. The Plovers and Snipes were illustrated; also the River Terns, which last breed in colonies on the sand spits which are often seen in the middle of a river, the nests being depressions in the sand, unlined, and fully exposed to the burning sun at the end of May and June.

Mr. Coulson exhibited an abnormal structure, dish-shaped, made by *Saturnia paronia* as its cocoon, it having got entangled in its own threads and unable to spin normally. He also showed a series of aberrations of *Coenonympha pamphilus*.

Mr. Mera exhibited living larvae of *Colias croceus* (*edusa*) from ova laid by a female captured at Eastbourne during the Society's Field Meeting there on July 29th. He also showed a series of *Triphaena fimbria*, bred in 1922, from Epping Forest larvae, and a specimen from Ipswich, typical of many taken there in and about 1880. This latter specimen was a uniform light brown colour, in contrast to those from Epping, all of which were much darker in general colour; he suggested that during recent years the species appeared to have become darker.

Mr. Enefer exhibited *Callimorpha quadripunctaria* (*hera*), found resting on vine leaves in a vineyard at Clarens, near Montreux, Switzerland. He also showed specimens of *Erebia pronoë* taken resting on clover on the mountain slopes at Mürren, in August.

OCTOBER 12th, 1922.

Mr. Stanley Edwards exhibited the fungus, *Clavaria stricta*, found at the base of tree-trunks at Blackheath.

Mr. Turner exhibited a photograph of *Clavaria pistillaris*, taken by Mr. Step about twenty years ago in Norbury Park, and stated that he had found a considerable number of this singular fungus on Ranmore Common, under beech trees.

Mr. Withycombe exhibited a female hornet, *Vespa crabro*, caught flying over a tram-car in Walthamstow.

Mr. Hugh Main exhibited (1) the recently hatched young of the yellow form of the slug *Arion ater*, found under a stump of a tree in Epping Forest; (2) the larvae of a glowworm, *Lampyris lusitanica*, from the south of France, and said that they fed readily on snails and slugs; (3) a black-bellied spider, which much resembled the S. France wolf-spider, *Lycosa narbonensis*, but which was not

found in holes as that species is, but under stones. The cocoon of eggs is carried by the ♀ parent until the young appear, when they are carried on the back of the mother; (4) a small black scorpion which occurred under stones, and was found by him, sparingly, on the heights above Avignon, but was abundant at Pont du Gard.

Mr. Step exhibited a small snake from the Pont du Gard, sent to him by Mr. Main. It was subsequently reported as *Tropidonotus viperinus*.

Mr. Blenkarn exhibited the Coleopteron *Magdalis carbonaria*, taken at Mitcham on May 28th, and stated that the species had not hitherto been taken further south than Sherwood Forest. He also showed *Rhynchites pubescens*, taken at Westerham on June 12th, not uncommonly.

Mr. L. W. Newman exhibited a colour drawing of a ♂ *Agriades coridon*, from Royston, with various streaking of ♀ coloration, especially on the hindwings, and the left forewing much clouded with brown on the costa. He also showed an extremely pale *Epinephele jurtina* from the Chilterns, having only a very little dark shading towards the base of the wings and traces of orange on the disc of the forewings.

Mr. Hugh Main exhibited lantern-slides (1) showing points in the economy of a large scorpion, which he stated was viviparous, and carried its young, for a long period after birth, on its back; (2) the larva of the Dipteron *Microdon*, which was generally considered to be a scavenger in the nests of ants where it lived; (3) the early stages of the rose-chafer, *Cetonia aurata*.

Mr. Dods exhibited lantern-photographs of plants.

Mr. Lucas exhibited lantern slides of the eggs and larvae of the snakeflies, *Rhaphidia notata* and *R. maculicollis*, pointing out the specific distinctions of the species; of the pupal jaws worked by the imaginal jaws inside; of the young larva of *Chrysopa perla*, which crawled like a Geometrid larva; of the lace-work cocoon of *Hemerobius*; and a portrait of the late Dr. Sharp.

Mr. Bunnett exhibited lantern-slides (1) showing the development of the Dog-stinkhorn, *Mutinus caninus*; (2) the development of the Common-stinkhorn, *Phallus impudicus*; (3) a species of "Earth star," *Geaster*; (4) ovaries of a "stick insect"; and (5) eggs of the woodlouse, *Porcellio scaber*, with newly-hatched larvae.

OCTOBER 26th, 1922.

Mr. F. T. Vallins, 372, Sherrard Road, Manor Park, E. 12, was elected a member.

Mr. R. Adkin exhibited his series of *Diacrisia mendica*, with its various local races, aberrations, and mongrel forms, in illustration of his paper (page 48).

Messrs. O. R. and A. de B. Goodman exhibited the following species of Pierids, all taken by them at Pont du Gard, on July 3rd, 1922. ♂ and ♀ *Pieris rapae* compared with ♂ and ♀ *P. manni*, the latter species being probably referrable to var. *rossii*; ♂ *P. napi*, of the extreme summer form *napaeae*, with markings on the underside of the hindwings practically absent, and on the forewings approaching the form of *P. manni*, with which it was taken. They also showed ♂ and ♀ *P. napi* in which a sub-costal spot was strongly developed near the apical blotch.

Miss Alice K. Lock exhibited a specimen of *Agrius convolvuli* in perfect condition, taken at rest in a garden at Sidmouth, S. Devon, on September 4th; and also a female form of *Colias croceus* (*edusa*) near var. *helice*, but intermediate, taken at the same place in September.

Mr. A. A. W. Buckstone exhibited a long series of bred *Pyrameis cardui*, from Oxshott parents, a selection from some 500 specimens which emerged. Among the forms produced were (1) five specimens with a pale blotch in the centre of each forewing; (2) a series with blue centres to the eyespots on the hindwings; (3) six specimens which have one of the nervures running through the white blotch on the forewings of a pink colour; (4) a specimen with the dark patch in the centre of the forewings divided; (5) a series in which the wings bore a curious waxed appearance; and (6) a specimen with an extra white spot on the forewings below. They all emerged in July and August of the present year.

Mr. Hugh Main exhibited a sample of flour infested with the beetle *Tribolium ferrugineum* in all its stages.

Mr. A. W. Mera exhibited a series of *Diacrisia mendica*, bred, from W. Sussex, in 1922, and an undersized female of a smoky colour, bred some years ago from the London district.

Mr. Enefer exhibited a ♀ specimen of *Orgyia antiqua*, bred from a larva taken at Clarens, Switzerland, on August 24th.

He also exhibited the roots of the Scarlet Runner bean, pointing out the bacteria nodules upon them, and explained the symbiotic

relations existing between leguminous plants and the nitrifying bacteria.

Mr. Main referred to the farmers' custom of growing leguminous plants and ploughing the crop into the soil in order to enrich it for the main crop to be grown following.

Mr. Bunnett noted that the roots of the bean were poisonous.

Mr. Step said that the lupine was a common crop plant in South Europe for the same reason. The Scarlet Runner was naturally a perennial, though grown in this country as an annual owing to its failure to survive our winter.

Mr. Tonge exhibited his series of *D. mendica*.

Mr. R. Adkin then read his paper, "*Diacrisia mendica* its History and its Varieties." (See p. 48.)

In the discussion which ensued Mr. Mera referred to the difficulty of carrying on a race in captivity after the second or third generation. Mr. Newman had bred it in large quantities generation after generation, but that was on the growing plant in an outdoor cage, where in fact, after eight years, he found it difficult to get rid of. He reported that he had obtained a sooty black female from Box Hill.

Dr. Cockayne contributed the following remarks :—"The experiments of Onslow have shown that the pale cream coloured form of male is dominant to the dark brown one, but that there are many factors for lightness and darkness involved. From my crosses of a very pale form of Irish male and English female I obtained in the second generation males as pale as the palest Irish ones. On the other hand, a correspondent in Dublin by interbreeding Irish *mendica* gradually got darker males, until he had some as dark, or nearly as dark, as the average English males. No doubt he was extracting recessives. Irish males vary very much in colour; many are darker than the first cross between pale Irish and English *mendica*, and a few are as dark as the paler English ones.

"The name *rustica* is unfortunate in that it covers a number of forms bearing different factors for colour and not a genetically homogeneous race, but since we cannot distinguish these different forms by their superficial appearance, it is convenient to retain it for the pale Irish and Eastern geographical races. The various kinds of spotting are very interesting, and I am sure these are due to a number of Mendelian factors, although my own data are insufficient to prove it definitely. The insect is unsuitable for extensive breeding experiments owing to its susceptibility to a disease,

which is thought to be conveyed through the egg from one generation to another, and which gradually increases in virulence. But for this *mendica* would be an ideal species for the study of the inheritance of minor variations.

NOVEMBER 9th, 1922.

Mr. Boris Jobling, 52, Charleville Road, W. Kensington, Mr. C. H. H. Stokes, 107, Queens Road, Upper Norwood, Mr. G. E. Bryant, 163, Gloucester Terrace, W. 2, Mr. E. Meek, 119, Kempton Road, East Ham, and Lieut. J. C. Seabrook, 8, West Warwick Place, Belgravia, were elected members.

The President exhibited a sample of pepper on which a number of beetles were feeding. The species was identified as *Ptinus tectus*. He also showed a spray of oak leaves rolled by the weevil *Attelabus nitens*, with the beetles in situ.

Mr. A. A. W. Buckstone exhibited a long bred series of *Spilosoma menthastri*, from pupae obtained at Broadstairs, and referred to one example which, by its white texture and absence of spotting, had much the appearance of *S. urticae*.

Mr. Hy. J. Turner exhibited the following *Coenonympha* forms from many localities in the Palaearctic region. *Coenonympha iphis*, *C. arcania* var. *satyrion* and var. *darwiniana*; and contributed the following notes.—

1. *Coenonympha arcania*.—This species is always distinguished in its typical form or race by the very irregular submarginal band of white on the underside of the hindwings, with a row of large perfect eyespots on the outer edge, of which the apical spot is out of the alignment across the other side of the white band, and almost embedded in the general dark ground colour. This form occurs in many parts of Europe, but as a rule not in elevated areas. A form with a very black extended band on the forewings, with a somewhat less irregular white band, is known as ab. *insubrica*.

2. race *satyrion*.—This is the mountain form (considered as a good species by some) which is very prevalent in the High Alps from 4,000-7,000 ft. It is generally of a mouse grey coloration, more or less marked as the locality is more or less elevated. The white band on the hindwing is of even width throughout, with a row of eyespots almost in the middle, the upper one being in alignment with the rest. The series taken at Karer See was somewhat inter-

mediate in general colour, being less of a mouse grey. It is a small form.

3. form *darwiniana*.—This is a form which occurs in the southern Alps, and is more or less racial, with the white band uniform in width, but the apical spot is not in alignment; the row of eyespots lie as in the typical form, and are in many specimens much enlarged; the general colour of the upperside is much darkened with the black areas somewhat extended.

When shown in mass these three forms were clearly distinct and well marked.

4. *C. iphis*.—This species is closely allied to *C. arcania*, and occurs in numbers locally over a very large area of the Palaearctic region. Series were shown from the Rhine, Belgrade, Mödling near Vienna, the Höhe Tatra, the Alps, etc., with specimens from N. Central Asia, and Thian-shan. They all somewhat resembled forms of *C. arcania*, but were readily distinguished by having only remnants (generally two irregular clouds) of a white band on the hindwings below, and on the upperside were uniform blackish brown. The eyespots vary from none to a complete row on the hindwing below, and are small and very sharply defined. The race *mahometana*, from the Thian-shan, are delicately dusted over with white below, the race *iphina*, from Central Asia, has the eyespots bordered with orange; and those of a darker shade were known as ab. *subnigra*.

Mr. W. J. Lucas read a paper entitled "The second maxillae (labium) of the Odonata, more especially as the mask of the naiad stage," and illustrated his remarks with a series of lantern slides. (See page 57.)

NOVEMBER 23rd, 1922.

ANNUAL EXHIBITION.

Messrs. A. de B. and O. R. Goodman exhibited four cases containing 83 out of the 113 species of butterflies known to inhabit the French Pyrenees and adjoining districts; collected in July, 1922.

I. Insects from Vernet-les-Bains, in Eastern Pyrenees, and from Pont du Gard, near Nîmes. *Papilio podalirius* var. *feisthamelii*, the dark southern form of the summer brood. *Pieris manni*, showing the characters distinguishing it from *P. rapae*. *Euchloë euphenoides*,

the "Gloire de Provence." *Laeosopis roboris*, common, flying around ash trees at Vernet like *Bithys quercus*. Very brilliant ♀ form of *Chrysophanus hippothoë* from the Aude Valley. *Lampides boeticus*. *Everes argiades*. *Apatura ilia* var. *clytie*, taken near Vernet at a height of over 3,000 feet. Very interesting series of *Argynnis cydippe*, with fine forms of var. *cleodoxa*, and a form of var. *chlorodippe*, which has not been recorded previously from the French side of the Pyrenees. *Melitaea dictynna* var. *cernetensis*, a constant race, less darkly marked than the Alpine form. *Brenthis selene* and *B. euphrosyne*, dark forms from the Aude Valley. *Melanargia lachesis* and *M. galathea*. *Lachesis* entirely replaces *galathea* in the Pyrenees Orientales, and the two only overlap in the Valley of the Aude.

II. Insects from Gavarnie, in the High Pyrenees, altitudes of 4,000 to 7,000 feet. *Parnassius apollo* with very dark scaled ♀ s var. *brittingeri*. *Colias phicomone*. *Polyommatus orbitulus* var. *oberthuri*, a rare Pyrenean form. *P. pyrenaica*, a very rare species confined to the High Pyrenees. *Brenthis pales*, large and darkly marked. Very interesting series of ♀ s of *Melitaea didyma*, showing variation from bright orange to steel grey, var. *alpina*. *Hesperidae*, several species of this puzzling family. *Erebia epiphron* race *pyrenaica*, the Pyrenean form. *Erebia manto* var. *constans*; this all black variety occurred this year in numbers, although for years it has only been taken singly. *E. stygne* with interesting ♀ undersides. *E. gorgone*, another Pyrenean species. *E. melas* race *lefebvrei*, replacing the *E. melas* of the Austrian Alps. *Epinephele pasiphaë*, from Vernet. *Coenonympha iphis* showing great variation, from the Aude Valley.

Lord Rothschild exhibited a series of over 500 British *Arctia caja*, including many aberrations, together with larvae, pupae, and parasites. He also exhibited for comparison a series of Continental European typical specimens and aberrations, and the various Asiatic and American geographical races of *A. caja*. He drew special attention the Armenian and South Caucasian *A. caja* race *wiskotti*, Stdgr., as being dimorphic, the ♂ having white and the ♀ rose-coloured hindwings. The Japanese race is distinguished by its large size and heavy marking, while most of the American races have red tegulae (patagia auct. plur.).

Mr. W. G. Sheldon exhibited a series of about 700 *Sarrothripus revayana*, containing all the named forms except ab. *sagittata*.

Mr. E. E. Green exhibited a small collection of miscellaneous Arthropods from Ceylon, including a large hunting spider (*Poecilotheria fasciata*). This is one of the reputed bird-eating spiders. It

has not been seen to catch birds, in Ceylon; but has been found devouring small mice and lizards. It lives in holes of trees, etc. A large Coccinellid beetle, which preys upon the Aphid *Oregma bambusae*. A "Cobra mantis," with expanded shield covering the thorax. A large Blattid, which lives in decaying tree trunks, in company with Passalid beetles, which it somewhat resembles. A brightly coloured Cicada (*Platypleura octoguttata*). A "Lantern fly" (*Fulgora maculata*) with apex of head produced into a long horn. A Pentatomid (*Catacanthus incarnatus*), locally known as the "Caricature bug." When viewed head downwards it has an amusing resembance to a very sunburnt face, surmounted by a glengarry cap. A Scutellid (*Tetrarthina variegata*), which rivals a Buprestid beetle in the brilliance of its metallic tints. A Reduviid (*Physorynchus tuberculatus*), which preys upon Millepedes many times its own size. A brilliantly metallic Elaterid beetle. A black and white *Elater* that sits on charred stumps of wood, where it becomes almost invisible.

Mr. Green also showed a series of *Pyrameis cardui*, raised from larvae taken by Mr. J. J. Lister at Cambridge, on *Carduus lanceolatus*. They show little variation beyond a slight tendency (in one or two specimens) to ocellation of the postmedial series of spots on the hindwing. Also a short series of *Euranessa antiopa*, raised from larvae taken by Mr. Lister at Gavarnie (France), on *Betula*.

Mr. H. A. Leeds exhibited many aberrations of Lepidoptera captured in 1922, among them being—

Melanargia galathea.—(1) Blackish border about double the usual width on the L.h.w.; (2) black area considerably increased; (3) borders of all wings golden tawny.

Aphantopus hyperantus.—ab. *caeca* ♂ and ♀.

Strymon pruni.—ab. *ptorsas* + ab. *anticofulvior* + discoidal spot on f.w. ♀.

Agriades thetis.—ab. *puncta* + *albolineata* + well-scaled cream-coloured broad crescentic band from costa, almost parallel with hind margin, turning inward inside inner margin of L.f.w. ♂.

Epinephele jurtina.—Three specimens with additional spots below the apical eye.

Argynnis aglaia.—Heavily black marked inner half of all wings.

Coenonympha pamphilus.—(1) Dark basal shade on lower half of L.f.w.; (2) hindwings uniform colour below except small white dots; (3) many bright red-brown streaks on L.h.w. below; (4) extra spots below apical ocellus.

Plebeius aegon.—(1) Outer half of all nervures whitish, black spotting very prominent; ab. *anticoradiata* + ab. *flarescens*; (3) ab. *leodorus* + tiny marginal spots below; (3) ab. *croceopost* + ab. *caeruleocuneata* + ab. *albomarginatus* + ab. *postero-impunctata* + ab. *caeruleo-cuneata* + pale ground with streaks towards apex of forewings, ♀ upper; (4) almost black ♀, no orange, with large blue wedges on h.w. upper. = ab. *nigrescens* + ab. *caeruleocuneata*.

Agriades coridon.—(1) Border of f.w. composed of very large black wedges, pointing inwardly; (2) ab. *coeruleo-subaurantia* + ab. *albipuncta* + ab. *fowleri*, ♀ upper; (3) black spots of all borders as completely ringed as in ♂ ab. *puncta*, ♀ upper; (4) ab. *anticojuncta*; (5) ab. *corydonis*; (6) ab. *pallida-obsoleta*; (7) ab. *bi-I-nigrum* + ab. *antico-sinistro-striata*; (8) ab. *semiarcuata* + ab. *postuoobsoleta* + almost unspotted border of h.w. below, ♀; (9) many other compound abs.

Rumicia phlaeas.—(1) ab. *intermedia* + ab. *partim-schmidtii* + ab. *caudata*, ♂; (2) ab. *ignita* + ab. *caudata* + ab. *magnipuncta* + ab. *radiata* + ab. *caeruleopunctata-major*, ♀ upper; (3) and other compound abs.

Aricia medon.—ab. *discreta*, ♂ under.

Adopaea flava.—ab. *partim-pallida* + 2 heavily scaled creamy streaks on L.h.w., ♀ upper.

Polyommatus icarus.—ab. *quadripuncta-anticostriata*, ♀ under.

They were nearly all from Hunts and Herts.

The Rev. G. Wheeler exhibited two large boxes of varieties and aberrations, including the type specimens of *Lowcia subalpina* var. *brunnea*, *N. semiargus* ab. *striata*, *Albulina pheretes* ab. *caeruleopunctata*, and others; also very fine striated specimens of *Glaucopsyche cyllarus* (underside), *Heodes virgaureae* var. *zermattensis* and *Lowcia gordius* (upper-side). There were also fine series of *Parnassius apollo* ab. *rufa*, *Apatura iris* ab. *iole*, *A. ilia* var. *clytie* and ab. *eos*, *Pararge megera* ab. *alberti*, *Hesperia malvae* ab. *taras*, etc. Many other aberrations were included showing obsolescence or excess of spotting, among the former a specimen of *Agriades thetis* ab. *krodeli* and one of *P. icarus* ab. *persica* were the most remarkable.

Miss L. Cheesman exhibited the "Camel-spotted Cricket," a Japanese longhorned grasshopper (*Diastrammena marmorata*), which is a pest in greenhouses, where it is introduced with orchids from Japan. An egg was deposited in sand directly the insect was introduced into the case. The species belongs to the Phasgonurid Locustids, and is an exception to the rule of 4-jointed tarsi, by

having only 3 joints to the tarsi, and therefore was formerly placed in the *Gryllidae*, but the ovipositor is flat, and there are other structural differences. It is recorded as destroying silk-worm eggs in Japan, and also as being injurious to plants by Reh. Investigations made by Boss, 1914, in hothouses in W. Prussia showed that it only attacked very young shoots of plants, apparently for moisture. Allied species are carnivorous, and the present species feeds on earwigs and millipeds. In confinement it feeds on raw meat, fruit and vegetables.

Dr. G. S. Robertson exhibited specimens of *Catocala fraxini*, originating from a specimen captured at Horsham, Sussex. The very dark specimen was of the 2nd generation from the original, the intermediate and the pale specimens were of the 4th generation.

Mr. Harold B. Williams exhibited his series of *Euchloë cardamines*, L., including the type specimens of ab. *caulosticta*, Williams, and ab. *radiata*, Williams ("Trans. Lond. Nat. Hist. Soc.," 1915, pp. 67 and 69-70), and specimens of other named forms, particularly ab. *citronea*, Wheeler, ab. *ochrea*, Tutt, ab. *commaculata*, Obth., ab. *turritis*, Och., ab. *minora*, Selys, ab. *dispila*, ab. *quadripunctata*, Fuchs, and var. *hibernica*, Williams. Also series illustrating the minor variation in depth of colour of apical markings and orange blotch, and in size of the discoidal spot.

Mr. Robert Adkin exhibited series of *Diacrisia mendica*, including typical males from Sussex for comparison with race *rustica* from Co. Cork, race *venosa* from Co. Tyrone, and the mongrel race obtained by crossing Sussex males with *venosa* females, which he had named race *mistura*. He called attention to the greyish tone of colour of race *venosa* as compared with the yellowish tint of race *rustica*, and pointed out that in the *mendica* and *venosa* mongrels this grey tone of colour was intensified, and contrasted strongly with the sandy brown colour of the *mendica* × *rustica* mongrels known as race *standfussi*.

He also showed a series of *Herse convolvuli*, captured in his garden at Eastbourne, in September last.

Mr. L. T. Ford exhibited a short series of *Peronea cristana*, from the Isle of Wight, and pointed out a form approaching ab. *purdeyana*, hitherto only taken at Folkestone.

Mr. Turner exhibited two old Entomological books, "Insectorum sive Minimorum Animalium Theatrum," by Thomas Moufet, published in London in the reign of Charles I., 1634, and "De animalibus insectis libri septem," by Ulysses Aldrovandus, published in

Bologna, in 1602 (a reimpression of 1638), and called attention to the numerous quaint illustrations.

Mr. A. A. W. Buckstone exhibited *Brenthis euphrosyne*, an underside with striated markings, from Herne, Kent; *B. selene*, one very strongly marked and speckled with black, from Ascot; *Vanessa io*, dull brown, bred from Lancashire larvae; *Ellopia prosapiaria*, two of a grey form, bred from Oxshott larvae; *Tephrosia consonaria*, a melanic form, from Maidstone; *Aplecta nebulosa* var. *robsoni* and var. *thomsoni*, both from Delamere Forest; *Crocallis elinguaria*, extremes of light and dark banded forms, bred from Wimbledon; *Gonodontis bidentata*, melanic forms, bred from Leeds.

Mr. Bateson exhibited specimens illustrating the forms of the leaf in *Primula sinensis*. These can all be represented as resulting from the combinations of three pairs of factors, any of which may be present or absent. Three of the forms are known in horticulture as *palm*, *fern*, and *oak*, the two last being recessive to the normal palm. Moreover, the edge of the leaf may be *smooth*, as normally, or *crimped*, having a great multiplication of minute lobes along the margins, as in other crispated varieties. Fern × Oak gives F_1 palm. By intercrossing, all combinations can be made, which may thus be factorially defined. The normal smooth palm is POS, the fern pOS; the oak poS; palm crimped, POs; oak crimped, Pos; etc. In the crimped forms the number of marginal lobes increases in combinations containing the old *sinensis* type of flower, those with *stellata* flowers having fewer lobes. For example, normal smooth palm has about 120 points; smooth fern, 180; palm crimped *stellata*, 630; palm crimped *sinensis*. 1,440.

Mr. A. W. Mera exhibited a series of *Psilura monacha*, bred from 1914 to 1918 from parents originally taken in Ringwood and North Kent. The melanic tendency being fully maintained to the last, the males were the darker of the sexes as a rule.

On behalf of Mr. Copeland, Mr. Mera exhibited some fine examples of *Catocala nupta* with smoky lower wings, taken at Loughton on September 12th, 1918.

Mr. W. J. Kaye exhibited a pair of the hybrid Sphingid *luciani*, Denso. The crossing is obtained from pairing *Pergesa elpenor* ♂ with *Pergesa porcellus* ♀. The result is an insect decidedly nearer the female parent, *porcellus*. There are, however, several of the male parent's characteristics, such as large subdorsal black spots on the first abdominal segment; the strong olive coloured costal area of the forewing, and the heavy black costal area of the hindwing. The

abdomen also is strongly olive, with only a very little pink suffusion, instead of being strongly pink with a little olive suffusion, as found in *porcellus*. Several minor male characteristics are also noticeable, and in general the colour tone is much more like *elpenor*, although a majority of the characters are like those of *porcellus*.

Denso says this hybrid occurs in Nature, as also does the reverse cross, named *standfussi*.

Mr. W. Brocklehurst exhibited a gynandromorph of *Dryas paphia* taken in the New Forest, July 18th, 1922, and *Notodonta tritophus*, taken at light, at Bedford, May 13th, 1907.

Mr. W. Gifford Nash exhibited a gynandromorph of *D. paphia* and *valezina*, taken in the New Forest, July 24th, 1922; *Argynnis aglaia* with deficient scales; underside vars. of *Melitaea cinxia*; vars. of *A. coridon* from Royston, including a nearly black male; examples of var. *plumbescens* and gynandromorphs; vars. of *Polyommatus icarus*, striated, obsolete, and minute; vars. of *Adopaea lineola*, pale and dark forms.

The Rev. J. E. Tarbat exhibited a short series of *Xylophasia monoglypha* from six different localities, the most interesting being a melanic form from Mucking, Essex, intensely black, like similar forms from Witherslack, Aberdeen, etc., and a very pale specimen of the same species from Freshwater. He also showed a couple of varietal forms of *Dysstroma* (*Cidaria*) *truncata*, one with very suffused grey upper wings and grey underwings, from Freshwater; the other a very beautiful form with a wide dark band on the forewing, taken at Bramcot.

Mr. L. W. Newman exhibited his 1922 captures of *Agriades thetis*, showing extreme variation in colour and marking, including fine striated forms; a series of the 1921 undersides to show the contrast between the hot and cold season coloration; very varied series of *Melitaea athalia* from Kent; compared series of *M. aurinia* from different localities; a long series of *Xylina semibrunnea* bred from ova after many years' attempts; almost spotless to heavily banded forms of *Mimas tiliae*; many named forms of *Abraxas grossulariata*, including *exquiseta*, *varleyata*, *lacticolor*, *iochalca*, *centripunctata*, etc.; both broods of *Polygonia c-album* and var. *hutchinsoni*; living pupae and imagines of *Colias croceus* (*edusa*), from ova laid by a September caught ♀; living pupae of *P. c-album* from ova laid in August.

Mr. R. T. Bowman exhibited a series of *Polia chi* var. *olivacea*; two examples of *Numeria pulveraria*, in which the outer margin of the transverse bands merges into the ground colour of the sub-

marginal area, and an aberration of weak coloration, due in all probability to lack of pigment in the scales.

On behalf of Mr. Arthur Dicksee, Dr. E. A. Cockayne exhibited—

1. Homoeosis in *Papilio horishanus* male, from Formosa. On the underside of the left forewing, between nervure 4 and 5, is a patch of the brilliant red and black of the underside of the hindwing.

2. Aberration of male of *P. thaiwanus*, from Formosa, together with a normal male and female. Instead of the hindwing being rounded it is of the squarer shape of the female, but even more pronounced, and it shows a greater attempt at a tail.

3. Eight specimens of *Agrias amydon* and of *A. muzoensis*, from Colombia. They prove that Frühstorfer in Seitz is wrong in stating that the female never has a blue mark on the hindwing. In some of these the blue mark is very distinct, and blue scales are present in all except one. He is also incorrect in stating that the female from Brazil is the only one with red on the hindwing. Red is present in more than half the series.

Colonel R. H. Rattray exhibited *Cupido minimus* ab. *semiobsoleta*, a ♂ with only five spots showing on the front wings. A ♂ with striation commencing; while the forewings are normal the spots on hindwings show a tendency to lengthen out. Ab. *striata*. A ♂ exactly similar to one taken by Mr. Joy in 1905. The forewings are absolutely without any trace of spots. The hindwings have on lower margin four black streaks of considerable but varying lengths, and one line very black on basal costal area, no other spot showing on hindwings. It was taken on June 4th, 1922. *Plebeius aegon* ab. *duplex*, a ♀ showing on each side a different tint of female colour, the right side of both wings strongly marked with light blue, the left a dark fuscous without any blue scales; it is not gynandrous. Another example, but not so strongly marked, was taken the same day within a few yards of this one. A pathological specimen with all four wings symmetrically light grey coloured, the underside markings showing through very plainly, taken in 1921 on same ground as last shown. *Agriades thetis* (*bellargus*) ab. *addenda* ♂, a ♂ with a patch of emerald green on the basal area of forewings. This specimen was taken home alive in a pillbox and killed with cyanide, leaving it in bottle not more than twenty minutes, nor was it possible for any damp to have got at the specimen. A ♂ with a large oval bar of a dark leaden colour across each forewing. These bars are almost symmetrical. Examined under a high power of the

microscope the scales are seen to be all more or less crumpled and to have failed to develop normally; there are a few blue scales mixed up with the dark ones. The specimen was taken during the fine dry spell in June last, and it is improbable that damp got to the wings before capture. The marks were seen before it was netted; taken same day and place as the one with green patches. *Plebeius aegon*. Four ♂s with similar symmetrical makings as last; all caught in a very restricted area on same day. Scales in similar condition to those of *bellargus* under microscope. *Adopaea flava*. A ♀ with a glistening white patch on forewings; the hindwings are a pale golden yellow. *Zygaena filipendulae*. A ♂ with right forewing having confluent spots, left forewing normal. *Hypocrita jacobaeae*. A ♀ with the red line on costal area of forewings joined to the two spots on end of wing by strongly marked red scales; the line on lower side of wing approaching very near to the lower spot. It was taken wild.

Mr. B. W. Adkin exhibited four specimens of *Vanessa io*, captured on Dartmoor in August, 1922, showing considerable variation in colour of border to forewing, and in colour and size of surround to "eye" in hindwing; two specimens of *Argynnis cydippe* (*adippe*) captured in the New Forest, one having reduced markings on forewing, the other, captured July, 1922, with enlarged markings to borders of wings and heavily marked olive-brown hindwings; with two specimens of *A. aglaia*, one a small suffused specimen taken on Dartmoor, August 10th, 1922, in fresh condition, and the other a light specimen from North Kent.

Mr. B. H. Crabtree exhibited—

1. Var. of *Argynnis aglaia* entirely devoid of black markings on the upperside, these being replaced by silver. Taken by the late Rev. F. B. Newnham, at Church Stretton, Salop, July, 1917.

2. Var. of *A. aglaia* with the forewing black and shot with dark green with a few fulvous spots on disc. Church Stretton, 1897.

3. Var. *A. aglaia* underside, heavily splashed with silver; the spots near thorax and body coalescing. Taken by Mr. M. J. Harding at Church Stretton.

4. Var. *Brenthis euphrosyne* with the forewings of upperside nearly spotless, hindwings with inner area black and radiated to the margin. Taken near Haverthwaite.

5. Series of varieties of *Agriades thetis* and of *A. coridon*. In the former were a blackish male upperside, one slate coloured, and one very green. A male underside forewings richly radiated and hind-

wings white. Several ab. *obsoleta* of both sexes, etc. In the latter were lilac, blue, and dark uppersides. A finely radiated male underside, a female *obsoleta* with cream-coloured area to all wings.

Mr. L. F. Hammond exhibited an aberration of *Aricia medon*, captured in Abbotts Wood, with white coloration of entire insect replaced by dull smoky grey or lead colour, this applying even to the thoracic hairs and underside of abdomen, legs and palpi.

He also showed a fresh specimen of *Epinephele jurtina* of a pale silvery grey, with just a tint of brown in the sheen all over same.

Mr. Hugh Findon exhibited a large collection of Australasian Mollusca and contributed the following notes :—

"The general interest of the exhibit lay in the fact that the New Zealand shells, which formed the greater part of it, were collected some 70 years or so ago, by a settler, when little notice was taken of nature there. Scientifically, it was of interest as corroborating the hypothesis that Australasia is still in Tertiary times, the shells bearing much resemblance to our own tertiary and earlier fossil forms.

"The *Trigonia*, from Tasmania, are the living representatives of a genus which has become extinct elsewhere at the end of the secondary formations.

"The 'horny-shelled" snails, *Paryphanta*, are not *Helix*, but have their nearest European allies in *Testacella*, the slug with a shell on its tail.

"The sea-mussel, *Mytilus*, is almost indistinguishable from our own common mussel, but the river mussels are a very early type and more closely resemble American species."

Mr. C. H. Williams exhibited the season's results of his breeding *Abraxas grossulariata* varieties, and his captures of aberrations of *Agriades coridon*.

Mr. G. H. Cornish, on behalf of Mr. W. Juby, exhibited an aberration of *Rumicia phlaeas*, with the usual red band on the margin of the hindwing represented by small red dots.

Mr. A. E. Tonge exhibited the following aberrations of *Agriades thetis*: (1) ♂ with R. hindwing violet, (2) ♂ ab. *obsoleta*, (3) ♀ exceptionally blue, (4) ♀ ab. *striata*.

Agriades coridon: (1) ♂ ab. *obsoleta*, (2) ab. *striata* on R. forewing, (3) ♀ s ab. *obsoleta*, (4) ♀ L. forewing with a pale patch, (5) a form between ab. *syngrapha* and ab. *semisyngrapha*.

Rumicia phlaeas: (1) ab. *schmidti*, (2) ♂ asymmetrical hindwing ab. *caeruleopunctata*.

Epinephele jurtina: (1) ♀ with pale forewings and fringes, (2) ♂ and ♀ bleached forms.

Mr. D. H. Pearson exhibited species and forms of Rhopalocera, mostly continental, taken by himself during the present year. *Melanargia galathea*.—Dark var. *procida* from Digne, and var. *leucomelas* from Digne and Clelles. *Erebia lappona*.—Banded and pale forms from Pontresina, a striated form from Mont Cenis. *E. alecto*. —Var. *pluto* from Col de Gallibier. *E. gorge*.—Large var. *triopes* from Trafoi and Alp Grion. *L. escheri*.—Blue and purple ♂ s and ♀ without orange spots. *E. icarus*.—Notts, 1922. Various blue ♀ s, some with well marked red lunules, and a fine gynandromorph, left side ♂, right ♀. *Melitaea dictynna*.—Light forms from the Pyrenees, and a very light form from Briançon. *Polyommatus hylas*. —♀ without orange spots and underside with strong orange markings. *Plebeius aegon*.—Row of British with forms of var. *masseyi*, and continental forms with ♀ striated form, and a very large form from Vernet-les-Bains. *Klugia spini*.—Var. from Clelles, with orange patches on upper wings. *Zygaena fausta*.—From Digne. *Z. purpuralis* and *Z. transalpina* taken in copula at Clelles. A drawer of *M. didyma* with a series of the very remarkable dark ♀ s from Gavarnie, light forms from Clelles and Digne, and several well blotched ♂ s.

Mr. W. F. H. Rosenberg exhibited rare South American Lepidoptera, including *Papilio enterpinus* from Ecuador, one of the scarcest species of the genus, with a specimen of *Perrente beryllina*, a Pierine butterfly, from the same country, which it closely resembles in coloration and pattern. Also rare moths from Brazil of the family *Saturniidae*, including *Copiopteryx sonthonnaxi*, *C. semiramis*, *C. derceto*, *Loxolomia serpentina*, *Rescynthis mortii*, and *R. hippodamia*. Mr. Rosenberg called special attention to the extremely scarce female of *C. sonthonnaxi*, pointing out the shortened and broadened tails of the hindwings, as compared with those of the male.

DECEMBER 16th, 1922.

Messrs. W. H. T. Tams, 19, Sulivan Road, Hurlingham, S.W.6; F. G. Mann, B.Sc., Chemical Laboratories, Pembroke Street, Cambridge; and John Robertson, M.R.C.S., L.R.C.P., F.Z.S., 69, Bedford Road, S.W. 4, were elected members.

Mr. C. L. Withycombe made the following communication, and exhibited some of the species referred to by him :—

"In the Neuroptera there often appears to be a tendency to reduction of the hindwings. Whereas this is also seen in other orders, the tendency is as a rule to complete reduction. In the Neuroptera the hindwings are generally reduced in breadth but increased in length. The most strongly reduced form is seen in *Croce*, where the hindwing is represented merely by a slender filament. The forewings are used in flight, the hindwings trailed."

The following forms were exhibited, showing different stages in reduction and elongation of hindwings :—

Glenoleon indecisum, Banks (Queensland, Australia), a fairly typical ant-lion, but with the hindwings elongated and narrowed slightly.

Cymothales (*Glenurus*) sp. (W. Africa), with hindwings still more narrowed and elongated.

Chasmoptera sheppardi, Kirby (Taurus Mts., Asia Minor), a Nemopterid with hindwings expanded distally.

Nemoptera bipennis, Illiger (Spain), with very long and narrow hindwings, only slightly expanded distally.

Larvae of *Croce filipennis*, Westw., were also exhibited alive, from Pusa, India. This form has not quite so long a neck as the larva of *Nemoptera*; also the mandibles are not toothed. The larva lives in dust on floors of outhouses, preying upon bedbugs, Psocids, etc.

Mr. Robert Adkin exhibited a number of Zygaenids reared from pupae sent to him by Lord Rothschild. He said that they had been collected indiscriminately on the Chilterns, in the neighbourhood of Tring, and to all appearances the cocoons were exactly alike, both in construction and in their position on the grass stems to which they were attached; but they produced 57 specimens of a six-spotted species which was clearly referable to *Z. filipendulae*, and 16 specimens of a five-spotted species. He found that when left to themselves the six-spotted species readily selected and paired with the like, as did also the five-spotted with the five-spotted, but there was no cross pairing. He said that it had been suggested that these five-spotted forms occurring indiscriminately among normal *Z. filipendulae* might be a five-spotted form of that species; he thought, however, that were that so there would not have been the careful selection in pairing that he had already referred to. Moreover, in apparently five-spotted specimens of *Z. filipendulae* that he had very rarely bred, there was always some indication of the sixth spot to

be found on a critical examination being made; but in these specimens there was no indication of a sixth spot. Neither did he favour a further suggestion that they might be the result of a natural cross between *Z. filipendulae* and some five-spotted species. From the general appearance of the imagines, and the nature of the cocoons, and the position in which they were constructed, he was more inclined to regard the five-spotted insects as a form of *Z. lonicerae*. He saw no reason why the two species should not occur in one spot, but he would be glad to have the opinion of the meeting after the members had had the opportunity of examining the specimens. In this determination Mr. Grosvenor, who also had reared some of a similar lot, fully concurred, as did other members present.

Mr. Hy. J. Turner exhibited various species of *Zygaenidae* from the Italian Peninsula, particularly illustrating the remarkable local variation and aberration of the beautiful *Z. transalpina*.

Mr. Tonge exhibited series of British *Zygaenidae*, including interesting aberrations of *Z. trifolii*, and many confluent forms of *Z. filipendulae*.

Col. Rattray exhibited various confluent forms of *Zygaenidae*.

Mr. T. H. L. Grosvenor exhibited most of the forms of the British *Zygaenidae*, and examples of the well-known continental species of the family to illustrate his paper.

Mr. E. J. Bunnett made an exhibit to show the similarity of form and structure of cocoons in four orders of insects.

Lepidoptera,	*e.g.*,	*Malacosoma*.
Coleoptera,	,,	*Hypera rumicis*.
Neuroptera,	,,	*Hemerobius*, sp.
Hymenoptera,	,,	*Ichneumon*, sp.

With their respective imagines.

Mr. Barnett exhibited a long and varied series of *Hibernia leucophaearia*, including banded, mottled, dark, and variegated forms.

Mr. Grosvenor read a paper entitled "Notes on the *Zygaenidae*." (See page 64.)

In the discussion which ensued few members appeared to know what particular form was meant by the name *hippocrepidis*; the Zygaenid egg was stated to be colourless when mature and at first was opaque; and surprise was expressed that the species of this family did not exhibit Mendelian characteristics.

JANUARY 11th, 1923.

Messrs. H. Baker-Sly, Eden Lodge, Westcott Road, Dorking, Surrey; J. P. Mutch, "Mayfield," Church Road, Bexley Heath; C. J. V. Gray, School House, Bradfield College, Berks; R. C. Fisher B.Sc., Forestry Museum, Royal Botanic Gardens, Kew; and L. G. Bowles, 193, Brockley Road, Honor Oak Park, were elected members.

Mr. H. Moore exhibited a pair of the Long-tail Silk-moth, *Argema moenas*, Dbldy., from Assam, and called attention to the female, less commonly seen, with tails not only long but broad and ribbon-like. He also showed a fine aberration of *Arctia caja* which he was presenting to the Society's collection.

Mr. A. A. W. Buckstone exhibited the following series of *Pyrameis atalanta*: (1) Bred from larvae taken wild at Wimbledon in October last. The imagines emerged during November, the pupae having been exposed to a warm but considerably fluctuating temperature. The yellow at the apex of the forewings and on the outer-margin of the hindwings was very much more pronounced than usual. The apex of the wings and the outer margin of the underside of the hindwings were also more conspicuously yellow. (2) For comparison a fair sample of a great many captured or bred under normal conditions.

He also showed a considerable number of *Aglais urticae*, bred from larvae taken at Merton in August last. The pupae were subjected to the same increased but fluctuating temperature as were those of *P. atalanta*. The imagines emerged in October and November. In the majority of the specimens the yellow blotch near the inner margin is diffused towards the hind and inner margins, the yellow on the hindwing is also pronounced, and a certain number of the examples have the veins of the hindwings of this colour.

Mr. Hy. J. Turner exhibited the following Rhopalocera from California: *Colias behri*, taken by Mr. G. B. Pearson, in the Yosemite country, at an elevation of 9,500 feet. This small but beautiful *Colias* is an extremely local northern species, found at high elevations in the Rocky Mts. Mr. Pearson writes, "We soon came to Tuolumne Meadows (anglice-Twamley), and here we encountered hundreds of *C. behri*, flitting from flower to flower (low-lying plants). Dr. Comstock, F.E.S., coming here later, found them by the thousand."

Parnassius clodius.—A pair of this small representative of a genus so dominant in the northern mountainous regions of the whole of the Eastern Hemisphere.

Nathalis iole.—A beautiful little sexually dimorphic Pierid, probably the smallest species of the family. The males are of a pale sulphur yellow ground colour, the females are orange yellow, particularly on the hindwings; both sexes have black apices to the forewings with dark inner margins, but the female has considerably more dusky markings on the hindwings.

Neophasia menapia.—A Pierid recalling the African *Belenois mesentina*, but much more delicate in structure, texture and markings.

A Paper entitled "The Geological History of Insects," was read by Mr. G. W. Young, F.G.S., with numerous lantern illustrations.

British Association.—Report of the Society's Delegates.

Mr. R. Adkin, the Society's delegate to the Conference of Delegates of the Corresponding Societies of the British Association, read the following Report of the meeting at Hull, in September last.

"Although I had made arrangements for representing the Society at the Conference, I was, almost at the last moment, prevented from being present, very much to my regret. I was, however, fortunate in being able to enlist the sympathies of Dr. Tierney, through whose kindness I am able to submit a short report of what took place at the conference, as follows:—

"At the meeting on Thursday, September 7th, the following matters referred to the Conference by the Council of the British Association were discussed.

(a) The consideration of what steps should be taken, in accordance with the recommendation of the Committee for Corresponding Societies in 1883, to induce local societies to group themselves round local (*i.e.*, District) sub-centres, (i) for the interchange of information, (ii) for the more economical publication of the results of research. The constitution and procedure of the Yorkshire Naturalists' Union, and the Gloucester Association of Science and Arts Societies, were described, to illustrate the working of such regional groups of societies.

It may be here pointed out that the South-Eastern Union of Scientific Societies, to which our Society is affiliated, appears to fulfill these conditions for the South-East of England.

(b) As to whether the delegates sent to the Conference might be authorised to act as local representatives of the British Association in their respective districts.

(c) In what respects the advantages derived by Corresponding Societies from their connection with the British Association may be increased, or better understood; as for example in regard to (*a*) improved facilities for publication; (*b*) help in obtaining lecturers of recognised scientific standing. A small committee was appointed to draft resolutions for consideration at the Tuesday session.

(d) The proposal made to the Council by the Corresponding Societies Committee, "That all Corresponding Societies, while retaining the power to appoint any member of the British Association as their Delegate, may instead (if they so choose), subscribe £1 to the British Association and have the right to send two Delegates during the year in which the the subscription is received."

"At the meeting on Tuesday, September 12th, the following resolutions arising out of the discussions at the Thursday session of the Conference, drafted and submitted by the Corresponding Societies' Committee, were formally received.

1. (a) To invite the scientific societies of Liverpool and district, on the occasion of the British Association's visit in 1923, to consider what further provision, if any, is desirable for co-operation between them, as for example, for scientific research, for the discussion of regional problems, and for the publication of results.

(b) To invite the Delegates sent to the Conference by the Corresponding Societies to render any assistance in their power in making known, in their respective districts, the objects and methods of the British Association, and to communicate to the Secretary of the Association, the names and addresses of scientific workers and others, to whom the preliminary programme of the next meeting should be sent.

(c) To call the attention of the Council to the inadequacy, discontinuity, and occasional overlap of scientific bibliographies already issued; and to request the Council to consider what steps may be taken, by the Association itself, or otherwise, to make more systematic provision for the bibliography of the departments of science represented in the sections of the Association.

(d) To request the Council to make such representations as may seem desirable, to the principal Government Departments, as to the assistance which may be obtained by them through the local societies in scientific enquiries involving regional distributions.

(e) To call the attention of Scientific Societies to the necessity for retaining in all offprints from their publications the original numbering of the pages, and of providing full reference to the date, place, and title of the publication from which they are extracted.

(f) To call the attention of the Council to the value of the Regional Exhibit arranged for the Hull meeting by the Yorkshire Naturalists' Union, and to suggest that it is desirable that such an exhibit should if possible be included regularly in the programme of the Annual Meeting.

(g) To inform the Conference of Delegates that the present practice of the Association is, to present a copy of the Annual Report to each Society sending a Delegate to the Conference, recognising the practice by which one Delegate sometimes represents more than one Society, and to recommend that in future no delegate be entitled to more than one copy, however many societies he may represent; but that if any Society desires a copy of the Report, it may be supplied at the reduced price of 10s.

(h) To apply to the Committee of Recommendations for £40, for the preparation of the Report of the Conference and the Annual Bibliography.

(i) To recommend that the *Kent's Cavern Committee* be not reappointed.

2. Communications from the Sectional Committees of the Association.

(a) *Section C.* recommends, as a subject for systematic research by the Corresponding Societies, the study of *Peat Beds and Submerged Forests.*

(b) *Section H.* commends to the Conference the proposal for an *International Institute of Archaeology in Rome,* in special regard to its scheme for a bibliography of archaeological literature.

(c) *Section K.* calls the attention of the Conference to its Committee on a Primary Botanical Survey in Wales, which desires local help in its researches."

"In conclusion, I should like to say that I propose to present to the Society, on publication shortly, the "Report" of the Hull meeting of the Association, so that it may be placed in our library, and thus be available for reference by our members, many of whom might not otherwise have an opportunity for seeing it. It will contain full reports, not only of the Conference of Corresponding Societies, but of the matters discussed by the various sections of the Association, many of them being of vital importance to an up-to-

date knowledge of many subjects of the closest interest to us as a Natural History Society, and I earnestly commend the attention of our members to them."—Robert Adkin.

JANUARY 25th, 1923.

Annual Meeting.

Mr. E. G. Bunnett, M.A., F.E.S., President, in the Chair.

The Meeting received and adopted the Report of the Council, the Statement of the Treasurer and the Balance Sheet. The Chairman declared that the following members were elected to serve as Officers and Council for the ensuing year:—*President*, N. D. Riley, F.Z.S., F.E.S. *Vice-Presidents*, K. G. Blair, B.Sc., F.E.S., E. J. Bunnett, M.A., F.E.S. *Treasurer*, A. E. Tonge, F.E.S. *Librarian*, A. W. Dods. *Curator*, S. R. Ashby, F.E.S. *Assistant Curator*, T. L. Barnett. *Editor of Proceedings*, H. J. Turner, F.E.S. *Hon. Secretaries*, Stanley Edwards, F.L.S., F.Z.S., F.E.S. (Corresponding); H. J. Turner, F.E.S. *Recorder of Attendances*, L. E. Dunster. *Hon. Lanternist*, A. W. Dennis. *Council*, T. L. Barnett, S. A. Blenkarn, F.E.S., A. W. Buckstone, F. B. Carr, O. R. Goodman, F.E.S., T. H. L. Grosvenor, F.E.S., H. A. Leeds, E. Syms, F.E.S., and C. Withycombe, M.Sc., F.E.S.

The President read his address, in which, after he had dealt shortly with the affairs of the Society and given brief obituaries of the members who had passed from us during the year, he gave an interesting account of a sojourn in Canada, entitled "Some Notes on the Natural History of Manitoba." (See page 73.)

The new President, Mr. N. D. Riley, was then inducted to the chair.

Votes of thanks were passed to the retiring President, Council, Officers, and Auditors.

Ordinary Meeting.

Mr. N. D. Riley, F.Z.S., F.E.S., President, in the Chair.

Mr. J. W. Munro, D.Sc., Green Lawn, Kew Road, Richmond, Surrey, was elected a member.

Mr. Frohawk exhibited a series of eight aberrations of *Papilio machaon*: (1) Anal angle spot on R. wing ochreous; (2) both anal

spots ochreous ; (3) with narrow submarginal bands and remaining black markings diminished ; (4) heavily marked black with band of hindwing joining the discoidal ; (5) heavily marked, the forewings suffused with black ; (6) narrow hindwings, elongated anal spots, broad bands, markings of upper wing smoky ; (7) a rich deep ochreous-yellow ground, captured at Herne Bay, in August, 1857 ; marking of forewings dusted with ochreous, and orange-ochreous anal spots ; (8) ground colour dull buff inclining to pale drab ; a fine dark var., bred in 1895. All except no. 7 were from Wicken Fen.

He also showed a number of Diptera, very like *Bibio marci*, which had been taken from the crop of a grouse in December last.

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CORRIGENDA.

p. 127, line 22. For " poS " read " PoS."

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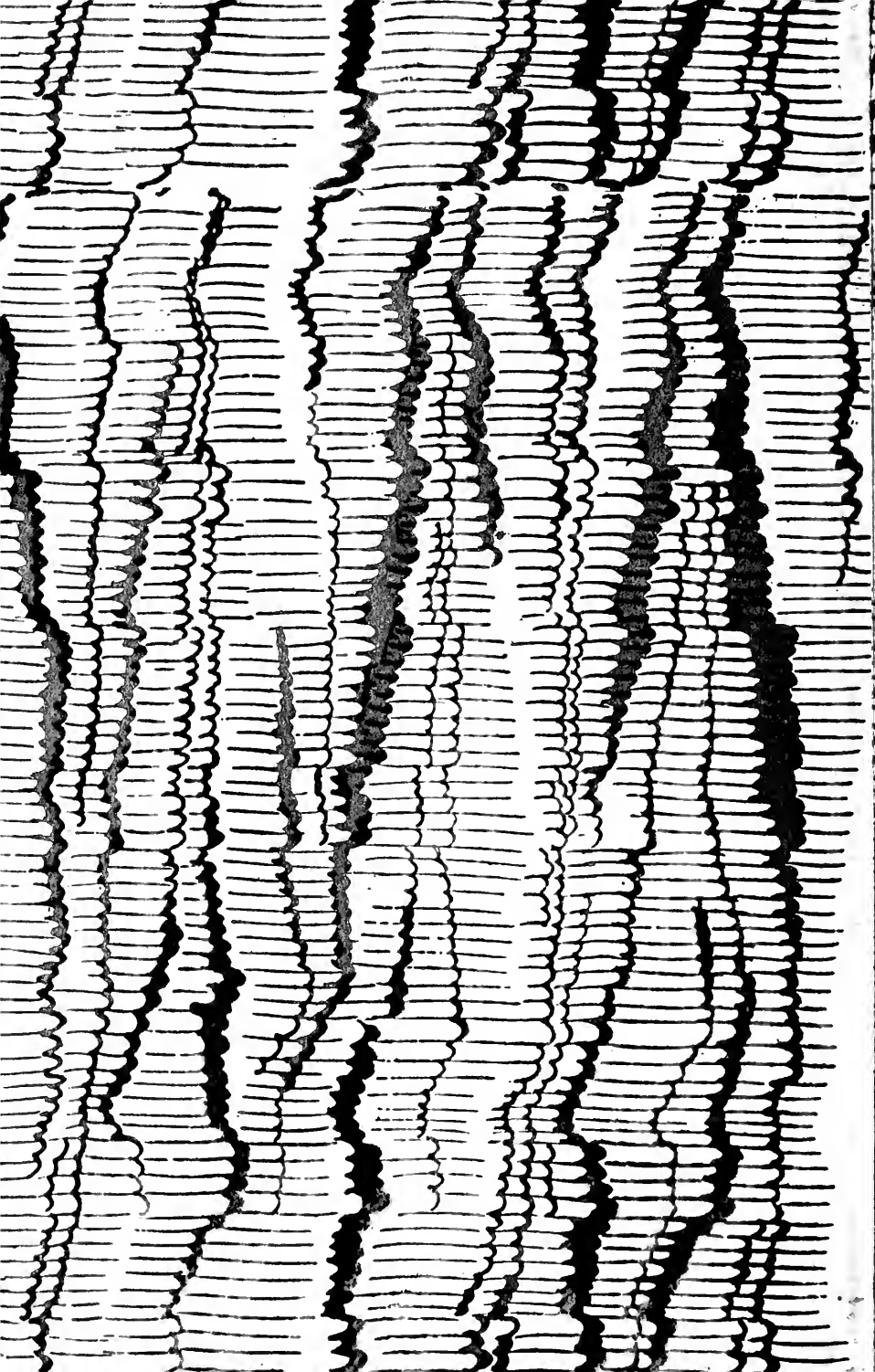


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