





S. 170.

City of London Entomological & Natural History Society.

THIS SOCIETY was founded in 1858 under the title of the "Haggerston Entomological Society," and has striven, for nearly half a century, to diffuse the knowledge of Natural History, particularly of Entomology. It has taken an active part in the preservation of Epping Forest and other similar movements for the public good, and also in the suitable housing of the famous "Double-day Collection" of Lepidoptera. Its own particular work includes the reading of papers, discussions, and exhibitions, and a special feature of recent years has been the compilation of a London Fauna List, now being published in the Transactions.

The meetings are held on the first and third Tuesdays in each month, from 7.30 to 10 p.m., at the London Institution, Finsbury Circus, E.C., which is easily accessible from all parts; the Meeting-room is exceptionally comfortable and well lighted, and no effort is spared to make the evenings pleasant and profitable. An annual Summer Excursion is arranged by the Society, and occasional Conversazioni. Visitors are welcomed to all the meetings.

There is a good library, containing, amongst other works, the "Zoologist," "Entomologist," "Entomologist's Monthly Magazine," &c. from their commencement, and also reference collections of Lepidoptera and Coleoptera, to which it is hoped other Orders may be added from time to time.

The entrance Fee is Two Shillings and Sixpence, and the Annual Subscription Seven Shillings and Sixpence, payable in advance, both being purposely kept low in order that all may avail themselves of the benefits the Society offers. The Society therefore looks with confidence for the support of all who are interested in the study of Natural History.

The year commences on the first Tuesday in December, but intending members may join at any time.

Further information may be obtained from either of the Hon. Secretaries.

28 APR. 1903

170.

TRANSACTIONS

OF THE

CITY OF LONDON

Entomological & Natural History Society

FOR THE YEAR 1902.



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Price Two Shillings.

CITY OF LONDON
Entomological & Natural History
SOCIETY,
 Established 1858.

MEETINGS HELD AT
THE LONDON INSTITUTION
FINSBURY CIRCUS, E.C.,

On the 1st and 3rd Tuesdays in each Month.

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TRANSACTIONS

OF THE

City of London Entomological

AND

Natural History Society.

PART XII.

(1902.)



WITH LIST OF MEMBERS.

THE SOCIETY'S ROOMS, LONDON INSTITUTION,
FINSBURY CIRCUS, E.C.

FEBRUARY, 1903.

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REPORTS OF MEETINGS.

Dec. 17th, 1901.—NEW MEMBER ELECTED.—Mr. T. H. Hamling, of 7, Hornsey Rise, N., was elected a member of the Society.

MÜLLERIAN ASSOCIATION FROM GUIANA.—Mr. W. J. Kaye exhibited specimens of *Ithomia zerepha*, *Ithomia florula*, *Stalactis phaedusa*, *Stalactis evolina*, and *Lauron partita*, species belonging to widely different families, in which the colouring and pattern were strikingly alike. It was stated that these specimens were found together on an occasion when scarcely another species was about.

ERANNIS SPECIES.—Mr. C. P. Pickett, *Erannis defoliaria*, very dark specimens, and *Erannis aurantiaria* almost unicolourous.

APOROPHYLA AUSTRALIS FROM ISLE OF WIGHT.—Mr. S. J. Bell, *Aporophyla australis* from Sandown, Isle of Wight.

APOROPHYLAS FROM SUSSEX AND READING.—Mr. H. H. May, *Aporophyla australis*, taken in September, 1901, at rest in pairs, on grass bents on Downs at Lewes, Sussex; also *Aporophyla lutulenta* from near Reading, and young larvæ of same, the former feeding on grass, the latter on chickweed.

LARVÆ OF EPUNDA LICHENEA AND APOROPHYLA LUTULENTA.—Mr. A. Bacot, larvæ of *Epunda lichenea* feeding on dock, and larvæ of *Aporophyla lutulenta* feeding on grass.

VARIABLE EPIRRITA DILUTATA, ETC.—Mr. V. Eric Shaw, a very variable series of *Epirrita dilutata* from the New Forest, Finchley, and Epping Forest, the specimens from the latter localities being very dark. A strikingly fine reddish *Colotois pennaria* was also shown.

PAPER.—Mr. Alfred Sich read a paper entitled "Observations on the Early Stages of *Phyllocnistis suffusella*." (See *Transactions*.) At the close of the paper Dr. Chapman rose to propose a vote of thanks, and remarked that he had not found that the sickle-shaped excrescence of the pupa broke off on the moth's emerging from the cocoon, as mentioned by Mr. Sich. Mr. Cox inquired if the larva finished at base of stalk or top of leaf, as he supposed that if food ran short it would be more advantageous to the larva to finish off in such a position that it would be ready to attack a second leaf. Mr. A. Bacot seconded the vote, and asked if it was true that the young larva showed no tubercles, but that they appeared later on. If this was so it was the reverse of the usual state of things. Mr. Sich, replying to the several questions, said that as regards the apical hooks on the pupa, he had found most with the hooks broken off. The larva, he had observed, spun its cocoon at the base of the leaf usually, but was to be found in all positions round the edge of the leaf. Rarely the cocoon was to be found in the centre of the leaf. As regards the tubercles in the young larva, he had never been able to find any.

Jan. 7th, 1902.—STAUROPEUS FAGI.—Mr. C. Nicholson exhibited *Stauropus fagi* from Epping Forest and the New Forest, the former being considerably darker. Mr. A. Bacot exhibited larvæ of the same species.

GRAPHIPHORA GOTHICA FORMS.—Mr. W. J. Kaye, a varied series of *Graphiphora gothica*, with various phases of the form *gothicina* and others, chiefly from Rannoch.

APORIA CRATAEGI FROM KENT.—Mr. V. Eric Shaw, some *Aporia crataegi*, recently taken in Kent. Mr. Shaw remarked that the species had been secured in the same locality year after year since 1893.

CUSPIDIA MEGACEPHALA ALMOST BLACK.—Mr. Shaw also exhibited a specimen of *Cuspidia megacephala*, from Manchester, with almost black forewings*.

EXOTIC GOLDEN CASSIDA.—Mr. H. Heasler, a beautiful golden-coloured *Cassida*, discovered in an imported apple. The beetle was remarkable in that, with handling, the gold colour temporarily disappeared.

GRAPHIPHORA INCERTA AND GRAPHIPHORA MUNDA.—Mr. L. B. Prout, *Graphiphora incerta*, from Rannoch, and a very variable series of *Graphiphora munda*, several of which were only with difficulty to be distinguished from *G. incerta*.

NEW FOREST COLEOPTERA.—Mr. Henderson, present as a visitor, *Clytus mysticus*, *Mesosa nubila*, *Callidium variabile*, and *Clytus alui*, all from the New Forest.

PUPA OF STAUROPUS FAGI.—Mr. Henderson further exhibited a living pupa of *Stauropus fagi*.

PAPER ON STAUROPUS FAGI.—Mr. A. W. Mera read a paper on "*Stauropus fagi*." (See *Transactions*.) In the discussion that followed Mr. Burrows said he understood that with this insect pairing took place about midnight. Mr. A. Sich enquired of Mr. Mera if he had ever observed the larva of *Stauropus fagi* changing its skin. Mr. J. W. Tutt said that as to times of appearance there was evidently an enormous range in the time. The species was well known to be found in Kent. As regards the change of colour in the larva, remarked on by Mr. Mera, it was no doubt largely a physiological effect. Mr. H. H. May had found a larva on buckthorn, and wondered whether this was a known pabulum. Mr. C. Nicholson said he did not consider this insect particularly well protected, as he had found the species in Epping Forest not very well concealed. Dr. Chapman, in making some observations on the larva, said that once the larva has assumed one or another colour it must keep to it, and could not undergo a second change.

Jan. 21st, 1902.—PUPÆ OF LACHNEIS LANESTRIS AND ENDROMIS VERSICOLORA.—Dr. T. A. Chapman exhibited specimens of *Lachneis lanestris* and *Endromis versicolora* in the pupal state, illustrating the circumstance that the imagines are developed in the pupa in the autumn for the emergence of the following spring. Those that go over to a second year remain all the winter undeveloped.

SYNOPSIS ABRUPTARIA.—Mr. C. P. Pickett, *Synopsis abruptaria* larvæ of a fourth brood.

SOUTH AMERICAN SATYRIDÆ.—Mr. W. J. Kaye, specimens from Guiana and Peru of the highly specialised Satyrids *Callitavra menauder*, *Haetera piper*, *H. phyllis*, and others of the same group. These insects he had always found flying very near the ground, and they

* Since named *ab. nigra*, Shaw (*Ent. Rec.*, xiv., p. 193).

were particularly fond of flitting about beneath low-growing plants. They were also strongly attracted by rotten fruit.

DARK GONODONTIS BIDENTATA.—Mr. T. H. Hamling, a very dark coloured (bred) *Gonodontis bidentata* (ab. *nigra*).

GRAPHIPHORA SPECIES.—Mr. H. H. May, a cabinet drawer full of *Graphiphora* species, mostly from Wimbledon. Mr. Sich, remarking on this exhibit, said that all the forms were much the same as one usually gets at Chiswick and Richmond Park. He noticed also in the series of *Graphiphora munda* there were no specimens of the form *immaculata*. Rev. C. R. N. Burrows said, at Brentwood one never meets with vars. of this insect. Mr. Alfred Sich further remarked that *Graphiphora pulverulenta* was now much commoner at Chiswick than formerly.

CONCERNING PUPÆ OF LACHNEIS LANESTRIS.—Mr. Bacot, in referring to Dr. Chapman's exhibit, said insects could not be induced to hatch if the weather was ever so favourable. Mr. W. J. Kaye enquired if *L. lanestris* went over two years in a state of nature. Dr. Chapman replied that probably more than fifty per cent. did so.

COLOR PHOTOGRAPHY LECTURE.—Rev. C. R. N. Burrows introduced Mr. T. Jessop, who gave a very clear demonstration of the process known as the "Sanger-Shepherd," by which colour photography had come to be a real thing. A large number of slides were exhibited and thrown on the screen, these included a number of lepidoptera, which were readily recognised. At the close Mr. H. H. May proposed a vote of thanks to Mr. Jessop, coupling with his name that of Mr. R. W. Robbins, who had kindly brought and worked the lantern for the occasion; Mr. Sich seconded the vote, which was carried unanimously.

Feb. 4th, 1902.—**POCKET BOX EXHIBITION.**—Mr. L. B. Prout, *Perizoma tarniata* from N. Devon. He remarked that although he had obtained ova he was unable to rear the larvæ when hatched for want of a suitable pabulum. Also, on behalf of Mr. J. P. Match, *Eugonia polychloros*, a dark aberration, suggesting reversion to a more ancestral form under stimulus of cold at time of pupation; a dark aberration of *Chrysophanus phlaeas*; a perfectly halved gynandromorphous specimen of *Agrotis puta* with the right side ♂ and left side ♀; and a curious aberration of *Anathes sobrina*, with white antennæ. Mr. W. J. Kaye asked with reference to the last species if it might not be a form of albinism. Mr. Prout said that out of a large number taken by himself and three others, only three specimens had these white antennæ. Mr. C. P. Pickett, a fine bred series of *Plusia moneta*, from Bexley. Mr. W. J. Kaye, a varied series of *Meristis tripannica*, including ab. *bilinea*, also a specimen of *Agrotis vestigialis* ab. *nigra*, from Oxshott. Mr. A. Bacot, a fine bred series of hybrids between *Malacosoma uenustria* and *M. castrensis*, the ♀s of the brood being remarkable for their constancy. Mr. S. J. Bell, a series of *Cymatophora repandata*, from Wimbledon and New Forest, including the ab. *conversaria* from the latter locality. Mr. T. H. Hamling, some *Gonodontis bidentata* ab. *nigra*. He stated that out of a brood of about 150, half were of the dark race. Mr. Russell James, a number of insects, including a ♀ specimen of *Chelonestes pinaria*, with antennæ transitional between ♂ and ♀. Rev. C. R. N. Burrows, *Hydrocicia nictitans* var. *pulvis*

and *Orthosia lota* ab. *ruja*. Mr. A. W. Mera, *Spilote grossulariata*, including one from Chiswick with a broad post-median black band, and another from Aberdeen with the marginal half of the forewing black. Dr. Chapman, some larval cases of a South American species of *Perophora*. Mr. Southey, a cabinet drawer full of *Synopsisia abruptaria*, with the dark form and some intermediates, from Holloway. Mr. Southey said he had never obtained the black form if the larvæ were fed on privet. Dr. Sequeira, a box containing a large number of dwarf specimens of British Lepidoptera.

Feb. 18th, 1902.—PAPER.—Mr. W. J. Kaye read a paper, "After Lepidoptera in British Guiana in 1901." (See *Transactions*.) In accordance with his invitation, the meeting was held at his house, in order that members might inspect the numerous specimens resulting from the expedition.

March 4th, 1902.—ANTHROCERA PALUDIS.—Mr. V. Eric Shaw exhibited specimens of *Anthrocera trifolii paludis* from the New Forest.

CLEORA LICHENARIA.—Mr. Kaye, fine specimens of *Cleora lichenaria*, from the New Forest.

ASYMMETRICAL CILARIA FULVATA.—Mr. Alfred Sich, a fine specimen of *Cilaria fulvata*.

PLEROCYMA CLAVARIA (CERVINARIA).—Mr. Hauling, some bred *Plerocymia clavaria*.

CYMATOPHORA GEMMARIA, BLACK.—Mr. Hauling further exhibited a striking black geometer, which he considered to be *Cymatophora gemmaria*.

LARVA OF COSSUS COSSUS. Dr. J. S. Sequeira, a living larva of *Cossus cossus*, spinning up in cotton wool for want of its natural surroundings.

VARIABLE ENNOMOS QUERCINARIA.—Mr. W. Bloomfield, a variable series of *Ennomos quercinaria* and ova of same from Kidmore, near Reading, the imagines being taken by shaking small beeches.

PAPER.—Mr. A. Bacot read a paper bearing on "The Classification of the *Sphingidae*." (See *Transactions*.)

March 18th, 1902.—NEW MEMBER ELECTED.—Mr. Montagu F. Hopson, F.E.S., of 16, Rossllyn Hill, Hampstead, was elected a member of the Society.

EBONY TUNNELLED BY LARVÆ.—Mr. V. Eric Shaw exhibited a block of ebony tunnelled by some unknown larvæ.

ANTHROCERA TRIFOLII IN EARLY JULY.—Mr. C. Nicholson, some *Anthrocera trifolii*, taken during the first week in July in the New Forest.

TEPHROSIA HISTORTATA FROM WEST WICKHAM.—Mr. Nicholson, on behalf of Mr. Gardner, *Tephrosia histortata* from West Wickham, taken off larch.

APOROPHYLA LUTULENTA.—Rev. C. R. N. Burrows. *Aporophyla lutulenta* taken at sugar at Mucking in 1901, although less commonly than in previous years.

CALAMIA LUTOSA FROM RAINHAM.—Mr. S. J. Bell, a series of *Calamia lutosa* taken off low reeds at Rainham.

DRYMONIA CHAONIA.—Mr. Alfred Sich, a bred specimen of *Drymonia*

chaonia, which had knocked itself to pieces through being placed in a pill-box,

PAPER READ.—Dr. Chapman read a paper, entitled “Notes on the *Gracilariidae*.” He commenced by going into the position the *Gracilariidae* occupied in the system of classification, and stated that not only for the family under discussion, but in a general way, we should use the characters afforded by the early stages, but should not debar the imaginal ones. The *Gracilariidae* offered most useful characters in the early stages, particularly in the larva and pupa. The mouth parts in the former showed remarkable specialisations, which might be considered as advanced, for it was accepted that if an organ was complicated it was to be considered advanced, and if simple degraded. This was said to be true only if applied to an organ, and not to the insect altogether. In the genus *Gracilaria* the unusual phenomenon in the larva occurred that while the early instars were modified the later ones were normal. Dr. Chapman in part accounted for this by stating that each larval instar is equal to the pupal period, and quite independent of further instars. As a rule the full grown larva was much more liable to specialisation, owing to its different mode of life. Various details were then given as to the different appearance of different mines made by the larvae. The structure of the pupa was then gone into, and it was stated that it came under the division “Incompletae,” having only two segments free. This was a most unusual and uncommon type, and as it was so rare in the lepidoptera generally, it was reasonable to suppose that the type was not a useful one. In *Gracilaria* the incomplete pupa was the extreme in that direction, having more movable segments than any other. At the close of the paper Mr. Prout said that the early stages in the larva being specialised and the later ones not so was against our usual ideas of phylogeny being built upon ontogeny. Mr. Nicholson enquired of the use of the silk spun by *Lithocolletis* larvae on the under-side of the cuticle of the leaf after it has consumed the parenchyma. Dr. Chapman replied to Mr. Nicholson’s question that the silk was used to make the cuticle more robust, the larva making two silken contacts which fold the leaf by contraction.

April 1st, 1902.—NEW MEMBERS ELECTED.—Mr. F. T. West, 64, Brooke Road, Wood Street, Walthamstow; and Mr. W. Jackson, 5½, St. John’s Lane, Clerkenwell, were elected members of the Society.

MÜLLERIAN ASSOCIATION OF GUIANA INSECTS.—Mr. W. J. Kaye exhibited a box of British Guiana insects, illustrating several instances of Müllerian association. One of these included *Lygeorea pasinuntia*, *L. ceres*, *Melinaca mneme*, *Melinaca n.sp.*, *M. crameri*, *M. egina*, *Meclanitis doryssus*, *Cerctinia fenestella*, *Heliconius retustus*, and *H. numata*, all with, or tending to have, a black hindwing. In such associations it was generally supposed that the *Heliconius* set the pattern or was the centre, by reason of its being the commonest and most conspicuous, but in this group the *Heliconius* species were actually rather uncommon, and it was supposed that here some other species was the dominant individual. *Melinaca mneme* easily came first in point of numbers, and as it was itself a strong variant, there appeared no reason why this species should not have been the type for the group.

SPECIAL EXHIBIT OF EUROPEAN RHOPALOCERA.—A very large quan-

tity of interesting material was brought up for inspection. Mr. Alfred Sich contributed from Wiesbaden, Mr. L. B. Prout from Teneriffe and Austria, Mr. H. H. May from Switzerland, where he stated that in the past summer, during a six weeks' stay, he had met with between 100 and 110 species of butterflies; Dr. Chapman a large number of *Erebias*. He said the genus *Erebia* undoubtedly had its headquarters in Switzerland. There were but few species in Asia and America, and the great mass were to be found in the limited area of Switzerland. The species of *Erebia* showed a parallel range of variation one to another, and from the difficulty in obtaining their life-history they offered great difficulties to specific determination. Mr. Prout asked if it was known what caused the greasy, smooth-scaled appearance of the species found at high altitudes. Dr. Chapman replied, he thought in a great measure it was due to rubbing, and the bad condition of the specimens. Mr. May said he found that frequently there appeared no pabulum in places where the species were flying. Dr. Chapman remarked that although the species like to fly round the barest rocks they do not breed there.

April 15th, 1902.—DARK HYBERNIADÆ.—Mr. C. P. Pickett exhibited several examples of spring *Hyberniadæ*, including some very dark *Eraunias leucophaearia*, from Epping Forest. He stated that this year (1902) such forms had been far more frequent.

ANGERONA PRUNARIA LARVÆ.—Mr. Pickett further exhibited some forced larvæ of *Angerona prunaria*.

SPILOSOMA LUBRICIPEDA.—Mr. V. Eric Shaw, *Spilosoma lubricipeda* from Meltham, near Huddersfield.

SPRING LEPIDOPTERA AT BRENTWOOD.—Mr. A. W. Mera, several of the spring Lepidoptera recently taken at Brentwood, including *Apocheima hispidaria* and *Phigalia pedaria*. He said he had found the larvæ of these two species very much alike, and would wish to know of a distinctive character. A series of *Graphiphora miniosa* was also exhibited from Brentwood (Essex).

GRAPHIPHORA POPULETI ABUNDANT.—Mr. W. J. Kaye said he had taken *Graphiphora populeti* abundantly at Surbiton, in a small circumscribed area. *Graphiphora gracilis* had not been seen.

NOTE ON GRAPHIPHORA GRACILIS.—Mr. Fuller said he had generally taken *Graphiphora gracilis* in May, resting on grass stems.

APPEARANCE OF GRAPHIPHORA MUNDA.—Mr. E. M. Dadd found that for *Graphiphora munda* the sallows were too late, this insect being the very earliest of the *Taeniocampidæ*.

NOTE ON PACHNOBIA SPECIES, ETC.—Dr. Chapman had noticed that at Hereford *Pachnobia leucographa* appeared later than *P. rubricosa*. Mr. Dadd said he had not found this the case at Selborne. He further gave some of his experiences in Berlin, where he said *Asteroscopus nubeculosus* was always found on alders in swampy places, and never on birch trunks. In point of time, insects in Berlin were fully a month later than in Britain.

DEVELOPMENT OF ASPHALIA FLAVICORNIS PUPA.—Dr. Chapman asked if it was known whether *Asphalia flavicornis* was developed in the autumn. He remarked that *Lachnæis lanestris* was developed from the middle of August right up to the middle of winter.

AMORPHIA POPULI × SMERINTHIUS OCELLATA.—Mr. A. Bacot ex-

hibited a fine hybrid *Amorpha populi* ♀ × *Smecinthus ocellata* ♂, together with pupa of same. Dr. Chapman on examining the pupa-case said that the female covering was abnormal, but the male covering quite normal.

ASSEMBLING WITH *PACHYS STRATARIA*.—Mr. Bacot said he had recently assembled 24 ♂ and 7 ♀ *Pachys strataria* on successive nights.

BREPHOS PARTHENIAS COMMON IN EPPING FOREST.—Mr. Pickett, on Easter Monday last, had found *Brephos parthenias* commonly in Epping Forest.

MAY 6th, 1902.—HYGROCHROA SYRINGARIA LARVÆ, ETC.—Mr. V. Eric Shaw exhibited some *Hygrochroa syringaria* larvæ full fed, also a *Dryocoetes glabraria* larva from the New Forest.

PLEROCYMIA CLAVARIA (CERVINARIA) LARVÆ ON HOLLYHOCK, ETC.—Mr. Kaye, *Plerocymia cervinaria* larvæ being fed on hollyhock; also a couple of *Lithosia deplana* which were being fed on a powdery green lichen growing on oak trunks.

SPILOTE GROSSULARIATA, EXHIBIT AND DISCUSSION.—Mr. J. A. Clark, many fine aberrations of *Spilote grossulariata*; Mr. C. P. Pickett, a cabinet drawer full of *S. grossulariata*; Mr. A. W. Mera, also a large number of the same species, with several fair aberrations, chiefly with a darkening tendency. Mr. Mera observed that it was frequently noticeable that the northern forms of this species showed the darkening on the margins, while southern, and particularly those specimens from north London, had the central portion of the wing dark. Mr. Riches and Mr. Nicholson also exhibited this species, the latter observing that larvæ found wild in the open country were always pale, while those found in gardens were generally dark. The imagines were, however, the same from both. Mr. Prout said he had found that larvæ from the country were generally later. Mr. Mera was strongly of opinion that the colouring in the larvæ of this species was not an hereditary trait. He further called attention to the fact that he had found *Pachys betularia* larvæ differently coloured in the same district on differently coloured tree stems. Mr. Kaye said there must be some other agency at work, as Mr. Merrifield had proved with *Papilio machaon*, that the larva, in changing to pupa, acted responsively to its environment.

LIVING LARVA OF *ANGERONA PRUNARIA*.—Mr. C. P. Pickett, a living larva of *Angerona prunaria*.

SHERINGHAM WOODS ENCLOSURE.—Mr. Pickett reported that the Sheringham Woods, near Cromer, were to be closed to the public in future, owing to destruction.

MELITÆA CINXIA LARVÆ.—Mr. Prout reported that he had just visited the Isle of Wight, and had found *Melitæa cinxia* larvæ very small, but when warmth was applied they began to feed rapidly.

DELEGATE TO SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES' CONGRESS.—Mr. Prout nominated, and Mr. Nicholson seconded, Mr. J. W. Tutt to be the Society's delegate to the Congress of the South-Eastern Union of Scientific Societies for 1902.

MAY 20th, 1902.—HYBRID MALACOSOMAS.—Mr. Bacot exhibited a hybrid larva from a pairing of ♂ *Malacosoma neustria* and ♀ *Malacosoma*

cosoma castrensis. He also showed a larva of *Malacosoma franconica*.

HELIOPHILA IMPUDENS.—Mr. S. J. Bell, a series of *Heliophila impudens*, including specimens from Wimbledon, both bred and captured, and one from the New Forest, the latter being more suffused with pink than the London forms.

GENERAL EXHIBIT OF CYANIRIS ARGIOLOUS, AND DISCUSSION.—Mr. A. W. Mera, series of *Cyaniris argiolus*, which showed the darker coloration of second brood ♀♀, as compared with those of first brood; Mr. C. P. Pickett, *C. argiolus* from Clandon, including a ♀ of first brood, showing a distinct tendency towards the coloration usually characteristic of second brood; Mr. L. B. Prout, specimens of first and second brood of ♀♀, to illustrate the difference already referred to, also a ♂ taken at St. Helens, Isle of Wight, on April 21st, 1902. The President, in opening the discussion on the spread of *C. argiolus* in the environs of London, remarked that he had never seen it in any suburban locality nearer than Wood Street, Walthamstow. Mr. A. W. Mera stated that he took larvæ of *C. argiolus* at Chiswick in 1877, and saw the perfect insect on the wing at Hammersmith a year or two later. Mr. Shaw recorded its appearance at Finchley in fair numbers recently. Mr. Bell had seen it occasionally in Brixton Road, and Mr. Bacot at Clapton—both localities within the four-mile radius. In response to a question raised by Mr. Prout, Mr. Mera stated that *C. argiolus* pupated on the underside of a leaf. Upon Mr. Prout's suggesting that a succession of favourable seasons might be the reason of the evident spread of this species round London, Mr. Bacot pointed out that as the ova are laid on blossom, should rough weather occur before they hatched, they would probably be swept away by the wind and destroyed. Mr. Prout, in summarising the discussion, drew three conclusions therefrom—viz., that *C. argiolus* had certainly become more plentiful of late years, that it was spreading near London, and that these facts were probably accounted for by favourable climatic conditions.

NOTE ON LEUCOMA CHRYSORRHOEA.—Mr. A. Bacot remarked that it was curious that a brood of *Leucoma chrysoorrhœa* in his possession did not seem adversely affected by the prevalent cold weather, as he considered that the severity of the climate was the cause of this insect's extinction. Mr. Prout pointed out that *L. chrysoorrhœa* could hardly have ever been as plentiful as it undoubtedly was in times past if the climate was the cause of its extinction. Mr. A. W. Mera questioned whether it ever really became extinct. He knew that the late Mr. J. A. Cooper took a specimen on a lamp near Eastbourne during the so-called period of extinction, and, further, that the first specimens he (Mr. Mera) had received since the recurrence of the species came from the same locality. Mr. Burrows recorded finding two nests of the larvæ of *L. chrysoorrhœa* at Stanford-le-Hope, Essex.

NOTE ON POLIA FLAVICINCTA OVA.—Mr. Prout recorded that from a batch of ova of *Polia flavicincta* hatchings had been going on over a period of three to four weeks.

DISEASE IN GRAPHIPHORA OPIMA.—Mr. Mera said the larva of *Graphiphora opima* was subject to disease and death when nearly full fed. He had observed that the premonitory symptoms were that the body of the larva was depressed behind the head, and that the larva nibbled the mid-rib instead of the edge of the leaf. Mr. Bacot believed that

disease generally attacked larvæ at a certain definite stage in their development. In rearing large numbers of *Lasiocampa quercus*, he had noticed that when many in the penultimate skin were dying, the forward larvæ of the same brood which had reached the last stage were not affected.

NOTE ON LARVA OF *EUTRICHA QUERCIFOLIA*.—Mr. A. W. Mera found that the larva of *Eutricha quercifolia* discharged a quantity of strong-smelling fluid before pupation. On one occasion when he was breeding this insect he had seen that as soon as the largest larvæ had pupated the rest of the brood sickened and died. This fact he attributed to the smell of the fluid referred to. Mr. V. Eric Shaw bore out Mr. Mera's experience with this insect.

June 3rd, 1902. —NEW MEMBER ELECTED.—Mr. G. H. Heath, of 277, Brockley Road, S.E., was elected a member of the Society.

MELANIC *GONODONTIS BIDENTATA*.—Mr. T. Hamling exhibited a bred series of the melanic form of *Gonodontis bidentata*, including specimens in which even the pale line in the forewing was obliterated.

BRED *ANGERONA PRIMARIA*.—Mr. C. P. Pickett, bred specimens of *Angerona primaria*, including a ♂ with right hindwing of lighter coloration than the left.

ASYMMETRICAL *DILINA TILIAE*.—Mr. Pickett, a long-bred series of *Dilina tiliae*, among which were a ♂ with unusually dark hindwings and two asymmetrical specimens.

CYANIRIS ARGOLUS AT CLAPTON. —Mr. Prout said he had seen *Cyaniris argolus* at Clapton during the day (June 3rd).

NOTE ON *CYCLOPHORA PORATA*.—Mr. Prout also remarked on the curious fact that although, while breeding from the first brood of *Cyclophora porata*, he had never been able to rear a second brood therefrom, yet pupæ from ova obtained by him from a second brood female taken at Starcross in August had produced imagines the same year (*i.e.*, a third brood).

THIRD BROOD OF *SYNOPSIS ABRUPTARIA*.—Mr. C. P. Pickett stated that two larvæ of *Synopsis abruptaria* belonging to a third brood which hatched in September, 1901, had only just pupated (June, 1902), the pupæ being abnormally large.

June 17th, 1902. —BRED *NEMORIA VIRIDATA*, ETC.—Mr. S. J. Bell exhibited bred series of *Nemoria viridata* and *Iodis chrysoprasaria*.

LARVÆ OF *PARNASSIUS APOLLO* AND *PARNASSIUS DELIUS*.—Dr. T. A. Chapman, larvæ of *Parnassius apollo* and *Parnassius delius*, which very closely resembled one another. Dr. Chapman pointed out, as one method of differentiation, that the lateral spots on *P. apollo* were orange, while those of *P. delius* were yellow, at the same time remarking that since he had first noted that fact the spots on *P. delius* had become almost as orange in tint as in *P. apollo*.

LYMANTRIA MONACHA INBRED. Mr. Pickett, larvæ of *Lymantria monacha*, which were fully up to the average size, despite the fact that they were the result of nine years' interbreeding.

GONODONTIS BIDENTATA AND *EUSTROMA SILACEATA*. Mr. L. B. Prout, *Gonodontis bidentata*, including a rather dark specimen from Ramoeh and a light one from Sandown; also a bred series of

Enstroma silaccata, including ab. *insulata*, Haw. Mr. Prout mentioned that this latter species would feed up on fuchsia in captivity.

GONODONTIS BIDENTATA, ETC.—Mr. V. Eric Shaw, dark forms of *Gonodontis bidentata* from Manchester; also a cocoon of *Plusia moneta*, and ova of *Ectropis punctularia* and *Anagoga pulveraria*.

OVA OF COENOCALPE VITALBATA.—Mr. C. Nicholson, ova of *Coenocalpe vitalbata*.

NOTE ON GONODONTIS BIDENTATA, DISTRIBUTION.—Mr. J. W. Tutt observed that it was curious that so far as he could remember there were no specimens of *Gonodontis bidentata* of the dark form in any of the large collections, old or recent. This pointed to the probability that this form was a modern development, and it would be interesting to see if the normal colour of the thorax would be maintained in the future. Mr. G. H. Heath said this form of *G. bidentata* had, to his knowledge, been commonly met with in the Dewsbury district for several years past.

MELITEA CINXIA RETARDED BY COLD.—Mr. L. B. Prout remarked that owing to the unseasonable weather his brood of *Melitaea cinxia* had remained an abnormally long time, both in the last larval skin and in the pupal stage. The resulting imagines were all obviously weak, and many were crippled, but on the whole there was much variation.

PACHYS BETULARIA PAIRED WITH AB. DOUBLEDAYARIA.—Mr. C. Nicholson recorded the capture at Brentwood of a pair of *Pachys betularia*, in cop., the ♂ being of the ab. *doubledayaria*.

July 1st, 1902.—PACHYS BETULARIA AB. DOUBLEDAYARIA.—Mr. J. A. Clark exhibited five specimens of *Pachys betularia* ab. *doubledayaria*, bred from York.

VARIATION IN BANKIA ARGENTULA.—Mr. G. H. Heath, a series of *Bankia argentula* from Chippenham Fen, the ground colour of the wing of some of the specimens being brick-red and of others grey-green; some also showed considerable variation in the position and prominence of the stripe near the outer margin of forewing.

ANGERONA PRUNARIA ABERRATIONS.—Mr. C. P. Pickett, bred specimens of *Angerona prunaria*, including a ♂ specimen with the darker bands barely discernable.

STATISTICS ON GONODONTIS BIDENTATA.—Mr. T. Hamling, a long series of *Gonodontis bidentata*, consisting mainly of the ab. *nigra*. The following statistics were given with reference to the exhibit:—

Ova obtained from	Number pupated.	Number ab. <i>nigra</i> bred.	Number type bred.	Cripples.		Non-emergences.
				ab. <i>nigra</i>	type.	
Typical parents ..	77	15	25	9	19	9
Ab. <i>nigra</i> ♀ with typical ♂	60	21	8	4	5	22
Ab. <i>nigra</i> ♂ with typical ♀	57	34	9	3	1	10
Ab. <i>nigra</i> ♂ and ♀	120	76	3	14	3	24
	314	146	45	30	28	65

NEURIA RETICULATA (SAPONARIE), ETC., AT MUCKING.—Rev. C. R. N.

Burrows recorded the capture of several *Neuria reticulata* and two *Choerocampa porcellus* at Mucking (Essex), the *C. porcellus* taken at valerian.

APAMEA UNANIMIS AT WICKEN.—Mr. Burrows had also found *Apamea unanims* plentiful at Wicken; many specimens were of the very dark form. He expressed the opinion that the season was about three weeks behind the usual time as regards emergences. He mentioned a large number of insects usually common in his garden that he had, so far, not seen this year, including *Axylia putris*, *Nylena lithocylea*, *Rusina umbratica* (*tenebrosa*), *Agrotis corticea*, *Naenia typica*, *Mamestra thalassina*.

August 19th, 1902.—GIANT RUSTICUS FROM SPAIN.—Dr. T. A. Chapman, specimens of a Lycaenid from central Spain, which were apparently a very large form of *Rusticus argus* (*aegon*).

SPILOSOMA MENDICA FROM FINCHLEY.—Mr. J. A. Clark, a variable series of *Spilosoma mendica*, bred from Finchley ova.

ENDROMIS VERSICOLORA AND DILINA TILIAE.—Mr. A. W. Mera, bred specimens of *Endromis versicolora* from the Reading district; also a bred *Dilina tiliæ*, with the usual central green band on forewing almost absent.

EUCOSMIA UNULATA AND EUPITHECIA LINARIATA.—Mr. V. Eric Shaw, a series of *Eucosmia undulata*, bred from ova obtained from a New Forest female; also *Eupithecia linariata* bred from Uxbridge.

NOTE ON DIMORPHA VERSICOLORA.—Mr. A. W. Mera exhibited *Dimorpha* (*Endromis*) *versicolora*, and remarked that he had obtained ova from a bred female, but could not get the larvæ to feed. Dr. Chapman confirmed this experience, but Mr. J. A. Clark said he had inbred this insect for three successive years.

AMORPHA POPULI PUPE UNDER LIME TREES.—Mr. J. A. Clark recorded that he had bred *Amorpha populi* from pupæ found under lime trees. The only poplar tree in the immediate neighbourhood was at least sixty yards away, and there was a high fence between it and the lime trees in question.

Sept. 2nd, 1902.—PLAGODIS DOLABRARIA BRED, ETC.—Mr. J. A. Clark exhibited specimens of *Plagodis dolabraria*, bred from larvæ beaten at High Beech, Epping Forest, and of *Lomaspilis marginata* from Queen's Wood, Highgate.

ARCTIA VILICA, CALLIMORPHA DOMINULA, AND TRIPLENA FIMERIATA VARS.—Mr. C. P. Pickett, bred varieties of *Arctia vilica*, *Callimorpha dominula*, and a series of *Triphaena jimbriata*, including a specimen with somewhat smoky hindwings.

DILINA TILIE VARS.—Mr. J. Riches, a variable series of *Dilina tiliæ*.

ÆGERIA MUSCIFORMIS.—Mr. V. Eric Shaw, a long series of *Ægeria musciformis*.

Sept. 16th, 1902.—CUCULLIA ABSINTHII BRED.—Mr. A. Bacot exhibited a series of *Cucullia absinthii* bred from Weymouth.

HYPOCRITA JACOBÆE FROM SPAIN.—Dr. T. A. Chapman, specimens of *Hypocrita jacobæe* from Spain, which showed no variation from the English type, except, perhaps, in being somewhat larger, although the difference between the larvæ was considerable.

SCIADION OBSCURATA VARS.—Mr. G. H. Heath, a series of *Sciadion (tinophos) obscurata* from Oddicombe Beach, near Torquay. Most of the specimens were dark grey, but a few showed a pale reddish brown coloration.

DILINA TILIÆ AND ANGERONA PRUNARIA VARS.—Mr. C. P. Pickett, *Dilina tiliæ* bred from various localities, including several asymmetrical specimens. Also a long series of bred *Angerona prunaria*, among which were some very dark forms, and pale forms with the band almost obsolete.

MELITÆA CINXIA FROM ISLE OF WIGHT.—Mr. L. B. Prout, a variable series of *Melitæa cinxia* bred from Isle of Wight larvæ.

HYDRIOMENA FURCATA FROM WIGAN.—Mr. V. Eric Shaw, a bred series of *Hydriomena furcata* from the colliery district near Wigan. Most of the specimens were dark, but a few were of about the same coloration as southern forms.

COLLECTING NOTES FOR 1902.—Mr. G. H. Heath reported that he had found sugaring a failure at Babbicombe, South Devon, during the first three weeks in August. Mr. L. B. Prout had found insects plentiful at sugar in the Isle of Wight from July 21st to 25th. From the latter date to the end of August sugar had proved a complete failure near Aberdeen and at Forres, but ragwort and heather paid fairly well. *Plusia bractea* occurred freely at flowers of *Lychnis respertina*. During the first fortnight in September insects were swarming at sugar at Sandown, Isle of Wight; *Caradrina ambigua* was fairly plentiful, *Aporophyla australis* occurred in abundance, and a few each of *Leucania albipuncta* and *Triphaena orbona* were also taken. Mr. V. Eric Shaw remarked that at Finchley sugar failed to attract up to about August 28th; after that date insects gradually became more and more plentiful.

Oct. 7th, 1902.—NEW MEMBER ELECTED.—Mr. T. H. L. Grosvenor, Boundary House, Hadley, Middlesex, was elected a member of the Society.

CHIASMIA CLATHRATA AB.—Rev. C. R. N. Burrows exhibited a specimen of *Chiasmia clathrata* with a great reduction of the light area.

SIREX JUVENCUS.—Mr. Burrows further exhibited a specimen of *Sirex juvencus*.

POLYOMMATUS CORYDON VARS. AND ABS.—Mr. C. P. Pickett, a long series of *Polyommatus corydon*, including some extra large and some very diminutive specimens from Folkestone.

ANTHROCERA FILIPENDULÆ AB.—Mr. C. P. Pickett, a fine aberration of *Anthrocera filipendulæ*, with the pairs of spots on forewing merged into large blotches. The specimen was bred from pupa, and came from Folkestone.

PERONEA TRISTANA ALIVE.—Dr. Chapman, a specimen of *Peronea tristana* alive.

ORINA TRISTIS VAR. SMARAGDINA.—Dr. Chapman, a specimen of the beetle *Orina tristis* var. *smaragdina* from Pino, Spain, taken May 30th, 1902; also eggs and empty eggshells of same.

SPILOSOMA URTICÆ.—Mr. A. W. Mera, *Spilosoma urticæ*, the resultant of a brood having a paucity of spots.

LEPIDOPTERA FROM CO. KERRY.—Mr. W. J. Kaye, a box containing lepidoptera taken in the west of co. Kerry in June, 1902, including

Coenonympha typhon of large size, *Melitaea aurinia* var. *praeclara*, *Eupithecia venosata* of the dark form approaching those from Shetland, and *Pyrausta funebris* (*octomaculata*).

COSMIA PYRALINA FROM WORCESTER PARK.—Mr. W. J. Kaye, a short fresh series of *Cosmia pyralina*, taken at sugar at Worcester Park, during the last week in July and first in August, 1902.

CALAMIA LUTOSA AND BARATHRA PERSICARIAE.—Mr. J. Riches, some *Calamia lutosa*, and the green and brown forms of the larva of *Barathra persicariae*.

NOTE ON AGROTIS VESTIGIALIS.—Mr. Prout remarked on *Agrotis vestigialis* being amongst the insects taken by Mr. Kaye in June in Kerry, and asked what the experience of members was generally regarding this species and its time of appearance. He, personally, had taken it on August 28th and September 1st this year at Findhorn, and had assumed that in Scotland it would normally appear in August. Several members said they had found July the best month for it. It appeared, therefore, that June and August were extremes in the times of appearance.

NOTE ON CHRYSOPHANUS PHLÆAS.—Dr. Chapman called attention to the difference in the series of *Chrysophanus phlæas* from Kerry and those from Folkestone, the latter specimens having heavy black margins, being darker and more heavily spotted, and the ground colour much richer in tone. Mr. Kaye also called attention to the fact that in the Irish specimens the raying in the hindwing was much more conspicuous than in the eastern Kentish specimens.

NOTE ON IRELAND AS COLLECTING GROUND.—Mr. W. I. Cox mentioned having been to Ireland, and the good impression obtained of it as a country for collecting in. Mr. Kaye said he had found insect life generally scarce, this being the dictum of Kane and other resident Irish entomologists. Woodland was scarce, but where it was found insect life was often much more abundant and concentrated.

BREEDING OF APOROPHYLA LUTULENTA.—Mr. F. J. Hanbury inquired if anybody present had had any experience with breeding *A. lutulenta*. Mr. A. Bacot answered he had found that they were exceedingly delicate when in the last stadium.

Oct. 21st, 1902.—POLYGONIA C-ALBUM PUPÆ.—Mr. Alfred Sich exhibited *Polygonia c-album* pupæ, illustrating how late the season had been. He said now that the food-plant, the hops, were washed, the species was getting scarce in Worcestershire. Mr. V. Eric Shaw said he understood that Mrs. Hutchinson fed her larvæ on nettle and currant.

CATOCALA NYMPHÆA.—Dr. T. A. Chapman, *Catocala nymphæa* from Piedrahita, in Spain. In the course of his remarks he said when it flew round the evergreen oak trees in bright sunshine sometimes in hundreds, a dozen or so could be disturbed off every tree. The species belonged to the section of the genus with pencils of hairs on the ♂ intermediate tibiæ.

EXHIBITION AND DISCUSSION ON HYDRIOMENA FURCATA.—In view of a discussion arranged on *Hydriomena furcata*, several members exhibited a number of specimens of this species. Mr. V. Eric Shaw, some fine black forms from Wigan, also varying phases from the New Forest, Finchley, and N. Cornwall. Mr. C. P. Pickett, specimens

from Oxshott, Clandon, and Folkestone. Rev. C. R. N. Burrows, specimens from the Essex marshes, containing very large green forms. Mr. W. J. Kaye, examples from Worcester Park and the Yorkshire moors, the latter being of the usual small size and very variable. Mr. A. W. Mera, the bilberry forms from Sevenoaks. Mr. L. B. Prout, a very long series of the same species, and also *Hydriomena autumnalis* and *Hydriomena ruberata*. Mr. C. Nicholson, specimens from the New Forest. He raised the question, "Where does this abundant species rest?" He had never found the imago except on the wing. With *H. autumnalis* (*trifasciata*) the case was quite the reverse. Mr. Sauzé, some bred examples, fed on sallow, from Dawlish, Cumberland, and Deal. Mr. H. J. Turner, Brockley specimens bred on nut, Macclesfield specimens fed on bilberry, and also some from Deal. The Macclesfield specimens were particularly fine, and some almost black. Mr. Prout said, in referring to Mr. Nicholson's remarks, that the bilberry forms were always more variable than others. According to Reid, when at Pitcaple he had found the larva feeding on heather in Scotland. Mr. Prout suggested that the phenomena of the larva feeding on such dissimilar plants as sallow and bilberry might be explained by the larvæ wandering from the bilberry to the small pieces of dwarf sallow that frequently grow amongst bilberry, and having once acquired a taste for sallow, feeding indiscriminately on the larger species of *Salix*. Dr. Chapman inquired if there was ever a second brood. The President answered that there was only one brood, the emergences being spread over a long period. Dr. Chapman, in calling attention to the strong tendency to variation in the bilberry-fed specimens, said that bilberry patches could offer a great variety of aspects and colours, each of which the moth could select as a resting-place. Mr. Prout said it was well known that when this moth flew up into the air birds attacked it freely, and he himself had seen it happen again and again.

SCIADION OBSCURATA.—Mr. H. J. Turner exhibited some *Sciadion obscurata*. The specimens included some very pale ones from Folkestone, very dark ones from Macclesfield, and some brownish-tinted somewhat intermediate forms from Dawlish.

Nov. 4th, 1902.—DEILEPHILID PUPÆ.—Dr. T. A. Chapman exhibited pupæ of *Celerio gallii* and *Hyles euphorbiae*, which were very alike, but which were distinguishable in *C. gallii* having the abdominal segments more flattened at the greatest width.

EMATURGA ATOMARIA AB.—Mr. W. J. Kaye, a fine aberration of *Ematurga atomaria* taken on June 2nd, 1902, at Horsley. It had the basal and post-median bands on forewing nearly absent, and all the bands on hindwing broken up, and almost absent.

CYCLOPHORA ANNULATA BRED.—Mr. V. Eric Shaw, some *Cyclophora annulata*, bred from ova laid by a ♀ taken at Eynesford, Kent, June 22nd, 1902, the imagines appearing from August 18th to September 3rd. He stated that the species was exceptionally easy to rear.

HYDRIOMENA FURCATA BRED.—Mr. S. J. Bell, *Hydriomena furcata* bred from sallow from Wimbledon.

ENNOMOS EROSARIA.—Mr. G. H. Heath, ova of *Ennomos erosaria* from Sussex.

DIASTICTICUS SPECIES.—Mr. E. A. Newbery, the coleoptera *Diastricticus vulneratus*, a species new to Britain, and *Diastricticus complanatus*, a species lately discovered which had hitherto escaped detection amongst *D. pristonychus* in most collections.

GEOMETRIDÆ FROM LOCARNO.—Mr. L. B. Prout, some *Geometridæ* collected by Dr. Chapman at Locarno.

LEUCOMA CHRYSORRHOEA WEBS.—Mr. A. Bacot, spun webs of *Leucoma chrysoorrhoea* containing hibernating larvæ, taken from hawthorn at Pegwell Bay, Kent. Mr. A. W. Mera remarked, on this last exhibit, that he had taken the larvæ at Stanford, Essex, which was away from the sea. Mr. F. J. Hanbury said he had seen the imagines of this species sitting on bare black rocks near Torcross, and that it was, in such a position, observable a great distance off.

DISCUSSION ON ESTABLISHMENT OF A CENTRAL ENTOMOLOGICAL EXCHANGE CLUB.—Mr. F. J. Hanbury brought before the members for discussion the matter of a Central Entomological Exchange Club for the British Isles, to be conducted on similar lines to the existing Botanic Exchange Club. The proposed rules of the club were read out, and commented on where alteration was necessary in order to meet the demands for the different matter for exchange. It would not aim at doing away with private exchange, but would facilitate the interchange of even common species from outlying and very varying localities. It would save correspondence, time, and postage, and would serve to supply all with local forms of very many species. He said that none except very rare species should be distributed, unless in first-class condition. The rate of exchange was a difficult matter, in view of insects having a money value, and he would suggest that some reliable dealer's list, such as Harwood's, of Colchester, might be used as a standard. Rare species would be exchanged for rare species, and not for a collection of lower priced insects which, together, would equal the price of the rarity. There should be, he thought, at least two distributors, who would take their turn by rotation, out of the list of members. Last, but not least, a report should be printed at the end of every year, containing such notes as were worth publishing concerning the insects distributed during the year. An alternative scheme was suggested, whereby members of the club should meet four times a year, a list be printed of all the species for distribution and sent to each member, and each member then attend with his quota of insects. The matter being open for discussion, Mr. Prout asked how the rate of exchange was arrived at in botany, where dried plants practically had no money value. Dr. Chapman thought the price was bound to be fixed for lepidoptera. Mr. Kaye thought that specimens not complying with the rules, instead of being destroyed, might be returned, as sent, to their respective owners. Mr. Shaw alluded to the various styles of setting and the varying nomenclature, each of which would cause some difficulty. He thought that anyone should be allowed to join the club if he or she complied with the conditions of membership. Mr. Sich wished to know how the difficulty would be met of finding the distributor or distributors. Mr. Hanbury answered this last query by saying that the leading men would take their turn as in the Botanical Club. Mr. Riches supported a self-contained club in the Society itself. Mr. Fuller thought that a small Exchange Club in the Society would never grow into the larger body. Mr. Bell asked

if a draft of the rules and procedure might be put in the Entomological Magazines to see what allegiance it would bring forth. Mr. Sich suggested a circular be printed and circulated. Mr. Prout asked the meeting if it cared to appoint a sub-committee to confer with other bodies in the matter. He suggested that Mr. Kaye, as Secretary, should draft an account of the matter for the magazines. This was agreed to and the discussion brought to a close.

Nov. 18th, 1902.—OVA OF ENNOMOS AUTUMNARIA.—Mr. V. Eric Shaw exhibited ova of *Ennomos autumnaria* from Dover.

LYMANTRIA MONACHA INBRED.—Mr. C. P. Pickett, a cabinet drawer full of *Lymantria monacha*, showing the result of several years' selection and interbreeding with a view to obtaining a dark race.

TILIACEA AURAGO AB. OVO.—Mr. W. J. Kaye, a bred series of *Tiliacea aurago*, from ova laid by a ♀ taken at Worcester Park. It was stated that on only this one occasion had the species been known to occur in this locality.

BOMBYCIA SPECIES FROM ASHDOWN FOREST.—Mr. S. J. Bell, *Bombycia duplaris* and *Bombycia fluctuosa*, both netted in Ashdown Forest between July 12th and 17th, 1902.

CYCLOPHORA PENDULARIA VAR. SUBROSEATA.—Mr. Prout, *Cyclophora pendularia* var. *subroseata* from North Staffordshire.

PALE AGROTIS SUFFUSA AB.—Mr. J. A. Clark, a splendid pale aberration of *Agrotis suffusa* from South Devon.

RULES OF PROPOSED EXCHANGE CLUB.—Mr. Prout notified, concerning the Exchange Club discussed at the previous meeting, that Mr. Kaye had drafted the proposed rules and regulations, and that it had been arranged to have them printed in the January number of the *Entomologist*, and that a current note on such would appear in the *Entomologists' Record* on the 15th of the same month.

PAPER READ.—Mr. A. F. Bayne communicated a short paper on "An Easter Holiday in the Andes." (See "Transactions").

Dec. 2nd, 1902.—NEW MEMBERS ELECTED.—Mr. Sydney W. Dale, 44, Coolhurst Road, Crouch End, N., and Mr. L. M. Seth-Smith, Alleyne, Caterham Valley, were elected members of the Society.

OVA OF EUSARCA ELINGUARIA AND ENNOMIDS.—Mr. V. Eric Shaw exhibited ova of *Eusarca elinguaris* on blackthorn, also of *Ennomos fuscantaria*, *erosaria*, *autumnaria*, and *alniaria*.

CYANIRIS ARGIOLOUS.—Mr. C. P. Pickett, a fine ♀ of *Cyaniris argiolus* of the second brood, showing a striking combination of light and dark blue tints.

LONDON TORTRICIDS.—Mr. Alfred Sich, 33 species of Tortricids taken in the London district.

NOTE ON ENNOMID SPECIES.—Mr. C. Nicholson remarked, concerning Mr. Shaw's exhibit, that the eggs of *Ennomos fuscantaria* were somewhat intermediate between those of *autumnaria* and *erosaria*. Mr. Prout said the species were evidently very close to one another, and mentioned that *E. autumnaria* and *E. quercinaria* had been successfully hybridized.

APOROPHYLA LUTULENTA.—Rev. C. R. N. Burrows, a series of *Aporophyla lutulenta* taken in the autumn of the present year (1902) at Mucking. There was a conspicuous absence of variation in the series, in contrast to his experience on former occasions.

OVA OF DRYOBOTA PROTEA.—Mr. Burrows, some ova of *Dryobota protea*, and remarked on the great beauty of the egg.

XYLENA MONOGLYPHA AB.—Mr. S. J. Bell, a fine aberration of *Xylena monoglypha* with a strong white blotch at termen of forewing; also a fine rich chocolate-coloured *Triphaena pronuba* from Sandown.

INSECTS FROM TORCROSS.—Dr. J. S. Sequeira, a series of *Caradrina ambigua*, *Agrotis saucia*, and others from Torcross, taken in September, 1902. He also mentioned having bred *Authrocera jilipendulae* in September, showing the lateness of the season.

ABANDONMENT OF CERTAIN SUMMER MEETINGS.—Mr. Prout, from the chair, intimated that a majority at the last Council meeting had proposed the abandonment of the meetings in July and August, and that he wished to know the feeling of the present meeting. On a show of hands the arrangement was approved.

SECRETARIES' REPORT FOR THE YEAR 1902.

It devolves upon the secretaries to each show off their Society to its best advantage, and if possible to show it in a better position than in any previous year. In some ways our Society has improved, the attendance for the past 12 months averages over 14 per meeting, whereas last year it only just touched 13. At the second meeting in July, and at the first in August, it was not possible to form a quorum, and no meetings were held, thus reducing the number of meetings from 24 to 22, while in the previous year 23 were held. It seems most desirable that some arrangement approved by the majority should be arrived at by which useless trouble and loss of time of the officers might be saved at these periods of the year. The average attendance for July and August was only 4, so perhaps when the matter comes up for the vote, members will agree to abandon meetings in these two months, and it is highly probable that an increased stimulus would be given for the resumption in September. The membership has again risen to 63 after being down to 56 last year, and it is satisfactory to note that visitors have been far more frequent at the meetings, 22 having been introduced as against three last year. The "Transactions," which seem now to have become a regular and constant fixture, are as eminently satisfactory as previously, and occupy 73 pp. Mr. Prout has completed his revision of the London Macro-Lepidopterous fauna, and an up-to-date Catalogue of the Library has at last got into print, thanks to the action of the Librarians. It is gratifying to know that enquiries are more frequently made for our "Transactions," and that the financial aid accruing therefrom is steadily growing. The donations to the Library include "British Vegetable Galls," by E. T. Connold, presented by Dr. Buckell, and "The Variation and Distribution of the genus *Aphodius*," presented by the author, Mr. Frank Bouskell.

Two field excursions were held: the first to Bysfleet, Mr. Kaye acting as leader. Only four members took part. The ground was new to those present, and a very favourable impression was gained; but owing to the lateness of the season, very little was secured. *Cyaniris cygnetus*, *Chrysophanus phlacas*, *Hesperia malvae*, *Nisontoides tages* and *Chiasmia clathrata*, in some abundance late in the afternoon, while larvæ of *Chesias spartiata* off broom, and larvæ of *Pseudoterpnæ pruinata* off *Genista anglica* were the chief things taken.

A second excursion was one held at Leith Hill on June 21st. The leader was Mr. V. Eric Shaw, and four other members were present. The journey was rather a long one, and the time on the collecting ground short, but some good collecting was enjoyed, and everyone carried away good impressions of the locality. The best insects secured were *Epione adrenaria* (in fine condition), *Eupithecia indigata*, *Eupithecia lariciata*, *Scodionia belgiaria* (one ♂), *Hydriomena autumnalis*, *Bapta bimaculata*, *Asthena luteata*, *Euchoeca oblitterata*, *Bomolocha fontis* and a fine banded specimen of *Leptomeres flos-lactata* (= *remutata*). A word perhaps should be said respecting the excursions. They are palpably badly attended, and the reason would appear that many members consider they can secure more specimens on a dual outing or even when they are quite alone. This opinion is doubtless well founded, but these excursions are intended to serve another purpose as well. An exchange of views is often very beneficial to each of the exchangers, and many a useful and interesting detail as to how such and such insects are to be taken is often to be obtained at such outings, provided there is a good attendance. Members will therefore perhaps in the coming summer consider the excursions, which are arranged for their benefit, and help to make them the real successes they should be in a Society such as this, which is composed of active and skilled field workers.

The following programme was carried out during the year:—

1901, Dec.	18.	“Observations on Early Stages of <i>Phyllocnistis suffusella</i> ”	Mr. Alfred Sich, F.E.S.
1902, Jan.	7.	“ <i>Stauropus fagi</i> ”	Mr. A. W. Mera.
“	“	21. “Colour Photography” — the Sanger-Shepherd Process, with Lantern Slides	Rev. C. R. N. Burrows.
“	Feb.	4. Pocket Box Exhibition		
“	“	18. “After Lepidoptera in British Guiana in 1901”	Mr. W. J. Kaye, F.E.S.
“	Mar.	4. “Some Considerations on the Classification of the <i>Sphingidae</i> ”		Mr. A. Bacot, F.E.S.
“	“	18. “Notes on the <i>Gracilariidae</i> ”	Dr. T. A. Chap- man, F.E.S.
“	April	1. Exhibition of European Rhopalocera		
“	Oct.	21. Exhibition and Discussion on <i>Hydriomena furcata</i>		
“	Nov.	4. Discussion on the Question of Establishment of a Central Entomological Exchange Club. Opened by	Mr. F. J. Han- bury, F.E.S.
“	“	18. “An Easter Holiday in South America”	Mr. A. F. Bayne.

time in succession, therefore, I now appear before you with the annual presidential address. But on the present occasion I do so with feelings somewhat different from those which I have experienced on the previous ones, inasmuch as I am now obliged to say "Farewell"—not, however, I am glad to say, to my confrères of the "City of London Entomological and Natural History Society," but only to the chair which has held me a not unwillingly captive during the past four years. Indeed, it is not without very mingled feelings that I am now vacating the position which your unfailing courtesy and kindness have made it so great a pleasure and so slight a burden to occupy throughout this period, and I can assure you that no mere hasty impulse should have allowed me to quit it, but that I find duties and engagements are so thickening around me that I cannot conscientiously promise to give all the time and thought which I feel every president who is worthy of his position owes to his society. Still, I hope to continue a fairly regular attendant at the meetings under the presidency of my worthy successor, Mr. A. W. Mera, a very old friend of this Society, and—I am glad to be able to add—of myself personally, a thorough and painstaking entomologist, and a most kindhearted and genial man—one whose natural modest and unassuming disposition has, perhaps, prevented his becoming well known to so wide a circle of us as might have been wished, but who certainly has not a single enemy in the society, nor a suspicion of one, but who will, I have every confidence, be able to guide its affairs smoothly and effectively.

Under the special circumstances wherein I appear before you this evening, I trust you will pardon my lingering a little on the purely personal element; I feel that I cannot vacate the chair without giving expression to my sense of indebtedness to all the officers and Council for their kindly sympathy and co-operation. If I may single out some, where all have deserved my thanks, I must mention especially our two able and energetic secretaries, each of whom, in his own department, has done such excellent work for the Society at large, and in this way earned the gratitude of one who has its welfare so much at heart as myself—to say nothing of the very cordial relations which exist between us personally. I have indeed been fortunate in having the co-operation of so good a reporting secretary as Mr. W. J. Kaye, F.E.S., and not less so in that of so capable and businesslike an organizer and corresponding secretary as Mr. S. J. Bell; and I congratulate the Society, and myself as a member of it, on our good fortune in retaining their services for the coming year.

Of statistics and matters of finance, you will have learned from the reports of our secretaries and treasurer. It is to be regretted that our membership-roll does not go forward with the rapidity which might be expected from our favourable position, our exceptionally comfortable accommodation, and, I think I may add, the general interest of our meetings and the high standard of our work. But this feeling of regret is tempered with not a little satisfaction that some healthy "new blood" has been infused during the past year, and that there are many signs of vigorous activity amongst us. When one looks through the list of sponsors for the nomination of new members, however, one is struck by the small number of those to whom this important duty seems to be left, and one cannot help wondering whether the majority of our members are really making all the effort

in their power to induce their friends to join us. I have pointed out in previous addresses that we occupy a unique position in two or three respects, particularly in the strength of our annual publication relatively to the want of numerical strength in our membership-roll, but also in the kind of *specializing* to which we seem to be more and more tending, as primarily a lepidopterists' society. But it is quite manifest that such a position cannot be maintained without a certain strenuousness on our part, and I would again urge you to bring the claims of the society before the notice of all sorts and conditions of entomologists, but perhaps especially of lepidopterists.

You have been reminded by the secretaries that the excursions, which are so prominent and so successful a feature in some kindred societies, appear as a very weak point in our statistical records. I do not know that I need dilate on the pleasure and advantage of those occasions. I am quite aware that there is a feeling abroad in certain quarters that the success of an excursion from a purely Natural History point of view is almost in inverse proportion to the size of the attendance; but I think this was disproved, as the leader (Mr. W. I. Cox) remarked at the time, by the most (numerically) successful of our recent excursions—the one to Darenth a few years ago; and even if large numbers do sometimes militate against hard work, they have very strong compensating advantages in the direction of wider interchange of thought and increase of general knowledge. Speaking as a regular attendant at them for some years past, I say with confidence that I have seldom (if ever) been present at one without gaining some new idea, or learning something new as regards localities or methods of field work.

Of our more serious work as a society, as it is shown in the list of papers read before us during the past year, we have no reason to feel ashamed. It is not necessary or even desirable that I should make any detailed reference to them now or attempt in any way to recapitulate the matter brought before you in them. We are hoping to have in our hands early in the new year copies of our twelfth annual volume of "Transactions," and shall then be able to read and digest them for ourselves. If I may be allowed to single out one paper as worthy of especial mention, as showing the high place which our Transactions are taking in entomological literature, I would refer to Mr. Sich's excellent one on the genus *Phyllocnistis*, read nearly a twelvemonth ago, but doubtless well remembered by those who heard it, as a really solid piece of work, whether from the point of view of the literary knowledge displayed or of the author's original observations added thereto. I have emphasised in former addresses the importance of our combining these two factors in our work—an acquaintance with what has been done already, as made known in entomological literature or by correspondence and communion with entomologists, and an aptitude for adding to that by our own personal research. Need I add that our Natural History Societies, with their meetings and their libraries, furnish just such aid as is required for the former of these factors, and consequently just such stimulus as is required for the latter.

The year 1902 does not seem to have been so eventful in the entomological world generally as some other years which I can remember; at least, in bringing it hastily under review, I am not struck by many

prominently outstanding features. In our literature we do not find any of the great biological or taxonomic works of which we had so many thrust upon our notice a few years ago, and which proved so fruitful in raising discussions and controversies on evolution and its effects upon classification; nor have we even had, in 1902, a "Staudinger's *Catalog*" or a "Kirby's *Catalogue*" to set us disputing on the principles of nomenclature. I therefore intend to take as my theme, for the few minutes in which I propose further to weary you with this address, a matter suggested not by literature but by my own experience of the very abnormal summer through which we have just passed. I want to say a few words, namely, on the extraordinary fluctuations of insect abundance from time to time, and—though I fear I am on very dangerous ground here—the correct attitude of entomologists towards the "over-collecting" question.

The experience to which I have alluded, which has led me up to this line of thought, need not be very fully recounted, especially as brief reports at different meetings have already given you some idea of it. I can neither say, as many of my correspondents are writing to me, that the season has been an unmitigatedly bad one for lepidoptera, nor can I say that it has been, on the whole, a really satisfactory one. "Sugaring," upon which so many of us rely for our success—especially *numerically*—has been very generally a failure, although with some notable exceptions. Butterflies and other sun-loving species have not been very much in evidence, and although this is largely because entomologists have experienced so little favourable weather for working them, yet I think in some cases there has probably been a real paucity of them. Especially is this likely to have been the case with those whose larvæ also require warmth and sunshine, such as the genus *Melitaea*. Reference has more than once been made at our meetings to the troubles and disappointments which we have met with in our endeavours to rear *M. cinxia*. Again, the season seems to have been but a poor one for immigrants—the genus *Eurymus*, *Sesia* (*Macroglossum*) *stellatarum*, *Agrius convolvuli*, *Agrotis saucia*, etc., etc.—compared with several of its immediate predecessors. But, as a set-off against these deficiencies, we find a few species have been more than normally abundant. My own success at Forres in taking a nice series of *Plusia bractea* led me to fancy it must be an extra favourable year for this much-coveted insect, and I since find this abundantly confirmed by reports from Ireland. I also learn from correspondents in widely-separated localities—Aberdeen, Isle of Man, and Dorsetshire—that it has been an abnormally good season for *Aporophylla nigra*. As for *A. australis*, I have never seen it in such abundance at Sandown as was the case at the beginning of this past September, and my experience of the locality extends over some twelve or thirteen years. It is usually a comparatively scarce species there, but this year one could meet with 30 or 40, sometimes even more, on a single round of the sugar, and its abundance was not confined to a single night, as I have sometimes found to be the case with certain Noctuæ, but continued for several evenings in succession.

I wish I could enlighten you as to the actual causes of this sporadic appearance of lepidoptera in exceptional numbers. Of course, it is very easy to theorise with a greater or less degree of plausibility, and such views as that the causes are climatic, that a large number of their

pupæ go over several years until a favourable season arises, that they are generally kept in check by parasites and only occasionally get the upper hand, or that they are occasionally augmented by immigration, are among the commonplaces of entomology. None of these factors which I have mentioned are likely to be altogether inconsiderable, and some, at least, have been in a measure raised out of the realm of mere theory into that of demonstrated fact; but the difficulty, to the thoughtful mind, is that they do not go back to *first causes*, as, for instance, those which regulate the migrations, or those which regulate the balance between parasites and their hosts. I suppose we must not be surprised at this difficulty in getting to the very heart of the problems, however dissatisfied we may be at our inability to lay out for ourselves a clear and comprehensive theoretical scheme; no one can have thought seriously for five minutes over the operations of natural selection, and the inter-relations between the various organisms and forces of organic (and even of inorganic) nature, without having realised how excessively complicated they are, and how multifarious the factors may well be which make for the survival or the dominance of this or that individual form.

Perhaps all that we can venture to assert at all dogmatically is that a particular species will be abundant just when and where there is room for it, in the so-called "economy of nature." But this assertion is little better than a begging of the question, as it does not attempt to show what special concatenation of circumstances will open up the path or clear the way for a species, so to speak, at this or that period. It has been generally remarked, and is plausible enough, that an increase of the right foodplant, or the introduction of the foodplant in a new locality, has a marked influence on the increase or spread of the species thus provided with the needful pabulum. Even such an old-fashioned entomologist as Newman, in his *British Moths*, emphasizes the correlation between the cultivation of turnips and the increase of that pest of the farmer (but pet of the student of variation), *Agrotis segetum*. Probably we can all add examples from our own experience. I myself have noticed the fluctuations in the commonness or scarcity of the pretty little Geometrid *Perizoma alchemillata* in accordance with those of its somewhat erratic foodplant, *Galopsis tetrahit* (common hemp-nettle). Our botany books tell us that this is a common weed, and from the little acquaintance which I have of Scotland I should say that that is so indeed in the North; but at Sandown it is, in my experience, as I have just described it, a "somewhat erratic" plant. Some seasons I have hunted round the hedges on the farm fields and hardly found a scrap, while in other years it is in absolute profusion in its favourite fields. Now in those years when it is scarce, one might be inclined to expect that the little which was available would be crowded with larvæ of *P. alchemillata*—just as we do indeed often find, in the case of an isolated buckthorn, that there is an excellent chance of reaping a big harvest of *Colias rhamni* larvæ; but in the case under notice, I have by no means found this so, but on the contrary have even fancied that the larvæ were *proportionally* scarce in the years of dearth of the *Galopsis*, while they certainly abound in its years of plenty, so that one cannot help thinking that there is a vital connection, though of course it might amount to nothing more than that the seasonal circumstances which favoured

the one had become, through the operation of natural selection, identical with those which favoured the other.

But I will descend from the region of abstruse speculations, which may not interest those of you whose mental activities run in other directions, and will venture to give you one or two of the thoughts which have been the outcome of the creed which I have enunciated when I said that "a particular species will be abundant just *when and where there is room for it.*" Not many years ago I was an uncompromising opponent of the experiments which seem so entertaining to a good many lepidopterists—of the naturalisation of species in new localities. I even characterised such a proceeding, without the fullest publicity, as "an acted lie against scientific knowledge." (*Ent. Rec.* viii., p. 278). I may as well say frankly that I have almost entirely abandoned that position, and though I have no taste myself for transplantation experiments, I think they are generally quite harmless, although I would still urge entomologists to abstain from planting marked local varieties or aberrations in new localities; for instance, if one of you put down some thousands of pupæ of Manchester *doubledayaria* in our London suburbs without publicly announcing the fact, you may seriously vitiate the statistics which the "Evolution Committee" of the Royal Society is endeavouring to collect. But in other cases—*i.e.*, the attempt to establish a *new species* in a particular locality—the reasons which convince me that it is generally harmless from the scientific point of view rest almost entirely upon the view which I have just put forth; if there is not *room* for the new comer (and this usually proves the case) the experiment will fail—witness the hundreds of unsuccessful attempts to establish *Porthetria dispar* in various parts of this country; and if there *is* room for it, its occupation of the spot will not upset any important scientific fact of distribution, for it is always probable that the same result might have been or might be brought about by natural migration, chance introduction, or other agencies apart entirely from the volition of man. For instance, it matters very little how *Plusia moneta* has become established in England, whether through accidental or intentional introduction; the *fact* that it is capable of breeding and multiplying here is unimpaired whichever be the cause. Perhaps, however, I ought not to pass away from this subject without reminding you that whilst such proceedings may be free from *scientific* danger, they require the exercise of some judgment and discretion if we want to avoid a serious *economic* menace; none of you would desire, for the sake of the gratified vanity which might come of a successfully carried-out experiment, to risk a repetition of the sad story of the Gypsy Moth in America.

The reverse aspect of this question of the occupation by a particular species of any locality where there is room for it, is the one to which I referred in the early part of my address as "dangerous ground"—the over-collecting question and our attitude towards it. We all know that there *is* such a thing, and that species have occasionally been almost wiped out of a particular area through the ignorant greed or misguided energy of a few collectors; let us all agree, then, if we must err at all, to err on the safe side of over-abstemiousness. But I have been so often amused—and occasionally even disgusted—at the absurdly superficial views which frequently obtain

on this question that, having cleared my conscience by the above advice, I am not afraid to give you my ideas upon it. Surely if the position which I have taken is anywhere near the true one, the *numerical* aspect really does not enter into the question at all. Let me explain what I mean. Sometimes we read, or hear announced at a meeting, that this or that local or scarce species was unusually abundant at such-and-such a time and place, and that the writer or speaker "had no difficulty in collecting a thousand specimens." Immediately the unthinking among us hold up our hands in pious horror, and perhaps threaten to excommunicate the unfortunate "exterminator." We turn over the next page (or listen to the next speaker, as the case may be) and learn that so-and-so "was very scarce this season; it cost me almost incessant hard work during the time it was out to secure a dozen examples." Probably we pass over the record without criticism, or we sympathise with the collector on his failure, or even congratulate him on his perseverance. But which of the two, think you, was the real "over-collector," assuming that it lay within the power of either to come under this stigma? Surely if it be possible to do permanent mischief to a particular species at all, it is by persecuting it when it is at its *weakest*, not by taking large numbers when it is at its zenith. Surely the state of the case is as mathematically demonstrable as is that of "Müllerian Mimicry," which its ingenious expounder has worked out so statistically.

Let us suppose the case of a moth with whose resting habits a certain local collector is really well acquainted, so that he stands a good chance, if diligent enough, of finding a good percentage of the specimens which successfully complete their metamorphoses in his district. Let us suppose, further, that, on account of the action of other than human enemies, this species is liable to very great fluctuations in point of number. Our collector, we will say, is able to give sufficient time to hunting it to be able to secure, on an average, just 50 per cent. of the total occurring. Now, the year 1902, perhaps, was a very bad year for it, and only 20 specimens from this little colony reached maturity. Of these our entomologist takes ten, most or all of them freshly emerged—there are several species which are best found at rest at this period. Consequently he only leaves ten, some of which may fall a prey to bats, or meet with one or another of the untold casualties which befall the moth tribe. It is just possible that in the long run so few impregnated females will have escaped for oviposition that the colony—unless speedily reinforced by immigration—may entirely work itself out in a generation or two by a too close inbreeding. But the year 1901 was as favourable for the species as 1902 was the reverse; 2,000 came to maturity, and again our friend got his usual percentage. This, and not any suspicion of "over-collecting," explains his abnormal "bag" of 1,000, but we must not lose sight of the fact that he has also left another thousand to "be fruitful and multiply and replenish the earth." If the foregoing be even approximately the true statistical basis of the question, it follows, logically, that our theory of over-collecting ought to be that it bears an exact ratio to the amount of hard work (of course assuming that it be also well-directed and successful work) applied to the quest by the entomologist.

I have called attention to this matter solely in order to defend some quite innocent members of our brotherhood from thoughtless—though

undoubtedly well-meaning—attacks on the part of those who have taken up arms against the ruthless “exterminator.” In these days of statistical study of variation, &c., it is absolutely unavoidable that large series should be obtained from restricted localities, and that there should be, consequently, a large sacrifice of insect life. On the other hand, no lover of scientific research would wish to risk the extermination of a single species, nor would he dream of applying those wanton methods of work which constitute the real “over-collecting” and one or two of which I have heard exposed in this room by my illustrious predecessor in the chair—for example, the collecting in sacks of every rosebud in a certain small wood at the time when the larvæ of *Platyptilia rhododactyla* were feeding, and the consequent extirpation of this local species there—or, at least, its entire disappearance for a considerable number of years. It is such actions as this which have naturally disgusted us, and given us an abhorrence of the very mention of large numbers, which abhorrence, perhaps, threatens to carry us too far—although I have not yet met with the entomologist who is quite so indiscriminating as to criticise the records which are published from time to time of the collection of thousands of larvæ or pupæ of *Arctia caia* or *Spilote grossulariata* with a view to variety breeding.

I hope I have said enough to give food for some reflection, and it now only remains to me to introduce to you my good friend and successor, Mr. A. W. Mera, and to wish continued and increasing health and prosperity to the City of London Entomological and Natural History Society.

PAPERS READ BEFORE THE SOCIETY.

OBSERVATIONS ON THE EARLY STAGES OF PHYLLOCNISTIS
SUFFUSELLA, ZELL.

(Read December 17th, 1901, by ALFRED SICH, F.E.S.)

BIBLIOGRAPHY.—The earliest notice I can find of this little insect is in the *Naturforscher**, written indeed by one of the old masters of entomology, Goeze. He says (*Natf.*, 14th St., p. 103, Tab. V., Figs. 1-8) in an article entitled “Von der Oekonomie besonderer Minirwürmer in den glatten Pappelblättern”: On the 14th July, 1774, I discovered what I first took to be slime left by a snail on a poplar leaf.” On examining other leaves he finds they are mines, and at their termination sees the “graves.” He soon finds a little pale-yellow worm, on which he counts twelve rings besides the head and tail. He is puzzled that there is no excrement in the mines, and wonders whether he has a moth, a fly, or a beetle before him. After some trouble he succeeds in rearing from the worms and their graves a beautiful little butterfly with veritable scales. Among the score of authors who mention this moth, Goeze is the only one who gives a practical hint on rearing it. He says, cut off the twigs (not the leaves only), and keep them in a bottle with water, or the little creatures will dry up. He says the moth’s tongue remains stiff, like the proboscis of a bug. It is not, however, so in these days. Goeze gives eight figures, but they are not of much account. He appears to have had both *Phyllocnistis suffusella* and *P. sorhageniella* before him, as he says some moths have four and some five dark streaks on the wing. I cannot find that he gives the moth any name. It is, with him, the Miner of the Smooth Poplar Leaf.

In 1839 Zeller, in his famous paper *Versuch einer naturgemässen Eintheilung der Schaben*, † describes, under the genus *Opoteya*, a species which he calls *saligna*, and which he says may be taken in the neighbourhood of willows and poplar trees, in the leaves of which the larva mines.

Writing in the *Isis* of 1846 (p. 299) Madame Lienig also mentions *O. saligna* as an inhabitant of Livonia and Curland. In the same journal, the following year (*Isis*, 1847, p. 894) Zeller describes a new species of *Opoteya* under the name of *suffusella*; but of this description more later. A year afterwards Zeller, in the *Linnaea Entomologica* (1848, tab. II. and III., fig. 26f), founded the genus *Phyllocnistis*, with the two species *suffusella* and *saligna*. In seven pages he gives a fair account of the larva, pupa, and mines. His description of the species and varieties will be again referred to.

* Halle, 1774-1804.

† *Isis*, von Oken, 1839, p. 214.

We now come to a very interesting account written by Heeger, as one of his "Beiträge zur Schmetterlingskunde," and published in the *Sitzungsber. d. Kais. Acad. d. Wissenschaft* for 1852 (ix., p. 278). He calls the insect *Opostega tremulella*, Fischer v. Röslerstamm, but there is not the slightest doubt that it is the same insect as Zeller's *Phyllocnistis suffusella*. In fact, he writes on the plate accompanying the article, after the word *Opostega*, the word *Phyllocnites*, in brackets, by way, I suppose, of correcting Zeller's Greek. He says that the *Italian* poplar is the foodplant; that the larva has two processes on what we now call the eighth and ninth abdominal segments, and the moth has four black streaks on the costa; all of which statements point to *P. suffusella*. He gives twelve figures, of which one or two are very good; in any case, they leave one in no doubt as to what species he was discussing, except, perhaps, his figure of the venation, but this may be easily accounted for. No one studying *Phyllocnistis* can afford to overlook Heeger's paper, to which I shall frequently again refer. Herrich-Schäffer (*Bearb. d. Schm. v. Eur.*, v., p. 341, tab. 109, fig. 871) gives the first coloured figure of the species and a short description.

We now come to Stainton, the father of British microlepidopterists, but in this particular genus he can scarcely be considered to shine with his usual brightness. In the *Insecta Britannica* (p. 285) he gives, I think, the best description of the imago of *P. suffusella* that can be found. In the *Entomologist's Annual* for 1856 (p. 59) he mentioned finding the larvæ numerous on aspens at Mickleham at the beginning of August. In the previous year they had been met with in Norfolk (*Ent. Ann.* 1855, 2nd ed., p. 81). The first mention by Stainton of *suffusella* is made, I think, however, in the *Zoologist* for 1848, in his supplementary paper on the British *Argyromiges*, but it is unimportant. In his *Manual* (p. 424) he again describes the species in 1859. In a paper read at Oxford and published in the *Entomologist's Weekly Intelligencer*, July, 1860 (viii., p. 127), he makes some very extraordinary statements concerning the larva. He says:—"Another peculiarity of this larva is that it never moults; its skin is, apparently, of so elastic a nature that it grows with the larva." In 1856 Professor Frey makes some interesting remarks in his work on the Swiss Microlepidoptera (*Fin. und Pter. Schweiz*, p. 315), and again notices the species in his *Lepidopteren der Schweiz* in 1880. In 1866 Rössler (*Jahrb. d. Nass. ver. i. Naturk.*, xix.-xx., p. 389; see also 2nd ed. *Jahrg.* xxxiii.-xxxiv.) notices, in his list of Nassau Lepidoptera, that the imago hibernates in moss or leaves. The moth is again described in Heinemann and Wocke's "Schmetterlinge Deutschlands und der Schweiz" (Band ii, Heft. ii., p. 708), in some remarks on the family *Phyllocnistidae*, and attention is called to the "vorstehende," or projecting palpi, though in the diagnosis of the genus they are described as drooping. But drooping, as Lüders remarks, only applies to the dead specimen. The account of this moth given in Snellen van Vollenhoven's "Nederlandsche Insecten" (Sepp, 2nd series, vol. iii., p. 177 [1877], pl. 33, fig. 1-20) is an excellent one, and it is accompanied by a good series of figures. Albarda, who, I believe, is the writer, refers to Heeger and Goeze, besides others, showing that he did not ignore the previous literature of the subject, as some writers are in the habit of doing. He describes the eggs, mentioning the sculpture, the mining larva, and the spinning stage, commenting on

the great change in appearance. He evidently had noticed both *P. suffusella* and *sorhageniella*, as he says those moths marked with dark patches are much commoner than those in which the spots are wanting, and he gives both aspen and poplar as foodplants. Speaking of the August brood, he says that a part yield the moth in September, while another part pass the winter as pupæ. In favourable years, he remarks, one still finds larvæ in November, which pupate before winter, though many of them die of frost.

In his "Lepidoptera of Asia Minor" (*Lep. Fauna Kleinasiens*, ii., p. 257), published at St. Petersburg in 1880, Staudinger states, he found mines, doubtless of this species, in white poplar, in the valley of the Kerasderebach. This is the first mention of the species—if it be *suffusella*, by the way—feeding in white poplar. Drs. Steudel and E. Hofmann, in a list of Wurtemberg Tineina (*Jahreshfte d. Ver. f. caterl. Naturk. in Württem.*, xxxviii., pp. 145-162) strike a true note when they say of *P. suffusella*, "throughout the summer among poplars." They are, too, the first to notice that the mines in *Populus tremula* present an especially white appearance. They also mention *Populus alba* as a foodplant.

Sorhagen, in his "Kleinschmetterlinge der Mark Brandenburg" (p. 291, 1886), makes some erroneous statements on the species, the most flagrant of which is that the larva comes out of the mine to make its cocoon. In 1887 August Hoffmann (*Stett. ent. Zeit.*, xlviii., p. 307) calls attention to the peculiar last larval stage, likening it to that which occurs in certain psychids. He gives a fair description of the larva and prepupal form.

By far the most detailed description of the imago, larva, and pupa we find, as we should expect, in the last published matter on the subject. Last year Lüders, in his "Beitrag z. Kennt. d. Lep. Gatt. Phyllocnistis" (*Jahresh. Realschule in St. Pauli, Hamburg, 1900*), successfully establishes his new species *P. sorhageniella*. He described the imagines, body, wings, limbs, scales, in very minute fashion, and the earlier stages in the same way, as far as he appears to know them. One is, however, rather disappointed to find that he appeared not to have studied the previous literature of the subject to any extent. The paper is accompanied by some very good plain plates. The figures are usually excellent, but those of the larva or larval details are certainly poor.

The last mention I can find of this moth is in Tutt's "Practical Hints" (i., p. 70, 1901), but this is not very extensive.

I have omitted one or two purely fannistic references, but Reutti (1898) and Stange (1899) I have not yet had the opportunity of consulting.

Synonymy.—In the *Isis* of Oken for the year 1839 (p. 214), Zeller, in that famous paper "Versuch einer naturgemässen Eintheilung der Schaben," described under the genus *Opostega*, Zell., a small moth which he named *saligna*. This description, however, is so insufficient that but for Zeller's subsequent writings we should still be somewhat in the dark as to which insect he intended the description to apply to. For, though the name *saligna* points, of course, to the willow frequenting species, he makes no mention of the characteristic lines, and he gives both willow and poplar as the foodplants. Again, in the *Isis* for 1847 (p. 894), Zeller describes, in a paper on the insects he met

with during a visit to Italy, a new species of *Opostega* which he names *suffusella*, from a female taken near Lake Agnano, in the neighbourhood of Naples. In the Latin diagnosis he writes:—"Alis anterioribus latiusculis, nitidis albis, flavido suffusis" = anterior wings rather broader, shining white suffused with yellow. In the German description, which follows, he says, "Most nearly allied to *Opostega saligna*. Head and thorax yellow instead of silver white. The forewings are somewhat broader, their white colour is very thinly suffused with yellow, least of all on the costa. In the middle of the wing is a cloudy brownish spot, without any sharp margin; near the base under the fold is a similar shade. The breadth of the wings appears to be the most essential difference. The colour may be individual or climatic."

This is the earliest description we have of *suffusella*, and it seems quite clear that Zeller had in his mind, when he named the species, not the cloudy patches on the forewings but the yellow tint suffused over the whole insect. The words *flavido suffusis* are sufficiently distinctive. This form, then, in which the head, thorax, and forewings are suffused with yellow, becomes the type of the species. It must, I think, be a rather uncommon form, as it is not often mentioned in descriptions of the species. Heinemann says (*Schn. Deutsch., Tineina II.*, p. 708), "More rarely suffused with yellow."

I suggest, by way of convenience, calling the prevalent white form variety *nebulella*, in allusion to the dark grey clouds on the forewings, which are, of course more conspicuous on a white than on a yellow ground.

In the *Linnæa Entomologica* for 1848 (pp. 264-272), Zeller, having recognised that his two species which he had previously described as belonging to the genus *Opostega* had, in reality, little in common with that genus, founded his genus *Phyllocnistis*, characterising it by the smooth head, small eyecaps, rather short wings, presence of labial palpi and the venation, which, by the way, is very different from that of *Opostega*. In the new genus he placed the two species *saligna* and *suffusella*. Under *saligna* he declares that he had previously—in the *Isis*, 1839—confused two species under this name, but now he separates out the willow-frequenting species, describing its chief characters, the narrower wings and the pair of darker longitudinal streaks from the base along the centre of the forewing. For this he retains the name *saligna*, which, he says, is in itself sufficient to show of what species he was thinking when he first described it.

In describing the poplar species, Zeller ignores his own description of *suffusella*, published, as we have seen, in the *Isis* for 1847, and brings forward as the type a form in which the cloudy patches of the forewings are absent. In this description he adds two varieties; the first he calls the common variety *b.*, and characterises it as having a suffused spot on the disc of the wing, and in well-marked specimens a second one behind the transverse fascia, and a third at the base. This var. *b.* is, then, the common form, with fuscous clouds, which I call *nebulella*. The second, var. *c.*, Zeller diagnoses as *alis ant. flavescenti-suffusis*, and states that he took a single specimen at the Agnano lake. This, then, is the above-mentioned yellow form, which, as I have shown, is the earliest described form of *P. suffusella*, and must therefore be the type. The cloudless form, which Zeller made here his type, is, 52 years afterwards, successfully claimed by Lüders as a

new aspen-feeding species, which he names *sorhageniella*, and, at the same time, he takes Zeller's var. *b.* (the clouded form) as the type of the species *suffusella*. Lüders appear to hold that the type of a species is the most abundant form. This may be so of the natural type, but it is usually considered that an author's type is the form first described under the distinguishing specific name.

The synonymy, therefore, would run:—

Opoteya saligna (pro parte), Zeller, 1839.

Opoteya suffusella, Zeller, 1847.

Phyllocnistis suffusella, var. *c.*, Zeller, 1848.

Opoteya (*Phyllocnistis*) *tremulella* (Fisch., M. S.), Heeger, 1852.

One word about Fischer's (or Herrich-Schäffer's) *Opoteya tremulella*. The name, as far as appears to be known, is only found in the "Schlesischer Tauschverein für Schmetterlinge" (*Bericht* iv., p. 21, 1843), but as the name *alone* is mentioned, without any description or reference, it must be taken, I suppose, as a *nomen nudum*. Should, however, a description turn up we may have to substitute *tremulella* for one of the other specific names—perhaps for *sorhageniella*, the aspen-feeder.

Ovum.—As the creature commences its own separate existence as soon as the egg is laid, that moment in its life-cycle may be taken as the starting point.

The ovum, then, is deposited on the leaves of at least three species of poplar—*Populus nigra*, *P. pyramidalis*, and *P. balsamifera*.

The young, somewhat sticky, or viscid leaves are usually chosen. In some instances I have seen leaves selected which were so lately in the bud that the margins were still rolled. The greater proportion of the ova is laid on the upper surface of the leaf, but they may very frequently be found adhering to the lower surface. It may be that the moth finds it easier to place the egg while reposing on the surface than while clinging to the under surface. From a larval point of view, the upper surface may be preferable, on account of the, possibly, more suitable cell formation, and on account of the ribs and veins being less prominent, and, therefore, more easily passed over in the course of mining. The under surface, however, perhaps, has the following advantages:—The larva is better sheltered from either hot sun or cold rain, and less exposed to the attacks of its enemies.

The situation most frequently selected is a point almost touching the mid-rib, and distant about one-third the length of the leaf from the apex. Sometimes the egg is placed close to a lateral vein, more rarely on the plain surface between two veins. I have never seen the egg on the extreme edge of the leaf, neither on the petiole nor on the bark of the twigs. The ovum is laid singly, though I have found two side by side, but not in contact. One egg on each surface of the leaf appears to be the best possible, though such large leaves as we sometimes find on the balsam poplar can accommodate two larvae on each surface. On one occasion I found five eggs on one very small leaf of a Lombardy poplar, but even then they were all laid separately, not packed side by side like the ova of *Giracitoria syringella*, nor imbricated like those of *Yponomeuta vigintipunctatus*, both of which species begin life by mining into the leaves of their respective foodplants.

The ova of *Phyllocnistis suffusella*, though minute, are really conspicuous, especially when new, owing to the milk-white colour, which

shows well in contrast to the greenish yellow tint of the young leaves to which they are attached. The ovum is, as we should expect, of the flat type, but it has evidently, from its fairly regular shape and slight sculpturing, made some advance on the primitive form of the lepidopterous ovum. When laid on a flat surface it is convex in shape, ovoid in outline, one end not being perceptibly narrower than the other. The egg is large, I think, for the size of the moth, the longer axis being about 0.4mm. in length, the shorter 0.25mm.; the height of the egg is about 0.1mm. The sculpture, which is sometimes difficult to see, consists of raised lines running irregularly over the surface, occasionally forming hexagonal cells. In some ova I have noticed a slight prominence at one end; this may be the micropyle. Though I have not actually seen the micropyle, I think there can be no doubt about the egg being of the flat type, as I have stated. The shell is delicate, and has a rather smooth appearance when new, but becomes loosely wrinkled before the larva hatches out. The colour is silvery grey with a bluish tinge, the egg appearing milky to the eye, but under a lens sufficiently transparent to admit of the veinlets of the leaf being clearly traced beneath the shell.

A certain time before hatching the egg loses its milkiess, and the shell, becoming transparent, displays the young larva coiled up in the interior. The head, which is very large, occupies almost the anterior half of the egg. The body, following the contour of the egg, is bent round, the posterior abdominal segments resting on (that is, above) the left lobe of the larval head. The jaws and muscles of the head are very conspicuous, owing to their dark amber colour. The dorsal vessel is plainly seen, occupying the centre of the dorsal area from the second thoracic to the fifth abdominal segment, the larva lying dorsum uppermost in the egg. The larva at this period is practically colourless, but at first sight it appears green, on account of the colour of the leaf on which the egg rests showing through the transparent body of the little caterpillar.

LARVA.—On examining a larva taken from the egg just before hatching, the first things to strike the observer are the size and great prominence of the amber-coloured jaws and the strength of the muscles which control their movements. These portions of the head remain, indeed, the most conspicuous parts of the larva throughout the three mining or feeding stages. The head is wide and very flat; in profile wedge-shaped, not unlike the head of a Nepticulid larva; posterior portion embedded in the prothorax. The clypeus is wide, lobes rather narrow, not meeting above. Antennæ large, apparently three-jointed, terminating in two points, of which the outer is the larger. Just below the antennæ two small hemispheres are visible. These are, doubtless, ocelli. The bi-lobed labrum is large, and closely covered with short bristles, and thrust forward in front of the head in a marked manner. Below the labrum are the very large mandibles, each one consisting of a strong, curved outer tooth, attached to an inner serrated blade. When at rest the blades of the mandibles slightly overlap. Below the mandibles the labium is situated. It is also furnished with bristles, and is more clearly bilobed than the labrum. To the bases of the mandibles are attached very strong tendons, two branches to each mandible, the inner running beside the œsophagus and the outer passing under the lobes of the head into the prothorax, where

they take a somewhat sudden turn outwards, and terminate in root-like points of attachment. The segments of the thorax and abdomen are distinctly marked off from each other, the ninth equally so from the tenth. They are much flattened ventrally and flattened dorsally. The prothorax is wider than the head, the meso- and meta-thorax tapering down to meet the much narrower abdomen, which, taken as a whole, is decidedly spindle-shaped. The second, third, and fourth abdominal segments gradually increase in width, while the rest narrow down to the thimble-shaped tenth segment. No anal flap is visible, but the tenth abdominal segment shows a sulcus, which foreshadows the bifid termination of the later stages. In the larvæ of this stage I examined I could find no trace of legs, prolegs, nor of the fleshy processes which afterwards appear on certain of the segments. Neither could I discover a single tubercle nor bristle on any part of the larva, except those mentioned in describing the head. Even the antennæ have no bristles.

I am unable to state the duration of the egg stage, but fancy it is about ten days in warm weather. On hatching, the larva pierces the base of the eggshell and the epidermis of the leaf lying immediately below the eggshell. It, at the same time, begins to feed on the juices of the leaf, mining its way, in about two hours, under the eggshell into the leaf, thus never coming in contact with the outer atmosphere. The eggshell is not eaten by the larva, neither is it filled with excrement, like that of a Nepticulid. It therefore collapses after a time, but generally remains adherent to the leaf, and its oval outline may usually be traced even in quite old mines. Heeger makes the curious statement (*l.c.*) that the larva comes out of the egg, and, after hardening itself in the air, enters the leaf. Possibly he noticed that the leaf cuticle in front of the egg was often broken, and imagined the larva entered there. For the next two or three days the larva has nothing to do but to eat, or, more properly speaking, to drink up the juice which it liberates from the leaf cells. To obtain sufficient juice for its requirements during this time it has to mine a space about two inches long by $\frac{1}{100}$ inch wide. By the time this is accomplished the larva has much altered in shape, owing to the thorax, which in the egg was laterally compressed, developing to a width of at least three times that of the head. The mesothorax is now the widest part of the larva. The first abdominal segment is still very narrow, and the tenth retains much of its former size. In profile the thorax forms a kind of hump, and the abdominal segments gradually taper away. The head, remaining its old size, does not any longer appear so disproportionately large. The little larva, for it is not quite 1mm. in length, now rests in the mine for about twenty hours, after which period the first ecdysis takes place. Unfortunately, I have never actually seen the process begun. I believe the old skin splits across the mesothorax, the widest part, and the larva, withdrawing its head from the old skin, immediately begins feeding, mining a little to one side of the old head, which remains wedged in one side of the mine, where it may still be found weeks afterwards. As the larva continues its progress it withdraws the abdomen from the old skin, which, being exceedingly flimsy, is soon lost to view. The larva has now entered on its second stadium, and unlike many "micro" larvæ, continues its mining habits as before, but it, naturally, makes a somewhat wider

mine. In appearance it is very much changed. It forms a link between the first and second instars, resembling the young larva in the form of the anterior segments, and the older larva in that of the posterior. The head remains practically the same in appearance. The thorax is not quite so wide in comparison with the rest of the body, as it is in the first stage. Certain of the abdominal segments, I think from the second to the seventh, have on each side a papilla directed upwards and backwards. The eighth abdominal has, instead, a fleshy cone on each side, if not two; the ninth, which is very narrow, is similarly furnished; the tenth is very remarkable, being flat, very narrow, very long, and terminating in two points. In this stage, also, the prothoracic shield first appears. After feeding for two and a half or three days, the larva again rests in the mine to undergo the second moult. The process is accomplished in a similar manner to that above described, except that we notice that the prothorax, with dark shield, comes off attached to the head. The larva now enters upon a very important stage in its life-history, for it is in this third stage that by far the greatest amount of material is assimilated by the larva, and any deficiency of vigour during this stage cannot afterwards be made good. Almost at the commencement of this period the larva causes the mine to assume its wide, ribband-like, glistening, characteristic appearance. Hitherto the slender mine might easily be mistaken for that of a young *Gracilaria*, but now the hungry larva mines right and left on each side as well as directly forward, keeping, however, always on the surface of the parenchyma, and the result is that it leaves behind it the special type of mine peculiar to *Phyllocnistis*. As the larva only consumes the fluid contents of certain cells, never, when quite healthy, any of the more solid portions of the leaf, it requires to mine over a considerable area before obtaining sufficient nourishment to bring it to perfection. The slender portion of the mine formed during the first and second stadia is usually about four to five inches in length, but the wider part, cut during the third stage, runs to a length of sixteen inches or more, so that a healthy normal mine is, when completed, usually not less than twenty inches in length. Yet the small creature that traverses this distance at the rate of three inches a day has no feet. The duration of the third stage is about five days, at the end of which period the larva has generally mined its way to the edge of the leaf. It now continues the mine parallel with the leaf edge for a space equal to its own length, and of an elongate oval form. In this space it subsequently forms its cocoon. In this, the last feeding stage, the larva attains the length of over 5mm. The wide, flat head, with its prominent wheel-like jaws, bears the same characteristics as in the two previous stages, but is larger. The prothorax now bears a distinct dark brown or blackish mark placed transversely on the dorsal posterior portion. This mark is, however, entirely wanting, as regards the colour, in those larvæ which mine on the underside of the leaf, except in very rare instances when the underside is exposed to the light. When present it forms, together with the amber mouth-parts, by far the most conspicuous parts of the larva. The dorsal vessel is yellowish, often becoming greenish towards the posterior half. The rest of the body might almost be described as colourless. It shows, however, a pale bluish grey when placed against a white background. The segmental incisions are very well marked,

except between the ninth and tenth. Compared with the previous stages, the larva is now more cylindrical, the prothorax being about twice the width of the head, mesothorax rather wider, and metathorax rather narrower. The first abdominal segment is very narrow still, the following segments increase in size to the fourth, which is the widest. Then they decrease gradually to the eighth. The ninth is very much narrower than the eighth and the tenth, half the width of the ninth and very long, terminating in two long points. If viewed in profile the head appears long, wedge-shaped, and partly retractile in the prothorax, which is much wider and deeper than the head. The segments gradually increase in depth to the second abdominal, and then slowly taper right away to the end of the terminal forks. The skin is very delicate and elastic, showing soft wrinkles whenever the larva moves about. The dorsum of the larva is fairly smooth, but there are wide lateral ridges; the venter is also rather smooth, though it shows certain depressions. In the lateral ridges the very small spiracles are deeply embedded. They are very difficult to observe, but if we take a killed larva, cut it in half, and carefully roll out the contents of the skin, we can easily see the tracheal tubes and the branches from them to the spiracles. From the lateral ridges rise on certain of the abdominal segments—Lüders says from the first to seventh—small fleshy cones, which appear to be retractile. While the larva is in the mine these points may be seen in contact with the leaf cuticle above them. The eighth and ninth abdominal segments carry each four long, partly retractile, fleshy cones, two situated dorsally and two ventrally, so that, viewed in section, these segments appear like a four-rayed star. It is not always easy to make out the ventral cones. These eight long, fleshy points are kept in contact with the mine, and are of great service to the larva in keeping it firmly anchored in position, acting as a thrusting-block while the larva feeds. They are also used in progression, as Albarda remarks (*l.c.*). Of the curious tenth abdominal Lüders gives such an excellent description that I feel bound to translate it (*l.c.*, p. 26):—"Tenth of extraordinary length, fully as long as the three preceding segments, narrowed down towards the posterior, flat, with a longitudinal furrow, so that it appears as if it were formed out of two parts grown together; it terminates as a fish's tail in two outwardly directed points." Every writer on the subject says the larva has no feet, and I believe that to be true, except in the last stage, as the larva always appears so perfectly helpless when taken from the mine. Nevertheless, there are some very suggestive furrows and depressions on the abdominal segments, which usually carry prolegs in other larvæ. When the larva mines on the under surface of a well-hidden leaf it is so perfectly colourless that it reminds one rather of a beautiful marine creature than an inhabitant of the dry land. The dark thoracic patch is then absent, and even the mouth parts are almost devoid of colour.

COCOON.—As soon as the larva has completed the work of mining out this space which is to become the cocoon, it stretches itself straight out, so that the head comes in contact with one end of this oval space, and the tail with the opposite boundary, the body of the larva lying parallel with the edge of the leaf. Now is the time to determine the sex of the larva, for the creature has not yet lost its transparency, though some of the internal organs appear to be gaining in opacity.

If a male we may see the testes, two oval bodies, one on each side of the fifth abdominal segment in the dorsal area. The larva, however, at this stage very soon loses its beautiful transparency, assuming a waxy appearance. In the position described it remains motionless for a period of 24 hours. Hoffmann (*l.c.*) also gives 24 hours for this rest, but Lüders (*l.c.*, p. 26) says "about two hours." Considering the great change which now takes place, I doubt whether the period, even in the most propitious circumstances, is ever so short as two hours. When lying thus, the thin upper skin of the leaf comes in contact with the sticky dorsal skin of the larva, and, as the moisture begins to evaporate, adheres to it, in the same way that a thin piece of paper will adhere if laid over wet glass. It may be asked, Why does the moisture in the mine begin to evaporate? While the larva continues to mine juice is constantly supplied by the cells cut open by the larva, and moisture is also excreted by the larva itself. When, however, the larva becomes quiescent, both these supplies fail, if not entirely, at any rate in such a degree as to be unable to keep pace with the natural evaporation going on. As the loosened upper cuticle of the leaf, with the larva adhering to it, dries, it slightly buckles the mine, lifting the central portion of the larva up with it. While this is proceeding, the larva, in its strange new form, may be seen inside the now effete, still outstretched, old skin, shrinking to the proportions normal to the spinning stage. It withdraws the head and tail away from those portions of the old skin, which appears to be firmly wedged into the angles formed at the circumference of the mined space by the upper and lower surfaces. At the end of the 24 hours the cervical and thoracic portions of the old larval skin appear to split off from the remainder, and the head of the new larva appears. As soon as the head is well freed from the old skin the "præpupa," as the larva has been called at this stage (*i.e.*, the prepupal stage) commences to line the lower surface of the mined space with silk, incessantly passing its head from one side to another, the threads running across the cocoon, more or less at right angles to the body of the larva. While incessantly spinning, it gradually withdraws its body from the old skin. The larva in its fourth instar is so very dissimilar from its previous appearance that the first time I observed it, not having read the literature on the subject, I opened the cocoon to see how long, I think, it would take me to execute vengeance on that horrid ichneumon. Perhaps the most noticeable characteristic about the larva in the spinning stage is its extraordinary activity. The apparent eagerness with which it commences to spin, and the energy it displays during the work are really astonishing. The only thing I have seen at all equal in activity is the young larva of *Gracilaria stigmatella* building its first cone at the apex of a young willow leaf. Before long the præpupa turns its attention to the upper surface of the cocoon. This it lines in the same manner, passing the spinneret rapidly from side to side. Here its legs and the adhesive discs of the thorax come plainly into view as it clings to the upper surface of the cocoon. In about ten hours the cocoon is complete, and in another ten hours the larva has thrown off its spinning dress and donned that of the real pupa, which is already so fully formed that it can wriggle actively in the cocoon.

PRÆPUPA.—The prepupal form of the larva is more cylindrical when viewed from above than in the three previous instars, though,

as Lüders remarks (*l.c.*, p. 27), the last four segments narrow down considerably. It is of a beautiful fresh, milk-white colour—under the microscope it appears snow white, almost glistening. It is covered to a great extent by a fine pile, which gives it a sort of frosted appearance, or, as Bacot better describes it (Bacot, in Tutt's *Brit. Lep.*, i., p. 38), "something like a coating of short, pointed spines." Head partly retractile in the prothorax, convex, of more normal appearance. As Heeger and Albarda say, it has the appearance of being divided into three equal parts. In the two depressions are two hemispheres which the above writers say are the eyes. The parts of the mouth are quite altered. The large mandibles are gone from above, and a spinneret has appeared below. On the thoracic segments are various furrows, which may be vestiges of thoracic plates, and less extensive furrows occur on the abdominal segments. In these latter, Lüders says (*l.c.*, p. 27), "There is a large anterior and a small posterior tubercle." This looks very like trapezoidal tubercles. The sides of the second to ninth abdominal segments carry nipple-like warts, large on six and seven, very small on eight and nine. Heeger (*l.c.*) calls these "Haarwärtchen," and Lüders states (*l.c.*) that these, except those on the eighth and ninth, are tipped with a bristle; but, if so, it must be a very minute one. The tenth abdominal segment terminates in two blunt cones. Viewed in profile the spinning larva has a strong superficial resemblance to that of a Nepticulid. The thorax is very deep, especially the metathorax, the body fairly cylindrical, but the last four segments run to a blunt point. On the venter we see on the meso- and meta-thorax two large ovoid "walled foot-like balls," as Lüders calls them (*l.c.*), and on the third, fourth, fifth, and sixth abdominal segments a pair of small dimples, in the position where the legs of normal larvæ appear. These balls are just like those in a similar position in the larva of *Nepticula centifoliella*, and are used in the same way. From the pair of discs on the abdomen the larva can, and does, protrude primitive prolegs. In *Nepticula* these prolegs appear to be simple "membranous prolongations" (Tutt, *Brit. Lep.*, i., p. 163), but here they appear more as retractile cylinders placed on sunken discs. The Nepticulid has the prolongations on abdominal segments two, three, four, five, six, and seven; here they are normal in position, but are also without any kind of hooks. It is little use seeking for these prolegs in a dead larva; we then see only the depressions, but if we watch a larva spinning silk over the upper surface of the cocoon we can easily see how it clings on by means of the two thoracic discs and the four pairs of abdominal prolegs. I have also seen these prolegs when I have had the larva on a glass slide, but the little creature is so terribly restless when alive that it requires a very great amount of patience to make or confirm any observation.

PUPA.—Of the pupa Lüders says it belongs to Chapman's pupæ-incompletæ, with no free segments, but in the next line he describes the movements of which it is capable. The position occupied by the *Phyllocnistis* pupa in Dr. Chapman's classification is as follows (*Trans. Ent. Soc. Lond.*, 1893, p. 118):—"Division B.—Incompletæ, appendages often partially free. Sub-division 2.—Pupa free to move and emerge from cocoon. Section a.—Larva concealed feeder, often miner. Sub-section 1.—Free segments five and six in female, and five, six, and seven in male." It is difficult to make out the pupal

morphology in such a small subject as *Phyllocnistis*, and I have to thank Dr. Chapman for his kindly aid. The pupa is slender, with a rather wide metathorax. The abdominal segments very well marked, except the eighth, ninth, and tenth. The posterior margins of the fourth, fifth, and sixth abdominal segments are much thickened and roughened. The limbs are not fixed firmly to the body. The antennal cases reach to the centre of the fourth abdominal segment. Coming out below these the third pair of legs is visible, and reaches to about the centre of the fifth abdominal. The cases of the forewings are narrow, and just reach the fifth abdominal segment, so that the cases of the third pair of legs form the terminal portion of the limbs. The spiracles are very small and oval in outline. The headpiece is armed with an S-shaped hook, below which, on either side, are two blunt knobs. The space between the hook and the knobs bears a serrated ridge. The pupa, viewed dorsally, has several peculiarities. On the dorsal headpiece are two warts. On the mesothorax are two bristles directed outwards, and a slight ridge down the centre. The metathorax carries six warts arranged in three pairs, two of them bearing bristles. The first abdominal has two large and two small warts. On each side of the anterior of the second abdominal are two large raised cylinders capped by a hemisphere, out of which springs a very large, stout, whitish bristle, directed outwards, almost at right angles to the dorsum, with a forward sweep. If the pupa be laid on its back these bristles support it most firmly, on the same principle as the legs of a wheelbarrow. On the third, fourth, fifth, sixth, and seventh abdominals these cylinders and bristles become lateral and much smaller. On the eighth abdominal they are present, but abortive. The second to the seventh abdominals are each armed with a series of short, strong black hooks, directed backwards, down the centre of the dorsal area. The third to the seventh also bear, in addition to the dark hooks, which are part and parcel of the pupal integument, a large pair of very different whitish hooks, directed backwards and outwards, and which rest on whitish sockets. The bases of these sockets may be traced some distance below the skin. Possibly they may be connected with the inner pupal envelope, and the moth, in emergence, may be able to exercise some useful control over their movements. On the sides of the ninth abdominal (I believe it to be the ninth) are two large, pale, sharply-pointed cones, only partly diverging. The tenth abdominal is rounded, but has a slight groove, reminding one of the same segment in the prepupal form.

EMERGENCE.—The elaborate armature of the pupa forms, altogether, a most efficient apparatus for bringing the insect safely from the cocoon into the light of day. The actual emergence of the moth is, I believe, brought about in the following manner:—Lying on its back in the cocoon, the moth, still in the pupal skin, is held in position by the bristles, of which the lateral keep the abdomen fairly in the centre of the cocoon, whilst the long dorsal bristles of the second abdominal segment prop up the head and thorax so that the head presses against the upper surface, or roof, of the cocoon. A thrust is now given by a lateral movement of the abdominal segments which rest on the lower surface of the cocoon. The dorsal hooks on one side passing in a forward direction over some of the silken cross-threads which line the lower surface of the cocoon. These hooks, once having passed over

the threads, cannot, from their conformation, slip back again, and so are held fast. The movement is repeated, and the hooks on the opposite side of the dorsum advance in like manner, till the crook on the headpiece of the pupa is pressed so hard against the roof of the cocoon that it snaps off, leaving a sharp, straight point on the pupal head. Perhaps the jerk of breaking causes the point to pierce the cocoon. In any case, the advance of the abdomen thrusts the point through, and the serrated edges of the head armature, aided by the lateral movements of the pupa, soon cut a clean transverse slit in the roof of the cocoon. The abdomen continues its forward movement until more than half the pupa is thrust out of the cocoon. By this time the struggles of the moth rend the pupal skin, which splits transversely across the thorax. On dehiscence the headpiece, clypeus, and mouth parts come off in one piece, but are held to the rest of the pupa-case principally by the antennæ, which separate out partly, but are attached at their base and apex. The limbs are then withdrawn from their sheaths, and the moth, finally escaping from the pupal shell, seeks a convenient point, to which it clings, while the wings rapidly expand, and the living gem assumes all the glories appertaining to the species.

THE MINE.—In sketching the above rough life-history I have partly described the normal mine. The cuticle, severed from the leaf by the larval jaws, remains loose while the larva is beneath, but as it advances it ejects the digested fluid from the anus with such force that it spreads over or floods the space immediately behind. This causes the leaf cuticle to again adhere to the parenchyma, and the wave-marks of each ejection may often be traced in an old mine. In perfectly normal mines no central excremental line appears. In some cases such a line does exist in a portion of the mine. It may arise from an ill-grown leaf, or from a defect in the larva's jaws. In one very marked case I found the point of the right mandible was slightly deflected, and morsels of the more solid portion of the leaf were cut off and thrown into the mine. The larva appeared to have no choice but to swallow them with the juice, and as long as they were very small the pieces passed through without, apparently, any harm being done. But one morning this larva seemed to be in trouble. It lay still in the mine, and I saw quite a large black mass, microscopically speaking, lying in the cloaca, which was much distended. However, the next day it succeeded in passing the obstruction, and again began to feed. Two days after it was still feeding, but the next day it was almost dead, and it never recovered. The larva has the power of passing from one leaf to another by extending the mine down the petiole, along the twig under the skin of the bark, and up another petiole into a leaf. I must admit I have only observed this in captive examples, and then only in three instances. However, we should not, I think, be surprised to find that a method habitually adopted by one species should be occasionally resorted to by another closely allied species. I think *Phyllocnistis saligna* normally passes from one leaf to another, a single leaf not sufficing for its full nourishment; but on this species I have only made very few observations. I first noticed this occur in *Phyllocnistis suffusella*, by observing that two larvæ from mines in small leaves which I had marked were missing. As they are, however, often difficult to detect, I supposed I had overlooked them. These mines, nevertheless, did not progress, and yet there was

not the slightest trace of a dead larva. Subsequently I was surprised to find part of a mine and a cocoon lower down on the same twig. When I examined this leaf a few days previously there was neither mine nor egg upon it. It appeared strange, but it was not till later that I connected the two events. On a later occasion—August 2nd, 1901—another larva was missing from a mine, and this one I traced into the petiole of the leaf, and found it about a quarter of an inch below the base of the leaf. The next day this larva had mined down round the leaf-stalk, and was brought up against a small leaf bud. The following day (August 4th) the larva was mining at the base of the petiole of another leaf, as though about to enter the leaf. On August 5th the larva had continued the mine down the twig instead of ascending into the leaf. August 6th, the larva was dead in the mine. It had mined down the stem below the water in which I kept the twig, and was drowned. As above mentioned, the eggs are often laid on very small leaves—too small for a larva's wants—but I fancy these leaves continue to grow while the larva mines. If they do not do so the larval habit of travelling from one leaf to another must be of common occurrence. However, I have seen hundreds of larvæ, and have never observed this travelling in a state of freedom. A larva will always avoid crossing the mine of another, but where there are two or more in a small leaf this becomes inevitable. Should a larva, in crossing another mine, come in contact with its inmate it is certain to kill it, not purposely, but incidentally, in the course of its operations. There is no hope for the victim once its delicate skin comes in contact with the intruder's jaws.

PRO-THORACIC SHIELD.—The dark brown ovoid patch on the larval prothorax is worthy of notice. It may be connected with a prothoracic shield, but I am scarcely inclined to think its colour is. I view it rather as of sematic significance. First of all, it only occurs on those larvæ which, by their position, are exposed to the light, and, therefore, more likely to be seen by their enemies. Secondly, it is situated not immediately behind the head but on the posterior portion of the prothorax. This mark is absent in the first instar, but clearly visible in the second, whilst in the third it appears in full force. The colour may simply be due to the access of light, light being, as Wood remarks (Tutt, *Brit. Lep.*, i., p. 170), "the most general and potent factor in the production of pigmentation," and, certainly, I think light is in this case the direct cause, for if we take a young larva mining the underside of a leaf and turn the leaf so as to expose the underside to the light, the colour in the patch will appear in the third instar. I have proved this by direct experiment, and have also noticed one case (September 13th, 1901), where a larva mining on the underside bore the black patch. The leaf in which it mined was so situated that the undersurface was exposed to the light. The first time I noticed this patch I passed the larva by, as I thought it was diseased. When a larva dies in the mine dark patches often appear, the result, perhaps, of a growth of some micro-fungus. Therefore, I fancy this dark patch may be something of the nature of a warning colour, like the black sunken patch in the larva of *Stauropus fagi*, as mentioned by Poulton (*Colours of Animals*, p. 281), a warning, for instance, for a parasite that the larva is moribund, and therefore useless for its purpose.

STAUROPUS FAGI.

(Read January 7th, 1902, by A. W. MERA.)

When I promised to read a few notes on *Stauropus fagi*, I was under the impression that I might produce a few details connected with the species that were not generally known, but on looking up the subject a little I find that a most exhaustive paper was read at this society some years ago, leaving no point of interest untouched.* Under these circumstances, all that is left to me is to repeat, in a somewhat curtailed form, what has already been said, hoping that some of the members, like myself, have not kept in touch with all that has passed. I believe the late W. H. Tugwell was the first to record the fact that the young larvæ of *S. fagi* eat nothing but the shell of the egg they have just left until after the first moult. Since that time I have bred them from the egg once or twice myself, and I could not detect that anything was eaten for that period, with the exception of the eggshell. It certainly seems very mysterious that a larva should exist for so long, and nearly double its size, on the one meal which it takes immediately after hatching. I remember reading that Mr. Tugwell said he watched his larvæ most carefully, and was perfectly certain as to his observation, but although I am quite sure no part of the leaf is eaten, I still think it possible that the larvæ may obtain some nourishment from the hairy stalks of the young shoots of the beech. I have repeatedly seen the larvæ resting on the new shoots of the beech, which are covered with what might be described as fine down, with their front legs moving in a manner which would suggest feeding, although nothing appeared to be missed from the twigs. I have not tried the experiment of depriving the larvæ of their first meal of shell, but probably it is a necessary tonic. I know that with *Andria (Dicranura) vinula* it is necessary for the larvæ to eat their cast-off skin, and when I have deprived them of it they have invariably died.

The larva of *S. fagi* is a most remarkable creature, with its long forelegs, and more resembles an ant than a caterpillar, and is quite unlike any other British larva. In confinement the larvæ require plenty of room, as they are very much given to fighting, and very soon lose their front legs in the struggle. In one batch that I had, several lost one or more of their front legs, and although I did not keep the wounded ones separate, when the moths emerged I had several which only had stumps for their front legs, with the first joint and claw missing. These had great difficulty in supporting themselves in a position for their wings to dry. I am really not prepared to say whether the forelegs of the larva produce the legs of the moths, or whether the above was simply a coincidence. Mr. Hamm tells me that the larva has the power of ejecting a strong acid. He says, "as I was once made painfully aware when I accidentally squeezed one, and some of the fluid went into my eye." He also tells me that the larvæ

* "Notes on *Stauropus fagi*," by A. F. Bayne, "Transactions" for 1893, pp. 4-13.

are very fond of moisture, and that when changing the food they go to the end that has been in the water and drink the moisture, but I should say that habit was not confined to *S. fagi* only, as I have noticed various larvæ do the same when kept in confinement. The favourite food in nature is undoubtedly beech, but the larvæ have been beaten from oak, birch and nut. Last year Mr. Burrows had one brought to him which had been found feeding on whitethorn, from quite near the town of Brentford. St. John gives apple as a food-plant, and in confinement they will eat maple and sycamore. In beech woods they may be found by diligently searching the lower branches.

The probable method of pupation would be among the dry leaves of the beech which lie so thickly in any hollows under the trees. Newman says that the larva spins the leaves of the oak together to pupate in, and that when the leaves fall from the tree they form a kind of parachute to convey the pupa to the ground without any damage. My own opinion is that the larva finds its way down the tree before pupating, as they evince all those wandering habits which are so general in most larvæ before they spin up, and they have been found by Mr. Holland in the beech woods at Reading on the ground in search of a suitable place in which to pupate. It is true they are very fond of spinning the leaves together, and when bred in confinement I have usually placed the larvæ which are ready to spin in small boxes with plenty of leaves, and they more often than not prefer to form their cocoon with a leaf top and bottom.

The substance of which the cocoon is formed of is more in the nature of a gum than of silk, for when the leaf is removed which forms the outer covering, all the veins of the leaf are represented on the substance of the cocoon, as shown in one or two examples which I have exhibited.

In rearing *S. fagi* I have always found by far the heaviest losses occur in the pupa stage. The larvæ as a rule feed up without any trouble, provided that they are allowed to have their first meal of egg-shell; but the pupæ have a way of drying up when the moth is fully formed, and I have not yet been able to find a really successful way of treating them. Out of a brood of rather over twenty I bred five moths, one of which was a cripple, and on opening the remaining pupæ, I found they had dried up with the fully formed moths inside. In one or two cases the front of the pupa was a little cracked, from which it would appear that the moth had made efforts to emerge but was not successful. Another time I had a brood of about the same number, and in this case the larvæ were evidently bent on getting out the same year, as they grew very rapidly and did not attain quite the same size as my previous lot. These all emerged in August and it was a most successful brood. As they were so short a time in the pupa, I imagine they had not had time to dry up. I believe it is no uncommon thing for part of a brood to emerge in August and part to come out the following spring, but I have not had that occur with any of my broods.

There is no doubt that the species is nowhere more abundant than in the large beech woods near Reading, Marlow, and other places along the ridges in the Thames Valley; but away from beech woods it would be considered rare. Epping Forest is another favourite locality, and I have taken it at Brentwood, in Essex, and Mr. Studd tells me he takes

one or two males each year in his moth trap near Exeter. Once, when I was quite a boy, I took one at Hammersmith, I should think about the year 1864. The specimen was taken resting on the side of the house, and it is still in my cabinet. There were certainly no woods in the neighbourhood in those days, but the country was fairly open, and as apple is said to be one of its food-plants it may possibly have fed up on that tree, as there were plenty of gardens and orchards at no great distance. The most northerly locality in which I have any knowledge of recent captures is Wyre Forest, on the borders of Worcestershire and Staffordshire, where a specimen was taken by Mr. A. J. Hodges, in June 1898 or 1899. It was resting on a small sapling oak with the wings almost wrapped round the tree. Mr. Massey tells me there is one recorded for Yorkshire about 40 years ago, and one for Lancashire, but with those exceptions it must be considered quite a southern insect. I saw one exhibited at the South London Entomological Society some years ago, which was taken by Mr. Kane in Ireland, and at the time he said it was the only Irish specimen known to exist. It was remarkable for being much lighter than the general run. Mr. Horne and Mr. Cannon both say they have never seen or heard of a Scotch specimen.

I understand that in the Reading district they show a preference for resting on small trees, also that when one is found it frequently happens that one or more are found in close proximity. The only time I ever took the species at Brentwood, after taking one male, I remembered having heard of their congregating propensity, and with considerable searching I took another male a few yards from the first. Mr. Studd tells me the only time he ever took them in Epping Forest he found two, male and female, on the same beech tree, not touching each other, but head to head, following the length of the tree.

From Mr. Hamm I learn that the earliest date on which it has ever been taken in the wood round Reading was April 25th, and it has been found from that date until July 18th, in varying intervals according to weather, etc. He says "I have known them to occur quite plentifully in some seasons in the middle of May, and then perhaps hardly one would be seen for a fortnight or more, when there would be a burst again, and then, perhaps, they would occur sparingly into July." Mr. W. Barnes found one in Sulham Wood on November 6th, 1891, and Mr. W. Holland found two in Chazry Wood, on November 4th, in the same year. These captures undoubtedly formed part of a second brood. The earliest date on which Mr. Burrows has taken them in the Brentwood district, was on May 23rd, 1893, and the latest July 4th, 1886. Strangely enough, my only record for Brentford was on the very day before Mr. Burrows took his earliest, being May 22nd, 1893. I believe the dark form was first taken by the Rev. B. Smith, at Great Marlow, Buckinghamshire, by assembling. Mr. Hamm tells me it was not taken at Reading until 1891 or 1892. In the latter year the species was very abundant and a large number were taken by Mr. Holland and Mr. Clarke. Mr. Burrows took the black variety at Brentwood as long ago as June 12th, 1886. In the Reading district I am told the dark form occurs on an average of one to every eight of normal colour, and there are also intermediate forms. Mr. Clarke seems to think the dark form has increased somewhat during the last five or six years, but it may be that he has become more expert in finding them. I am told that about Reading the dark ones are far

better protected on the dark beech trunks than the typical form, for when once you have been accustomed to finding them the latter can often be seen at rest some distance off, but the darker ones are only seen by most careful searching. I am a little surprised to hear that the dark ones are considered to be better protected than the type in the Reading district, but possibly the trees there assume a somewhat different tint from those I am best acquainted with. I know at Brentwood the type is very well concealed. They are to be found at various heights from the ground, the average would be about four to five feet, sometimes less, and sometimes as high as ten or twelve feet.

In looking through the Doubleday collection I find there are no dark ones whatever, and Newman has made no mention of that form, and as I have always heard that Newman had the late Frederick Bond's collection at his disposal when compiling his "British Moths," I think we may be safe in concluding that the black form is a modern development.

The habit which *S. fagi* has of resting with the underwings protruding beyond the costa of the forewing is very unusual, although it is not confined entirely to that species, as two or three other species which are of widely different genera, such as *Smerinthus ocellata*, *Amorpha populi*, and *Eutricha quercifolia*, exhibit the same tendency. In all cases, the part of the lower wing which is exposed to view has, to some extent, the pattern of the forewing, but the part which is covered has no trace of it. I have exhibited lower wings of both *S. fagi* and *S. ocellata*. In a paper read by F. Merrifield at the Entomological Society in 1899 there are some interesting observations on the larvæ of *S. fagi*, an extract from which I will give here. The paper was entitled "Experiments and Observations upon the Susceptibility of Certain Lepidopterous Larvæ and Pupæ to the Colours of their Surroundings." It runs:—"Mr. W. Holland and Mr. A. H. Hamm, of the Hope Department, who are extremely skilled and accurate observers, drew my attention last year (1898) to the fact that the larvæ of this species differed in tint according as they are reared upon beech or birch, and that the colours are in each case such as to conceal them. During the present year Mr. Hamm reared two batches (from different parents) upon the same foodplant, beech, but in other respects under very different conditions as regards environment. One of the batches was reared in a white, tissue-lined rectangular case, with a perforated zinc lid, the other in a similar case, lined with black tissue paper. We compared the two, placing both batches on white paper, on July 13th, 1899. There were 24 larvæ in the batch reared in the white case, and of these all but two were in the last stage, and mostly advanced in it. All but one were *much* lighter than the larvæ of the species usually met with in nature, and some most markedly lighter. The other batch consisted of fourteen larvæ, of which ten were in the last stage (mostly advanced), one in the last but one, and three in the last but two. All were very dark, and most of them far darker than those generally met with in nature. It is clear that this species is highly sensitive, and it would be of great interest to repeat the experiments under conditions which have been found in other larvæ to produce the strongest effects. It is remarkable that such considerable results followed from surroundings which were not apparently in contact with the larvæ, for these, at any rate when they were examined,

rested upon the twigs and not upon the walls of the case. I do not think, in any of the previous experiments with larvæ, that equal effects have been produced in this manner, and one is tempted to inquire whether it is possible that the larvæ, in earlier and specially sensitive stages, did not actually rest upon the black and white walls of the case."

I confess I am not cognisant of the conclusions at which Mr. Merrifield arrived from the above experiments, but it would seem that the evidence goes to show that there must be a power at work besides natural selection in bringing about those forms of insect life which so closely resemble their immediate environment, as in the above experiment there is a strong tendency to assimilate to environment, without the influence of heredity entering into the question, which in "Natural Selection" is an all important factor.

I will conclude by saying that I hope I have not tired the members present by a repetition of facts which, doubtless, many of them have heard before, but of those who have I will ask their indulgence.

AFTER LEPIDOPTERA IN BRITISH GUIANA IN 1901.

(Read February 18th, 1902, by W. J. KAYE, F.E.S.)

This is a holiday paper, and must be looked upon as a fill-up, as it were, to our programme, for want of sufficient solid matter. I have chosen a somewhat wide-embracing title, and I suppose I should be within the meaning of the Act if I began with the vicissitudes of the journey on the way to British Guiana, and describe the horrors or elysiums of the first three days out. Those who already know themselves to be bad sailors would probably never be induced to go so far afield, so I shall not be guilty of putting them off if I tell them that the sea was just the reverse to the surface of a billiard table, and only ten people out of 70 turned up for meals on those three first days. However, Barbadoes was reached on the twelfth day, and, after transshipping there, Georgetown was but another two days' journey. Georgetown is literally below the level of the sea, and in times past, when the drainage was not all that it should have been, has suffered terribly from epidemics of yellow fever. It is only 20 years since a visitation, and unless the drainage can still be improved it is dreaded that another outbreak may occur. For six days I remained in the town, calling on various people and gathering what information I could as to collecting and localities. This information turned out to be very meagre if that, and I made up my mind, once and for all, to go my own way, at any rate until I could interview the curator of the museum, Mr. Quelch, who was away in the bush.

My first essay to collect was in the botanical gardens, until I could get a steamer to take me to Bartica, on the Essequibo. Having, in 1898, made such good bags in the Trinidad Botanical Gardens, I expected great things from similar gardens on the mainland, but neither great things nor little things were there, and it looked as if lepidoptera had been forbidden to enter the garden. A call on Mr. Jenman, the superintendent, elicited the fact that no rain to speak of had fallen for nearly six months, and that the usual short wet season of December and January had not taken place at all. This was sad news to me, as I knew the best collecting period in this part of the world was immediately following the wet seasons, and as I had purposely timed myself to arrive at such a period the news of a long drought was not reassuring for good collecting. Every corner of the very extensive gardens was scanned for what it might possess entomologically; and every damp corner spied out, these being the most likely places. Everywhere it was the same—no lepidoptera at all; a few neuroptera skimmed over some of the broad dykes that drain the grounds, and that was all that was visible entomologically, but botanically these dykes contained one of nature's greatest wonders—the *Victoria regia*. Imagine a dyke a quarter of a mile long and ten feet wide completely covered with specimens of this wonderful plant. It so happened I saw the plants at their best, with their flower spikes fully developed. Visitors to our Kew Gardens are generally struck with the much-prized single plant, with some few leaves, which has every attention bestowed upon it to keep it alive, but in Guiana it is difficult to keep any dyke free from this weed, and one of the annual jobs on a large sugar estate is to clear out the *Victoria regia* from all the canals, dykes, and ditches which intersect the country. It seems most remarkable how it was that this plant did not find its way naturally to these places, seeing how quickly it has spread everywhere from the Botanical Gardens where it was introduced from the Berbice river, less than a hundred miles away, and with a perfectly flat country intervening. Having fully satisfied myself that there were no lepidoptera, or practically none, in the gardens, I gave the canal, which supplies a large quantity of water to Georgetown, some attention. It was quickly ascertained that the neuroptera were strongly represented, and for the time being I became a neuropterist, or, at any rate, a collector of the order. Soon, however, some lepidoptera came to the net, and the season may be said to have opened with the capture of *Thecla marsyas* and *Helicopsis cupido*. Some *Hesperiidae* of the subfamily of *Pamphilinae* were also in evidence, but by this time disappointment was irresistible, and there were many longings for the day to come round when the steamer was to leave for Bartica.

The day arrived, and having embarked we were quickly out of the Demerara river and making for the mouth of the Essequibo. It soon became obvious that this was more the sort of country for the entomologist and the naturalist generally. Seen from the steamer, the forests that clothe the banks seem quite impenetrable, but that is not so. On the *edge* of the rivers the forest certainly presents a perfect wall of vegetation, as there all sorts of climbing plants interlace the trees, but a short distance back the trees are not molested with these climbers, and for the most part one can progress without much hindrance. Bartica was reached in about nine hours on this occasion, and

although marked large and designated a town on some maps, it scarcely deserves the distinction, even in Guiana, where towns are scarce and qualification is low. It has this attraction to an entomologist, that it is surrounded with forest. Here, in a tumble-down, timber-built structure called an hotel, I put up for a month, making excursions all round. As my brother, who I have forgotten to mention was with me, was anxious to see at least one of the falls of the Mazaruni, we next day hired a boat, engaged a crew of eight, took hammocks and provisions for three days, and set out for a coviander's hut, the good boviander's name being Fransook. We did not arrive here until it was pitch-dark—about seven p.m.—and all thought of collecting had to be abandoned, at least for day flyers. A large acetylene lamp was part of the impedimenta, and to this a few moths turned up, but a full moon was shining at the time or the result would, no doubt, have been very different. Next morning we were up at the regulation hour of five, and, although warned, we could scarcely believe that our clothes, although protected, were quite wet with the heavy dew. Having pushed off at six, there were visions of great and many things by twelve. Here and there on some of the flowering vines, large numbers of the pale yellow *Catopsilia statira* were to be seen, with an occasional *C. argante*, also some of the common *Nymphidium*s of the *Erycinidae* were frequently seen, but it was impossible to work for these insects in such situations. The first fall, or cataract, was negotiated, and soon afterwards the first named fall, which has the very English name of Marshall, was safely passed. Immediately after passing this camp was pitched, and before I had the net ready a splendid *Morpho rhetenor* and *M. neoptolemus* passed us. This was the only occasion on which I saw *M. rhetenor*, but the latter was seen frequently afterwards and sometimes brought inside the net. Incidentally I may mention that all about this cataract orchids are growing in some profusion. *Oncidium altissimum* was in flower, and we measured specimens with flower spikes 12'.6" long. Lepidoptera were not at all plentiful here, and as everything was so dry I put it down to that cause. *Ithomia sarepha* flitted about among the dead leaves, and it has since struck me very forcibly that the bluish tinge to the wings seems to disappear in course of time. It seems to be pretty generally considered in the colony that the falls and cataracts in the rivers are the best places for orchids, and I expect that in the season close following the rains lepidoptera are also plentiful in these situations. The natural beauty of these falls where the river is studded with islands is most attractive, and the shooting of the falls is somewhat exciting, especially after the rains. On the way back *Papilio thoas* was found, commonly flying along the Catabo road. "Road," I should mention, here means simply a cleared passage in the forest. In this case the road has not been kept open, and has now become covered with thick underwood, almost the invariable sequel to these clearings. *Heliconius rhea* was in abundance; a *H. guarica* and *H. catharinae* were also taken. I should have liked to have explored this road, as the day was very favourable, but as arrangements had been made with the crew to return to Bartica, tracks were made for the boat. Our feelings can be imagined when we returned and found the boat was high and dry on the mud, the tide having gone out, and our boys asleep. There was nothing to be done except exist as we

could on the few remaining provisions and wait for the tide. Bartica was eventually reached in such rough water as to make our situation rather dangerous, and I made up my mind that probably I should collect as much material round Bartica as in making a lengthened journey up the Mazaruni, as I had originally intended. Moreover, personally my leanings are towards settling down to collecting rather than moving about and doing with a minimum of apparatus.

As my brother was leaving next day, we took a boat on March 31st to explore a creek in the Mazaruni near by. Here I was pleased to find *Mesosemia menoëtes* common, and in excellent condition. The ground was a steep slope on the side of a small waterfall, away from the sun. Owing to the prickly nature of a certain plant that was growing everywhere, it was impossible to investigate far up the creek, but seemingly this little black butterfly was the sole representative of the order. We are often struck with the extreme localism of some of our British lepidoptera, but here in Guiana it is the usual thing for a species to be local, and even when the haunt of a certain insect is thought to have been discovered, after taking a couple of specimens often no amount of perseverance will reveal a third. There are really very few common species—that is, species that the late Mr. Stainton would have said, “the young collector will obtain his first season with certainty.” This uncertainty gives a wonderful fillip to the collector, if I may judge others by my own experience; but why this great uncertainty should prevail is one of the many problems that want investigation. Is it possible that many of the species are found enough but have such tremendous odds to contend against that a bare half dozen, possibly, only arrive at perfection?—or are these species in a torrid climate less prolific? That there are enemies to larvæ I found by sad experience. Often I brought home a handsome papilionid larva, amongst others, but it was impossible to keep the small red ants from them, and death quickly followed. Whether these ants would attack a larva in vigorous health or not I hardly know: my opinion is that the larva is worried by the ants to start with, and later, when from want of food it becomes sickly, is attacked and succumbs. I shall be asked, “But why not keep the ants from them?” The answer is, because it is almost impossible to do so without special apparatus. It is, doubtless, also very necessary to have large airy cases for breeding, if only the ants can be got rid of. After many attempts and constant failure with the larvæ, I devoted the whole time to the net.

The most interesting butterflies were certainly the *Erycinidae*, which were everywhere, and at all times to be obtained. After a very short while an Erycinid could be noted by its habit of invariably settling on the underside of the leaves, in just the same way as many Pyrales do, especially of the sub-family *Pyralinae*. Day-flying moths of this latter family were seldom seen, and I only recollect one or two occasions when I congratulated myself on taking a new Erycinid, and found with disgust it was only a “miserable *Pyralis*,” as someone once called it. *Helicopsis cupido* was quite common around Bartica, and especially so on one particular tree, and *Eurybia juturna* was equally so, if not commoner, and always rested on the under surface of a *Maranta*, especially in damp places. *Eurygona lissias* and *Nymphidium lamis* were only met with once, and as they were both worn,

probably a few weeks earlier—some time in February—one would have a better chance. The occasion on which the latter of these two insects was taken I shall remember for a very long time. I had set myself the task of walking from Kalacoon, on the Mazaruni, where I had spent the previous day with Mr. McTurk, to Bartica, *via* the Caburi road. I had armed myself with a compass, and was told to return to Kalacoon if the road was too overgrown. A start was made at 7 a.m., and after about a mile had been covered the sun shone brilliantly, and *Morpho menelaus* simply swarmed. It was a grand sight to see about 20 of these fine fellows flashing about in all directions, and the day would have been memorable for that alone; but I dared not stay too long in this spot, as there was a lot of ground to cover before the midday meal. After this the forest became more dense and lepidoptera more scarce, and the ground was covered as fast as possible. A white Lymantriid, apparently not yet described, now became plentiful, but kept out of reach of the net, seeming to like to skim over the tops of trees and young underwood. After a lot of patience one of these was secured, and, following that, a very large *Nymphidium* made its appearance, which turned out to be *N. lamis*, as I have mentioned. The specimen is the worse for wear, and looks as if some bird had been at it. It had a very feeble flight, but this may have been due to its having lost some chips out of its wings. On getting up after having papered it, my eye fell on what looked like a human being perched in a tree almost straight above me. At first I felt startled and could not believe my eyes, but there was no mistake; here was an Indian, stark naked, crouched down in the fork of a tree, with a gun of some sort in his hands, waiting for an acuri to come and feed on the fallen nuts from the tree in which he was perched, when it would fall an easy prey to his weapon, however antiquated and out of date it probably was. An experience like this after one had been walking for over three hours through the still and lonely forest was a little nerve-upsetting, but a scientific fact was learned from it—namely, that the red skin of the Indian harmonised so wonderfully with his surroundings that it was difficult to see it, even though fully exposed to view. A short distance more was covered, and then no path was at all discernible, and it looked as if the distance would all have to be retraced. I actually did turn back for a short way, and then, in spite of my compass telling me I was going in an utterly wrong direction, continued what I originally thought might have been the track. Very soon familiar ground was reached, and thankful I was that food was not to be long delayed, as I thought it was. On the whole, one certainly would expect more on a walk like this of some eight or nine miles, through unbroken forest. Probably many more insects would have been obtained where *Morpho menelaus* was making such a show, about a mile in from the Mazaruni. One or two nice Erycinids were picked up here also, where the forest was composed chiefly of the tree known as Wallaba, the wood of which is used extensively for taking the place of slates on roofs of houses. In this Wallaba forest there is not a vestige of undergrowth of any kind, and rotten and decaying leaves is all that is to be seen beneath the dense shade. I should have expected some Ithomiids here, as the larvae are generally supposed to feed on rotting leaves, but only *Ithomia zarcpha* was to be found, and that only rarely. It already seemed evident that this was not the country for

Ithomiids, and throughout my stay this was found to be the case. The *Ithomia* already mentioned was abundant at Bartica and elsewhere, but there was no swarming of these gauze-winged lepidoptera such as I had met with in Venezuela at an altitude of 3,000 to 4,000 feet. Whether the altitude is necessary I do not at present know for certain, but from the experience in Guiana it looks as if it were so. I have told you of the walk home from Kalakoon, but I should have first *taken* you there, as there was considerable interest in the outward walk, which was done by way of a short cut, the distance being little more than four miles by the direct path. It was during this outward walk that a new *Papilio* was caught, so if anyone is anxious to get his series the locality is now given away. Another *Papilio* that was taken was *P. triopas*, found flying very low down and with a very lazy flight. A second specimen, taken later, in exactly the same spot—this time a female—had exactly the same habit, so it was evidently not a coincidence that this species was easily taken. Later on, when a magnificent specimen of *Catonephele obrinus* was seen, it certainly would have been a happy coincidence if it had been easily taken, or even if it had been taken with difficulty. This fine Nymphalid was always found to be most restive and difficult to approach, and even when attracted by rotten fruit, which I sometimes treated it to, never seemed to be off its guard. The delicate shades of green on the underside, as might be imagined, make the insect as inconspicuous at rest as it is conspicuous when on the wing. But, to continue this walk which was started. One of the difficulties to be contended with was the crossing of several streams. Those that are not too wide can sometimes be got over with a good broad jump, if one is feeling fit and up to it, but such a proceeding, although tolerably easy in one direction, often becomes impossible if one wishes to return the same way. I nearly always preferred bridging these streams with my own private bridge, formed of a couple of fallen trees, which are generally obtainable in such places, which must necessarily be damp, and where decay is rapid. Once the bridge is across, it requires a lot of negotiation to safely walk over the slippery, moss-grown trunk; but this "walking of tacubas," as these bridges are called in Guiana, must be got used to if one does not want to curtail one's field of operations. The short cut to Kalacoon has this disadvantage, that there are several of these streams to cross. On the other hand, the lepidoptera are drawn to these situations, and, of course, the lepidoptera in their turn draw investigators. The Nymphalid *Bia actorion* was generally present at these critical situations, and as it is very easily taken when once one is on the right side of the stream, the inducement to be on the right side was frequently strong. The flight of this handsome insect is most peculiar; it seems to flit along in an aimless sort of fashion, and then to settle for quite a long while. Often I could walk right up to the insect without its attempting to fly away. All the eight or ten specimens taken were secured in the early morning. In fact, early morning and late afternoon are quite the best times for collecting generally, and if one happens to be out about 2.30 or so and waits till about four o'clock, quite an awakening of insect life seems to take place. Personally, also, one feels quite a relief often at this time from the sweltering heat, and it is probable that insect, bird, and animal life feel the benefit also. The true Nymphalids never seemed to have too much sunshine for their wants, but

these were surprisingly few in number, and the species taken can be numbered on the fingers of one hand. A butterfly that really loves the sun, and which has been christened the sun butterfly by the natives, is *Morpho hecuba*. It never flies unless the day is very hot and sunny, and then soars along, hardly moving its wings, at an altitude of some 40 feet or so. I used to wait day after day for one to descend, but I never got even an outside chance of catching one. Members might be interested to know (and they will please forgive me if they are not) that a fine specimen of this species was recently sold by auction for eight and a half guineas. This must be strong evidence that the capture is very rarely effected. The species is far from rare in Guiana, as I must have seen a score of specimens, at least. If one of our expert breeders of lepidoptera could obtain a brood of 300 or so from ova, perhaps he might be induced to retail them at a reduction of the odd half guinea! This species, unlike its blue relatives, could not be attracted with meat or rotten fruit, but unless one can obtain a whole carcase there is very little use in putting 4lb. or 5lb. out, as ants or birds of prey, and possibly some carnivorous animal, may finish it in a night. My most successful bait was a complete bunch of bananas, which, with the aid of a nigger, I managed to suspend from a tree by a rope. Caligos seemed to relish this especially. The bold eye-like marking on the underside, I fancy, must be a warning mark, as these insects invariably settle with their wings folded, generally on a bare tree trunk, showing the eye-mark in a most conspicuous manner. The Satyrids of the genera *Pierella* and *Haetera* were also much attracted to these bananas, but a difficulty in the capture of any of these was that the slightest touch knocked off the bananas from the rotten stem. However, this particular bunch accounted for some nice insects. I had hoped to be able to show you photographs of this bunch of bananas with insects in it, but my knowledge of the science of photography was not like the bananas, sufficiently ripe, and the films show a blank. One of the great difficulties to contend with in collecting in these forests is that there is practically no natural bait in the shape of flowers. When one does, however, find a tree in flower there are generally Papilios, Erycinids, Lycaenids, and humming birds buzzing at it, and plenty of sport can be enjoyed. If one could only walk along the top of the forest instead of at the bottom one would have flowers in plenty, and with them their attendant fertilizers, the insects. Previously not a single species of the Hawk moths had been seen, but now the appearance of a Macroglossid was welcomed. It turned out to be the common *Aellopus ciculus*, but as I had never met with it before, and as the insect was tolerably plentiful in this one particular spot, plans were made for securing a series. The place where they occurred was a sort of green lane overgrown with weeds and coarse grass. Although visited at all times of the day, a specimen was never seen before 4 p.m., and about an hour later was the best time for them, so, with this knowledge gained, specimens could generally be secured, if a sufficient amount of dexterity was not wanting. The time of day at which certain insects appeared was most interesting. For the *Syntomidæ*, by far the best time was in the early morning, between eight and ten. It is well known that they are taken at all times of the day, and I have myself in Trinidad and elsewhere taken them in the afternoon, for instance, but certainly while in Guiana specimens were either taken

in the early morning or not again till after dark, when they were sometimes to be obtained at light.

On Monday, April 8th, two other men and myself made a tour of inspection of the Camaria road on the Cuyuni branch of the Esse-qui-bo. Entomologically there was not much to record. At the landing place, *Papilio macrosilans* was conspicuous, and a short way in, *Morpho achilles* was observed. Half way to this place a halt was made for the inner man, as it was necessary to procure firewood. The place was a swampy one, and the roots of the trees growing here had such buttressed roots that we were all struck with astonishment, it being quite difficult to move about between these great projections. I cannot refrain here from mentioning the signboards that one sees at intervals along the bank of the Mazaruni just before turning into the Cuyuni. It must be stated that there is a convict penal settlement here, and to prevent the off chance of anyone coming in contact with a convict these notice boards bear the initials, "H.M.P.S." I suppose I need not mention that a well-known lepidopterist abbreviates his name in this way, and in consequence I could never pass a board without some feeling of amusement at this strange coincidence. The return journey was made at 8.30 from the landing, having groped our way in the dark back through 4 miles of forest. Soon after embarking it looked as if a watery grave was close at hand. The boat struck on a rock and heaved over on its side. It was a touch and go, but fortunately we did not go, as we might easily have done—to the bottom. After hours of laborious, slow progression, we arrived at Bartica in the small hours of the morning. The lepidoptera from this time seemed to be getting scarcer, probably on account of the very hot, sultry weather which was presaging the rainy season. Some fresh insects began to put in an appearance—the Opsiphanids. These are essentially twilight fliers, and on the wing one would never suspect that they were Rhopalocera, as the flight is like some Lasiocamps or Saturniids, only not so rapid. *Opsiphanes invirae* and *O. cassiae* were taken flying high up round and round the hotel, closely followed very often by a bat. To the human intelligence, the bat would have acted wisely if it had suddenly reversed its direction, but Nature does things in her own way, and I fancy I accounted for more *Opsiphanes* by waiting at an open window.

One of the last places to be explored while staying at Bartica was Cow Island—called Cow, I fancy, because a number of cattle are kept here. The visit was made with two professional collectors, who were, curiously enough, stopping at Bartica. We had heard that the place was swarming with snakes, but we could not find one between us. Lepidoptera were not much in evidence either, and as the male sex of the grazing quadrupeds gave us some anxiety, we left this once-upon-a-time leper station, and pegged away again at the already well-known paths on the mainland. After spending a complete month at Bartica, and as rain had now begun in earnest, stopping collecting altogether on some days, I resolved to try new ground. Rockstone, some 30 odd miles higher up the Essequi-bo, was chosen, but as the journey up the river at this point requires a good, chosen crew to negotiate the falls, and as the place can be reached by a long, circuitous route, safer, however, and cheaper, the latter was chosen. To do this, Georgetown must be sought again, a steamer must be waited for to go up the

Demerara river, and then a narrow-gauge single railway conveys one across the nineteen miles of forest to Rockstone, on the Essequibo.

Rockstone consists of an hotel, in reality used only as a rishouse, the stations—railway and police—and a post-office; some rain shelters where the gold diggers sling their hammocks complete the list of the buildings, either public or private. When the hotel was first opened, about two years ago, the neighbourhood was found so unhealthy that no one could stay in the place more than a fortnight. Since then eucalyptus trees have been planted all round the place, and, whether due to their influence or not, the place has improved. It was originally thought that, perhaps, people from town would come out for a change. But the change has been such an unpleasant occasion that now one can have the place to oneself, as I actually did, save for those who come down the river and sleep here for the night. Entomologically this place is ideal. There is a large gallery running all round the hotel, with a white roof, and with a good strong lamp many moths come to light. In such a situation—namely, on the edge of a river—*Pyralidae* preponderate. *Noctuae*, probably, are next, and *Geometridae*, *Sphingidae*, *Syntomidae*, *Notodontidae* come in smaller numbers. The number of *Sphingidae* taken at light was disappointing. Not more than eight or ten specimens were so taken during the whole tour; but, as one of these, *Ambulyx eurycles*, is a very rare species, one must not grumble. This latter, however, was taken at Bartica. The day after arrival *Colaenis phaernsa* was dashing about just outside the hotel, among some second year's growth, where the forest had been originally cleared. After taking a couple or so, with much trouble, I sauntered up the railway and came across one of those real tropical sights, a regular herd of yellow butterflies, sitting on the white sand which forms the ballast for the railway. The first interesting thing was to see what species they belonged to, and I was surprised to find that they were *Aprissa (Catopsilia) statira*, and not *Catopsilia sennöe*, as I expected them to be. Both on this and subsequent occasions I noticed one or two *C. argente* amongst them. The next question to be asked was what are they doing here all together? I answered this that they were drinking, or thought they were, as the patch they were on was yellowish-coloured, and suggested that either a locomotive had let out some dirty water or, what was as likely, that some animal or other had done the same thing. On this occasion there was some reason why all these individuals should be collected in one spot, but subsequently, often after a heavy shower, one would come across a little swarm (there is no other word) all settled, and for no apparent reason, all huddled together. Continuing the walk up the line, a couple of anteaters were seen to suddenly emerge from the forest. I stood still and awaited them for some time, and from the way they sniffed the steel rails I should say that was their first acquaintance with civilisation. Lepidoptera along the line out in the sunshine were, as usual, scarce, so a turn was made into one of the forest paths, where timber was being hauled. Some of the numerous Euptychias immediately became visible, and then rain descended, and I crouched down under a macintosh cape that I always carried, and had to remain so for about a couple of hours. This put a stop to the first day's sport. The following day, April 27th, was very fine, and a most enjoyable ramble was made. A specimen of *Megaleura pelcus*, just drying its wings, with the pupa case alongside it, was taken from a mora tree, and there

can be no doubt that this species feeds on this giant forest tree. One of the episodes that one has to get used to in these forests is the crash one occasionally hears; it is, probably, one of these enormous mora trees falling. After a certain period they, like our elms, seem to get rotten at the roots and come thundering down. Immediately behind the hotel there was one of these trees, and I was fortunate enough to be looking out one afternoon and saw this giant fall without the slightest warning. Close by where the *M. peleus* was taken, the large brown Erycinid *Nymphidium arche* was plentiful. Their flight was most rapid, and when in the net always made that ominous whirr, the result of which often spells wreck. The *Papilionidae* were represented by a single specimen of *P. parsodes* during the fortnight spent at Rockstone, and there is no doubt that that family is not to be obtained in the wet season, or, at any rate, none but stragglers, for on the Potaro I never saw a *Papilio* at all. On the other hand, the *Morphinae* appear to be at their best at the commencement of the rainy season, and I was also informed that I was at the best time for the "big blues," or "bonny blues," as they are variously termed. In a general way, however, it may be taken that during the wet season the insects, like the vegetation, are in active growth and development, and a large majority must be in the larval state. Growth is, however, so rapid that sometimes in a month the whole metamorphoses from egg to perfect insect are performed. This is especially true of the *Heliconinae*. It was hard work at Rockstone, getting much during the day, and what with perpetual torrential rains at intervals, it was slow enough to fill in the time. On the slightest break in the weather the net and satchel were seized, and a bolt made for one of the forest paths. While the sunshine lasted something was generally to be taken, though for the most part not actually in the sun itself.

Evening work with the acetylene lamp was beginning to get exciting, especially as members of the attractive and much-sought-after family, *Syntomidae*, were getting fairly numerous. From 7 p.m. till 11 p.m. was busily occupied in scraping the roof of the verandah. A sheet put up behind the lamp did not answer the purpose it serves in our Fen country, and I found that in most cases the moths preferred hiding themselves behind some rafter in the roof. The dazzling light of the acetylene may have been too strong, and I am bound to confess that from one of the feeble paraffin lamps belonging to the establishment, I obtained more specimens than from my glorified installation. I find in my diary that I have made a note that Tuesday, May 7th, was the best collecting (that is, night collecting) from the start.

There had been many rumours from the private company who are responsible for your transit in this part of the country that the large stern-wheeled launch would one day make a second trial trip up through to Tumatumari, on the Potaro, a large tributary of the Essequibo, and it was suddenly decided that the following day the trip would be made. I had an invitation, so forthwith consented to go. We started at 7 a.m. The early part of the trip was plain sailing, but going through the rapids and dodging the rocks made us all a little anxious, especially as previously this good craft had stranded before the really dangerous places were reached. The Crab Falls and Tigri Falls were successfully passed, and as these were the chief cause of anxiety, we afterwards settled down a bit, to take in the scenery and something else. The picture presented at the falls oʘ

Tigri is wild in the extreme. The river is broken up into a number of channels, and between are islands of various sizes overgrown with bushes, past which, and over which in times of flood, as on the occasion of my visit, the water swirls by. At Tumatumari I was introduced to the genial gold officer, Mr. A. K. Menzies, who, when he heard I was a visitor, invited me to go to the Potaro Station, further up the river, and back from the waterside, some twelve miles. This sounded excellent, and the following morning, after having viewed the grand Tumatumari Cataract from all points of vantage, we started in the miniature launch huddled together with eight or ten swarthy niggers. The river was fairly "down" this morning, and the launch could only make two miles an hour. Through one of the rapids, although the engine was going as if it would burst, the launch would not move, and it became necessary to unhitch a boat we were towing, put some of our black passengers therein, and try again. We now crawled through, and the niggers, having pulled the other boat along by overhanging boughs, joined us again.

The Potaro landing was reached, and, having got the loan of a springless two-wheeled cart, a start was made for the next stage of the journey. The road is "a corduroy," made with small tree trunks laid crosswise, and the travelling is not devoid of motion. Here, at last, I said to myself, I should find insect life abundant and probably somewhat different, as we were now 170 odd miles from the coast. After eight miles had been accomplished my friend decided to go and ask for lodging at the house of one of the two other white men who live in this place. Next morning we decided to walk the remaining four miles to the Government station. Here practically the whole of the remaining collecting was done. The opening day was heralded with the capture of some nice Theclids, amongst others, but what was most gratifying was to see some insects swarming. *Melinæa mueme*, *M. crameri*, *Ceratinia valleria*, *C. veritabilis*, *Mel. egina*, *Lycorva pasiuuntia* and *L. cecis*, together sometimes covered the white blossoms of a plant growing alongside the roadway. The similar colouring of all these different insects could not but strike one. These colours—brown, yellow, and black—form quite the commonest colouring of the insects of Guiana, and it is now pretty well agreed that it has come about by the influence of mimicry, those brown, yellow, and black species that were distasteful remaining as types to which numbers of other species have converged by a process of natural selection. Although the enemies are, and must be, very numerous to bring about such a state of things, they are not by any means in evidence. Soft-billed birds are rarely seen, and the struggle must be kept up by lizards and such like creatures. The absence of birds, particularly song-birds, is most noticeable. The parrots, toucanos, and macaws one hears occasionally screeching overhead, high up among the branches of the tallest trees, but such a thing as a song-bird is foreign to these woodlands. Is it possible we here again have evidence of the terrible competition for life in these forests? Can it be that what might be song-birds are too engaged in looking after their safety, and, also, might not their song reveal their presence to some of their enemies? Such queries as these suggest themselves as being within the realm of possibility, after what one sees going on with the lepidoptera. Botanically, also, the struggle is keen, if not keenest of all, although in quite a different way. Might, here, is what is most needed; the strongest wins. The cases where lepidop-

tera exist merely by mistaken identity are, in Guiana, wonderfully numerous. Frequently I found myself taking something altogether different from what I thought it to be. One of the most interesting cases that came under my notice was an instance of three groups being involved—*viz.*, *Erycinidae*, *Ithomiinae* of the *Nymphalidae*, and the *Hypsidae*. Two different families of butterflies and one of moths. I do not think there is any reason to believe that any of these species are palatable. It is probably a Müllerian group, one of the species having been dominant. From the relative abundance of one to another, the moth would be more influential, as being in much greater abundance than either of the two butterflies. It is remarkable that a species of *Stalactis*, *viz.*, *satellites*, exists on the Upper Amazons that *exactly* resembles this moth *Lauron partita*, but apparently does not occur in Guiana. I feel considerable doubt in my own mind if true Batesian mimicry exists. Are some species really so palatable to birds, etc., that were they not similar in colouring to other distasteful species they would become exterminated? The accumulating evidence goes to disprove it: (1) the so-called mimicked species is often far more numerous than the mimicker—a state of affairs that would give little protection to a persecuted species; (2) the so-called mimicked species are attacked just as much as the so-called mimicking species. It appears, therefore, to matter little to an insect whether it be palatable or not. If it is like one or more other insects the attacks will be shared, roughly, in proportion to the abundance of each. The “proportions” have not been hitherto much considered, but they must be of the utmost importance in the competition.

After the first day at the Potaro station it rained, on and off, the whole time, and as it was now the middle of May I had to expect bad weather. In the West Indian islands and in Georgetown the sun generally appears immediately after a heavy shower, but in the depths of the forest, as one is on the Potaro, especially in the low, swampy parts, the sun sometimes does not show itself for days at a time, and collecting is very seriously interrupted. The interruption at last became so constant that I decided to work my way back to town, and thence go to Trinidad again, where I knew the sun was more obliging. As in coming, I broke the twelve jolty miles to the waterside at the eight-mile house, this time for two days, and during the time my kind host (Mr. C. B. Roberts) became so interested that he said he would collect for me, with what splendid results you will be able to judge for yourselves. I decided, when the time came, to walk to the waterside instead of driving, and the decision was repaid. Morphos, of how many species I don't know, swarmed, but *Morpho hecuba*, *M. adonis*, and *M. menelaus* were there for certain. *M. adonis* had not been seen before, but was now abundant. A single specimen only was caught, and as it has a large piece out of one of its wings, that probably explains how it came within striking distance, its flight having been enfeebled thereby. One of the most splendid Theclids, *Erebus nobilis*, was then taken, and the proverbial last day being the best, nearly, if not quite came true.

Gentlemen, there are many things I have not told you about. I have sketched the expedition up till the beginning of the return journey from the Potaro, and think this a fitting point to leave you, as up till now the fell fiend malaria had not interfered with the enjoyment of the trip. Soon after this I found I was not to escape,

and, owing to persistent attacks, had to abandon a more lengthened stay. I have since been asked, "Were all the butterflies worth the penalty?" Lying in one's hammock with one's temperature up to 104° or 105°, and feeling as if it was immaterial whether the world came to an end, one would say no; but with a return to health one looks on the penalty with a light heart, and feels inclined to risk anything, and I should boldly answer yes to any such query now. No words, and mine least, can convey an adequate idea of what collecting in these forests is really like till one tries it. I can only say in conclusion it has been a very real pleasure to write this paper. It has felt like living the time over again, and I hope I have transported you with me for the time being.

THE IMPORTANCE OF CERTAIN LARVAL CHARACTERS AS A GUIDE IN THE CLASSIFICATION OF THE SPHINGIDS.

(Read March 4th, 1902, by A. BACOT, F.E.S.)

A few years since I wrote a short paper dealing with the possible relationship of *Dimorpha (Eudromis) versicolora* and the Sphingids (*Ent. Rec.*, vii., pp. 217-246). Since then I have had the opportunity, thanks to the kindness of Dr. T. A. Chapman, Mr. J. W. Tutt, and many other friends, of examining a few more Sphingids and many other lepidopterous larvae, and my conclusions as expressed in the above paper have undergone considerable modification in consequence.

Many of the points of resemblance that I there referred to I have since found to be common, with some modification, to other, and, in some instances, widely separated groups. So that, while regarding them as signs of a relationship, it is in a looser and broader sense than I had previously imagined. Indeed, so widely divergent are some of these groups from each other, that there can be, I take it, no question of near relationship, and we are forced to regard them as parallel developments to meet similar needs. Just as analogous developments have arisen independently in Marsupials and Placentals, so we find the same specialisation arising among groups of lepidoptera having flat eggs and those having upright ones, a difference that is possibly as important as that separating the placentals from the marsupial mammalia.

To take a few instances that were referred to in my previous paper as signs of relationship between *Dimorpha (Eudromis) versicolora* and the Sphingids:—The horn on 8th abdominal segment: This character is as well developed in one of the North American Notodonts, closely allied to our *N. dietaea*, as in any of our British Sphingids; oblique stripes: these are a noticeable feature of *Notodonta trepida*. Shagreen or mammillary based secondary hairs occur in many butterfly larvae, and an analogous, if not exactly similar, development is to be found in some Geometrid larvae. *Charaxes jasius* offers a good

example of the former, and *Geometra papilionaria* of the latter; and it is remarkable that with butterfly larvæ, as Dr. Dyar has pointed out, and also with *G. papilionaria*, the shagreen or mammillary based hairs usually occur as a secondary growth, making their first appearance after the first moult, as is the case with the Sphingids other than *Smerinthus*. Bifid or forked hairs are also to be met with among the butterfly larvæ, *Leucophasia sinapis*, *Nemcobius lucina*, and *Chrysophanus phlacas* being examples, as well as among the Sphingid larvæ, and this character is also paralleled among the Geometrids by *Geometra papilionaria*, a further illustration that similarity of structure goes with a similarity of habits, and presumably of needs.

These, among many other examples, had so influenced my views since writing on the relationship of *Dimorpha versicolora* to the Sphingids, that when the problem of the origin of the last-named group was raised by Mr. Tutt, in view of the approaching publication of the third volume of his work on *The British Lepidoptera*, it was by no means clear to me whether the Sphingids were to be considered as a homogeneous group arising from a common Sphingid ancestor, or if they might not be the result of parallel development such as we find between the imaginal stages of *Syatomis phegea* and the Zyganids, or between *Arsilonche albocrossa* and the Calamias, Leucanias, Nonagrias, and Tapinostolas, which make up the group called "Wainscots"—a parallel development, or perhaps convergence, that is, of different stirpes related to each other, and at some very distant base, of course, springing from a common ancestor. But the common ancestor was in no sense a Sphingid, and gave rise to groups as widely divergent, say, as an *Aglata tau*, *Dimorpha (Eudromis) versicolora*, *Bombyx mori*, and *Hyperchiria io*, which subsequently converged and developed on parallel lines to form the apparently homogeneous group of moths we call "Hawks."

Evidence of breaks or faults in the larval characters of the Sphingids is not wanting, and one at least occurs with regard to the minuter larval characters of the 1st instar, characters that, to my thinking, are less likely to be the results of convergence than the more striking and obviously useful ones. Some discussion and correspondence that I had with Dr. T. A. Chapman, however, convinced me that there was in reality no doubt of the Sphingids being a truly homogeneous family (see Dr. Chapman's remarks on the antenna of the Sphingids, in Tutt's *British Lepidoptera*, iii., pp. 377-378) with a common descent. But the evidence of a rift within the group remains, and to my mind points to the sub-division of the European species of the superfamily into two main branches. Whether exotic material would show others of equal value, or if all the species would fall into one or other of my main divisions, remains to be seen.

Although the Sphingid larva presents a high degree of specialisation in the form, coloration, markings, and in some points of structure—such as the conjunction and raising of the bases of tubercle i on the 8th abdominal segment into a more or less developed horn bearing the two tubercles and their hairs on its summit, the shape of the head in some species, and in the tendency to have either a uniform coat of generally distributed fine short hairs, or to become completely naked—it still retains in all groups other than *Smerinthus* a more or less primitive 1st skin in which the single-haired primitive tubercles

may be clearly observed. Even in *Smerinthus* they can be easily distinguished under a 1in. objective, owing to their overtopping the smaller secondary hairs, which in *Smerinthus* alone are present on the general body area in the 1st instar. The arrangement of the dorsal and lateral tubercles, while agreeing in its general aspect with that of other lepidopterous larvæ, presents some special features. Briefly, the arrangement is: i and ii in trapezoidal position, iii supra-spiracular, iv beneath the spiracle, and v normally shifted up in front of spiracle on the anterior margin of segment. In one or two species, however, v on the 1st abdominal segment is clearly situated on the lateral flange, only slightly above the plane of iv, and decidedly sub-spiracular, while in *Hyles ephorbiæ* tubercles iv and v of 1st abdominal segment are conjoined, the two setæ being situated on a small oval plate beneath the spiracle, so that there is no doubt of the identity of the prespiracular of the Sphingids with v of the larvæ of other families. On the 2nd and 3rd thoracic segments, iv is wanting, iii bears two hairs on a small oval plate, and v is on anterior margin of the segment, as on the abdominals. This arrangement, so far as my present rather slender knowledge goes, holds good throughout the group, but probably only the position of v and the absence of iv on meso- and meta-thorax is likely to be characteristic of the Sphingids. When, however, we come to the dorsal tubercles on the last-named segments, we get the distinct line of cleavage within the group that has been referred to above. In *Ennuorpha* (*Choerocampa*), and also in Phryxids (*Deilephila*), the dorsals i and ii on the meso- and meta-thoracic segments are situated on separate sub-segments, and form the corners of an oblong or low trapezoid when viewed from above; while in all the other species I have seen of *Scsia* (*Macroglossa*), *Hemaris* (*Sphinx*), and *Amorpha* (*Smerinthus*), they are arranged as twin tubercles with conjoined bases (i + ii) on the same sub-segment.

With regard to the tubercles of lepidopterous larvæ in general, I am as yet very far from a sufficiently complete or exhaustive knowledge to allow of my mapping out their full significance or phylogeny, but I feel tolerably sure that they were more numerous on the ancestral larvæ than with the existing forms, and that specialisation has largely been by way of reduction in number, as a general tendency, but often secondarily by way of an increase in size of base and multiplication of secondary setæ on or around the individual primary tubercles. The more or less complete coats of minute spicules and secondary hairs springing from the general skin surface I am not here referring to, as they in all probability form a problem apart. The two processes above-mentioned of the evolution or devolution of primary tubercles may be in progress at one and the same time, as, for instance, in Saturniids and Lachneids, or Liparids and Arctiids; the former increasing the size of i, while reducing or losing ii, and the latter showing a waning tendency or want of equally vigorous growth on the part of i compared with ii. Beneath the spiracle, the tubercles not infrequently show tendency to combine. Above it, on the abdominal segments, the tendency is not for combination, but for the atrophy of one or the other pair, while on the thoracic segments it seems to be towards approximation in a single transverse band, if not to actual combination.

Now as to the value, for classificatory purposes, of the position of

the thoracic dorsal tubercles in the different groups. In all the upright egg groups but one that I have examined, the meso- and meta-thoracic dorsal tubercles are in a transverse band, the two innermost being probably usually i and the outer ones ii. In the flat egg groups the position is with some groups (*e.g.*, Geometers) the same as in the upright egg groups before mentioned, but in others there are an anterior and a posterior pair. The following list of the few species I have been able to refer to will, I hope, convey some idea of the position:—

UPRIGHT EGG SPECIES.

(1) With meso- and meta-thoracic dorsal tubercles set as anterior and posterior pairs: (*Hepialus? Inpulmonis*: ? is this to be considered an upright or a flat egg). *Lemonia (Crateromyx) dumi*: i and ii set at corners of an oblong, iii a twin tubercle.

(2) With meso- and meta-thoracic dorsal tubercles set in transverse line. *Butterflies*:—*Colias hyale*, *Euchlœ cardamines* (iii bears two hairs). *Notodontidae*: *Cnethocampa pityocampa*, *Notodonta trepida* (iii duplicated in *N. trepida*). *Liparidae*: *Dasychira pudibunda*, *Notolophus antiqua*. *Syntomis*: *S. phegea* (iii appears to be two-haired on abdominals; I cannot make out on thoracic). *Nola*: *N. cucullatella*. *Noctuids*: *Caradrina ambigua*, *Heliophobus hispidus*, *Cucullia absinthii*, *Arylia putris*, *Graphiphora populeti*, *Amphipyra pyramidea*, *Catocala promissa* (iii double). *Epunda lichenea* and *E. lutulenta* (? iii duplicated, the two hairs on separate plates, one much weaker than the other). Also a doubtful species, probably *Bryophila*.

(3) Meso- and meta-thoracic tubercles, with bases close together or on same plate. *Butterfly*:—*Nemobius lucina* (i and ii, although separated at base, are very close together). *Thyris fenestrata* (i and ii on same plate; iii double-haired). *Spilosoma urticae* (i and ii conjoined).

FLAT EGG SPECIES.

(1) With meso- and meta-thoracic dorsal tubercles set as an anterior and posterior pair.

(A) Separated by a wide gap, anteriors well to front of segment; many Lachneid species: *Entricha quercifolia*, *Cosmotriche potatoria*, *Macrothylacia rubi*, etc.

(B) Not widely separated, but situated on separate sub-segments, i in front of ii; some Sphingids: *Emmorrhinae (Chocrocampa) porcellus*, *elpenor*; Phryxids (*Deilephila*) *gallii*, *enphorbiae* (iii bears two setæ).

(C) Not widely separated, but set more trapezoidally than in B, ii outer as well as posterior to i: *Adscita (Ino) statices*: *Anthrocera (Zygæna) loniceræ*, *trifolii*, *jilipendulæ*; *Pterophoridae*: *Aciptilia galactodactyla*, *Edematophorus lithodactylus*, *Mimaesceptilus phacodactylus* (iii bears two setæ).

(2) With meso- and meta-thoracic tubercles having their bases touching or conjoined.

(A) i directly in front of ii; some Sphingids: *Sphinx ligustri* and *pinastri*, *Sesia stellatarum*, *Hemaris fuciformis*; *Amorphinae*: *Amorpha populi*, *Mimas tiliæ*, *Smerinthus ocellata* (iii bears two setæ).

(B) i and ii on same wart; some *Pterophoridae*: *Oxyptilus*

- teucrii* (on same wart). ? *Aciptilia pentadactyla* (it is possible, but unlikely, that ii is lost).
- (3) With meso- and meta-thoracic tubercles set transversely.
- (A) i and ii on same plate : *Zenura pyrina*, *Aegeria sphaeriformis* (iii bears two setae), *A. tipuliformis* (iii bears two setae), *Teichobia verhuelletta*.
- (B) i and ii bases close together : *Myelois cribrella* (i and ii very close, i inner and very slightly in front of ii) ; *Pterophoridae* : *Platyptilia gonodactyla* (bases touching, iii is duplicated).
- (C) i and ii bases separated and widely separated :—Psychids : *Pachythelia villosella*. Geometers : *Phorodesma smaragdaria*, *Geometra papilionaria*. Drepanids : *Drepana unguicula* (*cultraria*).

My knowledge of the difference is too recent, and the species examined are, perhaps, too few to allow of sound generalisations, but a few remarks on the subject, with the idea of getting further information or help from outside sources, may not be out of place.

Let me first deal with the duplicate hairs of iii. This is not a character for which I have previously kept a look-out, and I have probably overlooked it in many of the species that I have examined. It occurs in the flat egg races that have both types of dorsal arrangement, and is probably a generalised character lingering on in many species or groups of lepidoptera.

The dorsal tubercles on meso- and meta-thoracic segments, in all the upright egg species examined, save one, are either in transverse line, or consolidated. The exception, *Lemonia* (*Crateromya*) *dumi*, does not, so far as I am aware, belong to any of the four large groups that I am well acquainted with, *viz.*, Butterflies, Noctuids, Notodonts or Arctiids (I use this term in its widest sense as including *Syntomis* and the Liparids); and the fact of its possessing two setae on tubercle iii of these segments, suggests that it may very possibly be an early offshoot from the primitive stock which gave rise to the families section of the flat egg races, the Geometrids, has, I believe throughout, the transverse arrangement, for although I have only adduced evidence of two species, my memory asserts that it is the case with all the other geometrid larvae that I have seen.

I have examined and taken notes of larvae of *Teichobia verhuelletta* and *Myelois cribrella* only among the large group of lepidoptera known as "Micros." They have their tubercles set transversely, and from Dr. Dyar's writings, I understand that this is very general throughout the Micro-Lepidoptera. *Zenura pyrina* and *Aegeria sphaeriformis* have the two setae set transversely, i and ii being on a single plate but some distance apart. Dr. Dyar has figured the tubercles on meso- and meta-thorax of *Cossus cossus*, and the position of the setae is also transverse, but no plate is shown. I would hazard a guess that most of the other lepidopterous wood-borers, other than Hepialids, will be found to have this or some closely similar arrangement.

With the Psychids the thoracic segments are very greatly modified, the entire segments being plated over on the dorsal area, and, owing to this specialisation, the character is, with this group, of doubtful importance, but so far as I have been able to determine, the arrangement is transverse, at any rate on the true Psychids, although I have

a note on larvæ of *Narycia monilifera* that needs confirmation, in which I wrote that the arrangement was trapezoidal . . . on meso- and meta-thorax as on the abdominal segments.

In *Anthrocera* (Zygænid) and *Adscita* (*Iuo*), the arrangement is trapezoidal, i in front of ii, as on the abdominal segments; in these families, however, the anterior and posterior pairs are not widely separated, owing to the compressed nature of the segments. Dr. Chapman kindly gave me some young larvæ of *Heterogynis paradoxa*, but primary hairs are difficult to determine on the thoracic segments, owing to the presence of secondary tubercles. With the *Pterorophorina* or "Plumes," we get a divergence in position within the group, but I have examined so few larvæ that I cannot as yet say how wide or far the rift extends. In *Platyptilia gonodactyla* the position of the dorsal tubercles on meso-thorax is transverse, with their bases conjoined, but on the meta-thorax, although still set transversely, the bases do not touch, but are still close together. *Mimaesoptilus phaeodactylus* has them (the setæ) set one in front of the other trapezoidally, i inner and anterior, ii outer and posterior; they are, however, close together, closer than is the case on the abdominal segments, and it is doubtful if their bases, which are somewhat large, actually touch. Here I would suggest tentatively, until a more adequate quantity of material has been examined, that the characters in question (*i.e.*, the position of the dorsal tubercles on the meso- and meta-thoracic segments), are of considerable importance; not as indicating relationship (in any but the wide general sense, of a tendency, probably throughout the Lepidoptera, to a reduction in the size and importance of the thoracic segments during the larval stage, with the consequent crowding or consolidation of tubercles), but as a guide, pointing out the distance to which the initial tendency of specialisation has been carried in different stirpes, or, stated somewhat differently, whether the groups quitted the main stream prior or subsequent to the time when this character had reached its zenith; the fact of both positions occurring within the limits of a homogeneous group, such as the Plumes or the Hawk-moths appear to be, being evidence of an early division from the main stream, and subsequent independent development. Now I am of opinion that the stirpes giving rise to the Lachneids, Saturniids, Endromids, *Aglia*, Ceratocampids, *Bombyx*, Sphingids, etc., as well as that which gave rise to the *Pterophoridae*, belongs to this category; the trend of the larvæ in respect of the reduction of the thoracic segments not having reached its full strength when they branched from the main stream.

Some of the Saturniid larvæ bear on their meso- and meta-thoracic segments, forked processes, analogous to, but differing from, the 8th abdominal central horn in the direction of their forks or branches. In *Hyperchiria io*, both the dorsal and supra-spiracular tubercles of the meso- and meta-thoracic segments bear processes or horns, the forks of which are set longitudinally, while those of the 8th abdominal horn are set transversely, pointing, as I think, to the direction in which the coalescence of the bases of the original tubercles occurred, the caudal horn being derived from the joined and elevated bases of i+i (both anterior trapezoidals) on the 8th abdominal segment, while the two dorsal horns or pillars which occur on both the meso- and meta-thoracic segments are evolved from i and ii on either side, and the forked character of the supra-spiracular derives its forks in all probability from the original duplicate character of iii.

In *Lachneides*, the large size of the supra-spiracular warts on the thoracic segments of many species is probably also a sign of the dual character of iii in the stirps.

With *Citheronia*, probably, and certainly with *Aglia tau*, the character and meaning of the thoracic horns or processes, is, I take it, entirely different from those of the Saturniids proper. With *A. tau*, so far as my observation goes, the anterior and posterior dorsal thoracic tubercles do not combine to join the horns, those on the dorsum of the meta-thorax being developments of i alone, while the foremost pair of horns is placed on the pro-thorax, and not the meso-thorax, as with *Saturnia* (*H. io*). I believe that this difference also applies to *Citheronia*, but have not yet had larvæ for examination.

With *Dimorpha versicolora*, the meso- and meta-thoracic tubercles are in a single row, and consist of warts bearing several hairs, probably i and ii dorsal, iii is a wart of about equal size, and the wart below the spiracle is probably iv and v.

I regret to say that my notes on *Bombyx mori* were made long before I realised the value of the difference between thoracic and abdominal tubercles, and the hairs on the only preserved larvæ (in 1st instar), that I possess, are too confused to enable one to judge of their position.

I trust that these few notes on the position of the dorsal meso- and meta-thoracic tubercles will enable my readers to form some idea of the probable value of this character as a means of separating the Sphingids into two main divisions: (a) in which the larvæ* have the dorsal tubercles on these segments set as anterior and posterior, i and ii being on separate sub-segments; and (b) in which they are on the same sub-segment, i and ii having their basis conjoined, or the two setæ being on a single plate.

Classification on this character, it will be seen, throws the *Eumorphid* (*Choerocampa*) and *Phrygid* (*Deilephila*) groups into A, while *Sphinx*, *Amorphids*, *Hemarids*, *Sesiids* (*Macroglossids*) fall into group B—in contrast to the more usual grouping in which the *Amorphids* are treated as one group, and the swift-flying and feeding species as another.

There is, however, a feature peculiar to *Amorphid* larvæ which distinguishes them from larvæ of any of the other groups known to me. I refer to the coat of secondary hairs† which is present in the 1st stadium of *Amorphid* larvæ, but which does not appear until after the first moult in larvæ of the other groups. Although this feature is a far more striking one than that upon which I have based my divisions A and B, it is to my thinking of much less importance, consisting at best of the acquirement of a secondary specialisation at an earlier stage, whereas the position of the dorsal tubercles on meso- and meta-thoracic, although apparent only in the 1st stadium, is in no way altered, so far as I have been able to observe, by subsequent moults, but ceases to be noticeable, owing to the reduction in size of the primary setæ and the consequent difficulty of

* They must be examined in 1st stadium, as after the 1st moult the primary hairs degenerate and become obscured by secondary characters.

† Referred to as Shagreen hairs by Prof. E. B. Poulton, and Mannillary hairs by Dr. T. A. Chapman, on account of their raised bases, which form so characteristic a feature of some larvæ, especially those of *Smerinthus*.

distinguishing them from the numerous secondary tubercles, bearing setæ, that are indistinguishable after the second moult or thereabouts. In fact, so little does this 1st stadium appearance of secondary hairs in Amorphids (Smerinthids) impress me from a classificatory point of view, that I doubt if it affords good grounds for giving the *Amorphinae* group greater value than the other groups in B.

What it does afford evidence of, I submit, in spite of the weighty objections of Dr. Chapman to this view, is that the larva of *Amorphinae* is a more specialised and not more primitive form. There may or may not be a coat of minute spicules on a Sphingid larva, but these, although possibly, or, perhaps, probably, the original source from which the secondary hairs were developed, are not now in any way correlated, so far as I am aware, although there may be a closer affinity between spicules and the bristly setæ on horn in the 1st stadium. The secondary hairs do not appear until after the first moult, except in Amorphid (Smerinthid) larvæ, and appear to be analogous to those of Lachneid and Dimorphid (Endromid) larva, especially in regard to the development of pigmented specks, or spots surrounding their bases. The bases of these hairs in many, if not all, the Sphingid larvæ are raised to a greater or less extent in one or more stadia. In this form they are especially characteristic of Amorphid (Smerinthid), and to a less extent of Hemarid larvæ. Accompanying the raised base is the pigmented spot above referred to. This is usually of a pale, if vivid hue, in the Sphingids, and reaches its zenith, among the few larvæ I have seen, among the Phryxids. It is also noticeable in larvæ of *Dimorpha versicolora* and some Lachneid larvæ, but as dark instead of pale spots. It may not, perhaps, be out of place to call attention here to the persistent character of these spots on larvæ of all three groups, as they are frequently found standing out in sharp contrast to the general body colour, and even to specialised markings. In *Hyles euphorbiae*, wherever the black (a late feature) encroaches on the primitive green or yellow it does so at first as streaks or dots *at mid distance between* the hair bases, as though the area surrounding the hair base were distinct from the general skin surface, and, as a character of old standing, were antagonistic to later developments. This development of dark pigmentation along the lines of least resistance, as it were, produces the tessellated pattern of the dark forms of Eumorphid (Chærocampid) larvæ, and its influence may be traced in some Sphinx larvæ, for instance, *Hyloicus pinastri*, and the dark form of *Agrilus convolvuli*, where the dark pigment will be found chiefly as dark streaks at the juncture of the sub-segments (*i.e.*, furthest from the hair bases, as these are usually situated or more strongly developed at the ridge of sub-segment). In Amorphids (*Smerinthus*) this growth of secondary hairs extends over the whole body in the first larval stadium, and is so dense as to give the larvæ a doormat-like appearance, the hairs being stiff, bristly, and comparatively long, compared with their development in later stages; the primitive setæ only being determinable on account of their greater size. The hairs in this 1st stadium of *Amorphinae* (*Smerinthus*),* appear much

* For the best description of these hairs in *Amorphinae* (Smerinthids), see Dr. T. A. Chapman's detailed notes on pages 388, 389 of vol. iii. of Tutt's *British Lepidoptera*.

more numerous than the 2nd stadium developments of the other Sphingid groups, except perhaps *Hemaris*, which is very Amorphid as regards this character; and in *Amorphinae* it is a portion only of these hairs which develop the mammillary bases, the remainder undergoing no further development but a gradual atrophy, as do the actual setæ on the mammillary bases themselves. *Hemaris tityus*[†] forms a link between the *Amorphinae*, and the other Sphingid groups in respect of the development of these secondary hairs. It has, as with the other groups, the primitive 1st stadium that is wanting in *Amorphinae*, the primary setæ standing out clearly and alone on the bare skin surface. The absence of secondary hairs in *Hemaris* is the more accentuated by reason of the large size and the highly forked character of the primaries? i, ii, iii, iv and v, while in its 2nd stadium the usual Sphingid change of the primary hairs being replaced by a coat of secondaries, is also rendered more remarkable by the contrast between the unusual size of the 1st skin primary hairs and the enormous reduction in their size which takes place after the moult; they can only be detected from the secondaries, which they closely resemble, by their slightly larger size. In *H. tityus*, however, instead of the secondary coat being but poorly developed, and of a more or less evanescent character, as is normally the case; it is dense and very strongly developed, and persists until larval maturity. *H. tityus* in its 2nd stadium is more Amorphid (Smerinthid) than *Amorphinae* (*Smerinthus*) itself, in respect of the density of growth, size and forkedness of the bristles; while the 3rd instar of *H. tityus* is but little more advanced in respect of the waning of these features, and the development of the bases of certain hairs into mammillæ than the 1st of *Amorphinae* (*Smerinthus*), and is certainly not so advanced as *Amorpha populi* in its 2nd instar. The bearing of the above notes on the question whether the smooth-skinned larvæ having only the primary setæ present, or those of *Amorphinae* with their dense growth of secondary hairs in 1st instar, are to be considered as the more primitive form of Sphingid caterpillars, is, I think, clear and conclusive.

The argument that, because the caudal horn bears a bristly coat in the 1st instar of the larvæ of all groups, it therefore follows that this coat at one time covered the entire body, to be subsequently lost on the 1st skin of those of all the groups but *Amorphinae*, where its retention is a sign of the generalized nature of the group, is, I think, quite unwarranted. It is difficult to imagine why the larva should develop a dense growth of bristles in its 1st instar, and at a subsequent period lose it entirely on the body but retain it on the horn, and then, after a naked stadium, redevelop or partially redevelop it in a later instar. Besides, the course of ontogeny in Sphingid larvæ, as we at present know them, towards nakedness is to lose not only the secondary, but the primary hairs as well: but the primary setæ in the 1st instar of, say, *Sphinx ligustri*, are not by any means atrophied. It would seem, therefore, that a change which swept away the secondary hairs from the body surface as apart from the horn, and yet left the primaries intact, would be, to say the least of it, a remarkable one, and must have been quite separate and unconnected with the present trend

[†] For my full notes on larvæ of *Hemaris tityus* see vol. iv. of Tutt's *British Lepidoptera*, now in the press.

in the direction of nakedness, which is exemplified in the ontogeny of most Sphingid larvæ. Again, the very fact of the horn alone being left with its coat of bristles intact, suggests that they were an older character in that situation than elsewhere as a reason for their persistence; an explanation which would, so far as I understand it, sweep away the principal argument in favour of their having originally occupied the whole skin surface. It would seem just as probable that they should be first developed on the horn, as that the thoracic segments of some Lachneids should be ahead of the abdominal ones in the development of their hairy covering.

A CLASSIFICATION OF BRITISH SPHINGIDS ON LARVAL CHARACTERS.

First stage pale, with greenish tinge; a larger or shorter caudal horn on 8th abdominal segment, bearing tubercles i on summit; primary tubercles single-haired, except iii of meso- and meta-thoracic segments, which bear two setæ; bases of secondary hairs frequently developed into mammillæ, and sometimes pigmented (one or both of these characters usually well developed in middle 3rd or 4th instars). v normally situated as pre-spiracular towards anterior margin of segment, iv wanting on meso- and meta-thoracic segments. Abdominal segments with eight sub-divisions.

- (A) Dorsal tubercles i and ii on meso- and meta-thoracic segments set as anterior and posterior on separate sub-segments; an enlarged 1st sub-segment, consisting of three of the normal sub-divisions; hairs simple-ended or knobbed, not bifid.
- (I.) With 1st and 2nd abdominal segments swelled and the thoracics retractile within them; well developed eye spots on 1st and 2nd abdominal segments (adult characters).
- (a) i. Fairly developed caudal horn, *Hippotion celerio*.
 ii. Small caudal horn, *Eumorphia elpenor*.
 iii. Caudal horn absent in all stages, *Theretra porcellus*.
- (II.) Without swelled 1st and 2nd abdominal segments, and producing rudimentary ocellated spots on many or all segments.
- (a) i. With single row of ocellated spots, *Phryxus lirornica*.
 ii. With double row of ocellated spots, *Celerio gallii*, *euphorbiac*.*
- (B) Dorsal tubercles on meso- and meta-thoracic segments with bases conjoined or touching, situated on the same sub-segment; no enlarged first sub-segment; hairs in some groups more or less forked (bifid).
- (I.) With forked hairs, but without tumid thoracic segments.
- (a) Primitive setæ only in 1st instar, except on horn.
- i. With bifid character of hairs less strongly developed in 1st stadium, *Sesia stellatarum*.
 ii. With bifid character of hairs much accentuated in 1st stadium.
 a. Hairs pale green, *Hemaris fuciformis*.
 β. Hairs black, *Hemaris tityus*.
- (b) With dense coat of slightly bifid secondary hairs in 1st stadium, and more or less triangular heads in later stadia.

* This species has iv and v on 1st abdominal segment situated on a small oval plate beneath spiracle. This may prove to be a special feature of the species and its variants, or more probably it is a character of the group ii.

- i. Head rounded in 1st stadium, 7th oblique stripe strongly developed, *Mimas tiliae*.
 - ii. Head variable in 1st stadium, 7th oblique stripe strongly developed, *Smerinthus ocellata*.
 - iii. Head triangular in 1st stadium, 1st and 7th oblique stripes strongly developed, *Amorpha populi*.
- (II.) Larvæ with slightly tumid and translucent-looking thoracic segments in later stadia; forked hairs ill-developed, if present.
- (a) With stiff-pointed curved caudal horn.
 - i. Markedly forked in 1st stadium, *Hyloicus pinastri*.
 - ii. Not markedly forked in 1st stadium, *Sphinx ligustri*.
 - iii. *Agrius convolvuli*.
 - (b) With peculiar downward-curved rough horn, *Manduca atropos*.

AN EASTER HOLIDAY IN SOUTH AMERICA.

(Communicated by A. F. BAYNE, November 18th, 1902.)

I had really intended to write you before a few short notes on my Easter holidays this year, my ten days' absence being to a certain extent occupied with entomology, in case they might interest you. I left here about a week before Good Friday, and travelled *via* Mendoza to Puente del Inca. The journey from Buenos Ayres to Mendoza is a tedious one, taking two nights and a day, the train leaving here at about ten p.m. Until the middle of the next day no trace of a hill and hardly, even, a rise in the ground is to be seen—nothing but the open "pampa" and "lagunas" (large shallow pools), the latter crowded with waterfowl, swans, geese, flamingoes, with ducks and moorhen innumerable. On nearing Villa Mercedes, however, solitary "kopjes" appear, and then, in the distance, the line of the Sierras extending northwards towards Cordoba. On arriving at Mendoza, where I joined my brother Will, on the second morning, the scene changes, and as the sun rises you see first the foothills near the town, then the Uspallata range, and beyond a glimpse of Aconcagua and some of the other high peaks of the Andes. The Transandine from Mendoza to Puente del Inca is a narrow gauge line, constructed, in the steeper gradients, with a central toothed rail. It follows the valley of the Rio Mendoza, which it crosses and recrosses many times, through the Uspallata by a narrow gorge, and then into the main chain of the Cordillera. With the exception of a far off view of the high lands near the Brazilian coast, this was my first experience of mountains. I have not been in the Alps, but the Andes between Mendoza and the

Chilian frontier present none of the beauty you read of in connection with the former. There is a grandeur, but it is the grandeur of desolation and of the world in making. Trees are absent, and beyond Uspallata there is little vegetation of any kind, rain scarcely ever falling in the main range, but, I believe, after the melting of the winter snows a wealth of wild flowers springs from the ground in the valleys. The foothills are covered with cacti and other plants. A great part of the mountains may be described as peaks and ridges of bare rock above, with below a heap of *débris*, stacked at a slope at which it will not stand safely, and, as a consequence, continually slipping and falling in avalanches or coming down in "mud runs." Aconcagua itself is a little disappointing, being a huge and rather shapeless mass of rock, but Tupungato, a volcano, is typical of our—or, perhaps, I should say my—original idea of a mountain, the mountain of the picture-books we see in childhood and remember ever after, cone-shaped, white at the summit, and, when seen with the rising sun, of perfect loveliness. We stayed at the Puente, close to the wonderful natural bridge you have, no doubt, read of, for three or four days, and did a little collecting at the height above the sea of from, I suppose, 7,000 to 9,000 feet, in the valley towards Aconcagua, distant about ten miles. Three kinds of butterflies were taken, and a good many others seen, but any exertion is very difficult at the altitude, and our captures were, therefore, not so numerous as they would have been on lower ground. The first was a *Colias* (one ♂ and one ♀), a grand fellow, with a broad black band on the forewings, the male dark yellow and the female white; the second a Pierid, in form almost a little *Tatochila autodice*, Hb.; the third an *Argynnis*, small and pale coloured. The last-named gave us some occasion for thought. It is a strange thing, in the midst of the Cordillera, and far away from the old country, in the shade of Aconcagua, on the side of a hill having the contour of a chalk down, with a tiny lake at the foot, chasing a small fritillary amongst the stones and boulders, indistinguishable to the inexperienced eye from the *A. euphrosyne* or *selene* (although, perhaps, the resemblance is really greater to *A. lathonia*), and with a *Colias* on the wing the very image of *C. edusa*. But I must not allow myself to wander into attempting to describe the course of the river Mendoza, which, starting from the foot of the snow, runs through a gorge, narrow in many places, especially in the sierra of Uspallata, then is diverted to irrigate and fertilize the vineyards, containing one-seventh part of solid matter; or the Cordillera itself, with rocks of varied tints—purple, white, red, or greenish in the sunshine—the sunsets, the valleys by moonlight, the play of the lightning behind the peaks at night, or the bishop of stone sleeping in his mitre, whose head closed the valley to the east.

We left the Inca again the day before Good Friday (the weather had turned cold, and snow lay everywhere until the sun was high), reaching Mendoza at night. We started again on the Saturday morning, and spent a great part of that day at Tunuyan, visiting the river of that name—a glorious locality for insects. Imagine the old bed of a broad stream with high banks, deep pools here and there, tall rushes, bushy scrub (*monte*), large patches of aromatic shrubs—the bog myrtle of the country—with the peaks of the snow mountains far to the west, and you have

Tunuyan. The river runs swiftly across one end of the hollow, mud-coloured, is lost in the marshes of the "pampa," to appear again, it is said, in the south, and help to swell the Rio Colorado. Here among many kinds of butterflies were captured for the first time *Anartia iatropae*, L., *Tatochila rolocemi*, Capron, *Lycaena hanno*, Holl., *Asychis cerialis*, Cram; together with a good many of the species met with here, as *Pamphila phylaens*, Drury, *Lycaena* (?) *cassius*, *Thecla curytulus*, Hb., *Terias dera*, Dbl., and var. *minor*, Berg, *Colias lesbia*, Fb., etc. Elegant dragon flies, hornets, wasps, and beetles were abundant, and besides a good many of these, we took a pair of grey and white footmen, reminding one of *Coscinia cribrum* (the Ringwood one), several noctuæ, and a *Macaria* resembling closely *M. alternata*.

In addition to the list of insects taken at the Puente, we saw several examples of a fine dark-brown butterfly with a slow flight, a yellow *Colias*, a black skipper, and a painted lady or small brightly coloured *Vanessa*. Two or three noctuæ, one an Agrotid, were also taken, and one night at dusk a number of a large species of geometer, superficially like *Selidosema plumaria*, were flying over some low thorny bushes. Up to the present I have been unable to identify any of the Cordillera insects.

LIST OF DESIDERATA FOR THE SOCIETY'S CABINET.

LEPIDOPTERA.

P. Daplidice	J. Algæ	C. Scrophulariæ
A. Lathonia	T. Tridens	C. Lychnitis
P. C-album	A. Strigosa	C. Asteris
E. Antiopa	A. Auricoma	C. Gnaphalii
P. Iris	A. Menyanthidis	C. Absinthii
N. Semiargus	S. Musculosa	C. Chamomillæ
L. Arion	H. Vitellina	H. Armigera
D. Galii	H. Obsolcta	A. Cordigera
D. Lineata	H. L-album	E. Ostrina
C. Celerio	S. Maritima	B. Notha
D. Nerii	N. Neurica	P. Chryson
H. Tityus (Bombylifformis)	N. Concolor	P. Moneta
Æ. Myopæformis	N. Cannæ	P. Interrogationis
Æ. Formiciformis	X. Conspicillaris	P. Bractea
Æ. Asiliformis	L. Exigua	S. Anomala
Æ. Ichneumoniformis	P. Leucophæa	C. Fraxini
Æ. Cynipiformis	A. Corticea	N. Lunaris
Æ. Allantiformis	A. Cinerea	E. Erosaria
Æ. Sphæciformis	A. Aquilina	D. Obfuscata
Æ. Scoliæformis	A. Præcox	M. Cineraria
Æ. Chrysidiformis	A. Obscura	P. Fuliginaria
T. Bembeciformis	T. Subsequa	T. Papilionaria
M. Castaneæ	A. Depuncta	C. Orbicularia
H. Asellus	A. Subrosea	L. Contiguaria
Z. Exulans	A. Sobrina	A. Circellata
L. Pygmæola	P. Hyperborca	P. Straminata
E. Striata (Grammica)	P. Leucographa	R. Sacaria
E. Cribrum	G. Populeti	E. Filigrammaria
D. Pulchella	G. Erythrocephala	P. Affinitata
O. Fascelina	D. Rubiginea	P. Alchemillata
L. Cænosa	J. Croceago	P. Teniata
T. Cratægi	I. Retusa	C. Sparsata
M. Castrensis	C. Pylalina	L. Halterata
G. Illicifolia	V. Oleagina	T. Cognata (Simulata)
P. Harpagula	M. Saturata	H. Ruberata
C. Bifida	M. Exulis	A. Cuculata
G. Crenata	M. Perigrina	A. Derivata
N. Tritophus	T. Atriplicis	P. Fluviata
N. Bicolora	C. Polyodon (Perspicil- laris)	C. Lapidata
D. Dodonea	L. Semibrunnea	C. Polygrammata.
B. Fluctuosa	L. Socia	E. Silaceata
B. Duplaris		L. Prunata
B. Ocularis		

W. ILSTON COX,
Hon. Curator.

PRESENTED

28 APR. 1903



City of London Entomological & Natural History Society.

THIS SOCIETY was founded in 1858 under the title of the "Haggerston Entomological Society," and has striven, for nearly half a century, to diffuse the knowledge of Natural History, particularly of Entomology. It has taken an active part in the preservation of Epping Forest and other similar movements for the public good, and also in the suitable housing of the famous "Double-day Collection" of Lepidoptera. Its own particular work includes the reading of papers, discussions, and exhibitions, and a special feature of recent years has been the compilation of a London Fauna List, now being published in the Transactions.

The meetings are held on the first and third Tuesdays in each month, from 7.30 to 10 p.m., at the London Institution, Finsbury Circus, E.C., which is easily accessible from all parts; the Meeting-room is exceptionally comfortable and well lighted, and no effort is spared to make the evenings pleasant and profitable. An annual Summer Excursion is arranged by the Society, and occasional *Conversazioni*. Visitors are welcomed to all the meetings.

There is a good library, containing, amongst other works, the "Zoologist," "Entomologist," "Entomologist's Monthly Magazine," &c., from their commencement, and also reference collections of Lepidoptera and Coleoptera, to which it is hoped other Orders may be added from time to time.

An Entomological "Exchange Club" is now in process of formation under the auspices of the Society.

The entrance Fee is Two Shillings and Sixpence, and the Annual Subscription Seven Shillings and Sixpence, payable in advance, both being purposely kept low in order that all may avail themselves of the benefits the Society offers. The Society therefore looks with confidence for the support of all who are interested in the study of Natural History.

Further information may be obtained from either of the Hon. Secretaries.



