City of London Entomological & Natural History Society.

THIS SOCIETY has for its object the diffusion of the science of Natural History, by means of papers, discussions, exhibitions, and the formation of collections for reference. Since its commencement in 1858, a valuable and useful Library has been formed, which comprises, amongst other works, complete sets of the "Zoologist" (1843-1897), "Entomologist" (Vols. 1-32), "Entomologist's Monthly Magazine" (Vols. 1-35), and the "Entomologist's Record and Journal of Variation" (Vols. 1-10). There is also a collection of British Lepidoptera, and collections of other orders are now in course of formation.

The meetings take place 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. Exhibits are made at every meeting, and papers read on various Natural History Subjects, a special feature being the systematic discussion and exhibition of interesting groups of insects, &c.

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, the ballot being taken at the next ordinary meeting after that on which they are proposed.

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

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TRANSACTIONS

OF THE

CITY OF LONDON

Entomological & Natural History

SOCIETY

FOR THE YEAR 1900

PUBLISHED BY THE

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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.

Council for the Year 1901.

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Hon. Secretaries	W. J. KAYE, F.E.S., Worcester Court, Worcester Park, Surrey. S. J. BELL, 17, Wiltshire Road, Brixton, S.W.

AND

REV. C. R. N. BURROWS, H. H. MAY, F.E.S., C. P. PICKETT,
H. A. SAUZÉ, AND V. ERIC SHAW.

TRANSACTIONS

OF THE

City of London Entomological

AND

Natural History Society.

PART X.

(1899-1900.)

REPORTS OF MEETINGS.

THE SOCIETY'S ROOMS, LONDON INSTITUTION,
FINSBURY CIRCUS, E.C.
1901.

REPORTS OF MEETINGS.

Dec. 20th, 1899.—Resignations.—Mr. D. C. Bate and Mr. H. A. Hill had notified the Secretaries of their intentions to withdraw from the Society.

I. O. W. Lepidoptera.—Mr. Prout, *Melitaea cinxia* from larvæ taken at Niton, three *Heliophila vitellina*, two *Laphygma exigua*, two *Aporophyla australis* var. *ingenua* and *Heliothis peltigera* from Sandown. From Torquay, *Lithosia caniola* and *Heliophila putrescens*. From Folkestone a series of *Tapinostola bondii*.

Epunda lutulenta.—Rev. C. R. N. Burrows, a long variable series of *E. lutulenta* taken on sugar at Mucking, some of the better known forms were the ♂ abs. *cinerea*, *approximata* (yellow form), *approximata* (true), ♀ abs. *albidilinea* of a red shade, and the aberration known as *lünebergensis*. Preserved larvæ of *Caradrina ambigua* were also shown.

Lymantria monacha.—Mr. Pickett, a very varied brood of *L. monacha* the result of a cross between a type and the black form *eremita*.

Note on Oporabia autumnata.—Mr. Prout mentioned that four months had elapsed between the first and last specimens emerging from a brood reared in captivity. The first appeared on July 30th, the last December 4th.

Discussion on coast collecting.—The Chairman introduced the subject, and mentioned in his remarks that much useful ground had already been covered by Dr. Chapman in his paper on the subject of coast insects, he, however, hoped that the discussion would be a fruitful one. In his own experience he had always found that bleak situations on the top of cliffs, &c., were far more productive than the lower lying ground, also that sugar, to give satisfactory results, must be applied to posts and fences in such situations. Woods in the proximity to the coast were generally unproductive. Sandhills and such situations were, however, well known to be favourite resorts. Mr. Nicholson testified to the above, and also added that he had found ragwort, when sugared, gave good results, as well as bramble blossom. Mr. Dadd mentioned that some of his best day work had been spent in coast collecting, and cited Deal as a centre. He said he had seen insects at snowberry berries. Some speculation followed as to the reason of their attractiveness. Dr. Chapman suggested that wasps had probably eaten part of the berries and thus liberated the juice. Mr. Bell recounted some of his experiences when coast collecting. He had found *Agrotis lunigera* high up on the cliffs. *Agrotis ripae* was stated to be found in the larval state on prickly saltwort in such places that in the winter the sea would probably completely cover its feeding-ground. Mr. Prout said the larvæ were known to go down in captivity two or three feet into the sand and probably, in nature, they would be protected at such a depth from any action of the sea. Special coast insects were mentioned by several members. Mr. Bacot instanced *Malacosoma castrensis* and *Geometra smaragdaria* on the coast of Essex. Mr. Kaye cited *Sesia musciformis* and *Stenia punctalis*, the former frequenting the top and the latter the bottom of the cliffs in Cornwall. The President

made some concluding remarks in which he stated that the number of insects found on the coast was probably partly accounted for by insects congregating there, the sea forming an effective barrier to dispersal.

Jan. 2nd, 1900.—Pocket box exhibition.—Mr. May, a series of bred *Heliophila albipuncta*, from ova laid by a Sandown specimen, also a bred series of *Caradrina ambigua*. With regard to the former species the President remarked that he believed Mr. May was the first British lepidopterist to breed this moth. Mr. Prout, *Oporabia autumnata* ab. *sandbergi* bred from ova laid by a Rannoch ♀. Some *Gortyna ochracea* bred from Sandown pupæ; *Zonosoma porata*, a third brood bred in September, 1899, from ova laid by a Starcross ♀ captured on August 5th, 1899; *Amathes glareosa*, unusually large, bred September, 1899, from a Wimbledon larva; *A. xanthographa*, an ab. taken at sugar at Sandown in September; *Hecatera chrysozona* bred from Cambridge, and *H. serena* from Torquay ova; an interesting box of northern *Larentiidae* was also shown, which included *Melanippe sociata* var. from Iceland, *M. frigidaria* from Finmark, *Coremia designata* var. *islandica* and *C. arcticaria*, the latter of which Mr. Prout thought might prove to be only a var. of *C. munitata*; *Larentia caesiata* var. *gelata* from Greenland, *L. polata* from Tromsö, and *L. serraria* from Moscow. Mr. Kaye, a box of Deiopeias containing series of *Deiopeia speciosa* from Jamaica, *D. ornatrix*, and types of *D. pulchella* and *D. bella*, also a specimen of a lepidopterous larva from New Zealand, with a fungus growth upon it, which was probably referable to *Cordyceps robertsii*. Mr. Riches, a long series of *Amathes ditrapezium* bred from larvæ taken on Hampstead Heath. Mr. Riches said that the species had been obtained more plentifully during the past year than formerly. Mr. Pickett, some fine forms of many species, amongst which were—*Brenthis selene*, dark specimens, *Abraxas grossulariata*, *Hipparchia hyperanthus* ab. *arete* and intermediates, *Nemeophila plantaginis*, with red hindwings, *Anthrocera filipendulae*, with yellow hindwings, *Dilina tiliae*, very varied, and a remarkably dark var. of *Botys urticata*. Mr. Bell, series of *Agrotis corticea* and *A. lunigera* from Sandown, also *Boarmia repandata*: and a piece of buckthorn with malformed leaves; also a careful dissection of a pellet of indigestible substances rejected by an owl. Mr. Bacot, some bred *Pterophorina* which included *Aydistis bennettii*, *Leioptilus lienigianus*, *Cnaemidophorus rhododactylus*, *Oxyptilus heterodactylus* (*tenerii*), *Pterophorus monodactylus* and *Aciptilia galactodactyla*.

Resignation of member.—It was announced that the resignation of Mr. T. Gurney had been received. With reference to the resignation of Mr. Bate reported at the last meeting, it was resolved unanimously that a letter be sent requesting him to reconsider the matter.

Proposal for exhibition.—A proposal was made by Mr. Dadd and seconded by Mr. Jennings, that it be considered whether an exhibition should not be held at an early date. The proposal was carried.

Jan. 16th, 1900.—Resignation.—It was reported with satisfaction that Mr. D. C. Bate had agreed to remain a member. Mr. T. F. Clarke informed the secretaries that he wished to withdraw his membership.

Publication of Transactions.—The President asked if the meeting desired any change from that of the previous year in the matter of publishing the *Transactions*. No suggestions were forthcoming, and it

was therefore agreed that as previously a publishing committee should be formed to deal with the matter.

Wimbledon lepidoptera.—Mr. May exhibited *Triphaena subsequa* (*comes*), two banded forms, and one with the hindwings suffused; a specimen each of *Agrochola pistacina* and *A. litura*, with dark bands across the primaries; an example of *Glaca raccinii* of a peculiar grey tint, somewhat corresponding with a form known to occur in Wales.

Exotic Sphingidæ.—Mr. Kaye, a number of *Sphingidae*, which included *Wallengrenia aper* from Columbia, *Ambulyx substrigilis* with a fine dark var. from Assam, with *Angonyx testacea* (*ella*) from the same locality. *Polyptichus pusillus* from Natal, and *Pseudosphinx incisa* and *Ambulyx palmeri* from Rio Janeiro.

Folkestone lepidoptera.—Mr. Pickett, *Agrotis tritici* taken at sugar in July, 1899. *Cosmotriche potatoria* bred from larvæ found at Whitsuntide, 1899, also *Smerinthus ocellatus* bred from a Tottenham larva.

Agrotids.—Mr. Prout, fine series of *A. tritici*, *A. obelisca*, *A. aquilina*, *A. nigricans* and others; also *A. tritici* from Berlin, and *A. aquilina* and *A. obelisca* from Vienna; *A. nigricans* from Gratz, and *A. crassa* from Vienna. Mr. Dadd, many species of the genus *Agrotis*. Of the European, *A. nigricans*, *A. perpoleta*, *A. tritici* and *villeripennis* were shown; of the American, *A. subgothica*, *A. herilis*, *A. introferens* and *A. quadridentata* were exhibited.

Discussion on the Agrotis tritici group.—The President said that the first question to be asked was, how many species have we? *A. cursoria* he thought, was one of the most difficult species. He personally had found that generally this insect had narrower forewings, which character might be of use for separating it. As to whether this species occurred on the Kentish coast there was much doubt. On the Lancashire littoral it was, however, easily separated from *A. tritici*, the coloration there being very distinct. A paragraph was read from *British Noctuae and their Varieties*, where Mr. Tutt gives it as his opinion that only parallel forms to *A. cursoria*, of *A. tritici* exist on the Kent coast and that true *cursoria* is unrepresented. The same also applied to *A. obelisca*. Mr. Dadd followed, and said that *A. cursoria* was generally more sandy-coloured than *A. tritici*. He believed that local variation was strong, but that in some localities all forms were to be found together. Several of the North American species were discussed, and the remarks of Speyer concerning *A. aquilina* were introduced. Speyer affirming that the few *A. aquilina* from the south of France are different from *A. tritici*, the antennæ being longer and more pectinated. Mr. Kaye asked if *A. aquilina* had its status solely on the characters of the perfect insect, to which the answer was in the affirmative. The Rev. C. R. N. Burrows, who was not present, submitted that what we call *A. aquilina* is really only a marsh form of *A. tritici*, and that while *A. aquilina* inhabits the marshes, *A. tritici* frequents downs and such-like dry situations, and that the two are never transposed in habitat.

Feb. 6th, 1900.—Exotic Sphingidæ.—Mr. Dadd exhibited two boxes of foreign *Sphingidae*, and Mr. Bacot also showed some exotic species of this family. The specimens included *Thyreus abbottii*, *Choerocampa schenkii*, *C. porcellus*, *Elibia dolichus*, *Deilephila lineata* and *D. livornica*, with many others.

Rare dipteron.—Mr. Jennings, a specimen of the dipteron, *Hyelemia praepollus*, Wild., taken at Edmonton. The specimen was caught in August, 1896, but he had only recently been able to obtain the name of the insect from our most eminent authority, Mr. Verrall, who had examined it.

Anthocaris belemia.—Dr. Chapman, a living specimen of *A. belemia*, and remarked on the somewhat unusual habit it had of resting, whereby the striped underside was shown so that the stripes assumed a vertical position.

Hesperia comma.—Mr. Pickett, a series of *H. comma* taken on the Guildford downs.

Death of member.—Mr. Bell read a letter from the son of Mr. W. Gates, a former member, in which it was announced that Mr. W. Gates had recently died at the age of 71. Upon this Mr. Tutt moved that the secretaries be asked to write for any manuscript notes that Mr. Gates might have left, for the benefit of the Society, and to convey to the son the great regret of the Society at the loss of one of its oldest members. Mr. Clark seconded and the motion was carried.

Paper.—Mr. Kaye read a paper on "The re-classification of the Lepidoptera" (Printed in the transactions).

Feb. 20th, 1900.—Magazine.—Mr. Jennings announced that he had received the Halifax Magazine for the library.

Lepidoptera from Fusio.—Mr. Edwards exhibited three boxes of lepidoptera taken at Fusio, and Dr. Chapman also exhibited a large number of insects from the same locality.

Triphæna janthina, etc.—Mr. Clark, a bred specimen of *T. janthina* that had been forced through the winter. Mr. Pickett exhibited a long series of *Ematurga atomaria* from several localities, showing light and dark forms.

Paper.—Mr. Donisthorpe read a paper on the "Myrmecophilous Coleoptera." He divided it into three sections: (1) On the life-history, mimicry and relations to the hosts of myrmecophilous coleoptera. (2) On the best methods of collecting the British species. (3) A table classifying all the British species recorded, in the manner used by Wasmann for the myrmecophila of Hollandish Limburg. In speaking about mimicry and protective resemblance, Mr. Donisthorpe mentioned that, in certain cases, the resemblance was complete except for colour. This was pointed out to have less significance, than at first sight appeared, as it was known that in certain species of ants the sight was very feeble. Many of the myrmecophilous coleoptera acted as scavengers, such were some of the *Staphylinidae* and *Histeridae*, which were to be found in the channels with *Formica rufa*. Protection was said to be afforded in a variety of ways. Amongst the *Coccinellidae*, *Coccinella distincta* was mimicked by *Clythra* 4-*punctata*. Others are able to protect themselves by curling themselves up, while *Atemeles emarginatus* imitates the movements of ants. All true guests were said to have tufts of golden hair situated on the abdomen generally. It was known that certain species in the genus *Atemeles* even changed their host at different times. In his remarks on the method of working for these myrmecophilous coleoptera, Mr. Donisthorpe had found that the spring and autumn were the best periods of the year, but it frequently happened that some days were favourable with no apparent reason.

At the close of the paper Mr. Heasler proposed a hearty vote of thanks which was seconded by Mr. Bacot and carried unanimously. Messrs. Clark, Tutt, and Jennings took part in the discussion that followed.

Dr. T. A. Chapman read a paper entitled "A few days at Fusio (printed in the *Transactions*).

March 6th, 1900.—Cilix glaucata.—Mr. Kaye exhibited an unusually pale *C. glaucata* with types for comparison.

Preserved larvæ.—Mr. Pickett, a large number of preserved larvæ, including *Stauropus fagi*, *Jocheaera alni* and *Cerura furcula*. A freshly emerged specimen of *Amorpha populi*, that had been forced, was also shown.

Syntomis phegea.—Mr. Bacot, *Syntomis phegea* with larvæ. In referring to the specimens, Mr. Bacot spoke of them as *Artiadae*. Mr. Kaye said he thought that Sir George Hampson was correct in placing *Syntomis* and allied genera in a separate family, *Syntomidae*. The vein 8 of the hindwing being always absent, and the colouring also being generally of quite exceptional brilliancy, whilst in a large number of cases portions of the wing were transparent. Mr. Bacot remarked that ovum and larva were quite Arctiid. The President submitted that again it was a matter of opinion whether *Syntomidae* could be proved sufficiently distinct from *Arctiadae* for family separation.

Discussion on larvæ.—Mr. Prout, from the chair, made some remarks on the theory of a fixed hybernating stage. He alluded to *Acidalia rusticata* as a case contrary to the theory, that species he himself knowing to go into hybernation at the last moult and also in the last but one. Mr. Bacot made a strong point of the different stages in the existence of larvæ at which they become specialised. In some groups the larva is generalised in the first instar and becomes specialised later, such for instance as those of some of the butterflies, while the *Lachneidae* (*Lasiocampidae*) such as *Cosmotriche potatoria* and *Eutricha quercifolia* were specialised from the egg. The *Sphingidae* were also well known to be highly specialised from the egg. Mr. Bacot further touched on the subject of in-breeding in captivity, he thought that probably mortality was due to some extent, not so much to in-breeding as to insufficient attention. Mr. Prout said that before leaving the question of the highly specialised Sphingid larva, he would like to say that in a paper by Piepers the conclusion was reached that the horn present on the 12th segment was once of use to the larva, but is now gradually becoming atrophied. Mr. Tutt who made many useful suggestions said that, with regard to hybernation in a particular instar, those species that have a large geographical area might (and probably often did) have different stages in which they were able to hybernate. *Lasiocampa quercûs* was known to hybernate in a different instar in the south of England from that in the bleak moorlands where the imago presents a slightly different facies and is known as *callunae*. There was no doubt there was often a reaction on the part of larvæ to their environment. Those larvæ that have to exist under various conditions would be quickly exterminated if they could not respond to those varying conditions. Mr. Kaye thought Mr. Tutt's remarks were well illustrated by an analogous case in the culture of certain plants. Those that have a wide geographical range (particu-

larly in relation to altitude) being easy of cultivation, while those that are specialised to some particular climate are the most difficult.

March 20th, 1900.—Japanese lepidoptera.—Mr. Kaye exhibited two boxes of Japanese moths containing almost wholly those species belonging to the European Palæarctic Region, many of them being found in Britain; amongst the specimens were *Heliophila turca*, *Agrotis segetum*, *Bombycia fluctuosa*, *Malacosoma neustria*, *Acidalia remutata* and *Porthetria dispar*. Mr. Prout also had brought three boxes of Japanese lepidoptera containing chiefly those species that were not to be found in Europe. Amongst these, however, were some fine *Zonosoma punctaria*. Mr. Prout referred to some European Zonosomas also exhibited, and called attention to the fact that two species had recently been separated by their genitalia and also by their life-histories.

Phibalapteryx aquata.—Dr. Sequeira, a specimen of *P. aquata*, believed to be British, with several *P. vitalbata* for comparison. He remarked that *P. aquata* occcurred sometimes on the continent where clematis was absent.

Honeysuckle twisted on birch.—Mr. S. J. Bell, a remarkable piece of birch stem with honeysuckle tightly twisted round it.

Pyrausta purpuralis and P. ostrinalis.—Mr. Kaye, a large number of *P. purpuralis* and *P. ostrinalis*, mixed, and gave it as his opinion that it was not always possible to separate the two, and that for want of evidence as to life-histories he did not regard them as two species. Mr. Tutt objected and stated that in his opinion they were abundantly distinct, and occurred separately and abundantly in many localities; *P. ostrinalis*, he stated, was in countless numbers at Bourg St. Maurice in the Tarentaise, whilst *P. purpuralis* was entirely absent; similarly in Britain the habitats of the two species were quite distinct.

Invitation from Mr. Hanbury.—A letter was read from Mr. F. J. Hanbury inviting those members who wished, to inspect his collections at his house on March 26th.

Letter from Royal Microscopical Society.—A letter was read from the Curator of the Royal Microscopical Society, bringing to notice the name of Mr. Adolf Hempel, who was collecting in Brazil, and wished to find buyers for the specimens collected.

Announcement of conversazione.—It was publicly announced that the date for the forthcoming conversazione had been fixed for Tuesday, April 24th.

April 3rd, 1900.—Polyommatus corydon aberrations.—Mr. Clark exhibited some finely marked and other specimens of *Polyommatus corydon*, which he had acquired from the collection of the late Samuel Stevens; some of the specimens having the spots almost obsolete, others with the spots coalescing, whilst some were curious dusky specimens. It was stated that some of the specimens were labelled Brighton. Mr. Kaye and Mr. Pickett both remarked that aberrations of this species were of quite common occurrence at Dover.

Forced insects.—Mr. Pickett, several insects that he had hatched indoors, and stated that *Hybernia leucophaearia* was taken in nature between March 18th and 20th.

Aporia crataegi.—Mr. Bacot, hybernating larvæ of *Aporia crataegi*.

Conversazione.—Mr. Prout reminded all members of the forthcoming conversazione and asked that all might contribute something.

Discussion on the Micro-lepidoptera of the London District.—Mr. Prout called on Mr. Bate to open the discussion and to make some remarks on his exhibit of "Micros." Mr. Bate on rising said the first thing to be settled was—where do "Macros" end and "Micros" begin? Many writers had made the division above the Pyrales, that family heading the "Micros" so called. Mr. Bate went on to endeavour to account for the general neglect at the hands of most lepidopterists of these smaller insects. The pinning was granted to be a difficulty that was very real. From their less conspicuousness, some Micros considered rare, were not infrequently turned up in numbers, which fact of itself should be a strong inducement to many to take up the study of this division. Micros were ubiquitous, in one hour the speaker mentioned having taken as many as 30 species from a fence in Dulwich. The setting was far easier than was commonly supposed, and the use of cotton was preferable to that of paper strips. The wings if quite fresh could often be blown into the correct position for display in the cabinet. A large number of "Micros" were exhibited taken in the neighbourhood of Dulwich. The most interesting of these was *Schoenobius forficellus*. Mr. Prout said with regard to the division he thought we must begin the "Micro" division with the Pyrales. He remarked on the difficulty of dealing with the Tortrices from the fact that there were no structural characters to work with as in the Tineina. A curious fact was related as to how Mr. Taylor had on one occasion on Wimbledon Common had a "Tortrix night" at sugar, *i.e.*, one on which only species of that family appeared. It was remarkable that on the same night, that *Halias quercana* and *H. bicolorana* also appeared, and the natural question arose, Are these insects Tortrices? Mr. Clark said the setting of Tineina was no more difficult than that of the larger groups. Mr. Dadd supported the experience of Mr. Taylor by saying that he had had a similar night at Winchmore Hill, when also *H. prasinana* turned up. Mr. Prout inquired if anyone knew how many of the Pterophorina were known to occur in the London district. He himself knew of *Platyptilia gonodactyla*, *Pterophorus monodactylus*, *Aciptilia pentadactyla* and *Alucita hexadactyla*.

April 17th, 1900.—Spilosoma mendica.—Mr. Kaye exhibited a long series of *Spilosoma mendica* bred from ova, and read some detailed notes concerning the emergences and variation of the species.

Pachys strataria.—Mr. Pickett, a living specimen of *Pachys strataria* from Chingford.

Paper on Phorodesma smaragdaria.—At the commencement of the paper Mr. Burrows stated the enormous difficulty of finding the larva of this species. In England it was only to be met with on *Artemisia maritima*. It was said to have been found by Koch on *Achillea millefolia*, and at the present time it is not contradicted but the statement required further confirmation. *Phorodesma pustulata* was the only other species that had the curious habit of clothing itself with pieces of the food-plant. The use of this clothing in *P. smaragdaria* was now readily appreciable, it having been ascertained that these fragments shut up small quantities of air bubbles which, when the larva is subjected to floods, it makes use of to keep itself afloat on the water. The use of similar particles by

P. pustulata can have no such function as the larva is an oak feeder, and, moreover, feeds generally high up. Careful details were given as to how the fragments in *P. smaragdaria* were affixed. It was said that there were special spines, which were in excess of the usual tubercular spines, to hold these pieces. These special tubercles and spines were situated on the 1st, 2nd, 3rd, and 4th abdominal segments above and on the bottom of the 5th and 8th. The variation of the imago was then considered at some length, and although it had been said there was very little variation Mr. Burrows had detected a great deal. The form *prasinaria* was by some considered a distinct species. The markings were the chief feature of the variation, colour variation being rare. One of the most uncommon forms was that without the discoidal spot. In colour, a form had been taken that was quite blue instead of green. Some very interesting details were given as to the habits of the egg-laying, larva, and perfect insect, those of the former being, it was believed, submitted for the first time. Mr. Clark proposed a hearty vote of thanks which Mr. Bacot seconded. Mr. Kaye, in supporting, asked if the water in the localities where *P. smaragdaria* fed was brackish enough to freeze, and also if it were known whether this species was subject to attacks of ichneumons. Mr. Burrows on rising to reply, said that in great floods the feeding-ground of *P. smaragdaria* was completely inundated and in severe frosts completely frozen; no effect seemed to be made on this insect however. He had never heard of an ichneumon stung specimen.

May 1st, 1900.—Ova.—Mr. Dadd exhibited ova of *Pachnobia leucographa* and of *Xylocampa areola*.

Abraxas grossulariata aberrations.—Mr. Clark, some of the curious streaked specimens of *A. grossulariata* bred from Aberdeen. Mr. Bell also showed a melanic larva of the same species, which was completely black except the head.

Acanthopsyche opacella.—Dr. Chapman, five ♀ *Acanthopsyche opacella* with some ♀ s which, it was pointed out, had six rings of woolly hair on the body. It was previously known that there was some wool, but not so placed as was now shown to be the case.

Chesias rufata.—Dr. Chapman, some specimens of *C. rufata* from southern Europe. These were very large and of a grey banded form.

Geometridæ from Norway.—Mr. Prout exhibited the specimens of *Geometridae* collected in Norway by Dr. Chapman. These included *Thera variata* var. *obeliscata* but without variation. *Emmelesia albulata*, in which none of the specimens were so extreme as are to be found in Shetland. *Melanippe montanata* ab. *fuscomarginata*, *Cidaria abrasaria* a long and varied series, *Bupalus piniarius* of the white form as known in Scotland, and *Psychophora sabini*. Some larvæ were also shown of *Melitaea cinxia* from the Isle of Wight, of his own taking, and larvæ of *Proutia eppingella* from Chingford.

Melalopha pigra.—Mr. Pickett, some *Melalopha pigra*, one of which was an extremely dark and interesting form.

Cyaniris argiolus.—Mr. Kaye said he had seen some *C. argiolus* at Worcester Park for the first time since 1888. Several members mentioned its having been taken very close to London, and Mr. Dadd said that it had been suggested that it was sometimes imported as ova in holly brought in at Christmas time from the country.

Intoxication of insects.—Mr. May raised a question as to whether moths at sugar become intoxicated or only drop off for protection. Dr. Chapman suggested that at sallow catkins, moths cannot become intoxicated, yet they drop off in the same way; it was assumed that protection was the sole cause, and he did not consider that insects became intoxicated.

Discussion on Nomenclature.—This was introduced by Mr. Dadd, who stated that by nomenclature we should indicate the order, family, genus and species to which a given creature belongs. Haworth favoured the view of indication by special affixes for the different families. The arrangement has, however, not been adhered to. With genera the names should indicate the common affinities of those species that are included in that genus. English names were frequently much more descriptive than the scientific one. Latin and Greek names were very frequently only fanciful. Mr. Dadd was of opinion that discoverers of new species should not lend their names for the names of such. With reference to the great multiplicity of generic names, it was suggested that there should be a time limit for priority in resurrecting old names. Varieties of species were recommended to be termed var. A, B, &c., or even numbered, but not named. Instead of dividing existing genera up into a number of smaller genera it was urged that the system of sections should be employed. Dr. Chapman in proposing a vote of thanks to Mr. Dadd for introducing the subject, said one of the great things to be aimed at in a name was finality. Get the original name and keep it! He thought that the specific name ought to be an unique name and deprecated the use of the same name over and over again in different genera. The present system was a binomial one of which the first name was classificatory and the second descriptive. The classificatory name must be altered if it be necessary. Mr. Kaye seconded the vote and suggested a trinomial system by which there should be two classificatory names and a descriptive one. Mr. Nicholson thought that it was imperative that any system should be universal, and agreed that names should so far as it was possible, also be descriptive. Messrs. Bell and May thought that final unanimity was an impossibility, but Mr. Prout in the course of his remarks, mentioned that the International Congress of Zoology was considering the matter of unanimity and that such a thing need not be despaired of. Mr. Prout saw no objection to the use of sections in splitting up unwieldy genera. He was of opinion that the resurrecting of original names had better be done now than perhaps later on. With reference to the trinomial system suggested, he saw some good in its use for purposes of writing. Mr. Dadd then replied to the vote of thanks accorded him.

May 15th, 1900.—European Geometrids.—Mr. Prout exhibited some interesting Geometrids from various parts of Europe, including *Acidalia perochraria* from Innsbrück, *A. rufaria*, *A. humiliata*, and strongly-marked *Strenia clathrata* from Wolfsberg. *Cleogene nivcata* from Sau Alpe. *Strenia glarearia* from Kor Alp, and variable *Emmelesia minorata* from Heiligenblut. Several British insects were also shown which were to go into the Society's cabinet.

Phaeretra rumicis.—Mr. Dadd, larvæ of *P. rumicis*.

Tripiæna janthina.—Mr. Clark exhibited some *T. janthina* bred

by forcing, and gave some interesting dates of the emergences, and suggested that there were two periods at which the emergences of the same brood take place. The dates given were February 19th, 21st, 27th, and then April 28th, 29th.

Cyaniris argiolus.—Mr. Pickett showed specimens of *Cyaniris argiolus* taken on May 5th in Epping Forest.

Papilio machaon aberration, etc.—Mr. Kaye, a fine ab. of *Papilio machaon*, in which the marginal band of the hindwings was much extended and which joined the much enlarged discoidal spot. He also exhibited some young larvæ of *Drepana lacertinaria*.

Aglia tau, etc.—Mr. Bacot, larvæ of *Aglia tau* in their first skin. Mr. Riches, larvæ of *Amathes ditrapezium* and *A. triangulum* from Hampstead Heath. Mr. Nicholson, gall-flies from a swollen blackberry stem.

Conversazione report.—Mr. Bell read the report of the conversazione held on April 24th. Mr. May proposed and Mr. Bacot seconded a vote of thanks to Mr. Bell, and all those who cooperated with him, for their energy in carrying out the work in connection with the conversazione.

Hoxton Field Club.—Mr Bell read a letter from the Secretary of the Hoxton Field Club asking if any help could be given.

Paper.—Mr. Heasler read a paper received from Mr. Jarvis on "The land shells of Jamaica." The paper was well illustrated with specimens, and maps of the localities where the shells were collected were exhibited. Mr. Clark proposed and Mr. Kaye seconded a vote of thanks to Mr. Jarvis for writing, and also to Mr. Heasler for reading, this paper. The vote was put and carried unanimously.

Discussion concerning pupæ.—Mr. Nicholson, rising to open the discussion, referred to the matter of digging for pupæ. He said that in his experience this method of obtaining insects was not sufficiently profitable. Mr. Clark said he had done a great deal of pupa-digging at willow, poplar, &c., and had met with varying success. A row of lime trees had been found to be a good situation. Forest trees rarely paid for the trouble. Mr. Bell, contrary to general experience, had dug a large number of pupæ on one occasion in the New Forest. Mr. Dadd said that his experience was that a large number of empty pupæ were to be found. Mr. Nicholson then called attention to the remarkable habit of *Nyssia hispidaria* in going down such a long way into the earth to pupate. He had himself dug pupæ of this species at a depth of 2ft. Mr. May suggested that this species required exertion to get a sufficient circulation. Mr. May said also that when breeding he thought it safer to leave pupæ alone in the earth. Dr. Chapman asked if *N. hispidaria* went to such a depth for the benefit of development. Mr. Prout remarked that the alleged great depth had been challenged. He said that this species liked hard ground and went down till it found such. Mr. Cox said that many larvæ can be induced to pupate at certain trees if the ground be loosened a little on the surface ; in his experience any side of the tree paid equally well. Trees and hedgerows he had found productive. Mr. Pickett noted the unusual position in which he had found pupæ of *Lasiocampa quercus, viz.*, on bramble. Mr. Bacot referred to larvæ which protect their pupæ with cocoons. He said these larvæ appear to endeavour to save a little silk by spinning up in a corner or next to another cocoon. Mr. Kaye gave as his experience

in hatching pupæ that a bell glass was an excellent covering, as with slight moistening a humid atmosphere could be maintained such as was beneficial to emergence. Dr. Chapman referred to some of the scientific aspects of a pupa. He said that the lepidopterous pupa was descended from the nymphs of insects that had no pupal stage. The pupa as an intermediate stage has brought about specialisation in the larval form. He considered that the quiescent pupa was evolved for protective purposes.

June 5th, 1900.—Lozopera francillonana.—Dr. Chapman exhibited some specimens of *L. francillonana* with its parasite *Chelonus inanitis*; also a piece of the food-plant, *Ferula communis*, showing the entry hole of the larva, prepared exit holes, utilised exit holes with empty pupæ *in situ*, exits of parasites and tunnels made by the larva. This prepared stem showed that the larva makes its entry under the petiole and works its way upward and finally outward, leaving a thin layer of epidermis at the exit; if this be faulty the larva fills up the hole with silk.

Nemeobius lucina.—Mr. Pickett, specimens of *N. lucina* taken the previous day on the Guildford Downs, including a specimen having some of the spots on the hindwings almost yellow instead of the normal brown colour; also *Callophrys rubi*, *Cyaniris argiolus*, *Polyommatus alexis*, &c., from the same district, and a living specimen of *Arctia villica* bred from a Deal larva.

Psychids.—Mr. Prout reported that he had been successful in beating for "Proutias" at Epping, chiefly from hawthorn.

Sesia cynipiformis.—Dr. Chapman reported *S. cynipiformis* in a wound in oak bark at Epping.

Secretarial communications.—Mr. Bell read a telegram received from Dr. Sequeira advising that Mrs. Clark, the wife of one of the Society's Vice-presidents, died on the 3rd inst. Mr. Prout proposed a vote of condolence, which was unanimously adopted. The death at Port Elizabeth of Mr. E. Heasler, a member of the Society, was also reported. A proposal from the Chair that the Secretary should write to Mr. H. Heasler expressing the Society's sincere sympathy and regret was supported by all present.

Committee report.—Mr. H. A. Fuller, on behalf of the Committee appointed to make arrangements for the Annual Excursion, reported that Barthorne Woods (near Effingham Junction) had been fixed upon as a locality likely to give good collecting. Full details of times of trains, reduction of fares, &c., were given, and June 23rd suggested as a favourable date. Dr. Chapman proposed, and Mr. Bell seconded, the adoption of the Committee's programme, and at the Chairman's suggestion Mr. H. A. Fuller was appointed leader of the expedition.

June 19th, 1900.—Lepidoptera.—Mr. Bacot exhibited specimens of *Anthocaris belia* and *A. belemia* and two examples of *Thais polyxena*; one of the last was a striking aberration, the black markings on the forewings varying from the type both in formation and disposition. Some larvæ of *Pachnobia leucographa*, a pair of *Spilosoma urticae*, very strongly marked, and ova of *Cerura erminea*. Mr. Bacot further exhibited ova of *S. urticae*, and larvæ of *Axylia putris*, which he placed at the disposal of any members who were in want of them.

Habrostola asclepiadis, etc.—Dr. Chapman, a living specimen of *H. asclepiadis*, the close resemblance of which to *H. triplasia* was remarked upon. A living specimen of *Libythea celtis* was also shown, a species, which Dr. Chapman considered one of the most interesting of European butterflies. The genus *Libythea* was distributed nearly all over the world. He drew attention to the very long palpi and suggested that these served as a support to the antennæ, which are held forward when the insect is at rest.

Ova from crossed pairings.—Mr. Pickett, ova, the result of pairings between *Amorpha populi* ♂ and *Smerinthus ocellatus* ♀, and *vice versa*, also between *Dilina tiliae* ♀ and *S. ocellatus* ♂.

Larvæ of Zonosomas.—Mr. Prout, young larvæ of *Zonosoma punctaria* and *Z. porata*, also specimens of *Tephrosia bistortata* taken on the undercliff between St. Lawrence and Niton, Isle of Wight, on April 10th.

Annual excursion.—Mr. H. A. Fuller reported that Mr. Pickett had drawn his attention to the fact that the daily excursion rate to Effingham Junction was lower than the fare quoted by the South-Western Railway for the party. He accordingly wrote the railway company asking for an explanation, who replied that the rate quoted was the usual one for pleasure parties, at the same time, they confirmed the excursion fare and enclosed handbill *re* same. It was therefore decided that each member should take his own ticket at the lower fare.

Secretarial communication.—Mr. Bell announced that both Mr. Kaye and himself would be out of town on the occasion of the next meeting. Mr. Sauzé had kindly undertaken to perform the secretarial duties on that date.

July 3rd, 1900.—Library acquisitions.—Vol. 8 of *Buckler's Larvae* was purchased and the *Journal of the City of London College Science Society* was received gratuitously.

Callimorpha dominula, etc.—Mr. Pickett exhibited some extra large specimens of *Callimorpha dominula*, bred, and showing some aberration in the white patches; *Pterostoma palpina*, bred from willow from ova from a captured ♀ at Guildford. On members mentioning that they had rarely met with this species, Mr. Dadd said the larvæ could be taken on osier in September. A much varied series of *Angerona prunaria* and three *Arctia villica* from St. Margaret's Bay, one being asymmetrical without three white spots on the right fore-wing, which were normal on the left.

Smerinthus populi ab.—Mr. Mera, an aberration of *S. populi*, in which the reddish patches on the hindwings had disappeared, their place being taken by obscure pale yellow patches. A second specimen exhibited was normal, although both were taken as larvæ at the same time on sallow. He also showed a specimen of *Lasiocampa* var. *callunae* from Aberdeen parents. The short life-history was exceptional. The egg hatched in June, 1899, and the larva pupated in the autumn of the same year, hybernation taking place in the pupal stage. The imago emerged June 11th, 1900, and was of the *quercûs* form.

Hemaris bombyliformis.—Mr. Bloomfield, a specimen of *H. bombyliformis* taken at Horsley on the occasion of the Society's excursion on June 23rd. Some bred specimens of *Spilosoma urticae* were also shown.

Communications.—Mr. Pickett said that the eggs from the pairings of *Smerinthus ocellatus* and *S. populi* had proved to be infertile.

Excursion.—Mr. Fuller said the annual excursion had been highly successful, with an attendance of 20, but lists of captures that he embodied in a report were not to hand yet.

Discussion on the scarcity of butterflies in England.—Mr. Dadd compared England to its disparagement, in the number of species obtainable in one day, with the Continent. Individual species, he thought, were getting scarcer, naming *Vanessa io* as a case in point, and although *Dryas paphia* still swarmed in the New Forest, in his experience he did not find *A. aglaia* or *A. adippe* at all common, even *Pararge egeria* he thought was scarcer. Mr. Prout reminded the meeting of the scarcity of *Pieris brassicae* about 1891, when fears were entertained of its becoming a rarity. Now again its numbers had fully recovered. Some allusion was also made to the few specimens seen in the autumn of butterflies which hybernated, *e.g.*, *Gonepteryx rhamni*, compared with the numbers seen flying in the spring, and it was thought that many do not fly at all in the autumn but go at once into hybernation.

July 17th, 1900.—Lepidoptera from Woodford.—Mr. C. Oldham exhibited the following, all from his garden at Woodford, Essex. *Plusia gamma* of a fine red form, *Habrostola triplasia*, *Mamestra trifolii*, *Dianthoecia cucubali* and *Oligia bicoloria*.

Abraxas grossulariata aberration.—Mr. Pickett, a series of bred *A. grossulariata* showing much variation. These included a specimen in which all the usual yellow markings were replaced by black, a pale specimen with the black markings almost grey, and the yellow almost indistinguishable, and yet another finely powdered all over with minute black dots.

Donations.—The Librarian acknowledged the receipt of the May and June parts of the *Entomological News*.

Larva of Abraxas grossulariata in July.—Mr. Pickett mentioned that he had beaten larvæ of *A. grossulariata* at Oxshott as late as July 14th.

Aug. 7th, 1900.—Coleoptera.—Dr. Chapman exhibited living specimens of Coleoptera taken in Switzerland, belonging to the genus *Crina*.

Lymantria monacha, etc.—Mr. Pickett, a series of *L. monacha*, comprising light, dark and intermediate forms, also a series of *Plebeius aegon* taken on July 14th, at Oxshott.

Melitæa cinxia.—Mr. Riches, a series of *M. cinxia* bred from larvæ taken by Mr. Prout in the Isle of Wight. Mr. Riches mentioned that he had bred eighteen specimens from nineteen pupæ.

Death of a member.—Mr. Riches referred to the death of Mr. W. G. Pearce, of which the Society had received no notification.

Aug. 21st, 1900.—Abraxas grossulariata aberration.—Mr. Clark exhibited several vars. of *Abraxas grossulariata*, including a specimen with upperwings from base to usual yellow band entirely black.

Food-plants of Phorodesma smaragdaria.—Mr. A. W. Mera read some notes on behalf of Mr. Burrows with reference to the food-plants

of *Phorodesma smaragdaria*. Three batches of twelve larvæ each were sleeved out on *Achillea millefolium* (yarrow), *Tanacetum vulgare* (tansy), and French lavender respectively, on July 5th, when they were newly-hatched. An examination of the sleeves on August 20th resulted as follows. Of those on yarrow two had pupated. This it was said contradicted Mr. Burrows' statement that the larva would not feed on this plant. It appears as if they will do so if they are fed continuously on the same plant from the egg. Of the batch on tansy only eight were left, which were much darker than those on yarrow. The remaining brood fed on French lavender was only one short of its original number. The larvæ were much paler than those on the tansy and only about half the size of some of them. The only brood, therefore, which produced a partial second brood was that fed on yarrow, which plant is refused by larvæ taken in a wild state.

Macroglossa stellatarum.—Mr. Bacot remarked that larvæ of *Macroglossa stellatarum* seemed plentiful, and that he had taken some at Broxbourne and many other places. One of the larvæ in his possession was pale green, while the rest were dark olive-green. Mr. Clark stated that he had known pupæ of *M. stellatarum* to go over the winter and emerge in the following summer. This was contrary to the experience of other members present.

Sep. 4th, 1900.—Mr. Tutt submitted a copy of the *Report of the South Eastern Union of Scientific Societies*.

Aberdeen lepidoptera.—Dr. Sequeira, *Triphaena subsequa*, with very red forewings, and *Xylena monoglypha* very dark. Mr. Clark, *Amathes sobrina* a fine series.

Variation of Polyommatus corydon.—Mr. Pickett, a long variable series of *Polyommatus corydon* with one individual of a peculiar unicolorous brown tint. Mr. Pickett also exhibited, from Folkestone, a large number of *Eurymus hyale* and *E. croceus* with one var. *helice* of the latter, some *Vanessa cardui*, and a magnificent aberration of *Polyommatus alexis* (*agestis*) with confluent spots on the underside and with the pupils to nearly all the eyes obsolete.

Chœrocampa porcellus.—Mr. C. Oldham, *Choerocampa porcellus* with much of the red colouring replaced by yellowish-brown, and *Triphaena fimbria* taken in his garden at Woodford.

Holiday Notes.—Mr. Tutt gave some notes of his recent trip to Larche in the Basses-Alps. He said as long ago as 1850 the locality had been explored by Donzel, and it was remarkable that nearly all the now known scarce insects occurring there were detected at that early date. On the way up to Larche, Barcelonette was passed, and here many generally accepted mountain insects were observed near the river-bed, where also *Erebia neoridas* was seen. *Anthrocera fausta* and *A. carniolica* were to be found on the same ground, but differed much in their habits. *Polyommatus damon* was seen in swarms. The "blues" were in great numbers, and Mr. Tutt thought that possibly as many as two-thirds of the Palæarctic members of the genus might be obtained in the Guil Valley. The pastures at Larche were said to be magnificent, with a great wealth of wild flowers, to which great numbers of lepidoptera flocked. Some remarks followed on some of the Erebias seen—*E. scipio* on steep slopes, *E. neoridas* as high up as 6000ft., and *E. goante* coming in for most attention.

Sep. 18th, 1900.—Second brood of Acidalia dimidiata.—Mr. W. J. Kaye exhibited specimens, bred, of a second brood of *Acidalia dimidiata*; these hatched between August 27th and September 1st, from larvæ that hatched July 26th. Some hybrid *Melalopha curtula* × *pigra* were also shown.

Macroglossa stellatarum.—Mr. Pickett, a specimen of *Macroglossa stellatarum* bred on September 18th, from a larva found on August 15th. He mentioned that the larvæ of this species had been very abundant this year.

Noctuids from Deal.—Mr. Bell, some Noctuids the result of a single night's sugaring at Deal; these included some specimens of *Agrotis nigricans*, *A. tritici*, *A. puta*, and *Mamestra chenopodii*.

Acidalia species, etc.—Mr. Prout, *Acidalia rusticata* and *A. interjectaria*, giant specimens, reared chiefly on withered dandelion leaves, *Acidalia imitaria* showing extremes of colour variation. Some other specimens shown were, *Porthetria dispar* an abnormal ♂ blotched on the forewing with ♀ coloration. *Pharetra menyanthidis* of the type form, bred from Aberdeen, and ab. *suffusa*, Tutt, bred from Yorkshire, also a brood of *Melanippe galiata* from Torquay; the ova of these were laid July 19th, 1899, by captured ♀, and nineteen moths emerged August 30th-September 5th, 1899, while eighteen emerged May 17th-June 14th, 1900. Five of the autumn and four of the spring were of a handsome form with chalky-white ground colour with dark central band. Very few agreed with the forms the exhibitor had met with in the Isle of Wight.

Eurymus croceus, E. hyale and Papilio machaon.—Mr. Bloomfield, examples from Ringwood of *Eurymus croceus* and *E. hyale*, also some of the var. *helice* of the former; also *Lithosia griseola* var. *stramineola*. In reference to the specimens of *Eurymus*, Mr. Tutt remarked that the *E. hyale* from Ringwood were much more suffused in the margins with black than the specimens exhibited at the previous meeting. Mr. Bloomfield mentioned that a cousin of his had, at Ringwood, caught a specimen of *Papilio machaon*. Mr. Tutt said that *P. machaon* had been seen in several parts of the South of England and that recently at a meeting of the South London Entomological Society, Mr. Moore had intimated that the species had been very abundant near Boulogne, and suggested that it was possible that a few ♀s had come across in the spring and laid eggs on these shores, and from which the present specimens had emerged. It was also pointed out that *Eurymus croceus* had probably followed the same course, as there had been no observed influx of specimens, and the same had been true in 1877 and 1892 when the species was abundant. Mr. Tutt also said that *E. croceus* had not such a wide range in northern and central Europe as *E. hyale*. When the former occurs in great numbers in the northern parts of the continent it is almost as phenomenal as with us; with *E. hyale* the case was different, the species always being present, at least in the northern part of central Europe, and not subject to so great fluctuations.

Some remarks on Sphingidæ.—Mr. Bacot raised a very interesting point with regard to the different subfamilies of *Sphingidae*. He said it was a matter of great difficulty to get members of the subfamily *Sphinginae* to lay ova. With the *Smerinthinae* no such difficulty was experienced. He considered that those species that feed on the wing

required nourishment for the proper formation of the eggs before laying, while such insects as the Smerinthids provided the nourishment during the larval existence. Dr. Chapman remarked that there was no nitrogenous matter in sugar, but nevertheless thought there might be some action derived from this nourishment.

Oct. 2nd, 1900.—Trinidad Papilios.—Mr. Kaye exhibited a box containing many ♂ and ♀ specimens of *Papilio zeuxis*, Lucas, and *Papilio alyattes*, Feld., from Trinidad. He said that he thought it highly probable that these two species were in reality only one. He mentioned that his friend, Mr. Urich, in Trinidad, was at the present time breeding them with a view to establishing this supposed fact.

Leucoma chrysorrhœa.—Mr. Clark, some *Leucoma chrysorrhœa*, bred from Folkestone. The specimens were very distinctly dotted with black on the marginal portion of the wing.

Vanessa atalanta.—Mr. Pickett, *Vanessa atalanta* bred, showing a tendency in some of the specimens to yellow coloration in the marginal band of the secondaries.

Parnasius delius.—Dr. Chapman, a long series of *Parnassius delius* from the Engadine. One of these had the usual red spot on the lower portion of the hindwing black. A number of Heterocera were also shown from Pontresina and Guarda.

Melanthia bicolorata.—Mr. Prout, a long variable series of *Melanthia bicolorata* from Forres. Taken as a whole the specimens were larger than southern examples. Some very fine phases of the form known as var. *plumbata* were included, and also a giant white specimen with a very dark central band. Mr. Prout remarked on the peculiarly different habit in the north, of the larvæ feeding on alder, while in the south it was always found on various species of *Prunus*.

Quedius lateralis.—Mr. H. Heasler, from Wicken, *Quedius lateralis*, *Cholera fumata*, and *C. watsoni*.

Amathes glareosa.—Mr. Riches, *Amathes glareosa* from Shetland, also some larvæ of *Eupithecia subfulvata* found in his garden feeding on tansy.

Communication.—Papilio machaon introduced into Essex, etc.—Mr. Kaye called the attention of members to some paragraphs in the September numbers of "Country Life," where it was stated that 500 larvæ of *Papilio machaon* had been turned down in Essex, and also that similar attempts had been made with *Parnassius apollo* and *Euvanessa antiopa*.

Vote of Condolence.—Mr. Nicholson moved a vote of condolence with Mrs. Pearce upon the death of her husband, who had been for some time a member of this Society. Mr. Riches seconded the vote.

Oct. 16th, 1900.—Japanese Lycænids.—Mr. Kaye exhibited some *Lycaenidae* from Japan, with specimens of the same species from Britain for comparison. These included *Plebeius aegon* and *Cyaniris argiolus*, both species being very large from Japan. *Chrysophanus phlaeas* with var. *eleus* and intermediates. It was pointed out that in even typical *C. phlaeas*, from Japan, the markings on the underside were much more pronounced and distinct than in British examples.

Lepidoptera from Woodford, etc.—Mr. Oldham, *Jaspidia perla* from Woodford, and *Spilosoma lubricipeda* from the Isle of Ely.

Folkestone insects.—Mr. Pickett, specimens of *Macroglossa stellatarum* bred from Folkestone larvæ, also some *Melalopha anachoreta* the produce of a third brood.

Hydrelia unca.—Mr. V. Eric Shaw, a series of *Hydrelia unca* taken in the New Forest.

Notolophus antiqua, etc.—Mr. Clark, *Notolophus antiqua* bred from Aberdeen. The specimens were of a rather larger size than usual. The larvæ were found on heather in numbers. Some *Arctia caja* of a second brood were also exhibited.

Smerinthus ocellatus ab.—Mr. L. W. Newman submitted for exhibition a particularly fine aberration of *Smerinthus ocellatus* with very pale hindwings without any red coloration. Also some fine *Abraxas grossulariata* with the median portion of the wing much suffused with black.

Callimorpha hera, etc.—Mr. Riches, from south Devon, *Callimorpha hera* and some *Spilosoma urticae* from Eastbourne. The President remarked concerning these latter that he had not previously heard of Eastbourne as a locality.

Agrotis, etc.—The Rev. C. R. N. Burrows, exhibited from Mucking *Agrotis segetum* abs. *catenatus*, Haw., and *pectinatus*, Haw., *Agrotis nigricans*, a remarkably pale form with scarcely a trace of any markings. *Agrotis saucia* abs. *nigrocosta*, Tutt, and *majuscula*, Haw., in the latter form, the dark shade of *nigrocosta* spreads over the whole forewing. A form of the same species was shown as ab. *stictica* of Blanchard. *Peridroma ypsilon* (*suffusa*) a pale form with the usual colour of the basal portion of forewing entirely absent. *Hama abjecta* ab. *variegata*, Stgr., and *Xylena monoglypha* a very dark specimen with all the transverse lines and the outlines of the reniform and orbicular stigmata pale.

Manduca atropos.—Mr. Sauzé reported that he had hatched out a specimen of *Manduca atropos* on September 30th, without any forcing, and thought this rather an early date for such an emergence.

Nov. 6th, 1900.—Living Manduca atropos, etc.—The Rev. C. R. N. Burrows, three living specimens of *Manduca atropos* which when handled squeaked very audibly, also a long series of *Aporophyla lutulenta* taken during the year at sugar at Mucking.

Agrotis nigricans.—Dr. Sequeira, a very dark specimen of what appeared to be *Agrotis nigricans*. Some members thought the specimen might be *A. tritici*; also a specimen of *Melanippe rivata* with a slender band and a similar aberration of *M. montanata*.

Oporabia autumnata.—Mr. Prout, some *Oporabia autumnata*, Bork., bred August-September, 1900, from larvæ sent from Pontresina early in July by Dr. Chapman, who had found them feeding commonly on honeysuckle, alder, &c.

Sphinx ligustri, etc.—Mr. Oldham, *Sphinx ligustri* from Cambridge and some extreme forms of *Triphaena pronuba* from Woodford.

Macroglossa stellatarum bred.—Mr. Bacot, a long series of bred *Macroglossa stellatarum* showing slight variation.

General exhibit of Eurymus.—Many members brought up either long or short series of *Eurymus croceus* and *E. hyale*. Mr. Clark had some very fine forms, Messrs. Prout, Kaye, Mera, James and Rev. C. R. N. Burrows also exhibited. Mr. Mera had a magnificent aberration

of *E. hyale* in which the black scaling at the apex was extended inwards nearly to the discoidal cell. Mr. Bacot also among his specimens had some *E. electra* from South Africa.

Discussion on British species of genus Eurymus.—The President started the discussion. He said he supposed all members agreed that the British species of this genus were as a rule migrants. Personally he considered that in such sheltered parts of the country as Torquay and the south coast of the Isle of Wight *E. croceus* (*edusa*) might breed regularly. *E. hyale* always appears to be a migrant, and never to breed on these shores. The Rev. Mr. Burrows had recently called his attention to the colour of the sexes in *E. hyale*. Do all the ♀s have the paler coloration and all the ♂s the darker? Mr. Prout then referred to the previous visitation of these *Eurymus* species in 1892, and recollected that Mr. Battley, a former member of this Society, had traced the first specimens as having been seen at Dover, and later only in other parts of the country, pointing to a migration across the Channel at that point. Mr. Burrows in referring to the colour question of *E. hyale* quoted from Tutt's *British Butterflies*, a passage where that author hints at a parallel case to the ♀ of *E. croceus* in the form *helice*. Subsequent examination of a number of specimens went to confirm this view. Mr. Mera said he had found that intermediates between *E. croceus* and var. *helice* were more frequent in Devonshire than elsewhere, and thought perhaps the extra warmth was in some way influential. Mr. Bacot mentioned that a specimen of the var. *helice* in Mr. Clark's series was exactly like a ♀ of *E. electra*, and he had some doubt as to whether the two species could satisfactorily be separated. Upon the discussion reverting as to whether either of *E. croceus* or *E. hyale* bred in these Islands, Mr. Burrows stated that he had taken *E. croceus* for three successive seasons. Mr. Pickett said he had never been to Folkestone at the right time of year without meeting with this same species. Mr. James mentioned that *E. hyale* occurred at Broadstairs on September 25th, 1899. The President said that it was possible that eggs laid by stray ♀s last year had hatched, fed up and produced imagines in the present season.

Nov. 20th, 1900.—Mr. Wilfred Dadd, of 3, Colina Villas, Wood Green, was elected a member of the Society.

Epirrita dilutata.—Mr. Clark exhibited a long variable series of *Epirrita dilutata* from Polegate.

Apamea ophiogramma near London, etc.—Mr. Riches, *Apamea ophiogramma* and *A. secalis* (*didyma*) from Hornsey Rise; the larvæ of both species being found together feeding on cotton grass. Two fine *Bisulcia ligustri* were also shown.

Proutias.—Mr. Prout, the Psychids *Proutia betulina* and *P. eppingella*, with their cases, from Chingford.

Spilosoma mendica.—Mr. Bacot, *Spilosoma mendica* ♀s, one of which was very large and approaching the form *rustica* from Ireland.

Xylina semibrunnea.—Mr. Kaye, a specimen of *Xylina semibrunnea* taken in his garden at Worcester Park on ivy bloom, on October 25th, 1900.

Xylena monoglypha, etc.—Dr. Sequeira, *Xylena monoglypha* of the

black form, and *Notolophus antiqua*, large specimens from Aberdeenshire.

Aporophyla lutulenta.—Rev. C. R. N. Burrows, a fine series of *Aporophyla lutulenta* showing all the phases of variation including the form *consimilis* of Stephens.

Discussion on Sugaring.—A discussion on "Sugaring" was held. Mr. Prout in starting it said that it had never been satisfactorily settled what were the conditions, atmospheric and the like, that were essential to success. He remarked that Mr. Robson began collecting data, but had not as yet made any generalisations thereon. It appeared pretty certain that certain conditions suited certain families. One knows of evenings for *Tortrices*, for *Pyralidae*, &c., and Mr. Prout had himself had particular evenings when *Nomophila noctuella* swarmed. Other remarks put forward by the President were, that on rare occasions he had observed insects paired on sugar and that for some unaccountable reason he had always found certain trees, even of the same kind, were always more productive than others. Mr. Burrows said he had never seen insects paired at sugar. He thought he had good proof that insects came a considerable distance to visit the sugar as he had repeatedly found that when the wind was in certain directions he always got the same insects, such as when the scent blew over reed-beds he got reed-frequenting species. Dr. Sequeira said he had found that when sugar was productive light was not, and *vice versâ*. Mr. Burrows then asked members for their experiences with *Luperina testacea*. He personally had only twice found it on sugar. Mr. Prout said he had only once seen a ♀, but Mr. Cox mentioned that he had taken a series off sugar. Mr. Nicholson spoke next, and in the course of his remarks stated that Mr. Bright, of Bournemouth, had on occasions applied sugar to oak trunks in the early morning to attract *Limenitis sibylla*. Horse-chestnut was, he considered, one of the few trees that never pay for sugaring. As a general rule all trees were worth a trial. Autumnal insects he thought were less particular about the atmospheric conditions, than others, as they come on almost any night. Mr. Kaye said in answer to this that the air was always more humid at that time of year and the scent therefore travelled better. Dr. Chapman, in referring to atmospheric conditions in general, said it was certain with regard to the attractiveness of sallow bushes that a clear sky was always accompanied by a dearth of insects.

Dec. 4th, 1900.—Annual Meeting.—Mr. Alfred Sich, of 65, Barrowgate Road, Chiswick, was elected a member of the Society.

Cidaria immanata.—Mr. Clark exhibited a number of *Cidaria immanata* from Aberdeenshire. Mr. Prout remarked about these that although so varied they could not be mistaken for the Shetland forms.

Taleporia tubulosa (pseudobombycella) cases, etc.—Mr. Kaye, some cases of *Taleporia tubulosa* taken at Oxshott on birch trunks, also a specimen of the rare *Morpho godartii* from Bolivia.

Camptogramma bilineata aberrations.—Dr. Sequeira, a long variable series of *Camptogramma bilineata* from Devon, Kent, Aberdeenshire, &c.

Cheimatobia boreata.—Mr. Pickett, some living specimens of both ♂ and ♀ *Cheimatobia boreata* from Chislehurst.

Secretaries' Report for the year 1900.

Twenty-four meetings of the Society have been held during the past year, as has been usual for some time past. The attendance reached high-water mark on February 20th, when the number came up to 23 including three visitors. The lowest was touched on August 7th, when but four members signed the attendance book. The *net* average attendance works out to thirteen only, which cannot be called satisfactory, as at the last report the average attendance was fifteen, and that in turn was lower than the preceding twelve months. An attendance of thirteen, with a membership of 62, means only 20% of the members coming to the meetings. It is of course a fact that the continuance of the meetings all through the summer brings down the average very considerably, but the attendance must be considered from another point of view. On only two occasions did the numbers reach 20 or over. In other words on the most popular nights the attendance barely touched 33% of the membership. In view of these figures, we think it right to make a strong appeal to all the members to give stronger support to the society by coming in person to the meetings.

The past year has witnessed two principal and very satisfactory events. The *Transactions* have again been able to be printed by means of a special fund. The number of pages also has risen from 68 last year to 80 this year, which of itself proves that there are many members who are doing all they can for the benefit of the Society. As has been repeatedly said, a Society's standing depends largely on the *Transactions* it prints, and we have reason to be more than satisfied with this volume of 80 pages. The other principal event was the holding of a conversazione on April 24th. Previous to this function much doubt was entertained as to whether the finances of the Society would bear the strain, but, again, by the generosity of a number of members the money difficulty was overcome and a very successful soirée took place. The exhibits of lepidoptera both British and Exotic were particularly fine, and much material relating to coleoptera, diptera, neuroptera, hymenoptera, was also on view. Since the last conversazione three years had elapsed. If such an evening can be made triennial we are sure nothing but good can come of it.

An excursion was made on June 23rd, under the direction of Mr. H. A. Fuller, to Barthorne Woods, near Effingham Junction station. It proved in every way a success, and twenty members attended. Some anomalies were discovered in the reduced fares issued by the South-Western Railway Company, it being found that the cost per member was actually higher if all the tickets were purchased simultaneously for a party than if bought singly by individual members. Members accordingly took their own tickets.

The Secretaries have to thank all those members who have in any way contributed to the success of the Society by reading notes, papers, starting discussions, or who have helped in any other way. The following list of communications, papers read, subjects for discussions, &c., brings to our notice that whatever the obstacles, the Society is doing good work. The discussions, as before, have been very fruitful in eliciting the remarks of a number of members, and the papers and shorter communications have invariably been listened to attentively.

1899, Dec.	5.	Annual Meeting, Presidential Address	Mr. L. B. Prout, F.E.S.
,, ,,	19.	Discussion, "Coast Collecting."	
1900, Jan.	2.	Pocket-box exhibition, when a large number of interesting specimens were shown.	
,, ,,	16.	Discussion, the "*Agrotis tritici*" group.	
,, Feb.	6.	Paper, "The Re-classification of Lepidoptera"	Mr. W. J. Kaye, F.E.S.
,, ,,	20.	Paper, "Myrmecophilous Coleoptera"	Mr. H. Donisthorpe, F.E.S.
,, ,,	20.	Communication: "A few days at Fusio"	Dr. T. A. Chapman, F.E.S.
,, Mar.	6.	Discussion, "Larvæ."	
,, ,,	20.	Exhibition.	
,, Apr.	3.	Communications: "Micro-Lepidoptera of the London District." ...	Mr. D. C. Bate.
,, ,,	17.	Paper, "*Phorodesma smaragdaria*."	Rev. C. R. N. Burrows.
,, May	1.	Discussion, "Nomenclature," introduced by	Mr. E. M. Dadd.
,, ,,	15.	Discussion, "Pupæ."	
,, Nov.	6.	Discussion, "The British Species of the Genus Eurymus."	
,, ,,	20.	Discussion, "Sugaring."	

W. J. Kaye, S. J. Bell } *Hon. Secs.*

TREASURER'S ACCOUNT, December, 1899, to December, 1900.

Dr. *Cr.*

	£	s.	d.		£	s.	d.
To Balance from 1899 ..	1	18	10½	By One Year's Rent from 31st July, 1899, to 31st July, 1900	10	0	0
,, Subscriptions and Entrance Fees (1900) ..	16	7	6	,, Insurance	0	9	6
,, Subscriptions (arrears) ..	1	12	6	,, Attendance	0	10	0
,, ,, (1901) ..	0	5	0	,, Postage and Stationery	2	6	3½
,, Donation	1	1	0	,, Printing (Syllabus, Circulars, &c.)	1	4	6
				,, Subscriptions to Magazines	2	5	6
				,, Subscription to South-Eastern Union of Scientific Societies for 1900 and 1901	0	10	0
				,, Balance in hand ..	3	19	1
	£21	4	10½		£21	4	10½

Amount of Subscriptions unpaid .. .. £5 17s. 6d.
,, considered good .. .. .. £2 12s. 6d.

LIFE MEMBERSHIP FUND.

	£	s.	d.		£	s.	d.
To Subscriptions	10	0	0	By advance to General Fund, 1897	5	0	0
				,, advance to General Fund, 1899	5	0	0
	£10	0	0		£10	0	0

PUBLICATION FUND.

	£	s.	d.		£	s.	d
To Donations and Subscriptions	20	1	0	By Printing Transactions and part of London Fauna List	19	4	0
				,, Printing Balance Sheet ..	0	9	6
				,, Petty Expenses	0	0	8
				,, Balance in hand	0	6	10
	£20	1	0		£20	1	0

London Institution, 4th December, 1900.

C. Nicholson, *Hon. Treas.*

Examined and found correct.

A. Bacot
V. Eric Shaw } *Auditors.*

PRESIDENTIAL ADDRESS,

By Louis B. Prout, F.E.S.

Gentlemen,—

The completion of another year's work in connection with our Society reminds us that the time has arrived for one of those annual retrospective and prospective surveys which have come to be considered as an appropriate, if not indeed a necessary, accompaniment of such occasions. In looking back over the past year, I feel impelled to thank you first of all for the many tokens of your friendly regard and sympathy which have marked its course, and especially for the latest manifestation of these in the honour which you have now shown me in again re-electing me to the position which you have made it so easy and pleasant for me to occupy for the last two years. I only hope that I shall be able to show myself worthy of your continued confidence, but I will venture to couple with this the further hope that any success which I may achieve will not make you hesitate to place any other suitable member in the Chair whensoever it may appear to you desirable, and to find for me any other office in which you consider I could serve you to greater advantage. The aim of us all, I trust, is to make our Society healthy and prosperous, and worthy still to hold that almost unique position which—as I reminded you just a twelvemonth ago—we have held for the closing decades of the century which is now on the point of expiring.

The year 1900 has, I believe, been marked by the usual measure

of activity amongst naturalists, but I regret to have to confess that many and varied claims upon my time have prevented my keeping myself altogether *au fait* with the work done in the different sections of the wide field of Natural History, and, I therefore, do not feel competent to enter upon a review of the year's work. As regards our ever-increasing mass of literature I observe with satisfaction that a good deal is being attempted in the direction of coping with it and rendering it accessible ; the best class of monographers, undismayed by the magnitude of the task, continue to give us good bibliographical references, and I am glad to learn that Mr. C. Davies Sherborn, F.Z.S., has at last advanced far enough to be able to prepare for the press the first part of his colossal "Index Animalium" which is to be to zoologists what the "Index Kewensis" is to botanists. I have not heard recently of the progress of the still more gigantic work which was to be undertaken in Germany under the title "Das Tierreich." In the same category of useful compilations of hitherto scattered descriptions, &c., rather than as a final pronouncement upon matters of classification, one must regard Sir George Hampson's "Catalogue of the Lepidoptera Phalænæ" now publishing under the auspices of the British Museum, and of which the second volume, dealing with the *Arctiadae*, appeared early in the present year. I have been given to understand that another extremely useful effort in the department of compilation, or rather of indexing, has been taken in hand in connection with the indispensable, yet somewhat inaccessible, contents of the annual "Zoological Record," which are at length to be subjected to the needful indexing. It is evident that there is great need for still more bibliographical work, for more references and cross-references, abstracts and summaries and even full quotations, in order that the present generation may know something of what has been done by the preceding ones, that the lamentable waste of labour involved in the re-discovery of discovered facts may be prevented—or rather *minimised* for we can never hope to prevent it entirely—and that the zeal and enterprise of present-day workers may be directed to the investigation and solution of the many and urgent problems which still remain unsolved, or even untouched. I once received, in response to an application for information on a genus which I was then studying, a charming little letter from an entomologist whom I will not name, as he has since "gone over to the majority," in which letter he enclosed some doggrel about "Compilers who read, compilers who write, compilers who spoil good paper once white," &c.; but I regret to say that in spite of the gentle hint I have continued to "compile," and I venture to affirm before you all that I think the compiler—if he does his work intelligently and discriminately, for we do not want Johann August Ephraim Goeze, and Johann Friedrich Gmelin and others of their genus to re-appear upon the scenes—the compiler, I say, has a very useful place to fill, and I would even express the wish that more would engage in this work, and less would occupy themselves with mediocre "original work" which, after all, is generally not original at all.

We shall all, I am sure, agree that the greatest entomological production of the year has been the second volume of "British Lepidoptera" by our illustrious Vice-President, Mr. J. W. Tutt. Here we have a compilation and much more than a compilation, the work of the past respected and used as it deserves to be, the workers of the

present requisitioned—shall I say "commandeered?"—as a staff of departmental specialists to collaborate with the author, and the ground hereby cleared for the workers of the future, in order that their efforts may be profitably directed. Into the very difficult and debateable question as to whether and how these advantages of thoroughness could be retained without such an enormous expenditure of time and space, the present is not the occasion to enter; but we shall concur in heartily wishing the author long life and health in order that he may enrich our literature with many volumes elucidating the relationships, the life-histories, the distribution, and the many other matters of interest in the study, of our indigenous lepidoptera.

Passing by other books which would have deserved mention had time allowed, I will dwell for a moment on one or two topics suggested by a consideration of the book which we have just had under our notice. I have remarked that it deals with our *indigenous* lepidoptera. This is not, I need hardly remind you, due to any narrow insularity on the part of the writer, but altogether to circumstances beyond his control; and he has without doubt more than once felt the inconvenience of the limitation. Indeed, he has done as much as was possible under the circumstances to introduce us to the kindred forms of other lands. Not so very many years ago, I might have needed to admonish, or even reprove, a Society such as the "City of London Entomological" in connection with this subject of insular prejudice; but when I call to mind the general nature of our exhibits during the last few years, I feel that criticism is almost entirely disarmed, and I need hardly do more than state my conviction that in *this* respect "the former days were" *not* "better than these," but that a cosmopolitan view of our position as naturalists is the one that is most worthy of us, and that, though a stern necessity may prevent many of us from making acquaintance with extra-British species in their native haunts, yet an interest in them will greatly increase and render more intelligent and more profitable, our interest in our native forms.

A matter of very great importance in connection with such books as this of Mr. Tutt's, is that there shall be ample references to the sources of information, whether previously published or received by the author from private sources. Mr. Bateson, in reviewing volume ii of *British Lepidoptera* in the *Entomologist's Record* has urged the necessity of this, and after my remarks on bibliographical work in general, it is superfluous for me to add how thoroughly I agree with this. Even in the few years during which I have been engaged in bibliographical research, I have lost many precious hours in quest of the source of some incomplete reference or allusion, and have sometimes in the end come to the conclusion that it was merely in manuscript. I think it will be found practicable in later volumes to supply this deficiency without adding to the bulk of the book; I need not now go into details, but I may remind writers that such abbreviations as l.c. (*loc. cit.*), i.l. (*in litt.*), &c., do not take much time nor trouble even though they should need to be repeated many times.

Turning from writing to writers, I cannot refrain, as a lepidopterist, from alluding to the double loss sustained by us during the year in the deaths of Dr. Otto Staudinger and Dr. Ottmar Hofmann, both prominent figures in the entomological world for nearly half a century, each indeed, in his own particular department, an acknow-

ledged master, whose place it will not be easy to fill. It is encouraging to see, however, how many younger men are becoming yearly better known for their excellent work, and we need entertain no serious anxiety as to the prospects of the science and art of entomology for the coming century.

Perhaps you will have been thinking that I take too serious and exalted a view of a pursuit which, after all, has been taken up by most of us for mere recreation; it may be well, therefore, that I should state more explicitly the exact nature of my opinions upon what is often spoken of as the "mere collector" question, and the justifiableness or otherwise of the existence of such a class. Let me say then most emphatically that I do *not* expect nor even desire all our entomologists to throw themselves equally deeply into the scientific side of the study. Having had practically no scientific training myself, and being far from well versed in the higher walks of biology, I have much reason to sympathise with those who dread its making itself the be-all and end-all of our work among the insects. I am, therefore, ready to concede to my fellow entomologists the full right to be "mere collectors" if they please—with one or two reservations, however, which I feel bound to make. I take it that it should be expected of every collector, however modest his pretensions, that he should carefully authenticate every specimen he takes, by providing notes of the locality, date, &c. Thus much he owes to his brethren, who will thereby be enabled to use for their purposes the material he has collected; and if he be unwilling to take even this amount of trouble, it is his plain duty to confine himself to the collecting of pretty pictures or rare autographs or something else equally harmless and equally unscientific. Considering the many and important problems which hang to a great extent upon circumstances of geographical distribution and of phenology, it is little short of lamentable that specimens should be preserved without a reliable "history." It is noteworthy that the late Henry Walter Bates, the "Naturalist on the Amazons," who commenced his career as a mere collector, took pains to label his coleoptera from the very earliest days of his collecting; can we suppose that he would ever have worked out his great discovery of "mimicry" so perfectly, had he not habituated himself to this precision of method in dealing with the material which came to his hand? Fortunately lepidopterists have of late awakened from their apathy on this subject—in which I believe they were far behind other entomologists and zoologists generally, not to mention botanists. Even during the few years in which I have been collecting and exchanging, I have noticed a considerable change. When I commenced, I had constantly to ask my correspondents for data, and never dared to assume that they would furnish them unasked, indeed, it not infrequently happened that specimens came to me without data after all, and I had to write a second time in order to obtain them. But now all our lepidopterists of any position at all supply this information whether I expressly ask for it or not, and it would seem almost superfluous that I should further emphasise the subject. That it is not absolutely superfluous, however, the following statements will show. A year or two ago I sent to our best English professional for some specimens which I wanted, and when he sent them he of course gave localities so far as he was able; but there was one species of

which he was only able to tell me that it was from one of the best Scotch collectors, and probably taken in Scotland, and he took occasion to remark that he could not see the need for troubling about localities in the case of species which did not show geographical variation. Now this sounds plausible enough, but it is really an absolutely untenable position to take up. Who is to decide whether a given species is subject to geographical variation? And how shall we ever come to a knowledge of the subject unless we label every specimen? We are constantly making new discoveries in this connection, and we may confidently predict that many more will yet be made in the future. Again, the possessor of one of the largest collections of varieties and aberrations in this country has remarked to me that, while he appreciates the value of locality-labelling in ordinary cases, yet he would value a rare aberration or sport just as highly, whether he knew its exact history or not. There is a good deal more to be said for this gentleman's point of view than for that of the professional just mentioned, but the same argument prevents our conceding even to the captor of an apparently unique aberration the right to ignore the locality and other circumstances of its capture. It is a mere platitude to say that every effect has its corresponding cause, and even the most casual aberrations must be capable of *some* explanation, biological or pathological, or what not; and should such an aberration subsequently recur (a thing which has happened times and again) it may become a matter of great importance to be able to decide on the probabilities of there being any hereditary connection between the two, or any local cause bringing about a similar result on more than one occasion.

One other thing that should be demanded of the "mere collector" is that he should so far sympathise with the more studious entomologist as to be ready to collect not solely the material that he wants to "fill his own series" and "exchange for his own desiderata," but also, where it is within his power, such material as may help on any special line of work or research which may be in hand. I have myself met with such unvarying kindness in this respect, from entomologists in general and from members of this Society in particular, that I can hardly hope anything better than that other workers have fared equally well. Now that it is becoming pretty generally known that I venture to pose as a specialist in the *Geometrides*, and particularly the *Larentiidae* of Guenée, I find material for study in this family coming in as fast as I am able to deal with it. Depend upon it, it is only by this principle of co-operation that any good worth mentioning will be achieved. I believe most devoutly in *usefulness*—not necessarily *utilitarianism*—and I think that collectors who have not the time or the taste for hard work themselves can yet be of very great use to those who have.

But although I have thus spoken, it is still my own personal conviction that the studious worker will get the greatest pleasure and profit out of a subject like entomology or any other branch of natural history, pregnant as such subjects are with the interest and fascination that belong to the realms of reality and life; and I would urge you to try and find *some* special line of study within the great field, however slight and unpretentious such special line may be. I have already reminded you that I have endeavoured to make myself a specialist in

the Geometrides, and I should like to say here what I said some years ago to the members of the "North London Natural History Society," that I think specialists are a necessity of the age and we cannot have too many of them. Professors of "Things in General" like the immortal Teufelsdröckh at Weissnichtwo, are all very well in their way, but they do not, in my humble opinion, reach the highest ideal. If we allow ourselves to flounder about among mere generalities, in the present advanced state of the science of Natural History, we shall indeed find ourselves in a condition of "know-not-where," and shall achieve little or nothing worthy of achievement. I forget the original source of the oft-repeated quotation which describes the ideal which we should set before us, but it states my views so perfectly and in such a neat epigrammatic form, that I feel constrained to re-quote it; shall we not aim, then, to "know something of everything, and everything of something?"

As soon as anyone becomes known as a specialist, whether in a particular family or a particular line of research, he should not find it necessary to make many *appeals* for help, rather should the help gravitate towards him as he requires it. It may not always be easy for a keen collector to part with some interesting "catch" for the benefit of someone to whom it would be of more real use; but to judge from my own personal experience, already in part alluded to, it can be done, and I can honestly say that in my own endeavours to act upon this principle I have found more delight than I should have found in gloating over a rare aberration, of the meaning of which (through lack of parallel material) I am unable to form any adequate conception. I treasure to this day a kindly letter of appreciation which I received from a well known entomologist to whom I had the privilege of handing over a new aberration of a *Scoparia*, which he informed me was correlated with known aberrations of some other species of the genus. Surely material ought, as far as possible, to be placed where it will be of the most use, whether in the private collection of a specialist, or in a public collection which needs such material, and I am very glad to know that the *at first sight* unreasonable request of our Museum authorities for types of new species which we may work out there is gradually coming to commend itself to our judgment, and to meet with our approbation.

One word more in relation to the desirability of supporting current lines of research will be appropriate in an address wherein I have attempted a few allusions to the present year's work. Last May, Mr. W. Bateson, F.R.S., on behalf of the Evolution Committee of the Royal Society, published an appeal for particulars as to the past and present condition in different districts of certain specified lepidoptera which are well known to possess a melanic tendency, in order that material might be brought together for an exhaustive enquiry into the question of progressive melanism. I have several schedule forms which I shall be only too pleased to distribute, and I shall be glad if our Society is found co-operating in this interesting inquiry; London collectors have a good chance of doing so, for the list of species which are first to be placed under observation includes several which are known to exhibit the melanic tendency at times round London, *e.g.*, *Pachys betularia*, *Synopsia abruptaria*, *Triaena psi*, *Erannis marginaria* (*Hybernia progemmaria*), &c.

There are many other problems awaiting solution, some of them of merely passing interest, others again likely to prove of real and even vital importance to the well-being of the human race, such as some of those concerning heredity; and probably no worker in the whole range of biology has better opportunities of attacking these problems than the entomologist. But it is not easy to draw the line between the unimportant and the important, and there is hardly any investigation that is not worthy of being undertaken by him to whom its interest appeals; very often we find that a great discovery is made almost *accidentally*, in the course of the earnest pursuit of some quite different path of research. Some naturalists who are a good deal above the average might be inclined to smile at the zeal with which the humbler worker throws himself into some question of the differentiation of two closely-related species or varieties, and might tell him that his labour is virtually useless, seeing that from the evolutionary standpoint the difference between "species," "subspecies" and "variety" is more a difference of *terms* than one of actual fact. I may be mistaken, but I myself think that this work, properly carried out, is by no means in vain, but that good fruit may be expected from its persistent pursuit. My predecessor in this Chair, in his able philosophical dissertations has done much to shake our faith in the objective existence of any such sharply-defined segregation of individuals as we understand by our term "species." Yet I believe he would not for a moment deny—and certainly I will not for a moment deny—that the term is of the utmost utility for conveying a general idea, and that for every one case in which it breaks down in its precise application, there are hundreds—nay, I might safely say there are thousands—of cases in which it represents accurately that which we observe. Every breeder of our lepidoptera in any considerable numbers will certainly bear me out in this assertion. But while we know that a "species" *has*, in this vast majority of cases, such well-marked constitution and delimitation, it is nevertheless true that there are few problems which require more patience and care for their investigation than that of the specific right of two or more closely-allied species, and it may, therefore, be claimed that investigation of this kind is both a good training in itself and also a very likely avenue to the discovery of other matters of still greater value.

There are few things more calculated to anger me than the wholesale telescoping of species to which some writers are so prone—often upon a mere "bowing acquaintance" based upon the inspection of a few dried specimens in a Museum. A recent writer, for instance, sinks *Scoparia basistrigalis* as a synonym of *S. ambigualis*—a *synonym*, mark you, not even a variety worthy of being separately diagnosed—and does this presumably because he cannot find any difference in the neuration of the imago. As it is a little larger and more strongly-built he opines that it is produced by moisture, and it matters not that one of our best micro-lepidopterists, who has had many years' experience of *S. basistrigalis*, and has from careful observation become convinced of its distinctness—it matters not that this gentleman tells our author that the wood where he takes it is the *driest* in Kent, the name *basistrigalis* has to sink, sharing the fate of many another name between the same two covers. Not long ago I was talking to a very able botanist of my acquaintance, and our conversation turned upon the recent

multiplication of species, or subspecies, in botany. Said he, "I suppose as our research proceeds and our knowledge increases this tendency is sure to manifest itself, and though it is perhaps possible to overdo it, yet it cannot be denied that it is in the main correct and beneficial; doubtless you have observed the same tendency in entomology?" I had to confess with shame that a great many entomologists were doing just the reverse, and seemed to delight in obscuring the careful work of their predecessors by "lumping" everything which they possibly could. I do not care whether we prefer to use the name species, subspecies, race, variety or any other name to designate the difference of which we are conscious; but if there is an appreciable difference, then, in the name of scientific accuracy, do let us recognise that by some distinctive title which enables us to record the observed habits, &c., under their right heading.

I do not at all condemn theorising, or the formation of definite opinions as to the distinctness or otherwise of allied forms. In a never-to-be-forgotten address delivered at the meeting of the Entomological Society on January 20th, 1897 (*Proc. Ent. Soc.*, 1896, pp. lxii), Professor Meldola argued in favour of the holding of an hypothesis as a stimulus to definite research, and I most cordially concur in his view; but do not let us make the mistake of regarding such hypothesis as a proven fact, or of trying to force it down the throats of our fellow-workers. Again let me plead for an open mind in all branches of research, and for a provisional acceptance of all differentiations which are at all capable of comprehension and expression; in this way alone shall we clear the ground for the work of the generation that is to come.

Had time permitted, I should have referred again to some of the still more difficult and indefinite questions of *generic* separation. It must suffice to say that I am coming to agree more and more with an opinion expressed here some months ago by my good friend Dr. T. A. Chapman, that our binomial system of nomenclature is by no means so perfect as it has been held to be, and that there is cause for regret that it is impossible to establish a mononymic usage throughout an order, *i.e.*, so as to be able to write *Lepidopteron machaon*, *Lepidopteron caia*, and so on throughout, thus avoiding all the worries of generic nomenclature. If we are going to take the view which is advocated by some, that "genus" is absolutely the *next* grade above "species," we shall soon arrive at that state in which nearly every species requires a separate generic appellation; for it is seldom indeed that any large *assemblage* of species has branched off *simultaneously* from the common stock, and that, therefore, its constituents show amongst themselves no closer relationships in one direction than in another.

In conclusion let us turn our attention more particularly to the concerns of our own Society. I think we may congratulate ourselves that our year has been on the whole a satisfactory one, though we could wish for a larger attendance, and a larger increase of our balance in hand; as you will have observed from the Treasurer's statement, this has been about doubled—a state of things infinitely better than a decrease—but when we recollect at how low a figure it stood at the end of 1899, we realise that there is not even now very much to be proud of, especially as I believe there are several books awaiting binding, and the need of a new bookcase is making itself urgently felt;

at any rate I fear it will be some time before the Council is able to vote any grant from the general fund, to the assistance of the special publication fund. Are our members doing all that they possibly can to make known the aims and claims of the Society amongst their naturalist friends? We have recently made some acquisitions to our membership whereof we are proud, and we are still able to rejoice in the presence amongst us of several old and valued friends; but I have to remind you, with profound regret, that our ranks have been thinned by death, two of our very promising members having been removed from us during the year; I allude to Mr. W. G. Pearce and Mr. E. Heasler—both of them men whom we felt that we could ill afford to lose.

I have to thank you for the support which you have given me in carrying out my intentions indicated at our last Annual Meeting as to the general conduct of the Society; I think we may flatter ourselves that there is some improvement in punctuality and attention, but we must not relax our vigilance, or think that we have attained perfection in these respects. Our discussions have been on the whole well taken up, but perhaps they were hardly so fruitful as definite papers would have been, and I am glad to find that you have shown yourselves willing to co-operate with our Secretaries in their arrangements for a series of papers during the present winter session. Many and interesting have been our exhibits, and the night of *Eurymus* (*Colias*) may be mentioned as a special success. It has been suggested to me by more than one of our members that we might profitably have a little more system and pre-arrangement with regard to our exhibits, not of course to the exclusion of others, but as a nucleus, and to ensure opportunities for comparison of material in critical species. I am very ready to give this plan a trial, as it promises to stimulate interest in our meetings and to yield good results. I shall therefore as often as possible announce some group of allied species in which exhibits are invited for the following meeting; and with this end in view I shall welcome suggestions as regards species suitable for this purpose, or those in which any of our members are particularly anxious to see and study accumulated material. I hope our coleopterists will not leave this branch of our work entirely in the hands of the lepidopterists, but will propose some groups which they think they could appropriately treat in the same way.

Any other suggestion which members may have to offer on this or any other branch of our work will, I can asssure you, be most carefully considered by myself or by the Council; let us avoid anything like stagnation, and whilst conserving what is essential to the well-being of the Society, let us be radical in uprooting the sources of failure and the hindrances to our progress, so that the new century may see the "City of London Entomological and Natural History" moving forward with new hopes and new strength, to new achievements in the branches of work to which it has for so many years devoted its energies.

PAPERS READ BEFORE THE SOCIETY.

SECONDARY SEXUAL CHARACTERS IN BRITISH COLEOPTERA.

(Read May 2nd, 1899, by H. HEASLER).

In bringing the subject of secondary sexual characters before the Society, it is more particularly with the idea of drawing the attention of the members to the importance of these characters in throwing light on the history and development of insect genera, than the recital of a host of these characters, which are either well known or which convey no information to anyone who is not actually a coleopterist. For this purpose I propose omitting those characters whose utility is obvious, such as the dilated tarsi in our *Geodephaga*, the suckers on the anterior tarsi of *Dytiscus*, the antennal development in the cockchafer, &c., and shall deal more with those obscure characters which are so difficult to understand. This side of the question has always had for me a particular fascination, and it is only by the actual study of these structures, and their connections and points of resemblance in closely allied species, that one is able to trace something of the lines along which the numberless species of insects have been, or are being, developed by natural laws. The subject then becomes surrounded with an interest which the bare compilation of facts could never have given to it, and when facts have been compiled without some theory or working basis to go upon, it is generally found that they are useless for the purpose of any theory that may be subsequently developed, as the facts have not been got together in a way that the theory necessitates.

It may be in the memory of some of the members that when I read a paper on the subject of beetle coloration, I endeavoured to show by studying the coloration of certain groups that it was possible to see in some measure the past history of the family by this means alone, and it is with a similar object in view, namely, that of showing how the secondary sexual characters of insects assist us in forming some knowledge of the history of the families and genera displaying them, that I intend to treat the subject of secondary sexual characters. With this object in view I want to draw your attention especially to the family of the *Dytiscidae* or carnivorous water-beetles. I have read somewhere, I forget now where, that the reason given by someone of the fact that the females of so many of our water-beetles were rough where the males were shiny was for the purpose of assisting the male during copulation by giving a better surface to which to cling. This explanation seemed to me to be particularly ill-adapted to the facts of the case, since in the genus *Dytiscus*, where the roughness reaches the maximum, the male insect has very elaborate and well developed suckers on the anterior tarsi, which as everyone knows are contrivances suited only to a smooth surface, and the rule is the smoother

the surface the better they hold. What then is the reason that so many of our water-beetles have the upper surface dull and rougher in the females? It might seem to some that a dull rough surface was the original form of the various species, and on the face of it there certainly seems a great probability that such is the case, the family originally springing from some land form which gradually became more and more aquatic in its habits, and by the weeding-out process of natural selection the smoother specimens were preserved and the rougher ones destroyed. It is manifestly an advantage for an aquatic species to be smooth on account of the less resistance it gives to the water while swimming, which is an item of considerable importance where the habits of the species are carnivorous. This solution at one time seemed so obvious to me that I had no doubt it really was the correct one, in fact, there can be no doubt that the family, in common with the carnivorous ground beetles with which they are classed under the heading *Adephaga*, came originally from a striated species, as all the land forms are striated and the aquatic species in most cases show traces of striation. We may assume that the aquatic species have become smoother and smoother, ♂ s as usual taking the lead, and the fact that in most cases the females are dimorphic some being shiny like the males and some being dull, looks as if the females were gradually following the lead of the males. So far the facts seem obvious, and one might confidently predict that a time would come in the near future when the whole of the *Dytiscidae*, both males and females would be smooth, and sexual dimorphism in this family a thing of the past. But here comes the difficulty of settling the question in this way. If the smooth form be the highest development of the species, how is it that in two of the highest genera of this family the females have made the least progress towards the highest form, whereas in some of the lower forms the females are as shiny as the males, nor do they even occasionally throw a dull form which might be classed as a case of reversion, thus showing that the lower forms have advanced further in this direction than the higher forms. This is a well nigh insuperable objection of itself, since one does not go to the highest forms of a family to find vestigial characters better developed than in the lower forms of the same family. I think this point will be clear to everyone, at all events I am sure no lepidopterist would try to prove the connection between trichoptera and lepidoptera by trying to find connecting links between the two orders among the hawk moths or Bombycids. But another objection even more difficult to get over lies in the fact that the sulci in *Dytiscus* are altogether different from the striæ of the ground-beetles, and this should certainly not be the case if both were derived from a common ancestor. Having now cleared the ground by showing that the females are not dull because of the assistance it gives at pairing-time, and also that the dull and rough surface is not a vestigial character, it remains, therefore, that the real reason is that the character is of importance to the species, and has been recently developed. This is no doubt, I think, brought about by the concealment of the species being advanced by the breaking up the large smooth surface into a number of dark ridges and light furrows; this kind of concealment being a well known and very effective one, and in any case a rougher surface, even in water, is less conspicuous than a shiny one when it is amongst weeds and aquatic vegetation.

There is a very striking corroboration to this view of the question which cannot fail to be of interest, and it is this. If the furrows are the result of the female requiring special concealment, then they have no doubt been produced entirely by natural selection, and the question of sexual selection has had nothing to do with the matter at all, or at least, we may argue so, since it is not considered scientific to give two causes for a given result when one is sufficient to cover the facts, and it has already been shown how difficult it is to account for the structure by sexual selection. But if it becomes an imperative necessity at any time during the history of a genus or species to have a change of structure brought about by natural selection to suit its environments or habits, then the sexual characters must if necessary alter, to suit the amount of change demanded by natural selection. I wish to make this point perfectly clear, as it leads up to one of those interesting cases where a sexual difference in a certain structure would never have been noticed had not the theory demonstrated that it might possibly occur. My point is this, natural selection is a far more important factor in the life-history of a species or genus than sexual selection, and consequently when an alteration by natural selection becomes necessary, sexual selection even if opposed to it would at most only retard the alteration demanded by natural selection, and it consequently follows that if natural selection be all powerful in the matter, then sexual selection must accomodate itself where necessary to the structural alterations brought about by natural selection. Here then we will take up *Dytiscus* once more. We will suppose that natural selection has brought about the furrows on the elytra of the female to give it better concealment, and by the ordinary laws of nature if this rendered copulation more difficult, then the male must develop some new structure or improve some existing one in order to get over the difficulty. So far the theory, and it remains to be seen if the facts are in accordance with it and whether we can find the structure which the theory suggests as probable. With this in view, I took all my specimens of *Dytiscus* out of the cabinet, both males and females, and I found that at the base of the anterior and intermediate femora in both sexes, was a small stiff pencil of bristles which, in the normal position of the legs while swimming, would point backwards but when the legs were grasping anything beneath the insect, the femora being twined round with the coxa towards the front of the insect, these bristles would point downwards and would therefore assist the insect in getting a better hold, if there were any structure in the object clung to, into which these bristles would fit.

It had been suggested to me that the suckers on the anterior tarsi of the male were placed on the elytra of the female during copulation, which I had very much doubted, as the suckers being adapted for a smooth surface I had no doubt were placed somewhere on the thorax, and arguing on the analogy in the case of *Hydrophilus piceus* in which the onychium is dilated in such a way that the claw must catch over the lateral edge of the thorax, and also in the allied species *Hydrous caraboides* where the tarsal claw in the male is exactly the shape to fit the edge of the thorax, it seemed pretty clear that the tarsal claw in *Dytiscus* (and other members of the family) caught the edge of thorax, and the disc with the suckers was pressed down on the upper surface. I mentioned the matter to Mr. Donisthorpe, who very kindly obtained

some specimens of *D. marginalis* and watched them till two paired, and found that the beetle put one of the anterior legs over the edge of the thorax and pressed the disc on the under side, while the other disc was placed on the upper surface, he then watched another pair, which did practically the same thing, except that the opposite leg in this case was pressed to the underside of the thorax, while the leg which, in the other case was on the uuderside, was in this case on top; this can hardly be the regular method of pairing, but whether or no, it was perfectly clear from the position that the bristles on the anterior and intermediate femora of the male would fit into the sulci of the female elytra, and by careful comparison I found that the bristles on the femora of the males are better developed than in the females, so we see that not only do the ordinary facts fit in with the idea that the sulci of the female are a new and necessary development to the species, but we also find out the new fact that the male is also developing a character to suit the altered condition, and which at present is too slight to have been noticed at all had not the theory suggested the search for it.

We are now, I think, in a position to take this not as a possible theory, but as a probable fact, and we can see from this point something of the development of this character in the family, and from that something of the past history of the family of genera.

We have six species of *Dytiscus* occurring in Britain and four of these species have two forms of the female, one shiny and smooth like the male and one with sulcate elytra; of these four Canon Fowler in his manual of *British Coleoptera* only refers to one species, namely, *D. circumcinctus*, showing any intermediate form between the sulcate and the shiny form, and we have then the three gradations:

D. circumcinctus with sulcate, shiny and intermediate forms.

D. marginalis, *D. lapponicus*, *D. circumflexus* } with sulcate and shiny, but no intermediate forms.

D. punctulatus, *D. dimidiatus* } with sulcate form only.

As the sulcate form has been shown to be the highest development, and taking the British specimens by themselves (as I have not the time or material to discuss the matter as it should be with the whole genera, including exotics), what we learn is that probably *D. circumcinctus* was the species nearest allied to the ancestor which, after the sulci were developed, was the progenitor of the genus, and the other five species came from the same stock at a later period, but of the five only two have so far perfected themselves on this point, as never to revert to the ancestral form, whereas the other three still occasionally revert to the smooth form, and all this tells us that the formation of the various species has been a rapid and recent one, since so many revert, and it is also clear that the splitting up of the species was before the character was firmly fixed, and consequently the species themselves were recently developed. This view is corroborated by the bristles on the femora of the male not being very markedly more developed than in the females.

By this means a light is thrown on the posterior coxal development in the genus. The pointed coxal processes I was inclined to think the more highly developed than the blunt ones, but since they are

pointed in *D. circumcinctus*, which we have just considered our oldest British form, this would appear not so. The posterior coxal processes act the very important function of keeping the swimming legs in a line with the centre of the body, so as to get the full advantage of each stroke, and the shape is no doubt dependent upon the build of the insect, and that the blunt ones are the more powerful, and where more power became necessary natural selection effected the necessary change.

Having made clear the true meaning of the dull upper surface of the females, from the genus *Dytiscus* we can readily understand the other genera of the family, and instead of predicting that the dull form will disappear, we can now confidently predict that the shiny form of the female is the disappearing one; and the fact that in some species the females are always dull, in others the majority are dull, in some only a few dull, in others again none are dull, becomes perfectly clear, and the whole process instead of being a confused mass of facts without a beginning or end is now seen to be the whole process of natural selection, being worked out in a perfectly clear and intelligible manner. I must not forget that in one or two instances, and that also where the male is less adapted for rapid movement (I refer more particularly to *H.* 12-*pustulatus* and *H. depressus*), the male is also dull like the female. Again in *Hydroporus dorsalis*, in some of the females the elytra have a red spot at the shoulder, which must also be looked upon as a higher development, seeing that it only occurs in the dull females.

There is one other point in connection with the roughness of the surface in the females of our water-beetles, and it is that, although the same result is obtained, *i.e.*, that of making the insect duller, the method employed is different (as in *Dytiscus* it is by sulci, in *Hydroporus* by alutaceous punctuation, &c.) which is strongly in favour of its being a developing character, because were it a vestigial one, derived from a common ancestor, it would almost certainly have been built up the same way in both genera.

This point opens up another exceedingly interesting side of the question, which can be readily studied in the secondary sexual characters of coleoptera, and that is the various means by which nature, tied down by the little-known laws of heredity, struggles to obtain by various means the same end. If one only knew the part played by heredity in governing and checking the adaptations brought about by natural selection, what a flood of light it would throw on these obscure structures which are so puzzling. Take almost any genus of beetles you like, and you find the secondary sexual characters run along certain definite lines, and in a way that cannot fail to be noticed; in fact, one might almost tabulate some of the genera by these secondary sexual characters. If one takes the genus *Pterostichus* as a case in point, we find that all those displaying secondary sexual characters have them on the last ventral abdominal segment; in one species it is a depression, in two or three it is a raised tubercle, or ridge, but in all cases there is a close connection between them. In the genus *Amara*, again, a good number display secondary sexual characters, and here again we see the characters exhibited are the clothing of the inner margin of the intermediate or posterior tibiæ. In the genus *Ilybius* the characters in the males of different species are very closely allied indeed, and we find it a general rule that the closer the

insects are allied the closer resemblance there is in the secondary sexual characters. All this seems at first sight to point to hereditary descent from a common ancestor, seeing that the characters have apparently no use, and that the less the species have diverged the nearer the secondary sexual characters are to each other; and yet I am by no means assured that this is the true explanation, and I am always loth to put anything down to this cause when another solution is possible, and there are many difficulties in the way of solving the question by assuming that they are relics of once useful structures. There is one point here that I wish to emphasise, and that is, that the common practice of classing all these kind of characters as being rudimentary remnants of once useful structures is neither a scientific nor satisfactory way of settling the matter, as it simply but effectively puts the closure on the whole question at once, and in a way that admits of very little chance of discussion at any future time. I do not, of course, say there are no vestigial or rudimentary characters, because there are no doubt plenty of them, but I certainly think it should be the last resort of enquiry and not the first, as is so often the case. It is such an easy way of settling everything that is not of obvious use, but, on the other hand, it gives an outsider the idea that evolution has come to a stop, and that everything we see are degenerated species, which show us nothing but relics of structures whose usefulness came to an end some time back. The fact that the struggle is greater than ever, and that nature is producing new structures and new combinations continually, must, I think, be patent to everyone, and if we lay ourselves open to misunderstand all these structures as soon as they come under our notice, what chance have we of understanding the laws which govern their production. When one sees the effects of the struggle for existence in the species which have so far modified their habits as to use our civilisation as a means of getting an easier livelihood—*Anobium paniceum* is a case in point, to which nothing in the way of dried food comes amiss, *Dermestes lardarius* is another, *Attagenus pellio*, &c., and there are plenty of examples in lepidoptera and other orders as well where insects feed on artificial diet in houses and warehouses—I look on this as one of the most convincing of all ocular demonstrations of the struggle going on around us, which we can prove so logically and yet see so little of its actual reality.

I will point out one of the difficulties that present themselves to the mind in connection with the subject. The genus *Pterostichus* is a group of closely allied beetles, and in this group there are several coming close together, which have in the ♂s small but distinct secondary sexual characters on the last visible ventral segment of the abdomen. In *P. niger* it takes the form of a small longitudinal ridge, in *P. anthracinus* it is a minute tubercle, in *P. minor* it is a fine longitudinal raised line, in *P. madidus* it is a transverse ridge, and in *P. aethiops* it is an obtuse tooth. It will be clear to anyone that all these characters are closely allied, and they are mostly small, obscure, and of no apparent use to the possessor. At all events it is difficult to assign the use that a longitudinal ridge has to an insect, when in a closely allied species it is a transverse ridge, and in a third species it is neither transverse nor longitudinal but only a tubercle, while in another species it is not raised at all but is a depression, and our easy way out of the difficulty is to simply say they are the relics of a character which

at one time was useful to the progenitor of the several species displaying these characters, and which has gradually become obsolete from disuse. This, of course, puts the closure on the whole question at once, and if correct all well and good, but if not we are settling the matter in a way that is likely to stop all further investigation.

There is another point which renders this explanation of these characters in *Pterostichus* a particularly difficult one, and that is that in the genus under consideration there is one species, *Pterostichus niger*, which shows the same character in the ♀ as in the ♂. That the character has in this case originated in the ♂, and is a genuine secondary sexual character, there can, I think, be no doubt, as in the other species of the genus which have similar characters in the ♂ there is no sign of a corresponding structure in the ♀. If then these are vestigial characters how is it that *P. niger* has them not only well marked in the ♂ but in the ♀ as well, and shows no sign of losing them. I admit that there are of course great difficulties in the way of classing them as useful, and consequently developing, structures, but it is better to take this side of the case, which will prompt closer investigation, than to refer them to the limbo of ancestral characters on the decline.

What we really want to know in these matters are the laws which govern heredity, and until we have some broad generalisation on which to base our arguments we cannot but wander in the dark. That there are simple laws which would cover our present knowledge of facts I have no doubt whatever, but what those laws are, and how long we shall have to wait for an exponent of them, time only will show. There are many facts which show how close and important a part heredity plays in these obscure secondary characters. No matter what genus of beetles we take up, if they display secondary characters, then we find that within the limits of the genus the characters run on similar lines, and this holds good in nearly all cases, and to such an extent that it becomes a most obvious truth to anyone studying the subject. It is doubtless this fact which has caused the bulk of these structures to be considered relics of some characters displayed in the common ancestor of the genus. To my mind this question opens up an interesting field of study as to how far natural selection can effect its ends by utilising small variations from the type. I know it is generally argued, and generally admitted, that variations can occur in all directions, and that it is by this means the innumerable adaptations in nature are effected through natural selection; but on the other hand we do not find the members of a genus diverging indiscriminately in all directions, but, as a rule, we find them varying in one general direction, or along certain lines, no matter whether we take secondary sexual characters or others, and it seems superficially as if natural selection did not have it all its own way, but that the hereditary character, history or tendencies, were so firmly ingrained into a genus, that natural selection was powerless to utilise variations except in the direction which was governed by the hereditary tendencies of the genus in question. Once more reverting to the secondary characters in the genus *Pterostichus*, I have tried to show the difficulties and objections of referring these to vestigial characters, and it seems equally obvious that sexual selection can have nothing to do with the matter. If then they are developing characters they are due to natural

selection, which, in our present state of knowledge, seems equally difficult to understand, and failing this, we must suppose they are due to certain laws of heredity of which we are at present ignorant, owing to our not knowing what the fundamental laws governing heredity really are, and it is this last solution I am inclined to favour, first, because there is a fair probability of its leading to something by which our knowledge will be increased, and secondly because if these characters are vestigial it seems difficult to understand how a transverse ridge, a longitudinal ridge, a tubercle, and a depression, can in various species be relics of the same ancestral character. On the other hand it is easy to understand how different characters might arise in different species, which need not necessarily be variations of one character, but which at the same time are bound by the laws of heredity to bear a strong similarity, and consequently the closer the relationship of species the closer we should expect to find the secondary characters. As a good example I think the characters shown by the genus *Ilybius* in the *Dytiscidae* clearly indicate this side of the question. The ♂ characters all run as far as I know on one definite line, and that is the last ventral segment of the abdomen is keeled and wrinkled in a very peculiar way. In the ♀ s the centre of this segment is compressed in the middle, and the appearance in both sexes is that there is a superfluous amount of chitin, or that the segment grows too large for the requirement of the species. In the male the difficulty is got over by forming a keel and wrinkles, and in the ♀ by bulging the segment up in the centre. Thus on the one hand the characters are so closely allied in the different species as to be almost identical to each other, this agreeing with the close similarity between the species, but on the other hand the very artificial appearance of the segment is opposed to its being a vestigial character.

In fact it seems a general law, that the closer the relationship between members of the same genus, the closer are their secondary sexual characters related, but directly we try to tabulate the different families on these characters we are at fault, and this is I think because these characters are developing divergent peculiarities, rather than vestigial convergent ones. Another of the interesting points connected with secondary sexual characters, is in reference to those characters which suddenly crop up at wide intervals in distant families. Take for instance some species of the genus *Amara* ; we find in some the posterior tibiæ clothed with pubescence on the inner side in the ♂ , and we have no other genus of British ground-beetles showing this character, and it is not till we reach the end of the water-beetles, that we find it in *Hydraena gracilis*. Again there is a solitary species of ground beetle *Sphodrus leucopthalmus*, which in the male has large hind trochanters, and we must look among the British *Staphylinidae* before we find a similar structure in *Homalium pygmaea*.

Stenus juno with its pubescent metasternum has the same characters as *Scaphidium 4-macalatum*, a clubhorn in this respect.

If these are instances of similar characters arising *de novo* in each instance, it is a remarkable circumstance well worth noticing, but if it is due to any hereditary connection, then the persistence of some of these structures is simply amazing, and when connecting links are found between ground beetles, water beetles, " staphs," and clubhorns, the question is when does heredity cease, and what is the cause of

its astonishing persistence in these characters, which we class as vestigial.

In conclusion I would ask our members to bear the question of heredity more earnestly in mind in connection with our favourite hobby, and I think if all of us utilised all the information that we come across in our entomological studies, we should see more of the part played by this important factor in the natural world, and be better able to understand some of the results which we see around us.

THE RE-CLASSIFICATION OF THE LEPIDOPTERA.

(Read Feb. 6th, 1900, by W. J. KAYE, F.E.S.)

I am afraid I am not on untrodden ground in the subject that I have chosen for this paper. Messrs. Tutt, Chapman, Meyrick, and others, have all given us very valuable papers on the subject but in none of them I think is the subject treated from the families, genera, and species point of view simultaneously. In using the term re-classification perhaps some ambiguity may arise as to the probable drift of what I have to say. Ever since the days of Linné, who started the scheme, the lepidoptera have been almost in a constant state of re-classification. At some periods the original work has been more prolific than at others. But it is highly probable that a year has never passed in which some re-arrangement in the position of families, genera, and species has not taken place. This as we shall see represents progress, and however difficult and increasingly difficult it will be to keep pace with the times as fresh work and in different directions takes place, we must take it as a maxim that the more stereotyped we make our classification the less knowledge do we acquire. It is of course only during the past few years that the greatest revolutions have taken place, and our eyes opened to the almost childish arrangement that has existed in the past, of the position and nature of families and genera. But it is not my intention to entertain or amuse you with our forefathers' ideas of classification, but to give you an epitome of the present day results with some comments on their validity.

The very first piece of classification is our defining of two large divisions, the butterflies and moths. These have been scientifically named the Rhopalocera and Heterocera, but the names are not very fortunate as we find we have insects with clubbed antennæ which do not fulfil the general conditions that hold for the butterflies or Rhopalocera. We, however, do not meet with the other extreme, as butterflies are unknown that do not have some sort of a thickening at the termination of the antennæ. It might be supposed that, as the rule of clubbed antennæ does not hold everywhere for making the subdivision, failing the life-history it would be impossible from the imagines to form a correct conclusion. But it has been discovered that in the connecting group with the moths, the *Euschemonidae* and *Castniadae*,

the frenulum is present. We can thus make a division, just before those groups that have not yet lost the frenulum. We are in this way able to make an artificial line between butterflies and moths, and as a matter of convenience it is justifiable. All the species that fall under the head of Rhopalocera, form a very homogeneous group, but at the same time there is no great gap between this group and Heterocera. There is no reason if we make one large subdivision, why we should not form other large subdivisions. We might for instance invent a name that includes *Arctiidae*, *Notodontidae*, *Lymantridae*, *Hypsidae* and be equally justified. The bulk of our attention, however, has been in the past few years to get much smaller subdivisions in order, and indeed it is essential that we must know the family relationship before we can group families under still more comprehensive headings.

It is to the nature of families and their relation one to another that a large part of the work has been directed. What are the conditions for a family? Asked point blank in this way, probably a dozen individuals would each have a different answer varying with their idea of the value of different structures. As in the case of a species it is often a matter of opinion, so it is too frequently with families. There cannot, however, be any duplicate methods of grouping in nature, and for so-called utility, we should avoid any method which is not strictly with the laws of the universe. But I think that families have their being pretty generally in this wise. Species that have any one or more structural characters essentially the same in ovum, larva, pupa and imago, belong to a family. At the present time there are some workers who hold that the characters of the perfect insect have preponderating value over those of the other stages of the insect's existence, and we hear of such and such insects being relegated to the *Geometridae* because the neuration of the wings is of Geometriform arrangement, or again, that an insect is a Noctuid, because of its having neuration that holds for that family. This shows undoubtedly that if the two arrangements clash, there is something radically wrong with our work. It is inconceivable and absurd that an insect can belong to different families at different periods of its existence. The knowledge of the life-histories of thousands of exotic species will prove whether the work of Hampson and others, who cling so persistently to neuration, is on a sound basis. If it be finally proved that the system of grouping by neuration is valid, we have one of the most useful discoveries in the whole annals of entomology. In the second place the utility of such a system is immense. As already stated, there are thousands of exotics and even many others besides, of which nothing is known save the perfect insect. Of the value of neuration as a set off to other imaginal characters, we rely on its immutability by external circumstances and surroundings.

The antennæ, if our interpretation of their use be approximately correct, would not lend themselves for such a use. We suppose for instance that all the wingless females or semiwingless females once had better developed wings, and that, through disuse, they have gradually become atrophied, and in some instances have actually been lost altogether. As a consequence of this, I should be inclined to consider that the antennæ of the ♂s (if their use as scent organs is accepted) have undergone specialisation, be it in size,

number of pectinations or any other direction. The ♀ moth that sits on the tree trunk, one is justified in supposing, is not so easily brought to the notice of the male as one that can fly, and hence the antennæ are brought into the question. Other characters of the imago might be cited in the same way. The labial palpus, for instance, is no doubt a plastic structure depending on the value or use, in very many cases, that an insect makes of its proboscis. It is quite possible to imagine that an insect, isolated from its habitat of ages where certain plants grew, might be set down in a place where different plants grew—plants different in form, which would call for a greater or less length of proboscis. In those cases where the palpi are used to protect the proboscis, a large palpus would be necessary to encase a large proboscis. Protection cannot, however, be the sole use in such instances as in the *Libytheinae*, but it doubtless plays its part, and a large part. But although we can arrive at some conclusion for the non-acceptance of the above organs for family distinction, we cannot use others because they do not offer, or seem to offer, any sort of rule. Such are the spines on the legs and the rows of hairs round the eyes. The latter character, made use of by Meyrick in his *Handbook of British Lepidoptera*, shows one at what grave errors we can arrive by studying one side of the question only. If we can discover an imaginal character that will coincide with our idea of classification by the embryological stages, so much the better, and it is earnestly to be hoped that whatever the faults to be found with neuration to start with, we shall soon be able to understand and use the nervures for the location of species into families at least. To go beyond this and to use neuration for the definition of genera, is a total defeat of the great claim for it, namely, its immutability by external forces. As I shall later attempt to show, the characters of genera should be much more easily affected by external forces than those of families, and the greater the subdivision one makes the more so is this true ; specific characters being more mutable than generic ones.

I cannot leave the subject of neuration without calling attention to some of its values if even in the present imperfect state of our knowledge concerning it. Many, the vast majority of our *Noctuidae*, for instance, have now been bred, and in every case the neuration of the perfect insect has similar, often identical, neuration. With such constancy as this, we are pretty safe in assuming that nearly every insect with noctuid neuration is a Noctuid. In the key to the families set forth by Hampson to vol. i of his *Lepidoptera Phalaenae*, other imaginal characters are brought in when neuration fails to separate groups, and we have the frenulum, the palpi, and the antennæ all playing a minor share in conjunction with the neuration as the base. Thus every moth having in hindwing vein 10 absent and with 8 removed from 7, 8 anastomosing near base only, vein 5 nearer 4 than 6 in forewing, and with a frenulum, and with antennæ with shaft not dilated ; must be a Noctuid. In point of fact to the working entomologist who knows the appearance of a Noctuid, *the vein* 8 *remote from* 7 *and also* 8 *anastomosing near base only*, would not be attended to because the only family imaginally with which one would be likely to confuse with *Noctuidae*, would be the *Geometridae*, which also has the above conditions but which is immediately separated by its not having the frenulum. A very remarkable instance of the value of

neuration came under my notice the other day for the first time. It was a *Cocytia* which has been proved to belong to the Exotic family *Hypsidae*. The external appearance of the moth is strongly in favour of the *Sphingidae*, but the positions of vein 5 of the forewing and vein 8 of hindwing clearly show that the insect cannot belong to that group on a neuration base. Neuration here has been proved to be correct, by the discovery of the larva, which is very like a Lymantriid larva and which establishes the position assigned to it. Although this is a remarkable instance there might be cited numbers of others less striking, and they suggest very strongly that we are on a sound basis. As has already been set forth by Tutt, families cannot be put as linear descendants one of another, and, in fact, Chapman's work with the ova is proof positive of the impossibility of such an idea. Once this is clearly understood there is no doubt that many of the difficulties of neuration, difficulties brought about by attempting a direct lineal arrangement, will disappear. In the seven years that have elapsed since Meyrick first read his paper before the Entomological Society of London, our views have been immensely moderated, and many now obvious errors have been rectified. In the *Entomologist's Record* for 1892 doubtless many of you will recall the storm aroused by Meyrick's paper on the neuration. Tutt was particularly severe upon it, but must be credited with having said "I quite agree that Mr. Meyrick's facts will some day prove useful." Many of the facts have already fulfilled that purpose, but the number of our entomologists who take any account of them is exceedingly small. Having endeavoured to uphold one particular character of the imago above others, I will try to show that the most valuable characters of the perfect insect are relatively of more account than characters of the larva. It is frequently evident that certain structures are quite useless to the insect and that they can easily do away with them. The larva of *Philampelus satellitia* affords a striking illustration. This North American Sphingid, which is a pest at times to the vine growers, has a larva which when newly hatched has an immensely long caudal horn. After the first change of skin the horn is very much shorter, after the second, shorter still, and by the time the third is reached the horn has ceased to exist. We have here strong reason to suppose that in course of time the larva will have dispensed with the horn in all periods of its existence. It will be remembered that the caudal horn on the larva's 12th segment is one of the strong family characters of the *Sphingidae*. Why in this particular species the caudal horn should be taking the downward path is not known, or has perhaps not been thought out. Take again *Acronycta* (*Triaena*) *tridens* and *Acronycta* (*Triaena*) *psi*. With such closely related species it is reasonable to suppose that the larvæ were structurally alike originally; they are, however, now quite dissimilar, but the imagines of the two species (which must have been one originally) are so alike that few, if any, can always separate them. This from the facts to hand shows that the bifurcating from the common stock was most marked in the larva as it is there we have most divergence. If then these structures are plastic they are not so valuable as such characters in the perfect insect which are much less so. But there are other structural characters in the larva of which the tubercles are not the least important.

These tubercles offer an immense amount of variation according

as the larva needs protection. Larvæ that feed exposed have very often no trace of them generally when the larva is protected by colour, but on the other hand we find exposed larvæ with bunches of setæ on the warts. In concealed feeding larvæ, we usually find the tubercles simple, carrying perhaps only a single hair or perhaps none at all. But not only do the tubercles offer variation in the number and variety of setæ but they vary in position *on which we base our character*, with different changes of skin. This is to my mind the weak spot in the classificatory value of this character. Larvæ are not bound down to any particular number of instars and if in the penultimate change, the position of the tubercles were different to the ultimate, a change brought about to undergo one change less in this direction would quickly alter the former conditions. Over and above this the prespiracular tubercle is never constant. From the moderate constancy of the position of tubercles i, ii, iii, and iv, Dyar made six large groups, but the number of these groups is so small that it is obvious that many widely divergent smaller groups must be lumped together. The structure, therefore, of the larva does not lend itself for the formation of families. Neither does the structure of the ovum or pupa offer itself for family formation. There is not primarily a sufficient variety. But if the embryological stages are not found to be of value for family demarcation, they are of the utmost importance for determining the phylogeny of the families. I have been pointing out the claimed value of the spiracles in the larva. These I personally believe to be of not much consequence and for this reason. The larva, unlike the ovum and pupa, has an infinitely greater struggle for existence and therefore has to undergo a corresponding number of modifications. This we find to be the case and although the covering or cocoon of the pupa has very many modifications, the actual pupa itself has no power *per se* of modifying its conditions, the larva forming the cocoon before histolysis has commenced. Although the pupal state follows the larval, embryological conditions hold to a much greater degree in the former. From this reason it appears that we should place very much greater value on ovum and pupa than upon the larva embryologically, that is, in studying the phylogeny. Dr. Chapman, who I suppose must have taken this view, has in his very valuable paper on the phylogeny of the lepidoptera treated upon the ovum and pupa only and left out the larva. Tutt, in his *British Lepidoptera* appears to take the same view. Speaking of the larva and pupa he says: "It is necessary therefore in dealing with these stages (larval and pupal) to bear in mind two points:—(1) Whether the similarities which one sees are phylogenetic . . . . or (2) Whether they are œcological in their origin and due to a similar relationship of the animals to their organic and inorganic environment. The characters manifest in the egg state must almost of necessity belong to the first division; those in the active larval (considered as an embryonic) condition may belong to the first or second." Mr. Tutt does not suggest to which the pupa belongs. It is undoubtedly to the first along with the egg. Thus, although he does not say so in so many words, I think it is fair to assume that he gives much greater weight to the ovum and pupa than to the larva in determining the phylogeny. It would be presumption on my part to speak fully on the phylogeny of the lepidoptera with so little knowledge and after such work as Dr. Chapman's on this

subject. I will, however, venture this point, that while Dr. Chapman's paper on the phylogeny and evolution of the lepidoptera, is from the oval and pupal standpoint, it is also from the only satisfactory standpoint we can take, if we are to work, as biologists say we should work, on embryological characters. There are, however, certain characters in the imago which there appears to be no reason for rejecting when working in this direction. Comstock separates all the lepidoptera into two large divisions by the insect having either a frenulum or a jugum. This separation is quite valueless by itself as the jugum is not supposed to fulfil the same purpose as the frenulum and there are many insects which have neither structure. It is useful, however, in that we can trace the jugum to a structure in some neuroptera, and in the fact that the origin of lepidoptera from that order is substantiated by this character taken in conjunction with the pupal evidence, and showing that the *Jugatae* are the lowest of the lepidoptera. But, besides the frenulum and jugum structures, there is that character already touched on, the neuration. It is already ceded that the ovum and pupa offer themselves for phylogenetically arranging the groups, because œcology can play no part in their structure. It thus seems to me that if we can satisfy ourselves that the neuration of the perfect insect cannot undergo change œcologically, we are perfectly justified in assigning to it a place of phylogenetic value also. Probably in the vast majority of individuals œcology plays no part in the neuration, but I cannot altogether think that it never does. It is hard to believe that the hindwing of some species is not modified by circumstances and outward conditions. The members of the curious genus *Himantopterus* afford a good illustration. Of the very few members of the genus the hindwing shows extra-modification in each species, and point to very unstable conditions. Environment of course may be outside the cause altogether, but with such closely related species, and occupying so completely an isolated position, it is probable that some external agent is playing its part. Hampson, in his *Moths of India*, vol. i., remarks about these insects: "They are degraded forms which have arisen from an ancestral type; the veinlet in the cell and vein 1*c* of forewings being more or less developed, show that they belong to the *Zygaenidae* and the absence of mouthparts places them in the subfamily *Phandinae*, near *Pryeria*, while on the other hand they are allied to the *Psychidae*." We are not told what the degraded forms are degraded from, and there is no suggestion. But the species themselves show stages of modification, and although the term degraded is used, specialised probably is better adapted. With species closely related in every way, it is impossible to conceive any other than extreme forces acting to bring about modification. Upon this rule *Himantopterus* tends to prove that neuration, in the hindwing at all events, cannot be of the same value as evidence taken from the ovum and pupa. But although the hindwing appears to be capable of undergoing modification, and, as a result, neuration undergoing modification, the forewing seems much more fixed, and I can think of no parallel case to *Himantopterus* with the forewing. And from this it is not unlikely that in the neuration of the forewing we have much more fixed characters, indeed, the fact of our detecting so many more modifications in the hindwing goes to prove this. Meyrick, writing in the *Zoologist*, in

1898, said: "It may be doubted whether any group of animals exhibits a better character than the neuration of insects, which displays sufficient complexity and variation in the number and interconnection of the different veins, whilst at the same time it is practically unaffected by external forces except occasionally the easily calculable influence of a change in the form of wing; moreover the modifications effected are often irrevocable, and therefore less puzzling to follow." That the modifications are irrevocable is admittedly true, but that the change in the form of wing is an easily calculated influence cannot always be the case, particularly in the hindwing. But from the very fact that a change in the form of wing brings about neurational change, it is clear that we should treat the subject with that knowledge, and not implicitly cling to any and every phase of neuration. This change in the form of wing seems to be the only weak spot in the value of neuration, and if we can calculate, as Meyrick says we can, the influence, there is no reason why in conjunction with other important characters (which is all-important) we should not place the greatest value we can upon it. Of individual variety of neuration, for which reason some workers almost totally ignore that structure, there is this to be said, *viz.*, that it is only what one must expect. No two individuals, be they of any order from man downwards, are identical even in structure. In the great majority of cases the variation is only a variation in size, be it length, breadth or thickness, but variation in the position of any one structure is not unheard of, in fact the one is rather an outcome of the other in the system of neuration, and it seems to me possible to imagine that if a moth has any one vein particularly well-developed, say in length, the vein in closest proximity to it will be probably correspondingly shorter, and will therefore of necessity terminate or arise in a different position. It is obvious that, with a complex structure like the neuration, any such small primary variation can be the cause of further variation when the one vein is dependent upon its position to others. To shut one's eyes to the value, apart from the utility of neuration as a means of classifying, is, in the face of results now arrived at, inexcusable. Independently of the assistance of other characters we place Arctiids, Noctuids, and Lymantriids in close relationship, and this is also the result arrived at by study of the embryological stages. It must therefore be obvious that our work in this direction is of real value. Until now the great obstacle to its general acceptance is the fact that the workers who have taken up the subject are one-sided. It is perfectly true that we all tend to be specialists, and, moreover, the age we live in demands it, but we all require a general education first, and we should not lose touch with it as soon as we begin to specialise. If the work of Meyrick and Hampson had from the beginning been tempered with considerations of biology, which I have called the "general education," I venture to think that the study of neuration would have attracted much more attention than it has done. I alluded above to the correct result of neuration in placing Arctiids, Noctuids, and Lymantriids close together in descent, but on referring to Hampson's further arrangement we find that Notodonts are separated from these by such families as *Sphingidae* and *Cymatophoridae*. The futility of such an arrangement has already been exposed by Dr. Chapman from egg characters, who has shown us that *Notodontidae* have upright eggs, and must therefore be correlated with other upright-egged families of

which the *Noctuidae* would probably be the nearest. Except for the *Geometridae* the *Notodontidae* are the most perplexing from their neuration. Apart from their general appearance that suggests the *Sphingidae*, the neuration has precisely the same characteristics, including in two or three species the unusual short bar connecting vein 8 to 7 in the hindwing, and the position of vein 5 which arises at equal distances from 4 and 6. It is extremely interesting, however, to find that we have a link for this latter character so that we can trace even neurationally connection with the Noctuids. The genus *Cyphanta*, which contains two North Indian species, shows vein 5 arising almost from the corner of the cell with vein 4, but still has the small connecting bar between 7 and 8 of the hindwing, and other traits characteristic of the *Notodontidae*. It thus appears that, although no doubt can now be held in regard to the position of this family, viewing the case from all sides, there must have been further links that have died out and thus have made our task the more difficult. If it had not been for the knowledge of the embryological stages we should probably never have departed from the old idea that Sphingids and Notodonts were closely allied, and more than likely never have looked for a relationship in the neuration. But I am on ground on which I said I would not detain you. We already have grouped our insects into large divisions or families by essential structural affinities shown throughout their existence. If a structure in one stage is at variance with what we have laid down as rules, it must be that that particular structure is not fixed enough for family diagnosis, and is only suitable for minor subdivisions, such as we know as genera or even for species. It may be also that we interpret it wrongly, as has been the case with the neuration, for want of fuller knowledge of the insect's existence. In the case of families it is found that no single character will hold for definition. It is also true of genera in a still greater degree. Independent working on any single character invariably breaks down in the face of other characters. The minor structural parts are, particularly in the imago, so numerous, that we find we are able to give genera very varying interpretations. We make these groups perhaps by the antennæ of the imago differing only from those of another group, or, may be, the palpi, the leg structures, or the presence or absence of ocelli ; in the early stages also, where any character holds for a number of individuals, we give a name to that group and call it a genus. Now it seems to me that although this is perhaps useful from the point of view of convenience, it is not necessarily a statement of the true genealogy of the species. My point is this: All structures, even minor structures, are not of the same fixity. We can define some genera much better than others, some have a larger number of recognisable characters than others. We often speak of a very natural genus, meaning that the genus is well differentiated from all others. But in these latter days of entomology when large genera are split up again and again by slight structural differences, surely these cannot be of the same rank as the well-defined or very natural genera? If they are not of the same rank they should not go by the designation, and I am glad to see there are some entomologists who are recognising this, and dividing genera into sections A, B and C, or more according to the facts of the special case. The definition of a genus is hard if not impossible, but the cases are considerably lessened by the system of sections. The conditions for

forming a genus at the present time are so varied that it would take an altogether unknown quantity of sheets of foolscap to state them. In point of fact a genus is a collection of species which have been descended from a common parent. But that collection of species may have undergone one or more of an infinite number of different conditions, and called into play those habits and structures which are most beneficial to that collection of individuals. It follows, therefore, that one set of individuals will develop one structure better than another set, which will not require such modification. This is exemplified on all sides. We find larvæ of one group easily separated from larvæ of another group. Some particular structure of the imago is different in one group from another, although otherwise the divergence is hardly perceptible. The difficulty in dealing with all these various phases is to decide how many of these characters are going to be considered as being ground for forming a genus. If say, that a species of Noctuid is closely connected with the genus *Xanthia* by its larva and egg, but in the perfect state has lost the general characteristics and has slightly different structures also, are we to form a new genus for that species? My answer would be *no* for a genus, but *yes* for some sectional division. With the fresh discovery of minor structural divergences the number of genera are increasing by leaps and bounds, and it would seem that in perhaps a hundred years or more each species will be in a separate genus. But to come back to our question as to whether we should create a new genus for our particular species. We must satisfy ourselves whether the structural differences we see are œcological or not. If it is possible that they are so, and that the whole life-history of the insect is extremely close to another, and the characters of the egg and pupa (essentially the embryological characters) show strong affinity, there can be no reasonable cause for separating the two. Characters, which we have strong reason for supposing to be so easily acted upon, are *in themselves* of no better value than for species demarcation. Although in the present state of our knowledge it is difficult to understand why the genitalia should be so easily influenced, we are forced to assume that they are so, as we find that in some species that are exceedingly close to one another, this structure varies so much that we are able to make use of it as a specific character. It remains to be seen whether even this structure is always sufficiently constant in local races of a species. Has for instance *Lycaena agestis* from the South of France got identical genitalia as (what we know to be only a variety of it) *artaxerxes* from Scotland? It is admittedly probable that it has, but if there is a divergence we should be compelled to give it less importance than even species rank. Genera at the present day appear to be made much too much for the sake of catalogue, and not sufficiently thought out as to whether they are sufficiently natural genera or not. It is also thought that because structural differences are used that there can be no doubt that the splitting is justified. Meyrick in his paper last year to the *Zoologist*, writes "Characters of colour and general form are bad only because they are particularly liable to be modified by changes of environment. Now some structural characters are quite as liable, and are therefore equally bad" and then goes on to illustrate the beaks of birds. I think Meyrick has, however, missed out a word, and that word is *generically*. Those characters that are particularly liable, should be taken for specific value when possible, but if they are common to two or more species,

from my point of view they are not of necessity cause for making a *genus* of them, but as merely a section probably of another genus. As we shall presently see with species, we are too often, in our exactitude, led away into subdivisions which are of themselves *inexact* because the divisions, all going under one name have such a varying factor of fixity. It is already stated, and it must be obvious to every scientific worker that it is impossible for all our genera to have their being under the same conditions. Markings of egg, minor structural differences in larva, pupa, or imago, complete difference in habit, such as the larva of one species being an internal, the other an external feeder, are all severally or by combinations of two or more of these traits, held to be of sufficient specialisation for the formation of a genus. But the internal larva calls for a different structure from the external, and therefore this habit is, or should be, only considered under the larval structural character and not stand alone as of value. As is true of everything in nature there is gradation, and we actually have larvæ that are external for part of their existence, and internal for the other part. *Leucania brevilinea* is a case in point which has a larva that feeds within the reed stem until it is attaining towards full growth, and then feeds on the leaves, but always still hiding by day within the reed. At first glance it would appear as if this insect was an internal feeder and of that stock, and was gradually becoming an external feeder, from the fact that generally we know of internal feeding larvæ as being generalised in structure. In the first place, the true or absolute internal feeding Noctuids, such as *Nonagria*, are not the lowest Noctuids, and it must be assumed that their internal habit is a recent one called into use for protection's sake. Certain traits correlated with generalised internal feeders, such as a delicate cuticle and great elongation, are brought about from the habit of feeding within long narrow reeds. Of course if one goes far enough back one must believe that these rather specialised internal feeders were remotely descended from internal feeders of a generalised type. To come back then to *Leucania brevilinea*, if it has not quite reached perfect protection by absolute internal feeding it has not advanced so far as true Nonagrias which spend their whole larval (and pupal) existence within the stem. *Leucania phragmitidis* has reached further than *L. brevilinea*, it feeding wholly within the stem, and only coming out to pupate in moss near the root. *L. lutosa* has advanced still further for protection's sake. It feeds wholly within the stem and feeds down to the root where, it emerges to pupate without any wandering for a suitable place for pupation.

It is obvious then that upon the feeding habit, as enunciated, we have not very clear grounds for working with. Are we to have two genera dominated by the characters of the two extremes, and to fit in all the intermediates according as the greater number of characters leans towards? Or, again, shall we place all the intermediates in one group between the two as has even already been done? What we have to answer in reality is: did those two or three groups have a common ancestor more recently than the family relationship? If they did then they should have some grouping distinction, whatever it may be. A genus should occupy the same position to species as a species does to the various forms which are bred from a single individual which are known as varieties. As soon as any of those varieties become definite and fixed to produce their kind they become species. If then we can satisfy ourselves

that the *divergence* of a group of species took place more recently than from the family ancestor, we are correct in placing those species in a genus. Although we have departed from the idea that the families could be placed as linear descendants one of the other, we have hardly thrown off the old idea when we come to genera in a family. But it is equally fallacious. Let us consider the special Leucanias again. It is not the *existing* external feeders that have been derived from the *present* internal feeders. That the two are derived from a common stock is true, but how many generations are we to include for the next subdivision? One thing always seems to me clear, that if we are to subdivide so greatly it will be necessary to have many more terms for those subdivisions than we already have. Our genera hold too varying a value. At any one period of the world's history it is quite impossible to know what the relations were then of species to species and groups to groups. We have no means of ascertaining when one variable insect gave place to those varieties which of themselves were destined to become species. Some took place at one period, some at another. Those that took place earliest have therefore become more fixed, and those the latest least. But must we have genera so unequal that those that have remained as genera, so called, for ages, are to stand alongside small groups of species (also called genera) that have a less general relationship, and therefore different relationship? Let me try to illustrate my point. For many years we included all our five Theclids in one genus *Thecla*. They were acknowledged to be related by certain ties. With more intimate knowledge of our species it was found that we could subdivide our genus into three smaller groups, and we called them *Zephyrus*, *Callophrys*, *Thecla*. But *Thecla* has altered its relationship, and, instead of being a genus, has moved up to a family relationship in reality. But we still retain it as a genus and leave that family relationship or higher, wider grouping without any designation at all. The old arrangement was, if the species were really related, perfectly sound, perhaps not so convenient, but there was no error. We make the error in our supposed rectification in not giving *Thecla* a family relationship over the genera into which it divides up. Attempts have been made to cope with the difficulty and we find genera split up into named sections, a course which gives a genus a general relationship to the subdivision, and is equivalent to calling if a family. We have the old genus *Acronycta* thus split up. But it is quite possible that some day we shall find that one of the sections is subdivisible, and then it would be necessary to find some new name for the value of that subdivision. The greater this subdivision the more relationship is it necessary to give if we wish to avoid artificial methods for locating our species.

One more word about genera. From what has already been said it should be clear to everyone that we at present have genera that can be said to stand for father, grandfather, back to an almost indefinite relationship to the collection of individuals under it. In just the same way as species in a genus, all the genera of a family, countless ages back, are descended from a still more remote ancestor. If we could only have the written pedigree of every insect we at present know of, we should require an almost endless number of headings, in other words relationships. It thus always, to my mind, appears that it is quite impossible to really naturally classify with only the few

scanty groupings of—family—subfamily—genus—subgenus and species. Darwin in his *Origin of Species*, says "groups of species such as orders, suborders, families, subfamilies and genera, seem to be at least at present almost arbitrary." The outcome of all the research with regard to the structure of our insects has already been to reveal that subdivision is necessary, but do not let us create genera upon genera when we ought to be grouping them under some more intelligible heading. The jump from some of the more recent so-called genera, is, on consideration, altogether unintelligible, and by no means a statement of the valuable facts already gleaned, which should be part of the definition of science itself. It need hardly be remarked that, if our genera are so ill-defined, our families must also be ill-defined and of a flexible nature. In our primary grouping, namely, that of common individuals to a species, we try and make our heading as narrowed as we can. We recognise that varieties are not entitled to be called species, and also that subvarieties are not entitled to be called varieties and we endeavour to keep them separated and thus defined, although all come under the broad head or family relationship of species. The aberration that occurs with the type is only just commencing to become individualised, while the variety which we call a race, which is separated in some particular spot, is much nearer becoming a species. We make these distinctions in the lowest subdivision, although we still require a vast number more names for the great number of various stages previous to an individual's becoming a species. Let us look at some of our well known British species. We have perhaps not yet forgotten the *Tephrosia* tangle and the amount of discussion that it aroused, the question being whether we had a particular two species that were very similar or only one. The summary as set forth by Tutt was this: "We have (1) the differences in the eggs; (2) the differences in the general character and appearance of the imagines; (3) the difference in the shape of the wings; (4) the independent life-histories of the two insects; (5) the constant difference in the times of appearance; (6) the fixed double-broodedness of one and the single of the other; (7) the fact that the two insects breed true, and always produce their own kind." But although there are all these differences, what are they when we compare another species of the same genus that has differences of twice the number of characteristics? That third species must have passed through many more phases before it arrived at all these differences, and has probably taken a much longer period also to develop them. And my question comes to this—What is the value of a species, or rather what is the minimum divergence in time, structure, habit, or any other characteristic, taken severally or conjointly, that is to determine whether we have a species or not? If we are to settle this by saying that it is a matter for individual opinion to decide whether the amount of divergence is sufficient, then we must see that as all our species have not been described by one individual, we must have a large number of very unequal species. Even if the one individual could have described all the species, as all these species have not become so on the same lines, it must have been almost impossible to weigh characteristic with characteristic, so that every species should have passed through an equal amount of specialisation. In regard to the former remarks, the multitude of describers with their varying ideas as to a species, has

given rise to one of the most harrassing nuisances in entomology. Species that are thought to be species by one individual, are duly described; another worker sinks them under some other species, and in a few years the same thing is redescribed by someone else, and then later on it is found there are two names for the same individual. The priority rule says we should hold to the former name, and although the second may have been in use for years we compel ourselves to change it for the former. This is of course not all, we have to remember the other name as well if we want to read about our subject. You are, however, to hear a paper on synonymy, so I must not trespass.

I have introduced it merely to show that it is of our own making in great measure through this varying standard of species rank. That the standard is varying is admitted pretty generally. Tutt says "that there is no real distinction between races and species is certain, the matter often resolving itself into one of opinion;" that the matter is only a case for opinion is true, so long as we do not insist on any one or more special traits being necessary to determine whether an insect has diverged sufficiently from others to rank as species. In the case of the two Tephrosias—*bistortata* and *crepuscularia*—the two Triænas—*psi* and *tridens*—certain Anthrocerids and others, the amount of divergence is nothing like that in the large majority of our named species. Why then do we place them in the same rank? If the one is being descended from the others, then the more fixed or older form is taking the rank of a genus, looking upon a genus in the genealogical sense. Then in turn that genus will be wholly unequal to the vast majority of the genera generally. We have been discussing a species when we know all about it; how difficult must it therefore be when we have only the imago! Cockerell says: "The essential distinctions between species are physiological, the morphological ones being only valid so far as they happen to coincide with the physiological." Tutt, falling in with this view says: "Thus the two forms of *Amphidasys betularia* in spite of their external differences, cross freely in a state of nature; whilst *Anthrocera trifolii* and *A. lonicerae*, although equally able to cross and produce fertile progeny, are specialised in a state of nature to some particular food-plant, habit and habitat, and are maintained distinct." In the meantime, with the hosts of insects of which we know nothing of their life-history, we unfortunately have to totally rely on the morphological characters. The recent attention called to the genitalia, tends to show that we here may have a morphological character upon which to place some reliance. The character has the great advantage that as far as we can see is not influenced by any œcological cause. Although I am entirely with Cockerell in saying that the essential distinctions between species are physiological, I do not follow him in the second part of his remarks, namely, that the morphological ones are only valid so far as they happen to coincide with the physiological. I maintain that certain morphological characters are the entire result of the primary physiological distinctions, and are therefore every bit as valid. The insect, for instance, that is closely related to another, but specialised to a particular food-plant, will perhaps grow to a larger or less size, and if it were found by actual measurement that within certain limits the two forms kept to their own respective measurement, this could be taken as a specific value. The instance of size is perhaps not such a happy one as

might have been chosen, but it is one that might easily and does happen. We have a well known instance of size in our *Selenia bilunaria* and *juliaria*. It is true that in this case the food-plant is not the reason of the difference, but the altered time of appearance.

Do eggs laid by the summer brood *always* produce a spring brood or do they repeat the summer emergence only occasionally ? And also do imagines as a rule, or under any circumstances, that hatch in the spring, only produce the spring brood ? The experiments of Mr. Merrifield give us an answer to the latter question. He has found that with a reduced temperature the second brood fails. In nature this is exemplified in northern and western Scotland, and probably elsewhere. An answer is not forthcoming to the former query. One surmises that the spring brood yields a summer brood, and the summer brood the spring brood. But it is possible under certain conditions that the summer brood might fail to produce the spring brood. This might commence sporadically, but in course of time become regular. Should we then, as soon as this summer emergence fails to yield spring emergences, call it a species ? It would depend upon our arbitration. My personal answer would be no—not until the isolation had caused a greater amount of divergence. The divergence would be certain to take place at a later period. That the form should be named is indisputable, but not named with species rank, but as subspecies or some other such title. The use of the term subspecies shows now very evidently that there are some of our workers who feel that the number of denominations is too limited. Even with our species—subspecies—variety—and aberration, we are by no means able to relegate all the individuals to these four headings without difficulty. The trouble is, however, not comparable to the forming of genera, because we can by breeding test our theories very often as to species. Two, three and even a dozen so-called species can sometimes be proved to be only one species proper, with varying facies, called forms, by rearing from the egg. We are unable to demonstrate the same with genera for a collection of species. In common with many others I at one time thought that perhaps we might have a definition of a species. That is totally impossible when we consider the various paths by which a species obtains its fixity or differentiation from others. But it would be possible to have a long series of categories, any one or more of which we might accept as valid for a species taking that rank. Supposing we fix on ten salient features from which characters we accept a species. By a small algebraical calculation we should have 1022 groups, from any one of which a species could take its standing as fulfilling one or more of those ten features. This is admittedly only taking ten main points. We might raise that number, and then the groups would be still more numerous. I cannot but think that as time goes on and as we still get nearer and nearer to exactitude, that the results to which our classification leads us will compel us to adopt some such scheme. If we look upon classification as an artificial arrangement for placing together the forms most like each other, and do not accept classification as illustrating the genealogy of the beings, there can be nothing to be said against one artificial arrangement within an artificial method. But even if we take the vein that I have been assuming this evening, that our classification reveals the descent of living beings in nature, I can see no objection to our maintaining certain conditions for our

lowest subdivision. We need not call the lowest a species, it can be sub-species or something still less advanced than that. With a much larger number of standard relationships the varying amount of divergence would be proportionately lessened. That we should be much nearer being natural by such a scheme, I have already given as my view. Primarily classification was very arbitrary with a very small amount of the natural element. Now we have made it less arbitrary and with more of the natural element. But that we have not yet by any means lost the arbitrary part of it is very certain. We shall never be able to entirely separate the two.

Gentlemen, I fear that although I have had the honour of seeing my name down on your agenda-list for a paper, I have not satisfactorily fulfilled the conditions for a paper. For a long time past I have had my attention drawn to the *pros* and *cons* of classification. It is a question that bears any amount of discussion, and if I shall have evoked the thoughts of our members and have induced them to give us their views this paper will have fulfilled its purpose.

A FEW DAYS AT FUSIO.

(Read February 20th, 1900, by Dr. T. A. CHAPMAN, F.Z.S., F.E.S.)

It is many years since I determined that Fusio ought to be explored. Baedeker, who is one's guide, philosopher, and friend in those regions, leaves in his index map of Switzerland one central square with Fusio in the very middle thereof, of which he gives no detailed map. This suggested that it was not much explored, and by the ordinary tourist hardly worth exploring, all the more should it be interesting to the entomologist. All sorts of reasons led my summer excursions, when I had one, anywhere but to Fusio, and so it came about, that before my wish to explore it was carried out, those indefatigable investigators, the Germans, anticipated me, and had discovered some seven or eight years ago a new butterfly in the region. Even with this further incentive it was only last summer that I found myself in the desired locality.

One reaches Fusio by passing through the St. Gothard tunnel, and if the line could be continued southwards another five miles in the direct line of the tunnel, we should reach the valley in which Fusio lies, a few miles above that village. As a matter of fact, however, nearly a hundred miles have to be travelled to reach it; the railway follows the valley of the Ticino eastward, and then southward and westward to Locarno, and then the diligence takes one nearly due north again up the Val Maggia. There are several passes from the upper Ticino to the upper Val Maggia, which might be taken; but they would occupy as much time as the circuit by rail and diligence, and would not admit of baggage accompanying the traveller. Still it is quite feasible to

reach Fusio by stopping at Faido, a few miles below Airolo, sending baggage on by post, and walking over the Campolungo pass to Fusio. One may in this way begin one's collecting a day earlier, and prospect the ground which makes Fusio famous at the earliest possible moment. The walk is, however, rather a long one, and involves a climb of 5100 feet. One must be in rather better training than one often is, in one's first day out and after a long journey, to do this comfortably and risk the weather.

We, at any rate, took the easier if more ignoble route, and reached Locarno one day at the end of June last, and were pleased to be welcomed by a thunderstorm, which did not at all incommode us, and rendered the air cool and pleasant, where we had feared to find it insufferably hot. Next morning we proceeded to Fusio, passing the very picturesque gorge at Ponte Brolla and reaching Bignasco, the principal village in the valley, in time for lunch. Bignasco possesses a good inn and would be a good centre for a short stay, being opposite the opening of a great side valley, the Val Bavona. As a matter of fact we found two German entomologists staying here, who joined us at Fusio a few days later. The road mounts more rapidly above Bignasco and in some dozen more miles reaches Fusio at an altitude of 4200ft. On the way up we saw a profusion of butterflies, chiefly *Melitaea athalia*, *Argynnis adippe* var. *cleodoxa*, *A. latona*, and many others that we did not verify. *Polyommatus orion* was taken and seen abundantly, great large fellows nearly twice the size of those taken ten weeks before at Locarno. On rocks, by the way, cases of *Bankesia alpestrella* were present, as they also were at Fusio. Fusio is situated rather finely at a point where the cataract from the Campolungo pass joins the main stream near the top of a rather more rapid ascent than generally prevails in the valley. Shortly above Fusio the valley extends for some miles, without any considerable ascent, past the châlets of Sambuco.

In the immediate neighbourhood of Fusio, many insects are abundant. At the beginning of July we took *Erebia medusa* behind the village, and nearly everywhere, up to 2000ft. above Fusio, *Erebia ceto* was common, flying in a lazy flapping manner very much like that of *E. aethiops*, caught with the greatest ease unless on very awkward ground. The females were not seen till a week or two later. The chief entomological attraction of Fusio is the little butterfly that flies in the Campolungo pass, the smallest of the Erebias, *Erebia flavofasciata*. We went in search of this and explored many slopes on both sides of the pass; this involves a considerable walk, with a climb of 3500ft. to the top of the pass, and having no knowledge of the habits of the butterfly and its precise habitat, and being out of favour with the weather on one or two occasions, having a sunless sky, it was some time before we managed to find it, and not then without some assistance from our German *confrères*, who had by this time, settled down at Fusio. *E. flavofasciata* occurs at an elevation of 7000ft., and always on slopes of grass in close association with the outcrop of a white rock of dolomitic composition which is here bedded in ancient crystalline strata. This seems to be the circumstance that makes the butterfly so local, and enabled it to escape detection till so recent a period. We were told that it had been met with on a pass some ten miles to the north-west over the same range, but we did not visit this

spot, and so I cannot verify that the geological conditions are identical, but that seems to be very probable. The only other locality I have heard of, is that recorded by Mr. Nicholson who has specimens from near Pontresina, some 60 miles almost due east. I do not know what the geological conditions may be in its eastern habitat. At Campolungo there are a good many rare plants, but whether there are any rare and local grasses that might perchance be its food-plant and thus account for the localisation of the butterfly I do not know. We found on the same ground as *E. flavofasciata*, *Psodos quadrifaria* flying freely, interesting from the circumstance that with *Catasta auriciliella* and some other alpine forms, it has a disposition of yellow markings on its wings, which seems calculated to secure the same effect and possibly the same objects that *E. flavofasciata* looks for in its peculiar markings. Amongst the butterflies met with at Fusio was *Erebia mnestra*; it was only coming out and a few males were taken, generally in fine condition, it was most abundant in one or two little gullies at about 6000ft. on the sides of the Campolungo pass, flying along with *Melampias epiphron* and swarms of *Erebia tyndarus*. We again met with this butterfly at about 5500ft., near Macugnaga, in a damp opening in the wood by a stream, again only males were taken (July 20th). On the Simplon about 5500ft. we once more found males in very fair condition along the roadside, but no trace of females. In the Laquinthal, at the same date males were found in very worn condition, and here females were met with (July 30th). At Evolena, between Ferpecle and the Alp Bricolla, at 7200ft., the species was found on a limited slope in great abundance, both sexes occurred, the males perhaps more freely, the females were a little worn, most of the males very much so (August 10th). The female of this species is regarded as very much rarer than the male, and this is the only place where I have taken it freely. It is, of course, as everyone knows, the rule for the males of nearly all lepidoptera to appear before the females, and the fact is nowhere perhaps more forced on one's notice than amongst the *Erebiae*, and the effect very often is to leave one with the impression that the males and females occupy different localities. At Simplon, where males were not uncommon, we asked ourselves as to *mnestra*, where were the females? The answer no doubt was, not yet emerged, although they were already rather worn in the adjacent Laquinthal. I have been very much impressed with the same facts as to *E. eurgale*, at Mendel and some other places. The males would be abundant wherever one went, but no females could be seen, and this continued for ten days or a fortnight, then a female or two would appear, then moving on to another locality one would find females abundant but hardly a male could be found. I doubt very much whether we understand more than very superficially anything about the explanation of these facts. That the male should come out before the female, and have already powers of vigorous flight by the time she emerges, seems easily understood and to be distinctly advantageous. But that he should emerge a fortnight before the female and that many should perish and the majority be torn and wasted by that date, and that females should still emerge when the males are represented by only a few exhausted individuals, is difficult to understand. Also what comes of sexual selection, which we must look for amongst butterflies, if anywhere in insects, if the females have little or no chance of ever seeing a freshly emerged male

in full beauty. I can only make one suggestion in partial explanation, and that is that our facts are in some degree imperfect, that the ♀ does really emerge much earlier than we suppose, but that she keeps perfectly quiet and does not show herself for some time after, not until she is fertilised and has acquired some power of flight, which is no doubt rather defective in many female butterflies when fresh, and before they have deposited some ova. I may also note in connection with *E. mnestra*, the extreme similarity, almost amounting to identity except in size, between the females of *E. mnestra* and *E. glacialis*. Till I worked out a classification on the ♂ genitalia, *E. glacialis* was always associated with *E. scipio, epistygne* and other large species with which it has little in common except size, and *mnestra* was similarly placed with the smaller *manto, epiphron*, &c., with which it has no immediate alliance. The genitalia showed *mnestra* and *glacialis* to belong clearly to the same group, whilst *manto*, &c., belonged to another, and *E. scipio*, &c., to a third. It is curious that no one had noted the close resemblance of the ♀s of the two species, which is so obvious when looked for, but would, I suppose, have been regarded as meaningless, if not misleading, when the close alliance of the two species was unsuspected.

Amongst the species taken at Fusio are some specimens of *Lycaena alcon*. We met with it afterwards at Macugnaga, and the forms at the two places seem to be slightly different. *L. alcon* is not, I believe, an uncommon species, but it so happens that I have only twice before met with it, and so it interested me a little. I thought it might interest you to show along with these specimens some of the three allied species, *L. euphemus*, *L. arcas* and *L. arion*, as well as the less close *L. iolas*, whose male very much resembles that of *L. alcon*. A discrimination of these species by their upper surfaces is really difficult, and especially by description. It is easy by the undersides, and here both sexes of each species agree instead of requiring separate treatment.

The abundance of larvæ and pupæ of *Anthrocera exulans* on one slope in the Campolungo Pass was phenomenal. Stones lying about of all sizes were abundant, and on many of these a dozen or more cocoons of *A. exulans* would be clustered, and it was difficult to find a stone without one or more cocoons.

Setina aurita in much variety was abundant at all the stations we visited, not only at Fusio, but Macugnaga, Simplon, Evolena, &c. The imagines were found at Locarno in May, and were still coming out at Arolla after mid-August, and half-grown larvæ occurred even at that date, another of the many instances of the long seasons of emergence that many insects have where, as on the Italian slopes of the Alps, alpine and almost subtropical conditions occur at a few miles distance. I may note *Melitaea phoebe*, taken April and July; *Standfussia tenella* (var. *zermattensis*), April to August; *Hercyna schrankiana*, April to August. These cases are to be distinguished from those of double-broodedness, as in the case of *Polyommatus orion*, where a dwarfed form occurred at Locarno in April, and a large form in July, the difference being that in the latter case the species does not inhabit any of the higher levels. *Melitaea phoebe*, which I have mentioned above, has no great range of elevation, but the April and July specimens were clearly one brood, the April specimens at Locarno, the July ones some distance up the Maggia Valley towards, but below, Fusio.

Along with *Erebia flavofasciata*, at various parts of the Campolungo

Pass, other interesting species are met with ; *Malacosoma alpicola*, so closely allied to our common *M. neustria*, was frequently represented by odd specimens of full-grown larvæ, and at one place the colonies of younger larvæ on the turf of the open hill-side were quite common. The young larvæ are practically indistinguishable from those of *M. neustria* ; the full-grown ones are without several of the longitudinal lines that persist in that species. *Brenthis pales* was just coming out, and we failed to capture one remarkable specimen we saw, that was little, if at all, larger than *Cupido minima*. A nice form of *Anarta melanopa* flew freely at the top of the pass, but we did not learn how to capture it as freely. Mr. Edwards, however, succeeded in the even more difficult task of bagging *Pieris callidice*, of which hardly a specimen escaped him. He was equally expert in finding specimens of several species of *Gnophos* freely on rocks, where *Dianthoecia caesia* and some other Noctuids were found.

On the slopes close to Fusio a very splendid metallic green beetle with pink stripes (*Oreina*, sp.) was abundant. The polymorphism of this beetle was very interesting, and even puzzling. We met with it again at Macugnaga, and distinct differences in the forms prevalent at the two places were obvious. At Fusio, the mass, including nearly all ♀ s, were green, but some black males were not uncommon, as well as a few blue ones. At Macugnaga there were many blue males, as well as both males and females of the black colour and females of the blue form. The presumption that there were three species was very strong until they were found *in cop.* in various combinations.

I have brought practically all my captures for your observation—the good, bad, and indifferent—thinking that a longer series gives a better idea than a short one of the general facies of a species and of the range of its variation in the district illustrated, and that this outweighs any feeling I might have of being ashamed of showing you bad and ill-set specimens. At the same time, I may say that of many species that were common, I only took a specimen or two, and of some took none, or handed them over to other members of our party, as *Papilio podalirius*, *P. machaon*, *Syrichthus sao*, *Parnassius delius*, *Spilothyrus alceae*, *Anthocaris belia*, &c.

The following list would, I think, include all the butterflies we saw or took :—

Papilio machaon.
,, *podalirius.*
Parnassius apollo, frequent.
,, *delius*, Simplon.
Aporia crataegi.
Pieris brassicae.
,, *rapae.*
,, *napi.*
,, *callidice*, Fusio, &c.
Euchloë cardamines, Fusio, &c.
Leucophasia sinapis, ,,
Colias palaeno, ,,
,, *phicomone*, ,,
,, *hyale*, ,,
Gonepteryx rhamni, ,,
Callophrys rubi, ,,
Chrysophanus gordius, Simplon.
,, *eurybia*, Fusio, &c.
,, *dorilis*, ,,
,, *phlaeas*, ,,
Plebeius aegon, Fusio, &c.
,, *argus*, common.
Polyommatus optilete, Macugnaga.
,, *orion*, Bignasco.
,, *pheretes*, Fusio, &c.
,, *orbitulus*, Evolena abundant, Simplon.
,, *astrarche*, Fusio, &c.
,, *eros*, ,,
,, *icarus*, ,,
,, *eumedon*, Fusio, Macugnaga.
,, *escheri*, Fusio.
,, *corydon*, abundant.
,, *hylas*, Fusio, &c.
,, *donzelii*, Simplon.
Cyaniris argiolus, Fusio.
Cupido minima, abundant.
Nomiades semiargus, abundant.
Lycaena alcon, Fusio, Macugnaga.
,, *arion*, frequent.

Polygonia c-album, Bignasco.
Eugonia polychloros, Fusio.
Aglais urticae, Fusio.
Eavanessa antiopa, Fusio, larvæ, &c.
Melitaea cynthia, Fusio, &c.
,, *merope*, Simplon.
,, *phoebe*, Bignasco.
,, *dictynna*, Fusio, &c.
,, *athalia*, ab.
Brenthis euphrosyne, Fusio, &c.
,, *pales*, ,,
,, *amathusia*, ,,
,, *thore*, Macugnaga.
Argynnis aglaia, Fusio, &c.
,, *niobe*, ,,
,, *var. cleodoxa*, Bignasco.
,, *paphia*, ,,
Melanargia galathea, Fusio.
Œneis aello, Fusio.
Satyrus semele, Evolena.
,, *cordula*, Val Anzasca, Maggia.
Pararge maera, Fusio, &c.
,, *megaera*, Fusio.
,, *egeria*, ,,
Epinephele lycaon.
,, *janira*, Fusio, &c.
Coenonympha arcania, ,,
Erebia ligea, Fusio.
Erebia euryale, Fusio, &c.
,, *epiphron*, Fusio, &c.
,, *pharte*, Fusio.
,, *melampus*.
,, *christi*, Simplon.
,, *flavofasciata*, Fusio.
,, *ceto*, Fusio, &c.
,, *aethiops*, Fusio.
,, *nuestra*, Fusio, &c.
,, *gorge*, ,,
,, *glacialis*, Evolena.
,, *tyndarus* abundant.
,, *pronoe*, Simplon.
,, *goante*, Fusio, &c.
,, *stygne*, Arolla.
,, *lappona*, Fusio, &c.
,, *evias*, Fusio.
,, *medusa*, ,,
Spilothyrus alceae, Bignasco.
,, *lavaterae*, ,,
Syrichthus fritillum, Fusio, &c.
,, *malvae*, Fusio.
,, *sao*, Simplon.
Nisoniades tages, Fusio, &c.
Thymelicus thaumas, Macugnaga.
,, *lineola*, abundant.
Pamphila sylvanus, Fusio.
,, *comma*, Macugnaga.

Mr. Prout has examined the Geometrids and has made the following notes on them.

Notes by L. B. Prout, F.E.S., on the Geometrids collected by Dr. T. A. Chapman, at Fusio.

Total number of species about 40, comprising: *Acidalia* 6 species, 3 (*flaveolaria*, *incanata*, *fumata*), more or less characteristically mountain species. *Gnophos*, 4 or 5 species; the series of *G. glaucinaria* variable and interesting, the darkest example quite unequalled by anything in the very long series from the Zeller and Frey collections, not at all resembling the dark var. *plumbeolaria*, Stgr., from the Rheingau, which is of quite a different tone and much less sharply marked; the 3 *G. dilucidaria*? also variable and seem very sharply marked, and the top two of rather a white, glossy ground-colour. *Dasydia tenebraria* ♂, high Alpine species, Frey gives its distribution from 9000′ to beyond 10,000′. The example is intermediate between the almost unicolorous type and the whitish-banded ab. *torraria*, Hb. *Psodos*.—This interesting alpine genus is represented by 4, if not by the whole of the 5 known species. The top specimen is somewhat puzzling, and seems to me to be nearest a weakly marked aberration of the local *alticolaria*, Mann, a species apparently confined to the highest Alps of Piedmont, Switzerland and the Tyrol, and usually strongly marked with whitish bands. Of *P. coracina*, which Frey gives as common, from Valais to Stelvio, up to 7500′ elevation, there are only 2. Of *P. trepidaria* there are 3; Frey says it "hardly varies at all," but these are interesting as being a good deal darker than any of his. Of *P. alpinata* (*horridaria*), which is common up to the same limit as its congeners, there are 8, including one ♀. But the longest series (12) is in the handsome, though not particularly variable, *P. quadrifaria*, a widely distributed but local species, from 4500′ to far above 7000′, Frey. *Cleogene*.—Another characteristically alpine species, *C. lutearia*, represented (from

this locality) by males only (6). *Minoa murinata*, 2, both belonging to the pale aberration *cineraria*, Stgr. *Tanagra* (*Odezia*) *atrata*, 1. The "*Larentiidae*" of Guénée are fairly well represented, there are 15 species of Staudinger's great genus *Cidaria*, and apparently 5 of *Eupithecia*, 9 of the 15 Cidarias, namely *aptata*, *turbata*, *salicata*, *caesiata*, *infidaria*, *nobiliaria*, *incultaria*, *minorata* and *adaequata*, are principally mountain species, most of them falling in Guénée's typical genus *Larentia*. Not many of the specimens call for individual mention. Of *Cidaria* (*Thera*) *variata* there is only one example, belonging to the type form (which we do not seem to get in England), the central band rather broader than usual. The 3 *C. salicata* appear to approach var. *ruficinctaria*, Guénée. The 2 *C. spadicearia* are both interesting, one on account of the very striated central band, the other on account of the singular, and probably almost unique accentuation of a submarginal dark band on the hindwings; neither shows the increase of white colouring which seems characteristic in many Swiss localities. The 3 *C. caesiata* are fairly typical, and agree well with my Simplon form. The single *hastata* is somewhat intermediate between the large typical forms and the var. *subhastata*, though nearer to the former.

Notes on the Geometrids collected at Macugnaga.

There is only a small collection (44 specimens) of Geometrids from this locality, but it will perhaps be interesting to compare them with the Fusio collection. About 21 species are represented, but I cannot quite satisfy myself as to the determination of one worn *Larentia* (? *tophaceata*). *Acidalia*.—There are 5 species of this genus, only 2 (*fumata* and *contiguaria*) being identical with Fusio species, the other 4 not characteristically alpine. *Gnophos*.—Three species, each represented by a single specimen, and each also represented from Fusio. *Halia brunneata* ♂, 3 ♀, showing the usual strong sexual dimorphism. This species is not represented from Fusio. *Cleogene lutearia* 6, including two ♀s. Does the ♀ emerge later than the ♂? In any case, as with most Fidoniad species, she is probably much more sluggish. *Psodos trepidaria* 4, smaller (2 of them considerably smaller) than the 3 from Fusio; they are also a little brighter than those, 2 or 3 of them being prettily marked with some bright yellowish scales. *Cidaria*—8 species, 3 of which (*infidaria*, *hastata* and *adaequata*) occur also at Fusio. The one *hastata* has more white on it (central band broken up, white band on hindwings broadened) than the one from Fusio.

The Pyrales presented several species in great force such as *Scopula aerealis* at all localities, *aenealis*, *rhododendralis* and *austriacalis* at Fusio. *Botys alpinalis* (*uliginosalis*?) was less abundant but widely spread, *terrealis*, *sophialis*, *Stenia punctalis*, *Catastia marginea* (common), *Pyrausta octomaculata*, *cingulalis*, *aurata*, *nigrata*, were all met with, *Catharia pyrenaealis* was met with as larvæ, pupæ, and imagines, and afforded a very interesting glimpse of its life-history and of the curious structure of the pupa*.

Hercyna alpestralis was abundant everywhere at higher levels, and *phrygialis* very frequent, *schrankiana* and *aethiopella* also occurred. Crambids included *Crambus conchellus*, *pinellus*, *pyramidellus*, *ericellus*, *radiellus*, *furcatellus*, *perlellus*, *fascelinellus*, *pratellus*, *dumetellus*. Several

* Details since published *Ent. Mo. Mag.*, vol. 36, p. 75.

Scopariae, of which *murana* and *crataegella* were most common, of Phycids only *Phycis ornatella*, *betulae*, *fusca*, *melanella* and *elutella* were taken. At Macugnaga *Sesia ichneumoniformis*, *conopiformis* and *bibioniformis* (?) were met with on the wing.

Besides the Noctuids alluded to *cymbalariae*, O., was taken on several occasions, but always singly, *Agrotis ocellina*, *alpestris* and *corticea* were frequent on flowers. *Noctua dentina*, *proxima*, *Xylophasia lateritia*, *Cucullia asteris*, *Hecatera chrysozona* and others were found at rest on rocks. *Abrostola tripartita*, *Dianthoecia capsophila*, *A. euphorbiae*, and others occurred. *M. bombyliformis* was frequent, and *Syntomis phegea* at times abundant. *Nemeophila plantaginis* was rarely common, a black form was met with. Odd specimens of *Notodonta camelina*, *Miana strigilis*, *Gnophria rubricollis*, and *Z. bidentalis* were taken.

Of Tortrices *Sciaphila penziana* varied between *bellana* and *colquhounana* without reaching the whiteness of the one or the suffusion of the other. *P. bipunctana* was frequently common, though not so abundant as in Norway. *S. alpicolana* was rare, it is a very pleasing species. *Aphelia argentana* was common as usual and in early July in fine condition.

The remaining Tortricids and Tineids presented no species of note that I have identified. Mr. Barrett has taken some specimens for further investigation. I am indebted to Mr. Turner for comparing some of the species for me.

THE FAUNA OF THE LONDON DISTRICT.

LEPIDOPTERA.

Compiled by Dr. F. J. BUCKELL, M.B.; Edited, with the additions subsequent to 1893, by LOUIS B. PROUT, F.E.S.

(*Continued from Transactions, Part IX., 1899.*)

In presenting the third instalment of the London Lepidoptera list to subscribers and readers, it is again my pleasant duty to thank old friends for their continued interest and help, and also several new contributors for valuable supplementary records. I have also used Bonhote and Rothschild's "Harrow Butterflies and Moths," incorporating records from this source, wherever it was not distinctly indicated that the captures were outside our area; Harrow, it will be remembered, is one of our district boundaries.

The following fresh abbreviations have to be explained:

B. & R. = Bonhote and Rothschild, "Harrow Butterflies and Moths," 2 vols., Harrow School Scientific Society's Memoirs 1895, 1897.
E.M.M. = Entomologist's Monthly Magazine.
Js. = Russell E. James. North London District.
Mh. = J. P. Mutch. Hornsey Rise, Highgate, &c.
R. = R. W. Robbins. Walthamstow district.
Sw. = V. Eric Shaw. Finchley, Mill Hill, &c.

Material is accumulating for the supplement which has already been promised, and it is hoped that this may be published in Part XI of our *Transactions*; may I urge entomologists working the London district to provide me with all available information for this during the year 1900, so that the supplement may be as complete as possible? Communications respecting the Micro-Lepidoptera of the district are also greatly needed; very few lists of these have yet been received.

Louis B. Prout.

London, December 14th, 1900.

370.—*Ennomos fuscantaria*, Haw. I. Clapton (R.), Woodford (Ent., xix., 67); Stratford and Ilford (Mu.). II. Scarce (F.); Eltham, occasionally at lamps (Jo.); Dulwich (E.R., ii., 140, W.). III. Richmond, at light (A.); Wimbledon (Taylor). IV. Hanwell, a few (Ba.); Highgate, at light (Mh.); 16 at light in 1898 (L.); Crouch End and Highgate, c. 1899 and 1900, not seen before (Js.).

371.—*E. erosaria*, Bork. I. S. Hackney (Se.). II. Scarce (F.); Eltham, occasionally at lamps (Jo.); Bromley (Ent., xvi., 19); Blackheath (T.). III. Barnes (Ta.). IV. Highgate (Bu., So.).

372.—*E. quercinaria*, Hfn. General throughout the suburbs. Hyde Park, St. James' Park, and Kensington Gardens are well known

localities, and some very interesting varieties have been bred from larvæ there collected.

373.—*Colotois pennaria*, L. Common in districts I., II., and IV.; for district III. I have, curiously, only one record, Chiswick (Si.); this doubtless requires to be considerably supplemented.

374.—*Phigalia pedaria*, Fb. Generally common, though avoiding the central parts; Tooting, "rather rare" (Bell, Bell—R.); Chiswick, l. on plum, sallow, &c. (Si.); Finchley, Mill Hill and Highgate, "rather scarce" (Js.).

375.—*Apocheima hispidaria*, Fb. I. Hale End* (Ss.) [common some years at Chingford, just outside our district boundary—L.B.P.]. II. Scarce (F.). III. Richmond Park (Ba., Sd., P.).

376.—*Lycia hirtaria*, Cl. Records show this essentially London species to be quite generally distributed. Much more abundant certain years than at other times. "Absolutely swarming in a small garden at W. Hampstead in 1896" (C.); Finsbury Circus, c. (Js.).

377.—*Pachys strataria*, Hfn. II. Scarce (F.); Eltham, occasionally (Jo.); Forest Hill, on fences (E.R., ii., 69). III. Kingston Vale, on a fence* (Ent., xxii., 151); Richmond Park, ♀ on oak trunk 15/4/99* (Si.); Coombe Wood (Bu.). IV. Highgate (So., Mh., Js.); Muswell Hill (So.); Ealing (Fe.).

378.—*P. betularia*, L. Common throughout. It may not be out of place here to urge London entomologists to co-operate with Mr. W. Bateson and the "Evolution Committee of the Royal Society" by gathering accurate statistics of the percentage of pale and dark forms. Ab. *doubledayaria*, Mill., is already recorded for Stamford Hill (Ba.); Forest Gate (Ent., xxx., 200); Stratford (Mu.); Dulwich (Ent., xxxii., 237); Hornsey Rise (Mh.); and Highgate—2 at light (L.). Concerning the colour-variation of the larva, Mr. Sich records "green examples on willow and young shoots of apple, brown ones on birch and elm."

379.—*Synopsia abruptaria*, Thnb. Another very generally distributed London species. So far as I have been able to ascertain London has practically the monopoly of the very interesting dark aberrations; in addition to the recent records for Holloway (E.R., x., 121, 122, 171, xi., 269), I can speak positively of their occurrence from time to time at Hackney, Dalston, Hornsey Rise, Crouch End, one ♂, nearly black, June, 1899 (Js.), &c. I have been given to understand that they are much less frequent in the southern than in the northern suburbs, but it is much to be desired that more detailed statistics should be provided. Reference to the articles in the "Ent. Record" just alluded to, will show that members of the "City of London Entomological Society" have taken the most prominent part in working out and naming these forms, and it is to be hoped that they will not allow their interest in them to abate.

380.—*Cymatophora repandata*, L. I. Hale End, n.r., sometimes at sugar (N., P.); Hagger Lane Forest (Bu., Cl.); Isle of Dogs, n.c. (Wy.). II. c. (F.); Croydon (H.); Brockley (E.R., i., 350); Dulwich (W.). III. Wimbledon Common (Bu., P.). IV. N. London (Sd.); Southgate (Ba.); Highgate, l. (Ent., xxv., 65); Hampstead, l.c. (Js., Mh.); Finchley (Bu.); Harrow (B. & R.).

381.—*C. gemmaria*, Brahm (*vitis-gladbachii*, Gladb., Lang, nom. vetustius). Common everywhere, chiefly (if not indeed exclusively) in the darkened ab. *perfumaria*, Newm. Partial second brood October, 1893 (Js.).

382.—*C. roboraria*, Fb. III. Richmond Park (K.).

383.—*C. consortaria*, Fb. II. Eltham (Jo.). III. Richmond Park (K.); Coombe Wood, c. (K.).

384.—*Ectropis consonaria*, Hb. II. Croydon (Cl.).

385.—*E. crepuscularia*, Hb. (*biundularia*, Esp., 40, 3, *nec* Vill.). I. Hagger Lane Forest, n.r. (Be., Ta., P.); Hale End, c. (J., Ss., Tr.). II. n.c. (F.); Forest Hill* (E.R., ii., 69); Croydon (Cl.); Shooters's Hill Woods (T.) III. Wimbledon Common (Bu.). IV. Highgate (So.). Single-brooded, in May and June, appears in April in abnormally forward seasons only. Ab. *delamerensis*, White, not recorded in the district.

386.—*E. bistortata*, Goeze (*biundularia*, Bkh., *abietaria*, Haw.). II. Dulwich (E.R., ii., 140, W.); Croydon (Cl.). Appears in March and April, and a partial second brood in July.

387.—*E. extersaria*, Hb. (*luridata*, Bkh., nec Hfn.). II. Eltham (Jo.); Croydon (Cl.). III. Richmond Park (A.); Coombe Wood (K.). IV. Hampstead Heath* (So.).

388.—*E. punctularia*, Hb. II. c. (F.); Croydon (Cl.) III. Wimbledon Common* (Bu.); Coombe Wood (K.); Richmond Park, on palings, 2/6/95* (Si.).

389.—*Sciadion obscuraria*, Hb. II. Croydon (Cl.). [Probably outside our district boundaries.—L.B.P.].

390.—*Pseudoterpna pruinata*, Hfn. I. Wanstead, l., n.r. (P.); Woodford, at light (Bishop). II. n.r. (F.); Bromley (Ent., xvi., 233); Shirley, frequent (Sh.). III. Tooting, scarce (Bell—C.; Bell—R.); Wimbledon Common (D., Ta.); Barnes (Ta.), l. on broom (Si.). IV. Hampstead Heath* (So.).

391.—*Terpne papilionaria*, L. I. Woodford, at light* (Ent., xix., 67); Hagger Lane Forest (B. B. Thompson). II. n.r. (F.); Eltham, among alder, n.r. (Jo.); Bromley (Ent., xvi., 19); Croydon (H.); Shirley, c. (Sh.). III. Wimbledon Common (Ent., xxii., 151, Ta.); Coombe Wood (K.). IV. Hampstead Heath (So.); Highgate (Ent., xix., 65, Mh., So.).

392.—*Comibaena pustulata*, Hfn. Widely distributed, sometimes common; odd specimens have been taken at Ladbroke Square Ent., xx., 200) and Brondesbury (E.R., ix., 297). Lark's Wood at Hale End, Wimbledon Common, and the Highgate Woods are well-known localities.

393.—*Iodis chrysoprasaria*, Esp. (*vernaria*, Schiff.). II. n.r. (F.); Eltham (Jo.); Croydon, c. (Sh., Cl.). III. Richmond, at light (A.); Coombe Wood (K.). Mr. W. J. Kaye records a straggler at light at Worcester Park, just outside our boundary (E.R., xii., 313). IV. Harrow (B. & R.)

394.—*I. lactearia*, L. Generally distributed throughout the more rural parts.

395.—*Hemithea aestivaria* Hb. (*strigata*, Müll.). The same may be said of this species, which indeed is sometimes extremely abundant.

396.—*Cyclophora porata*, L. I. Hale End, n.c. (J., N.). II. n.r.

(F.); Dulwich (W.). III. Wimbledon Common (Ent., xxii., 151). IV. Ealing (Fe).

397.—*C. punctaria*, L. I. Hale End, n.c. (J., N., P.); Woodford, at light* (Ent., xix., 67). II. Scarce (F.); Shirley, frequent (Sh.); Dulwich (W.); Grove Park, 4/7/97* (C.). III. Wimbledon Common (Ent., xxii., 151, Ta.); Richmond Park 2/6/98* (Si.). IV. Ealing (Fe.); Highgate Woods (So.)

398.—*C. linearia*, Hb. IV. Ealing (Fe.).

399.—*C. annulata*, Schulze. II. Croydon (H., Cl.).

400.—*C. orbicularia*, Hb. II. Croydon (Cl.).

401.—*C. pendularia*, Cl. II. c. (F.); Croydon (Cl.). III. Wimbledon, l. (P.). IV. Ealing (Fe.).

402.—*Asthena luteata*, Schiff. I. Hale End, n.r. (J., N., Ss., &c.); Chingford (Be.). II. n.c. (F.); Croydon, r. (Sh.); Lee, 8/7/98* (C., Ent., xxxii., 40). IV. Hendon (So.); Mill Hill, r. (Js.).

403.—*A. candidata*, Schiff. Generally common except in the more central parts.

404.—*A. testaceata*, Don. (*sylvata*, Hb.). II. Croydon (H.).

405.—*Euchoeca obliterata*, Hfn. II. Abundant (F.); Eltham, c. (Jo.). IV. Harrow (B. & R.).

406.—*Ptychopoda** *dimidiata*, Hfn. Generally distributed, including Clapton (N.).

407.—*P. bisetata*, Hfn. Similar distribution to the preceding, *i.e.*, generally in the more rural parts, not recorded from Clapton.

408.—*P. trigeminata*, Haw. II. Occasionally (F.); Eltham, r. (Jo.); Forest Hill* (E.R., ii., 69; Dulwich (E.R., ii., 140); Bromley (Ent., xvi., 19). [*C. rusticata* vide No. 414].

409.—*P. herbariata*, Fb. Very occasionally in London; the only recent record which I have found is that for Southampton Row* (E.R., x., 228).

410.—*P. fusco-venosa*, Goeze (*dilutaria*, Stgr. Cat. = *interjectaria*, Gn.) I. Clapton Marshes (P.); Hale End, abundant (P.); Woodford, at light (Ent., xix., 67). II. Abundant (F.); Forest Hill (E.R., ii., 69); Dulwich (W.); Croydon (Sh.), Westcombe Park, Blackheath (T.). III. Hammersmith (Bi.); Chiswick, c. (Si.). IV. Hanwell, c. (Ba.); Southall* (Ba.); Highgate (So.).

411.—*P. virgularia*, Hb. Abundant, common even within the four-mile radius. "Comes to sugar" (Si.).

[*L. marginepunctata*, Goeze, vide No. 415.]

412.—*P. straminata*, Tr. II. Scarce (F.); Bromley (Ent., xviii., 20); Shirley, r. (Sh.). IV. Highgate (So.).

413.—*P. subsericeata*, Haw. II. Scarce (F.); Shirley, r. (Sh.). IV. Highgate (So.).

414.—*Cosmorhoë*† *rusticata*, Hb. IV. Hampstead Heath* (Ent., (xxiii., 261).

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* The old genus *Acidalia* (nom. bis lectum) is greatly in need of revision, but the present is not the occasion; I therefore follow the grouping of Herrich-Schaeffer and Meyrick, which is at least in part supported by larval characters. The name *Idaea*, Tr., is preoccupied (*Idea*, Fb., in *Ill. Mag.*, vi.), while the type of *Eois* is *russearia*, Hb., *Ztr.*

† H.-S. and Meyr. are at variance as to the position of this species; I provisionally retain it in *Cosmorhoë*, Hb., Stph.; if it be congeneric with *dimidiata*, &c., the name *Cosmorhoë* will supplant *Ptychopoda*.

415.—*Leptomeris** *marginepunctata*, Goeze. II. Eltham, at lamps (Jo.); Westcombe Park (T.).

416.—*L. flos-lactata*, Haw. (*remuntaria*, Hb., in error). I. Hale End, c. (N., P., &c.); Hagger Lane Forest (Bu., Cl., Bl.). II. Abundant (F.); Dulwich (E.R., ii., 140, W.). III. Wimbledon Common (Bu.). IV. Highgate Woods (So.); Finchley* (Bu.); Mill Hill, c. (Js.); Southgate* (Ba.); Harrow (B. & R.)

417.—*L. imitaria*, Hb. I. Hale End, n.c. (J., N., P.); Chingford (Be.); Woodford at light (Bishop). II. n.c. (F.). III. Wimbledon Common (Ent., xxii., 151). IV. Twyford (D.); Hanwell, 1898* (Ba.); Hampstead, Highgate and Hendon (So.); Crouch End, 1897* (Js.).

418.—*L. aversata*, L. Common nearly everywhere, including Islington (Bu.); Ladbroke Square (Ent., xx., 200); &c.

419.—*L. inornata*, Haw. I. Hale End (P., Ba.). II. n.c. (F.). III. Richmond, a few (A.). IV. Highgate (So.).

420.—*L.* (*Ania*) *emarginata*, L. I. Hale End, at sugar* (N.). II. Sometimes common (F.); Grove Park, July 1893 (C.); Plumstead (Cl.). III. Wimbledon Common (Ent., xxii., 151); Ham Common (A.). IV. Southall, at light (Ba.); Hanwell, 26/7/98* (Ba.); Hampstead, Highgate and Hendon (So.).

421.—*Erastria amata*, L. (*amataria*, L.). I. Clapton (Bt.); Hale End, c. (J., N., Ss., &c.); Woodford, at light (Ent., xix., 67). II. c. (F.); Grove Park (Ent., xxxii., 40); Dulwich (W.); Forest Hill (E.R., ii., 69). III. Wimbledon Common (Ent., xxii., 151); Petersham, at light (A.). IV. Twyford (D.); Southall (Ba.); Hanwell (Ba.); Ealing (Fe.); Willesden (Bu.); Finchley (Sw., Js.); Hendon (So.); Highgate, at light, formerly (Mh., So.).

422.—*Deilinia pusaria*, L. Generally common, except in central London. Clapton, 17/6/00 (J. E. Gardner).

423.—*D. exanthemata*, Scop. Nearly as common as the preceding species.

424.—*Bapta temerata*, Hb. I. Hale End (J., N., Ss.). II. Croydon (H.); Bromley (Ent., xvi., 19); Shirley (Ta.). IV. Ealing (Fe.); Highgate Woods (So.); Hampstead Heath, r. (Js.).

425.—*Macaria alternaria*, Hb. III. Coombe Wood (Ent., xxvi., 62).

426.—*M. notata*, L. II. Sometimes common (F.); Croydon (Cl.); Shirley, c. (Sh.). III. Coombe Wood (Ent., xxvi., 62).

427.—*M. liturata*, Cl. II. Sometimes common (F.); Croydon (Cl.). III. Coombe Wood (Ent., xxvi., 62); Chiswick* at sugar (Ent., xxvi., 301); Hammersmith* (Ent., xxvi., 277). IV. Harrow (D.).

428.—*Itame vauaria*, L. Common wherever the food-plant is grown.

429.—*Chiasmia clathrata*, L. I. Woodford, at light* (Ent., xix., 67); Ilford (Mu.). II. n.c. (F.); Croydon, frequent (Sh., H.); Shirley (W.). IV. Harrow (B. & R.).

430.—*Lozogramma*† *petraria*, Hb. Common in all suitable places.

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* Has page-priority over *Arrhostia*, Hb., H.-S., Hein., Gppbg., Br. Mus. Coll.; but need Mr. Meyrick have supplanted the better-known name?

† In order to preserve this monotypical genus, I fix *arenacearia*, Hb., 114, as type of *Lithina*, Hb., Verz., p. 338; *Lithina* thus supplants *Eubolia*, Stgr. Cat.; Duponchel's type of his *Eubolia* is *limitata*, Scop.

431.—*Anagoga pulveraria*, L. II. r. (F.). IV. Highgate Wood* (So.).

432.—*Psednothrix belgiaria*, Hb. II. Shirley, frequent (W.). [Dr. Buckell adds a query to the word "frequent," and I believe Mr. Wood himself has somewhere written that the species has now become scarce here.—L.B.P.].

433.—*Ematurga atomaria*, L. I. Forest Gate (M.). II. Abundant (F.); Shirley (J., Ta., &c.); Croydon (H.); Abbey Wood (W.). III. Wimbledon Common (D.). IV. Ealing (Fe.).

434.—*Chlenastes piniaria*, L. I. Lothbury* (Ent., xx., 211); Stamford Hill, 1884* (Js.); Stratford (Mu.). II. Not scarce (F.); Croydon (H.); Shirley, c. (Sh., W., &c.). IV. Ealing (Fe.); Highgate, at light, 1899 (Js.), ♀ at light, 1900 (L.).

435.—*Perconia strigillaria*, Hb. II. Scarce (F.); Shirley, frequent (Sh.). III. Wimbledon Common (Ent., xxii., 151, Bu.).

436.—*Spilote grossulariata*, L. Common everywhere.

437.—*S. sylvata*, Scop. I. Epping Forest, near Walthamstow, 12/6/93* (Oldham). II. Shirley (Sh.). ["Formerly at Abbey Wood" (F.)] IV. Shepherd's Bush* (Ent., xxxii., 259); Barnet*, in 1881 (Bu.); Harrow (B. & R.).

438.—*Ligdia adustata*, Schiff. I. Clapton, scarce (Js.); Chingford (Be.); Hale End, c. (J.); Woodford, at light (Ent., xix., 67); Ilford (Mu.). II. c. (F.); Croydon, general (Sh., Cl.); Bromley (Ent., xvi., 19). III. Chiswick (Si.). IV. Southall, two in 1887 (Ba.); Hampstead Heath (Ent., xxv., 133); Harrow (B. & R.).

439.—*Lomaspilis marginata*, L. I. Hale End, a few (Ss.); Woodford, at light (Ent., xix., 67); Wanstead (Cl.). II. Abundant (F.); Croydon (H., Cl.); Forest Hill (E.R., ii., 69); Dulwich (W.). III. Wimbledon Common (D., Ta., &c.); Chiswick, l. on Lombardy poplar (Ent., xxv., 133). IV. Hanwell, c. (Ba.); Ealing, abundant (Ent., xxv., 132); Harrow (B. & R.); Hampstead (Bu.); Highgate, at light (Mh.); Highgate Woods (So., Hollis); Finchley (Bu.).

440.—*Pachycnemia hippocastanaria*, Hb. II. Addington Hills (Ent., xvi., 135); Shirley, c. (Sh., Bu.).

441.—*Erannis* (*Theria*) *rupicapraria*, Hb. I. Tottenham (Be.); Chingford (Be.); Hale End (Tr.); Wood St.* (Ba.). II. Abundant (F.); Brockley (E.R., i., 350); Sydenham (E.R., iii., 292). III. Richmond Park, least common of genus (A.); Chiswick, not often taken (Si.). IV. Twyford (D.); Hanwell (Ba.); Harrow (Ent., xvi., 266); Hampstead (Mh., So.); Mill Hill, r. (Js.); Finchley, Feb., 1899 (Sw.); Highgate (So.); Muswell Hill, l. (Bu.); N. London (Sd.); Harrow (B. & R.).

442.—*Erannis leucophaearia*, Schiff. In all suitable localities throughout the district, especially common at Hale End, Richmond Park, &c.

443.—*E. aurantiaria*, Esp. Also very general, though our list of localities is not quite so long as for the preceding species. "Not common" at Croydon (Sh.), but is certainly plentiful at West Wickham.

444.—*E. marginaria*, Fb. Common everywhere except in the heart of the city; has been recorded for Clapton, Stratford, Earl's

Court, Kilburn, &c. London specimens are generally darker than the type, though they very rarely reach ab. *fuscata*.

445.—*E. defoliaria*, Cl. Common everywhere in the suburbs, including Clapton, Dalston, Tooting (common), &c.

446.—*Alsophila aescularia*, Schiff. Common everywhere excepting the central parts.

447.—*Operophthera brumata*, L. Generally abundant; occasionally as near the City as Islington (Bu.) and Dalston (P.).

448.—*O. boreata*, Hb. I. Tottenham (Be.). [The determination of the specimen on which this record rests is, in my opinion, open to question.—L.B.P.] II. Abundant (F.); Shirley, c. (Sh.); Brockley (E.R., i., 350). III. Richmond Park (A.).

449.—*Epirrita dilutata*, Bork. Generally common, though Mr. Carr says "not common" for Lee and Shooter's Hill, and Mr. Sich "occasionally" for Chiswick. The vast majority of London examples belong to ab. *obscurata*, Stgr.

450.—*Malenydris didymata*, L. I. Hale End, c. (J., N., &c.); Hagger Lane Forest (P.); Woodford (Ent., xix., 68); Hackney Marshes (Cl.); Forest Gate (M.). II. c. (F.); Croydon (H.); Brockley* (E.R., i., 350). III. Tooting, fairly common (Bell). IV. Common everywhere (So., Bu.).

451.—*M. multistrigaria*, Haw. II. Abundant (F.); Shirley, c. (Sh.). III. Wimbledon Common (Ent., xxii., 151, D., Ta.); Richmond Park (Si.); Tooting, fairly common (Bell). IV. Hampstead Heath (Mh., Ba., &c.).

452.—*Amoebe pectinataria*, Knoch. I. Hale End, n.c. (J., Ss.); Hagger Lane Forest, plentiful (Bu., Cl.). II. c. (F.); Dulwich (E.R., ii., 140); Shirley (W.). III. Wimbledon Common (D., Ta.); Hammersmith (Bi.). IV. Highgate Woods (Mh.); Harrow (B. & R.).

453.—*Perizoma alchemillata*, L. II. Eltham, r. (Jo.). IV. Hampstead Heath (Bu.); Highgate, at light (Mh., So.).

454.—*P. niveata*, Steph. (*albulata*, Schiff.). II. Locally common (F.); Grove Park (Jo.). IV. Willesden (E.R., ii., 291); Finchley and Mill Hill,, c. (Js.); Highgate, at light (Mh.).

455.—*P. flavofasciata*, Thnb. (*decolorata*, Hb.). I. Hale End, c. (J., N., Ss.); Chingford (Be.); Woodford, at light* (Ent., xix., 67); Ilford (Mu.). II. n.c. (F.); Eltham, c. (Jo.). IV. Hanwell, 3/6/99* (Ba.); Ealing (Ent., xxv., 182); Hendon (So.); Finchley (Sd.).

456.—*P. bifasciata*, Haw. (*unifasciata*, Haw.). II. l., c. (F.); Eltham, at lamps (Jo.); West Norwood, l. (E.R., i., 165); Croydon, locally common (Sh., Cl.).

457.—*Eupithecia** *venosata*, Fb. I. Clapton, 1/6/00* (J. E. Gardner). II. r. (F.); Croydon, l. and imago common (Sh.). IV. Ealing (Fe.).

458.—*E. linariata*, Fb. II. l., n.r. (F.); Eltham, l., c. (Jo.); Croydon, l.c. some years (Sh.); Bromley (Ent., xviii., 20); Beckenham (Cl.).

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* *Eupithecia*, Curt., is dated April 1st, 1825; *Tephroclystis*, Hb., Verz., p. 323, Meyr. is accepted by Professor Fernald as having been published after August 27th, 1825. It is with no small satisfaction that I therefore restore the better-known name.

459.—*E. pulchellata*, Steph. II. Croydon (Cl.)

460.—*E. oblongata*, Thnb. Common almost everywhere. L. on flowers of marigold in garden (P.).

461.—*E. succenturiata*, L. II. r. (F.); Eltham, at lamps, r. (Jo.); Croydon, r. (Sh.). III. Wimbledon Common, at light (Bu.).

462.—*E. subfulvata*, Haw. I. Hale End, l.* (P.). II. Scarce (F.); Eltham, at lamps, r. (Jo.); Croydon, c. (Sh.). III. Hammersmith (Bi.). IV. Hanwell, 17/8/99* (Ba.); Hampstead (Ent., xxv., 180); Highgate (So., Mh.); Muswell Hill* (Bu.); Harrow, r. (B. & R.). Messrs. Clark and Riches have this autumn (1900), taken the larvæ rather freely in their gardens at Crouch End and Hornsey Rise, on tansy, &c.; Mr. James reports the imago "common" at Crouch End.

463.—*E. cauchyata*, Dup. (*pernotata*, Gn.). IV. Ealing (Fe.). [This record is more than questionable, but as the name stands in Dr. Fenton's list I feel bound to quote it.—L.B.P.].

464.—*E. plumbeolata*, Haw. II. n.c. (F.).

465.—*E. isogrammaria*, H.S. I. Dalston (P.); Stamford Hill, c. (Js., Ba.); Woodford, at light (Ent., xix., 67). II. c. (F.); Croydon, swarms among food-plant (Sh.); Forest Hill, 2 (E.R., ii., 60); Westcombe Park (T.). IV. Crouch End, occasionally (Js.); Highgate, 1900* (Js.).

466.—*E. satyrata*, Hb. IV. Highgate (Cl.).

467.—*E. castigata*, Hb. I. Dalston (P.); Hale End, n. r. (N., P.); Chingford (Be.). II. c. (F.); v.c. (E.R., i., 69, H.); Dulwich (E.R., ii., 140, W.); Westcombe Park (T.). III. Wimbledon Common (Bu.). IV. Common everywhere (So.); Hampstead Heath (Bu.); Highgate (Mh.).

468.—*E. fraxinata*, Crewe. I. Stamford Hill (Ba.). II. n.r. (F.); Eltham (Jo.); Plumstead (Cl.). IV. Highgate Wood, at rest* (Mh.).

469.—*E. pimpinellata*, Hb. I. Walthamstow, l. and imago (J.); Woodford, at light (Ent., xix., 67). II. Croydon, locally common (Sh.). IV. Hampstead Heath (So.).

470.—*E. denotata*, Hb. (*campanulata*, H.-S.). II. Croydon (Cl.). [Is there an error of determination here?—L.B.P.].

471.—*E. indigata*, Hb. II. n.c. (F.); Forest Hill, two (E.R., ii., 69).

472.—*E. nanata*, Hb. I. Woodford, at light (Ent., xix., 67). II. c. (F.); Shirley, v.c. (Sh., Cl., &c.). IV. Hanwell, 1898* (Ba.); Highgate (So.); Hampstead Heath, c. (So.).

473.—*E. subnotata*, Hb. Very generally, including Hackney Marshes (Cl.); Isle of Dogs, c. (Wy.); Holloway and Islington (Bu.), &c.

474.—*E. vulgata*, Haw. Common everywhere, the melanic ab. *subfuscata*, Haw., very frequent.

475.—*E. albipunctata*, Haw. I. Coldfall Wood, l.* (P.). II. n.c. (F.); Croydon (Cl.). III. Wimbledon Common, l. (P.); Chiswick, formerly common on *Heracleum sphondylium*, perhaps also on *Angelica*; locality now destroyed (Si.). IV. Crouch End, c. (Js.).

476.—*E. expallidata*, Gn. II. Croydon, r. (Sh.); Plumstead (Cl.).

477.—*E. absinthiata*, Cl. I. Stamford Hill (Ba.). II. c. (F.); Croydon, c. (Sh.); Plumstead (Cl.). IV. Southgate (Ba.); Harrow (B. & R.).

478.—*E. goossensiata*, Mab. (*minutata*, Gn.). II. c. (F.); Shirley, c. (F.). IV. Hampstead Heath, c. (So.); Highgate, at light (Mh.).

479.—*E. assimilata*, Gn. Generally common in gardens on red currant and hop.

480.—*E. lariciata*, Frr. I. Hale End, a few (P., Ss.). II. Croydon (Cl.)

481.—*E. abbreviata*, Steph. I. Walthamstow, n.c. (J.); Hale End (P.). II. n.c. (F.); Croydon, frequent (E.R., i., 70); Dulwich (W.). IV. Highgate Woods (So.).

482.—*E. dodoneata*, Gn. II. Scarce, formerly abundant (F.); Eltham, sparingly (Js.). IV. Hendon (So.).

483.—*E. exiguata*, Hb. I. Ponder's End (Bu.); Chingford (Be.); Hale End. f.c. (N., P.). II. Scarce, formerly abundant (F.); Croydon, c. (Sh.); Forest Hill, f.c. (E.R., ii., 69). III. Barnes (Ta.); Wimbledon Common (Ent., xxii., 151). IV. Hanwell (Ba.); Hampstead (Ent., xxv., 183, Mh.); Highgate (So.); Muswell Hill (Bu.); Southgate, two (Ba.); Harrow (B. & R.).

484.—*E. sobrinata*, Hb. I. Stamford Hill (Ba.); Woodford, at light (Ent., xix., 67). II. c. (F.); Eltham, at light (Jo.); Croydon, c. (E.R., i., 70, Cl.) [probably outside our boundary.—L.B.P.]; Forest Hill (E.R., ii., 69); Dulwich (E.R., ii., 140). IV. Highgate (So.); Finsbury Park* (Ba.).

485.—*Eucymatoge togata*, Hb. I. Hale End* (P.). II. Lee* (F.).

486.—*Gymnoscelis pumilata*, Hb. I. Walthamstow, c. (J., N.); Hale End (P.). II. c. (F.); Croydon, c., l. on furze (Sh.); Forest Hill, 3 (E.R., ii., 69). III. Richmond Park (A.); Putney (Bu.). IV. Ealing, abundant (Ent., xxv., 183); Muswell Hill (Bu.).

487.—*Chloroclystis coronata*, Hb. I. Tottenham* (P.). II. Not uncommon (F.); Eltham, occasionally on fences (Jo.); Croydon, r. (E.R., i., 70); Dulwich (W.); Shirley (W.). III. Chiswick (Ent., xix., 134); Richmond Park (A.). IV. Hampstead Heath (Ent., xxv., 183); Highgate Woods (So.); Mill Hill, r. (Js.).

488.—*C. rectangulata*, Hb. Common everywhere where there are apple trees. Sich and Prout note that the specimens are all dark, sometimes deep black (ab. *nigrosericeata*, Haw.); probably this is the case throughout the district.

489.—*Lobophora** *sexalata*, Retz., Vill. II. Scarce (F.); Eltham, occasionally (Jo.).

490.—*L. halterata*, Hfn. II. c. (F.); Eltham, on aspen trunks, sometimes v.c. (Jo.); Shirley, n.c. (Sh.); Bromley (Ent., xvi., 19). III. Hounslow (E.R., i., 116). IV. Harrow (B. & R.).

491.—*L. viretata*, Hb. II. Occasionally at light (F.); Eltham, ditto (Jo.). III. Petersham, at light (A.); Chiswick, on a wall* (Si.).

492.—*L. carpinata*, Bkh. II. n.c. (F.); Eltham, occasionally (Jo.); Shirley, n.c. (Sh., Cl.).

493.—*L. polycommata*, Hb. II. Croydon (Cl.). [? an escape.—L.B.P.].

494.—*Thera juniperata*, L. III. Tooting, r. (Bell, Bell—R.). Abundant just outside district boundaries on the Purley Downs, &c.

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* *Lobophora*, Curt., Aug. 1st, 1825; *Trichopteryx*, Hb., Verz., p. 323, Meyr., *post*, Aug. 27th, 1825, sec. Fernald.

495.—*T. variata*, Schiff. I. Stamford Hill, r. (Js.); Clapton (Robbins); Hale End, n.c. (P.). II. c. (F., Cl., &c.); Bostall Wood, melanic (E.R., ix., 330). III. Chiswick, at sugar* (Si.). IV. Hanwell*, (Ba.); Southgate (Ba.); Hampstead (So.); Highgate (So., Mh.); Harrow (B. & R.); Crouch End, r. (Js.); Finchley, 2 in 1899, 1 in 1900 (Sw.).

496.—*T. firmata*, Hb. II. Scarce (F.).

497.—*Hydriomena ruberata*, F. III. Wimbledon (Cl.).

498.—*H. autumnalis*, Ström (*trifasciata*, Thnb., Bork.). I. Hale End (P.); Wanstead (M.). II. n.r. (F.); Eltham, c. (Jo.); Brockley* (E.R., i., 350); Croydon (P.). IV. Harrow (B. & R.).

499.—*H. furcata*, Thnb. (*sordidata*, Fb.). Generally common, except in the more central parts. Crouch End, v.r., formerly c. (Js.).

500.—*Mesoleuca** *bicolorata*, Hfn. I. Chingford (Be); Hale End, abundant (N., P., &c.); Stratford (Mu.). II. c. (F.); Lee, 1897* (C.). III. Wimbledon Common (Bu.); Richmond Park (A.); Barnes (Ta.); Hammersmith (Bi.); Chiswick, n.c. (Si.). IV. Hendon, c. (So.); Finchley and Mill Hill, r. (Js.); Southgate (Ba.); Harrow (B. & R.).

501.—*M. ocellata*, L. Apparently very general in N.E. and S.E.; for S.W. our only records are Wimbledon (Da., Bu.) and Richmond (Si.); for N.W., Highgate and Hampstead (So.); Harrow (B. & R.).

502.—*M. albicillata*, L. I. Hagger Lane Forest (Bu., &c.); Hale End (Ss., P.); Woodford (P.). II. c. (F.); Eltham, n.r. (Jo.); Croydon (Cl.); Bromley (Ent., xvi., 19). III. Wimbledon Common (A.). IV. Southall, 1/6/88* (Ba.); Southgate* (Ba.).

503.—*Melanthia procellata*, Fb. II. n.c. (F.); Croydon, c. among clematis (Sh., Cl.). IV. Harrow (B. &. R.).

504.—*Rheumaptera hastata*, L. II. Shooters Hill*, some years ago (Jo.).

505.—*Xanthorhoe* (*Epirrhoe*) *tristata*, L. II. Croydon (Cl.). [Accidental occurrence?—L.B.P.]

506.—*X.* (*Euphyia*) *picata*, Hb. II. Croydon (Cl.).

507.—*X.* (*Euphyia*) *amniculata*, Hb. (*unangulata*, Haw.). II. Croydon (Cl.); Bromley (Ent., xvi., 19). III. Wimbledon Common (D., Bu., &c.); Richmond Park (Bu.); Ham Common (A.).

508.—*X.* (*Epirrhoe*) *rivata*, Hb. I. Hale End* (N.); Woodford, at light (Ent., xix., 67). II. c. (F.); Croydon, c. (Cl., Sh.). III. Wimbledon Common (D.); Chiswick (Ent., xix., 134).

509.—*X.* (*E.*) *alternata*, Müll. (*sociata*, Bork.). Generally common in the more rural parts.

510.—*X. implicata*, Vill. (*montanata*, Bork.). As the preceding.

511.—*X.* (*Epirrhoe*) *galiata*, Hb. II. Croydon (H.).

512.—*X. fluctuata*, L. Common everywhere. The dark ab. *neapolisata*, Mill., frequent, as also many other aberrations.

513.—*Anticlea rubidata*, Fb. I. Hale End, 26/6/00* (P.); Ilford (Mu.). II. n.r. (F.); Eltham, c. (Jo.); Croydon, frequent (Sh.).

514.—*A.* (*Earophila*) *badiata*, Hb. Generally common. Recorded

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* Type, *albicillata*, L.; I have retained the dissonant species *bicolorata* and *ocellata* provisionally in this genus, because their exact position does not seem to have yet been worked out.

from Green Park, Piccadilly, 27/5/98* (C.). Our only recorded station in district III. is Wimbledon Common (D.).

515.—*A. nigrofasciaria*, Goeze. II. n.c. (F.); Eltham, occasionally on palings (Jo.); Eden Park* (P.). III. Barnes (Ta.). IV. Highgate Woods (So.); Hendon (So.); Mill Hill, r. (Js.); Harrow (B. & R.).

516.—*Ochyria designata*, Hfn. Locally common throughout the suburbs.

517.—*O. spadicearia*, Schiff. (*ferrugata*, Auctt.). I. Hale End, n.c. (N.); Woodford, at light (Ent., xix.. 67); Ilford (Mu.). II. Abundant (F.); Norwood (E.R., ii., 156); Sydenham (E.R., ii., 164); Streatham (Fo.). III. Wimbledon Common (D., Ta.); Barnes (Ta.). IV. Ealing, abundant (Ent., xxv., 185); Highgate (So.); Mill Hill and Finchley, r. (Js., Sw.).

518.—*O. ferrugata*, L. (*unidentaria*, Haw.). Apparently common throughout, unless it be in district IV., where our only records are: Highgate (So.); Winchmore Hill (Ba.); Harrow (B. & R.).

519.—*O. quadrifasciata*, Cl. II. n.c. (F.). III. Richmond Park (Bu.).

520.—*Camptogramma bilineata*, L. Common everywhere.

521.—*Percnoptilota fluviata*, Hb. I. Woodford, at light* (Ent., xix., 67). II. "Formerly not rare, now extinct" (F., Jo.). IV. Highgate* (So.).

522.—*Coenocalpe tersata*, Hb. I. S. Hackney (Se.) [an escape?] II. n.c. (F.); Eltham, r. (Jo.): Croydon, c. (Cl., Sh.); Lee, at light, 1899* (C.); Westcombe Park, at light, 1900 (T.). IV. Ealing (Fe.).

523.—*C. rittata*, Bork. I. Clapton (Cl.) [obviously quite accidental occurrence.—L.B.P.] II. Scarce, formerly common (F.). IV. Hanwell at light, 22/8/98* (Ba.); Highgate* (So.).

524.—*C. vitalbata*, Hb. I. Woodford, at light* (Ent., xix.., 67). II. n.c. (F.); Eltham, r. (Js.); Croydon, c. (Cl., Sh.). IV. Highgate (So.); Harrow (B. & R.).

525.—*Triphosa dubitata*, L. I. Dalston* (P.); S. Hackney (Se.); Clapton* (Ss.); Woodford, at light (Ent., xix., 67). II. c. (F.); Eltham, at lamps (Jo.); Dulwich (W.); Bromley (Ent., xvi., 233); Westcombe Park (T.); Shirley, c. at heather bloom (Sh.); Streatham (Fo.). III. Barnes (Ta.); Hammersmith (Bi.). IV. Very generally distributed (So.); Southall, a few (Ba.); Paddington (Ph.); Harrow (B. & R.).

526.—*Calocalpe certata*, Hb. I. Finsbury Park (N., Ba.); Tottenham (Be.); Clapton (Ba., Ss.); Stratford (Mu.). II. c. (F.); Eltham, at lamps (Jo.); Croydon, r. (Sh.). III. Wimbledon (Bu.); Chiswick, occasionally (Si.). IV. Very generally distributed.

527.—*C. undulata*, L. I. Ilford (Mu.). II. Occasionally (F.); Eltham, r. (Jo.). IV. Hamilton Terrace, N.W.* (Ent.. xxxii., 237).

528.—*Philereme vetulata*, Schiff. II. Common, but very local (F.); Chislehurst (Jo.); Croydon, c. among buckthorn (Sh.). III. Wimbledon Common (Ent., xxii., 151). IV. Hampstead, l. (Ent., xiii., 220).

529.—*P. transversata*, Hfn. (*rhamnata*, Schiff.). I. Ilford (Mu.). II. Common among buckthorn (Sh.). IV. Harrow (B. & R.).

530.—*Chloroclysta siterata*, Hfn. IV. Muswell Hill (Bu.).

531.—*C. miata*, L. II. Scarce (F.); Eltham, at lamps, rather common (Jo.). III. Chiswick (Ent.. xxv., 203). IV. Hampstead (Bu.); Harrow (Ent., xxv., 203, B. & R.); Crouch End, 1893* (Js.).
[*Euphyia picata*, Hb. *vide* No. 506].

532.—*Cidaria** *corylata*, Thnb. I. Hale End, c. (J., N., Ss., &c.); Isle of Dogs, n.c. (Wy.). II. Scarce (F.); Shooter's Hill Wood (T.); Shirley, frequent (Sh.); Croydon (Cl.). IV. Mill Hill, r. (Js.); Highgate Woods (So.).

533.—*C. truncata*, Hfn. I. Hale End, c. (J., Ba., P.); Hagger Lane Forest (Bu., Cl.); Woodford, at light (Ent., xix., 67); Tottenham (Be.); Ponders End (Bn.). II. n.r. (F.); Dulwich (W.). IV. Hanwell (Bd.); Muswell Hill (Bu.); Crouch End, 1892* (Js.); Highgate Woods (So.); Hampstead (Mh., So.); Harrow (B. & R.).

534.—*C. immanata*, Haw. I. Hagger Lane Forest (Bu., Cl.); Ponders End (Bu.). II. n.r. (F.); Dulwich (W.); Shirley, c. at heather bloom (Sh.). III. Scarce (Bell—M.). IV. Harrow (B. & R.); Hampstead, at light (Mh.).

535.—*C. fulvata*, Forst. Common in most parts, excepting the more central.

536.—*Lampropteryx suffumata*, Hb. II. Formerly common, now extinct (F.). IV. Highgate Wood (So.); Hendon (So.); Harrow (B. & R.).

537.—*Eustroma silaceata*, Hb. II. Occasionally (F.); Eltham, occasionally (Jo.); Bromley (Ent., xviii., 20); Croydon (Cl.). III. Chiswick* (Ent., xxv., 203).

538.—*Lygris* (?) *prunata*, L. IV. Harrow (B. & R.).

539.—*L. testata*, L. I. Tottenham, at light (Be.); Hagger Lane Forest (Bu., Cl.); Hale End, c. (J.); Woodford, at light (Ent., xix., 68). II. Common but local (F.); Bromley (Ent., xviii., 20); Shirley, c. at heather bloom (Sh.). III. Tooting, f.c. (Bell, Bell—M.); Wimbledon Common (Ta., Si.); Chiswick* (Ent., xxv., 204); Bedford Park (Ent., xxv., 204). IV. N. London (Sd.); Hampstead Heath, c. (So., Mh.); Harrow (B. & R.).

540.—*L. pyraliata*, Fb. (*dotata*, Stgr. Cat.). I. Chingford (Be.); Hale End, c. (N., J., P.). II. Scarce, formerly abundant (F.); Croydon (Cl.); Dulwich (W.); Lee (C.); Grove Park (C.). III. Bedford Park (Ent., xxv., 204). IV. Hanwell (Ba.); Ealing (Fe.); Southall, common locally (Ba.); Willesden (Bu.); Finchley (Bu., Sw.); Hendon, c. (So.); Highgate, at light (Mh.); N. London (Sd.); Harrow (B. & R.).

541.—*L. associata*, Bork. Generally distributed, and mostly common.

542.—*Peluria comitata*, L. Very generally distributed, including Canonbury, Highbury, Holloway, &c. (Bu.); Stamford Hill, l. abundant (Js.); Hackney Marshes (Cl.); Isle of Dogs (Wy.); Greenwich Marshes (T.). Mr. Bell's list indicates it as "rare" at Tooting.

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* *Dysstroma*, Hb. Verz., of which Hulst makes *truncata* the type, was probably published in the same year (1825) as *Cidaria*, Tr.; pending further enquiry, I retain the more usual name.

543.—*Plerocymia* clavaria*, Haw. (*cerrinata*, Schiff., in error). II. n.r. (F.); Bromley (Ent., xvi., 19); Croydon, l.c. on mallow (Sh.). III. Wimbledon Common, at light (Ent., xxii., 151); Barnes (Ta.); Chiswick, l. on mallow (Ent., xxv., 204); Bedford Park (Ent., xxv., 204). IV. Southgate (Ba.); Harrow (B. & R.).

544.—*P. chenopodiata*, L. (*limitata*, Scop.). II. Common, but local (F.); S. London (Ent., xvii., 90); Dulwich (W.); Bromley (Ent., xvi., 233); Croydon (H.). III. Tooting (Bell—R.). IV. Southall (Ba.); Hanwell, c. (Ba.); Twyford (D.); Mill Hill (Js.); Finchley (Sw., Js.); Highgate (So.); Hampstead (So.); Harrow (B. & R.).

545.—*P. mucronata*, Scop. (*plumbaria*, Fab.). I. Woodford, at light (Ent., xix., 67). II. n.c. (F.); Dulwich (W.). III. Tooting, c. (Bell, &c.); Wimbledon Common (D., Ta.). IV. Hampstead Heath (So.); Harrow (B. & R.).

546.—*P. bipunctaria*, Schiff. II. Locally abundant (F.); Dulwich (W.). IV. Ealing (Fe.).

547.—*Anaitis plagiata*, L. II. c. (F.); Dulwich (W.); Bromley (Ent., xviii., 20); Croydon, frequent (Sh., H.); Eden Park (P.). IV. Southall (Ba.); Highgate Woods (So.); Crouch End, 1896* (Js.); Highgate, at light (Mh.).

548.—*Eucestia spartiata*, Herbst. I. Walthamstow, n.c. (J.); Snaresbrook (Bl.); Forest Gate (M.). II. Abundant (F.); Eltham, c. (Jo.); Shirley (Sh.). IV. Hanwell, fairly plentiful (Ba.); Hampstead Heath (So.); Muswell Hill* (Bu.).

549.—*E. rufata*, Fb. I. Snaresbrook (Bl., Bt., P., &c.); Forest Gate (M.). II. n.r. (F.). III. Barnes Common (Ta., A., Si., &c.).

550.—*Odezia atrata*, L. I. Stamford Hill* (Ba.); Woodford, at light (Ent., xix., 68). III. Wimbledon Common (D.); Richmond Park (Bu.). IV. Southall, a few (Bu.); Willesden (E.R., ii., 291); Edgware (Sw.); Finchley, c. (Sw., Js.); Mill Hill, common locally (Js., Sw.); Hendon Lane (Sd.); Highgate (So.); Alexandra Park, N. side, netted among furze (Mh.); Hampstead (So.); Brondesbury* (E.R., ix., 297); Southgate, c. (Ba.); Harrow (B. & R.).

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* In our National Collection this genus (under the name *Ortholitha*) is maintained as distinct from *Onychia*, Hb. Verz. (*i.e.*, *Petrophora*, Hb. Tent., type *maeniata*, Sc.), but nearly all authors unite them.

BRITISH MUSEUM

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 "Doubleday 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.