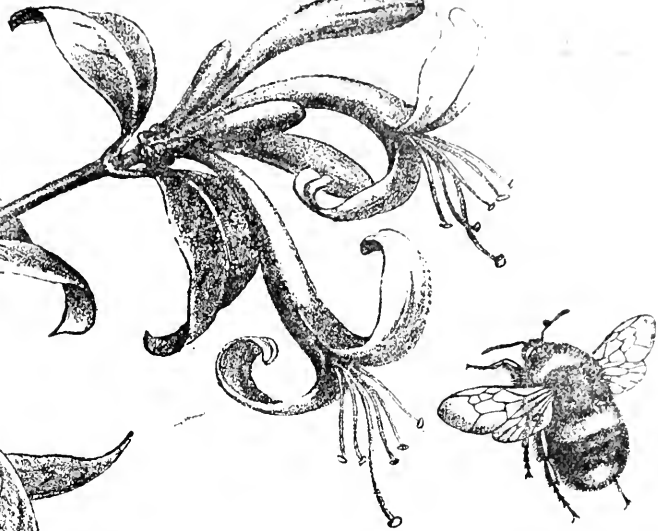

THE ENTOMOLOGIST'S RECORD AND JOURNAL OF VARIATION.

EDITED BY

J. W. TUTT, F.E.S.

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PREFACE TO VOL VI.

On the completion of our sixth volume, we again tender our heartiest thanks both to our subscribers and to our contributors, for their continued support and encouragement.

Nothwithstanding the increased frequency of publication, we have found it impossible to prevent the accumulation of material at a rate in excess of our power of using it. This is not an unmixed evil, for it has relieved us of the difficulty, that existed not many years ago, of obtaining a sufficiency of interesting matter wherewith to fill our entomological magazines. At the same time, it points to the necessity for a continuance of the policy of completing a volume in eight months. Accordingly, we have to announce that the twelve numbers of the ensuing volume will be published on the following dates:—Sept. 15th, Oct. 15th, Nov. 1st and 15th, Dec. 1st and 15th, Jan. 15th, Feb. 1st and 15th, March 1st and 15th, April 15th.

We have taken a new departure in the volume now completed, by giving to the first article in each number somewhat more of a popular character. The echoes of approval that have reached us, show that this practice has been widely appreciated by our readers.

The special line that we have taken in dealing with the philosophical questions that underlie the study of entomology, as well as the publication month by month of short notes of the more important matters of interest to British workers published elsewhere, have undoubtedly led to a much wider and more general recognition of the fundamental principles underlying entomology as a science, and have induced a large number of the younger workers to fall into line with the advanced scientific thought that characterises the last decade of the present century. The steady spread of our Magazine among collectors, shows that they appreciate our attempt to reduce everything we print into words that may be understanded of the people, and to present our subject without the mystifying verbiage in which some people wrap what is called science.

We would again appeal to our readers to be also contributors to our pages. Many a collector observes facts which if recorded in print will be of value to the progress of entomological science, whilst, if not so recorded, they bear no fruit. General notes on the rearing of larvæ, on food-plants which larvæ will take to in captivity, on the varying treatment which different larvæ require when the time for pupation arrives, on the management of hybernating larvæ, and a host of other similar matters, are points on which many of our readers must have information to impart, that will be of considerable interest to their brethren.

The Special Index to this volume is in a forward state of preparation. The intervention of the holidays will, however, delay its publication till September or October.

We can only in conclusion renew our thanks to all our subscribers and well-wishers, and ask them, whenever practicable, to introduce the magazine to the notice of their friends, and to see that a copy is placed on the table of every Public Library in the United Kingdom.

To our foreign subscribers we also offer our best thanks, and can only hope that there has been enough of general scientific interest contained in our pages, to induce them to continue their support, and to extend the knowledge of our magazine whenever opportunity offers.

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The Entomologist's Record
AND
JOURNAL OF VARIATION.

No. 1. Vol. VI. January 15th, 1895.

ABOUT LARVÆ.

By G. M. A. HEWETT, M.A.

It is with some reluctance that I write the title of this article, if I may use so dignified a name: not because I have any doubts about my own interest in the subject, but because I know very well that there are so many men knocking about in the world, who not only rear a hundred larvæ to my one, but who also study them through everything, from an eye-glass to a microscope, whereas I confine myself to the naked eye. Moreover, I don't keep a note-book. I am a little superstitious about note-books. I have several times bought one. I am perpetually coming across nearly new ones in odd corners of my house. But as surely as ever I begin one, or even try to continue an old one, something goes wrong with the larvæ whose histories I am recording. At least I am driven to conclude that this is the case, because I cannot find any record of having kept any larvæ beyond the third moult. Of course it is just possible that, having got the infants to an age of comparative security, with measles and whooping-cough safely weathered, I have ceased to think their doings worth recording. But I prefer the view that an unkind fate sends an obscure malady to all larvæ, whose domestic lives I try to set down in a note-book. It is a poetical way of looking at it, and also it saves me a great deal of worry and trouble.

> "The diarrhœa takes them all at random,
> If of their lives you make a memorandum."

It will doubtless be urged upon me that this is a very casual and half-hearted way of studying natural history. I can only reply, with apologies to Mr. So-and-So and Mr. Somebody Else, that it is better than not keeping them at all. There are various classes of collectors, as has been pointed out already in the *Record*, in sharper language than I can command: (1) those who don't keep larvæ because it is too much bother; (2) those who don't keep them because they lack time and room; (3) those who keep them merely as machines for producing perfect specimens; (4) those who keep them from interest, more or less intelligent; (5) those who keep them with deep scientific ends in view, not caring much, comparatively speaking, for the specimens of insects which result from them. It is a very good thing to know well one of these latter gentlemen, as they are often willing to give away the pupæ which have ceased to interest them. The first class, of those which I have mentioned, is rare, hardly even local. Number two is fairly common in the London district, and turns up casually in many of our larger towns. The third and fourth classes are generally distributed, and further information can be obtained from the exchange columns of the *Record*, the latter of the two being distinguishable by the general preponderance of bred specimens of common insects. The last class is still rare, but spreading. I expect that many of us know pretty well which locality it originally started from. Also the various classes interbreed pretty freely, so that interesting hybrids are comparatively common. I fear that I am digressing. I generally do. I should like to say that digression is the mark of a great intellect and the source of all merit, just as divergence from the type is the secret of the origin of species and the improvement of the race. But I am afraid that the parallel will hardly hold. I wish somebody would write and say that my view is the right one. It seems difficult, now-a-days, to advance an opinion that does not find some supporters.

> "That colour is grey, sir! What say *you*?
> Does it seem to you black or white?
> I wasn't quite sure, but I like your view;
> Yes! I'm pretty well sure you're right."

Well! As to larvæ. I used always to sleeve them from the very beginning, but I don't now. A brood of *Taeniocampa opima* walked through the meshes of a fine gauze sleeve and vanished, all but one, who stuck. I bred him all right in a pot. That was lesson number one. A brood of about sixty *Acronycta tridens* dwindled down to twenty—the places of the missing forty being taken by four fat earwigs. Lesson number two. No! Sleeving requires more care and attention than many pots. But it is useful if you are going to be away for a week or so, and have no one to feed your larvæ, though even there I have had a lesson. I had to stay away an extra week, and found that half of a sleeve of *Boarmia consortaria* had wanted to pupate, and had died for lack of earth.

> "I've known men sometimes put inside the earth
> Because they died;
> These died because of soil there was a dearth
> To get inside."

Excuse these traces of the cloven hoof. Where was I? Oh, yes! Larvæ, I remember. But really I know awfully little about them. I keep the young ones in tin boxes, because the food keeps fresh for a long time. Only it must be put in pretty dry, or it goes mouldy. In fact, with all Noctuæ larvæ, I am being driven to make it a standard rule, "Give them no drink." Dry all moisture off the food, or they die. In fact, some insects insist on perishing because of the moisture in the food. Therefore, if there is any choice of food-plants, pick that which is naturally the driest, and give Noctuæ lots of sun on the pot, so long as you do not roast them. Geometers will stand much more wet; in fact, they like a good deal, provided that they can dry themselves in moderate sun afterwards. But, whatever larvæ you keep, there is no doubt that endless care and attention is the best way to keep them healthy, and they dearly like plenty of room. I can't go so far as to say that I keep each larva in a tumbler by itself, as one entomologist, at any rate, is said to do. But I do think that ten or twelve to a good-sized flower-pot, when they are moderately grown, is an ample allowance. I must say, even at the risk of appearing jealous of other men's varieties, that I think adherence to the type a good rough measure of the care with which larvæ are kept. Anyone who happens to have kept a young sparrow-hawk will remember that a day's starvation leaves a mark on the plumage. Now there is no doubt that varieties which are the result of an inadequate food-supply are often very pretty and interesting to look at, but I can't see that they are of any great scientific value. But a very interesting paper might be written—it possibly has been written—on the question whether larvæ, if starved, are liable to produce varieties, other than half-cripples, and whether the so-called varieties produced by change of food, are due to the chemical difference in the food-plant, or to the fact that the larva half-starves itself, rather than eat the nasty stuff which is given to it.

I know not a few men, who could perfectly keep larvæ successfully, but who refuse to do so, because they imagine that there is a lack of sport, and exercise, and interest in larva hunting, as compared with the capture of the perfect insect. Of course, I quite grant the somewhat shady side of nursing and petting larvæ, and then putting the same creature, when it has reached the moth stage, brutally into a cyanide bottle, or something equivalent. I would prefer to leave that part of the question alone. I don't feel quite competent to deal with it. At any rate, I for one am not prepared, after breeding with some care, say a fine male *Apatura iris*, to take him to an oak wood and give him a run for his money. The odds are a trifle too heavy on the insect. But what I do wish strongly to insist upon is that the pursuit of larvæ is just as fascinating, from an æsthetic or any other point of view, as the pursuit of the imago. Is it night work that charms you? Then take a sweeping net, and go out on to the wild heath-land and sweep for *Agrotis agathina* and *Noctua neglecta*. You will drink to the full the weird beauty of the night, as the twilight comes creeping in from the north and east. You will get the slight thrill of terror, as the other hunters of the night, in air and heather, brush past you. You will see the last glimmer of day fade out in the west, and feel how life is always ebbing away somewhere. You will gaze in awe at the unfathomable depths in the blue-black heavens, or watch the mist-wreaths twining in the valleys and hollows. Is it bodily exercise that you desire, to relieve the hard-worked brain, or for the pride of feeling the muscles harden? The man who can sweep the heather for two hours, can do most feats of endurance. The man who can beat for a day in spring at the pines, and sallows, and oaks, and birches, without blistering his hands and aching in every muscle, need fear few other tests, and will sleep the sleep of the weary. Is it skill and keenness of eye that you wish to cultivate? Then go and pick me off that larva of *Sphinx ligustri* from the privet hedge. Its back is turned away, but you can see the dark row of spots where its feet are clasping an inner twig, low down in the hedge. Go and look up into the beeches for a morning, and let me see you come back with a dozen *Limacodes asellus*. And then, if your neck is weary of looking up, take a turn in the afternoon at *Macroglossa bombyliformis*, or search the dead wood (if you will insist that *bombyliformis* has been in the pupa for some time) in and around the sallows, for the cocoon of *Dicranura furcula*. I don't think you will find that you have gained much, in point of easiness, by your troublesome objection. No! Sir. I will grant that you don't care for larva-hunting because it is too hard work, or because you can't find enough to make it interesting. I will grant that it is easier to box insects off treacle, than to beat the woods at night with a lantern hanging between your teeth. I will grant that it is perhaps more comfortable to net *Colias edusa* in a clover-field than to work up to your middle in a Norfolk broad for pupæ of *Leucanidae*. But that it is more worthy of the name of sport, that it exercises the imagination better, that it kindles more love of the beautiful and mystical dame Nature—if you want to hear this asserted, you must go to some other than yours truly.

The Life-History of a Lepidopterous Insect,

Comprising some account of its Morphology and Physiology.

By J. W. TUTT, F.E.S.

(*Continued from Vol. V., page 294*).

Chap. III.

PARTHENOGENESIS or AGAMOGENESIS.

Turning now to our own countrymen, we find that Newman in the monograph already alluded to, gives a list of those lepidoptera in which entomologists had up to that date (1856), noticed the phenomenon of parthenogenesis. These were *Sphinx ligustri, Smerinthus populi, S. ocellatus, Liparis dispar, Psilura monacha, Diloba caeruleocephala, Saturnia polyphemus, S. pyri, S. carpini, Orgyia gonostigma, O. antiqua, Bombyx mori, B. quercus, Arctia caia, A. villica, A. casta, Odonestis pini, O. potatoria, Lasiocampa quercifolia, Psyche fusca, P. helix, P. graminella, P. nitidella, Solenobia triquetrella, S. clathrella, S. lichenella,* but we are hardly likely to agree with him that among lepidoptera "agamic exception to diprotogenous reproduction becomes characteristic." The observations by means of which the above list was formulated, were in many instances "made carelessly," and the records of some of the observations "penned in terms the most loose and unsatisfactory," yet Newman declared that after eliminating the probably apocryphal "there remains a substratum of truth, which carries conviction to every ingenuous mind."

We learn further from this paper that "in the case of *Bombyx mori, Lasiocampa* (*Bombyx*) *quercus*, and *Pysche helix*, the experiments have been performed with a care and precision that leave nothing to be desired." It would appear that those on *B. quercus* were made by the late Mr. Tardy of Dublin, but that, although the facts were well known, they were never published in any of the entomological magazines *in extenso*. The following summary of the experiments is then given:—"Mr. Tardy reared a single female of *L. quercus* from the larva. The female laid abundance of eggs in the breeding-cage; the eggs in due time became larvæ, fed as usual, and spun up. These circumstances attracted Mr. Tardy's close attention; but he felt inclined to suppose that, without his knowledge, a male might have gained access to the female. Still, he was so interested in the subject, that he determined to repeat the experiment, and to guard against the possibility of mistake.

The result was a second and third generation of perfectly vigorous and full-sized moths, without a single coition having taken place." Newman adds:—"The experiments on *Psyche helix* and *Bombyx mori* appear to have been conducted with equal care It is worthy of notice that no Papilio (butterfly), Noctua, Geometer or Pyralis has been reported, if *Noctua pacta* be excepted, a name evidently given in error. There are SPHINGES, BOMBYCES, TINEINA, and the remainder are of the group of PSYCHIDÆ, supposed to hover between the BOMBYCES and TINEINA. The instances recorded," and this is worthy of note, "occur among those insects which are most frequently reared from the larva, and therefore, those in which such phenomena are most likely to be observed."

In the *Entomologist's Weekly Intelligencer*, vol. iii., pp. 175–6, we read:—"A recent writer in *The Midland Quarterly Journal of the Medical Sciences*, in a notice of Siebold's work 'On a true Parthenogenesis in Moths and Bees,' observes respecting the *Solenobiæ*:—"Eggs are produced independent of the male influence, and the fact of such eggs possessing vitality in the present state of physiology can scarcely be said to be marvellous. We expect that hereafter it will be proved that, under certain conditions, perfect males will always be formed, and sexual reproduction will take place; but if, as each generation lasts a year, it should ordinarily continue to be asexual as long as in the Aphides, it would take at least from nine to eleven years before the experiment was complete; and indeed it might require much longer, as we are entirely ignorant of the circumstances which may or may not be favourable. Indeed, we may be said to have a positive proof that such will be the case, since the male of at least one species in which this parthenogenesis occurs is well known, namely, that of *Solenobia inconspicuella*. The larvæ of this moth are common amongst lichens, near London, and well deserve more attention than they have hitherto met with even from entomologists. We ourselves have bred them, but only females, whilst in the allied genus *Talæporia*, we have frequently reared both males and females of *Talæporia pseudo-bombycella*, and curiously enough, we almost feel assured that no parthenogenesis takes place in this species."

In *The Substitute* for 1856 (p. 40), Sir John (then Mr.) Lubbock, after mentioning the occurrence of parthenogenesis in *Daphnia schaefferi*, appeals to entomologists to furnish him with information of any instances that may have come to their knowledge of its occurrence in moths, and states that Jourdan has published several. Mr. Gregson responds to this appeal (p. 77), and says: —"In reply to Mr. Lubbock's enquiry, I have found some hundreds of a case-bearer now feeding, bred from a case which never had a male near it: they are feeding upon lichen." Mr. J. W. Douglas of Lee, writes:—"I have on several occasions seen larvæ which had issued from a case of *Fumea nitidella*, in which, as is well known, the female deposits her eggs. There is every reason to believe that these eggs were unimpregnated, because I found the cases directly after they were spun up, and long before the imago appeared. I am tolerably sure that I have had larvæ from cases which the larvæ were carrying about when I found them at Black Park, and to which cases no male imago had access; but I cannot find the memorandum I made at the time, and so will not be positive."

Mr. Newman (*Entom.*, vol. ii., p. 28) writes:—"In my little pamphlet on *Physiological Classification*, I gave a number of instances in which female insects had produced fertile eggs, and even living young, without the possibility of having had previous access to males of the same species: these were all cited from works of the most eminent naturalists of the Continent, and are entirely trustworthy: but still there is something in all records that makes you think, if not to say, 'I should like to try that experiment myself.' In my own instance, this opportunity has been afforded. In one of my breeding-cages were placed three full-fed larvæ of *Nyssia pilosaria*, they soon became pupae: and at the end of February and beginning of March three females emerged; they continued very quietly on the sides of the cage during the day, but at night amused themselves with busily perambulating some fallen and withered leaves, and with inserting their telescope-like ovipositors into every cranny and crevice they could find. Of course I suppose they were laying eggs, and still suppose so, but of this I cannot be sure. However, on Sunday, the 17th of April, I found the cage positively swarming with minute loopers, which bearing in mind as I did the three female *pilosaria*, I concluded at once to be juveniles of that species. A fortnight has elapsed, and there is now no doubt on the subject; they have been feeding on birch, which, if it shared my feelings, was anxiously expecting the emergence of a brood of *Endromis versicolor*, certain twigs embossed with the eggs of that species having been deftly affixed to the twigs of birch provided for their sustenance. The *pilosaria*, now a fortnight old, are rather restless, wandering frequently off their food plant, and reminding one forcibly of Japhet in search of a father. Still the fact, as here narrated, is amply sufficient to prove that the union of the sexes in this particular species is not absolutely essential to the production of abundant and vigorous progeny: whether they arrive at maturity remains to be seen."

At a later date (*l.c.* p. 254) Mr. Newman writes:—"Referring to my memorandum at p. 28 of the *Entomologist*, I have to state that the larvae of *Nyssia pilosaria*, which I then described as having been produced from a virgin female, acquired the full larval stature of the species, and in due time became pupae: but here ends their history: they have exhibited no indication of life since pupation: the experiment has therefore failed as an instance of continuous agamous generation."

Mr. A. E. Eaton records an instance in *Orgyia antiqua* (*Entom.*, vol. iii., p. 104):—"The details of this case were communicated to me by a friend, who has satisfied me that perfect isolation from the male was maintained throughout. *First generation*:—From a pupa found at Venn Hall, Sherborne, Dorset, in the autumn of 1864, a female imago emerged, which laid eggs. *Second generation*:—Of the above-mentioned eggs ten hatched in the spring of 1865, but of these larvae one only, the largest from the first, came to maturity; this produced a female which laid eggs. *Third generation*:—Five larvae from these eggs attained the pupal state of development, and one of them produced a female imago by the middle of October. The series is, therefore, incomplete."

Another species in which parthenogenesis has been observed is *Sphinx ligustri*. Mr. A. P. Nix of Truro, states (*Entom.*, vol. iv., p. 323) that he "had some eggs from a bred female of *Sphinx ligustri*: she had no intercourse with a male but the eggs have all hatched." Mr. Clogg writes from East Looe on July 12th, 1871, as follows (*Entom.*, vol. v., pp. 356-7):—"Whether the following fact concerning *Sphinx ligustri* is new or not I cannot say, it appears so strange to me that I think it worth sending to you. This year I have bred a female *S. ligustri*, and not wanting her as a specimen I allowed her to remain in the breeding-cage for some days, during which she laid many eggs on the net covering the cage. I thought, of course, that they would be unfruitful; but, much to my surprise, after a time young caterpillars began to make their appearance; and although the eggs were all laid during one night, they continued to emerge from the 2nd to the 6th of July. I have now nearly fifty of them; they have grown already to nearly three times their size when they were born. Being certain that a male was never near the female that produced the eggs, I am quite at a loss to know how and when the eggs could have been fertilized; in fact, I am perfectly puzzled to account for it in any way."

The tale is continued by Mr. T. Brown of Cambridge (*Entom.*, vol. v., p. 395) who under date of August 18th, 1871, writes:—"Three weeks ago I found, in Wicken Fen, a full-grown larva of *O. coenosa*, and I put in a box by itself. During the night it spun its cocoon, and five days afterwards it emerged, a fine female; a few days a fterit laid more than fifty eggs: they duly hatched, and are now under the care of Mr. Hellins. I am quite certain that this female was not impregnated before laying its eggs, as it was completely isolated from coming into contact with any male. A similar circumstance occurred with me some few years ago; the species then were *Smerinthus tiliae* and *S. ocellatus*."

In 1879, Mr. W. G. Pearce of Bath writes (*Entom.*, vol. xii., pp. 229-30):—"As previous to this year I was unaware of parthenogenesis among the Lepidoptera, I send you this note, thinking the subject may prove as interesting to others as it is to myself. Last summer I fed up about a dozen larvae of *Liparis dispar*, three of which I gave to a friend, and they all emerged as males; the first of my own to come out was a male, which I immediately killed. After this I kept three females, wishing to secure eggs, but as no other male made its appearance I was disappointed, although the moths I was keeping laid batches of eggs, two of which I threw away, thinking, of course, that they were infertile, and the other batch would have shared a like fate had it not been deposited upon the side of a box in which I had other pupæ. Judge of my surprise when, on May 6th, I found that larvæ were emerging therefrom, and these identical larvæ are still feeding. As I kept the pupae in a securely-fastened box with a glass lid, no male could have had access. I shall be curious to see if this power of reproduction will extend to the next generation."

A case of parthenogenesis is reported by Mr. J. A. Watson (*Entom.*, vol. xv., pp. 261-2) to have occurred in *Anarta myrtilli*. The record reads as follows:—"Having noticed what to me is a curious thing, I venture to send you the following note: A few weeks ago my son (aged four years) brought me a pupa of *Anarta myrtilli*, which he had found in the road, and I put it in a tin box to please him, thinking it would not survive the pressure it had received, as it was nearly flat. To-day, the 4th July, requiring a box for collecting, on opening the lid I saw the remains of the imago of *A. myrtilli* and the eggs it had deposited on the side of the box, with dust at the bottom, which through curiosity I put under a pocket lens, when to my surprise I saw a number of small larvae. This led me to examine the eggs, and I found that they had all hatched. Nothing could possibly have got into the box, as it was in my desk, and I had almost forgotten it. Of course the larvae were all dead, or I should have tried to rear them."

Further instances will be found in *The Entomologist's Record*, vol. i., pp. 95 and 174.

Although, from what has been written, it will be seen that it is certain that parthenogenesis does occur in Lepidoptera, yet it must be confessed that the material based on true scientific experiment is not large, and that many more careful observations based on the most exact experiments are required. The peculiar phenomenon presented is worth all the patience with which the entomologist must attack this subject, and he would have the reward of knowing that he had helped to make clearer one of the greatest mysteries of insect life.

The phenomenon of parthenogenesis can only be explained by supposing that the potency of the male element is handed down generation after generation and that former fertilisations affect the embryo, independently of the actual union which fertilises the ovum. The male element must be looked upon as possessing not only a great and direct influence on the development of the eggs immediately fertilised by it, but also on the eggs of successive issues not directly fecundated. That this is so, is shown by the fact that the unfertilised egg undergoes varying conditions of development short of the actual development of a perfect embryo. This was foreshadowed in the section on the variation in the colour of the egg (vol. v., pp. 139-141). In cases of parthenogenesis the influence must be powerful enough to cause full development not only for one generation, but for one or more generations beyond the one normally reached, and in this way may be explained the phenomenon that some species, which usually do not multiply without sexual intercourse occasionally produce parthenogenetic young, even in cases like *Sphinx ligustri*, *Bombyx mori*, &c., where it could scarcely be expected. It is remarkable that in most orders of insects the parthenogenetic progeny is usually male, but in the *Psychida* among Lepidoptera, helotoky, or the production of parthenogenetic females, alone takes place.

RETROSPECT OF A LEPIDOPTERIST for 1894.

By J. W. TUTT, F.E.S.

Another year has passed, and the time has arrived for another retrospect, another look into the internal workings of that strange human mixture which makes up "the entomological world." A strange mixture indeed it is, its units bound together by a common interest in the handiwork of Nature, which everywhere surrounds them.

What a great contrast has the year of grace 1894 presented to its predecessor. It is true that we had a glorious spring, a lovely month in March and April, when the luscious catkins of the sallow threw out their rich perfume into the clear bracing air, attracting crowds of flies by day, still greater crowds of moths by night; when thoughts of *Taeniocampa miniosa*, *Pachnobia leucographa*, and even *Dasycampa rubiginea*, mingled with the sweet scent of the cherry, while white pyramids of pear-tree snow loomed eerie-like in the approaching darkness or, to to be more exact, the lengthening twilight. Yes, those early days were delicious. But those early hopes of a successful entomological future were doomed, alas, in most cases to disappointment during the coming summer. No thought of failure, however, suggested itself then. What harvests were made at the sallows by those who worked them! What lovely *Brephos notha* gladdened the eyes of those who found its haunts in nooks where the aspens stood with their dark leafless trunks and waving boughs, black against the clear blue of those exquisitely delicious, early spring-summer days! But the warm south winds gave way to keen and biting blasts, and the hot spring sun was shaded behind never-ending banks of black, black clouds; the fruit-trees were soon denuded of their blossom; the early leaves were nipped and withered ere their beauty had begun. When, in June, the entomologist peeped into the woods, the vegetation appeared to be just as he had left it six weeks before; moths refused to emerge, and when, at last, a few warm days did come, the treacle-pot was found to be useless, for moths would not be attracted by those delicious feasts, seasoned with the most powerfully seductive aromas that human mind had yet devised to lead them to their doom. Not yet though had the consummate degradation of moth palate been achieved, that was so soon to be effectually brought about by the substitution of methylated spirit for the powerful rum which had hitherto been their most insidious moral foe. During all these dark days nothing occurred of importance, except the capture of a few *Pachetra leucophaea* on the North Downs, and *Hydrilla palustris* in Wicken Fen. The number caught shows that this latter insect cannot be so rare as is generally supposed, and if one dare to prophesy, one would suppose that in its chosen haunts it will be found to be moderately common when its habits are known. Much turns on this; there are but few insects that are really rare when once their habits are known. Then came the rain, and the good old British climate of which so much has been said and sung, was almost at its worst from an entomological point of view. Not quite at its worst, though, for suddenly, here and there, in far-distant places all over the country, the moths appeared to have awakened to the love of rum and jargonel, nay even to that of methylated spirit, mixed with their treacle. The eastern coast of Scotland was the first to feel the "sugar" wave, and thence it travelled south and west, and a few entomologists were happy again. Essex was revelling in *Agrotis obscura*, Portland in *A. pyrophila*, and still the Scotch coasts produced their thousands and tens of thousands of moths, and *Crymodes exulis* fell to the Shetland workers, whilst the yellow male of *Hepialus humuli* was taken as far south as Lanarkshire. Single specimens of *Pieris daplidice* were recorded from Margate and Addington, and a couple of *Sphinx pinastri* as being bred from larvæ found in Suffolk. Unfortunately the capture of odd specimens of our rare butterflies does not help science much, except as a reminder that a species occasionally attempts to spread and to carry on a precarious existence on the borderland of its geographical range. Then the rain came again, and field entomology in England was almost impossible, though the Scotch hills around Braemar resounded to exultant shouts, announcing the capture of some hundreds of that much-coveted Burnet moth, *Zygaena exulans*. We *do* want *Zygaena exulans* in our cabinets, but when a valued correspondent writes that he is "afraid the insect has been badly shaken this year," one knows only too well what this means, and feels pained that the desire of having leaves no happy mean between the taking of a small number for one's self and particular friends and the ruthlessness with which an insect in limited haunts and easily caught, is sometimes hunted down. I say this in all humility, and with a full knowledge of the pressure which collectors who must possess at any price put on the minds of those who can obtain our rarer species, and of having been a pleased participator oftentimes in the spoils of the chase. But *Zygaena exulans* was not the only species obtained in the Scotch mountains, whilst the Southron was in despair. *Crambus myellus, C. furcatellus, Stigmonota dorsana* and *Sesia scoliiformis*, were obtained in equal or greater abundance than before, and in spite of the high code of morals one has so recently been laying down, a still small voice whispers:—Oh! what must it have been to be there. *Crambus ericellus*, too, on the English side of the Cheviots, is a good record. Then the Southerners had a turn. In the south-western counties the butterfly hunters had (I almost regret to say) a successful search for *Lycaena arion*. Scientifically, the capture of a rare insect like this in England is a delusion. Not a word of its habits, or its life-history, do its ruthless destroyers tell us. It is obtained for the cabinet—that is all! A few *Plusia moneta* were captured and bred. The "Crimsons" came to sugar in the New Forest, and the rare *Tortrix piceana* was bred in considerable numbers. Then *Callimorpha hera* gladdened the eyes of Messrs. Jäger and Porritt in South Devon. But these were as oases in the great desert of despair. Taken all in all, entomologists were extremely wretched and unhappy; there was but little to catch, and as it is the nature of an Englishman to be dull and uncomfortable if he cannot "go out and kill something," the entomologist was dull and uncomfortable accordingly. And all the time the wretched rain rained and poured and soaked and drowned, and drowned and soaked and poured and rained again, and so it went on until August began to draw to a close, although in the meantime Professor Carlier had a struggle with a *Catocala fraxini*, with an oar. Then, when the changing tints of the leaves began to warn us that autumn was coming on apace, a change occurred. From almost all parts of the country the cry was heard, "sugar is paying." In the Isle of Wight, *Leucania albipuncta* to the tune of more than a dozen, *Laphygma exigua*, and lots of *Aporophyla australis* occurred with what was perhaps the best of all, a somewhat large second brood of *Caradrina ambigua*. At Brighton, also, *Leucania albipuncta* put in an appearance. In late autumn, appeared quite a bevy of *Tryphaena subsequa*, a month or even two beyond its usual date. Late *Colias edusa* began to appear, and occurred until well into October, whilst *Epunda lichenea*, and beautiful vars. of *E. lutulenta* were also taken. What grand series of this insect some of us now possess, and yet how rare it once was! A strange race of Scotch *Spilosoma menthastri*, in which the ochreous ground colour of var. *ochracea* is replaced by a brownish tint, was reared in Elgin, although neither the captor nor the possessors have given us a hint as to the probable reason of the increased tint. We have had one or two frights this year. Perhaps we were most affected by the startling news of almost a hundred specimens of *Plusia ni* having been caught and bred at Penzance. Fortunately the excess of zeal threw sufficient doubt on the captures, to prevent all but the most hardy participating in this marvellous haul. The other scare concerned *Catephia* *alchymista*, and this soon happily dissipated itself. *Sesia conopiformis* has been recorded as new to the British list, but as no one has yet verified the insect, its inclusion is perhaps as yet premature, whilst *Xanthia ocellaris*, has been added to the British list, on the strength of specimens captured the previous autumn and referred to this species. These few notes I think cover the chief points in our collecting season of 1894, so far as it concerns Macro-lepidoptera, a scanty and meagre account enough it must be confessed.

Among the smaller species but little is left to chronicle. The capture by Mr. Durrant of large numbers of *Steganoptycha pygmaeana*, and the regularity with which *S. subsequana* is now taken, are subjects for congratulation, and *Stigmonota dorsana* was again captured in the Braemar district; but, contrary to what used to be the case when the Macro men were so chary of recording, because of the possibility of their localities being visited by unwelcome strangers, and the exchange value thus ruthlessly let down, it is the Micro collectors now who have least to say about the work they do, and who hide their lights unnecessarily under a bushel. The addition of *Cataplectica farreni* to the British fauna has been recently alluded to in our pages, and Dr. Wood has kept up his reputation among the *Nepticulae* by describing a new species, mining in the leaves of birch which comes "painfully" near *N. lapponica*. This new species has been named *confusella*, a very happy term it would appear, and representing I do not doubt what must have been Dr Wood's, and will be many another lepidopterist's condition of mind, before he can hope successfully to separate it from its ally *lapponica*.

Let us now glance for a moment from the collectors and their collecting to the places where they most do congregate. The Entomological Society of London has been a little disturbed, owing to the meeting nights. It has been suggested that one meeting per month for ten months in the year is sufficient for the Fellows, but this does not find much favour among the most regular attendants. One feels, however, that some regularity of the meeting nights should be attempted; continual recourse to a card is not always convenient. A fair number of new Fellows have been enrolled, but not so many as the large number of provincial workers would warrant. We have now a much larger number of entomologists spread over the country than hitherto, and to many of these the subscription offers no bar, and we cannot help feeling that the many, who would help scientific entomology if they could, have as yet failed to understand that increased subscriptions mean increased bulk in the *Transactions* and better plates. For the same reason, the City of London and South London Entomological Societies appeal to provincial entomologists. These are centres of active scientific work, and one is grieved to see entomologists holding aloof from membership because they cannot attend the meetings. The *Transactions* have to be printed, and it is hard that the entomological public who directly or indirectly benefit by such societies should coolly ignore their general utility. Any provincial entomologist who, at any time will write to me or to the various secretaries about details of membership, will, at any rate, be sure of courteous attention. The City of London Entomological Society under the genial Presidency of Mr. J. A. Clark, has made for itself a very solid position in the entomological world. The tendency there to draw out and encourage the younger members has been crowned with success, and the able secretaries, who provide an excellent bill of fare for the members, have long since learned what a mistake it is to leave things to chance. The South London Entomological Society does good work, but has yet to issue a winter's card which shall attract that large and brilliant assemblage of entomological workers, which for a time eclipsed even the Entomological Society of London itself. This Society has a remarkable membership. The leading entomologists in all parts of the British Islands are included in its ranks; talent exists in plenty, then why is there no regular list of papers issued to attract the people who are ready to come? The present Secretaries have cleared off vast arrears of work; now they have the future to look to, for when all is said and done, the secretary of a society makes the society, to a large extent, what it is, and spells for it success or failure. As to the doings of our provincial societies, we are largely in the dark. Either most of them do not issue *Transactions* or we do not see them. Of the North London Society we hear occasionally, and understand that good work is done by young aspirants to literary and scientific fame—that it is indeed a nursery of men who will some day do great things. The Lancashire and Cheshire Society, under my good friend Mr. S. J. Capper, is a model family, but one wants to see those papers in print, of which one at present only reads the titles. An intelligent body of entomologists like this should not have their papers relegated to obscurity, or trust to chance publication in one or other of the Magazines. The Birmingham Society, too, with a remarkably strong contingent of workers, has never yet favoured us with a sight of its *Transactions*. We do not even know whether it issues any. The Cambridge Society is a little Sphinx-like, but we suppose that the constant flux of members into and out of the University, leaves no permanent basis to work on, but this is all the more reason why the leading residents (both belonging to the University and the town) should unite into a strong club, of which the undergraduates should only form the floating population. It should be within the bounds of practical politics, with men like Dr. Sharp, Mr. Bateson, Mr. Farren and others available. The Leicester Society has advanced beyond its neighbours, for it has printed its two "crack" papers. Let us hope the energetic secretary will continue to peg away until he gets the whole year's work into print. Of the Entomological branches of larger societies we learn nothing. We should be glad to see the *Transactions* of the Essex Field Club, the Derby (Burton-on-Trent) Society and others, but they never come to hand, and here I may add that any Philosophical or Scientific Society (British or Foreign) which publishes the papers read before it in the form of *Transactions*, is quite welcome to *The Entomologist's Record* in return for copies of its own work. May the Societies go on and prosper, is our most sincere wish! They are the centres of enlightenment and encouragement to younger workers; they ring the certain knell of the good old butterfly-catching days without science; they are the living witnesses of the dawn and progress of a new era in scientific life.

The scientific articles which have appeared, and which have certainly been more numerous than usual, are quite up to, if not beyond, the ordinary standard, and they are not so restricted as usual to a few workers. "The notes on the earlier stages of *Nepticulae*" (*E.M.M.*) by Dr. Wood, have been completed, whilst Mr. Bankes' able paper on "*Lita instabiliella*, and its nearest British allies," in the same magazine, is a worthy companion, rather more complete and exhaustive perhaps than Mr. C. G. Barrett's paper on "The British species of the genus *Psyche*, and its allies," which, however, is a very useful contribution to our scientific knowledge of the group. Mr. Louis B. Prout's papers "On *Coremia ferrugaria* and *C. unidentaria*" and "*Melanippe rivata* and *M. sociata*" (*Ent. Rec.*) show him to be a scientist of no mean order, with a thorough grasp of the differentiation of allied species. "*Erebia epiphron* and its named varieties" (*Ent. Record*) is another excellent synonymic study by Dr. Buckell, as also is his paper "On *Anosia archippus*," which shows into what errors the best of entomologists may fall. "*Zygaena exulans* and its named varieties" (*l.c.*) is an attempt to clear up a rather long-standing muddle. Dr. Riding's paper "On an additional method for detecting the species of certain lepidoptera" (*l.c.*) makes us desire to see more of the work of such an excellent observer. Mr. Hampson contributes a useful paper, which is open however to serious doubt, and almost solicits criticism, "On recent contributions to the classification of Lepidoptera, by Prof. J. H. Comstock and Dr. T. A. Chapman" (*Ann. and Mag. of Nat. Hist.*). Papers that cannot altogether be passed in silence are Capt. Thompson's, "The pronunciation and accentuation of Entomological names" (*Ent. Record*), and Mr. Bayne's "Notes on *Nyssia hispidaria*" (*l.c.*), a model of what a good field naturalist's notes and observations may be made to assume. Two papers to which reference has previously been made in these pages may again be referred to; these are the annual addresses delivered to the South London Ent. Soc. in 1892 and 1893, by Messrs. C. G. Barrett and J. Jenner Weir respectively; whilst Mr. W. E. Sharp's (the Vice President) address to the Lancashire and Cheshire Society, entitled "The New Entomology," is a good study of the philosophical bearings of our science. But among the minor constellations, who dabble in the philosophical aspect of entomology, three men stand out as giants among the crowd. These are Professor Poulton, Dr. Chapman and Dr. Dixey. We believe the former's work has this year been published in *The Proceedings of the Royal Society of London.* Dr. Chapman has given us only two or three short studies, "Some notes on the Micro-Lepidoptera whose larvæ are external feeders, and chiefly on the early stages of *Eriocephala calthella*" (*Trans. Ent. Soc. Lond.*); "The evolution of the lepidopterous pupa" (*Ent. Record*), and the completion of his observations on "The larvæ of *Arctia caia* (*l.c.*)" Dr. Dixey gave us an excellent paper "The phylogeny of the *Pierinae*, as illustrated by their wing-markings and geographical distribution" (*Trans. Ent. Soc. Lond.*), whilst following Mr. Merrifield's "Temperature experiments in 1893, on several species of *Vanessa* and other lepidoptera" (*l.c.*), Dr. Dixey gave us another excellent paper "On Mr. Merrifield's experiments in temperature variation, as bearing on theories of heredity" (*l.c.*). Neither can we afford to lose sight of Prof. Weismann's entomological references in the Romanes' lecture for 1894, a brochure which has already been reviewed in these columns, whilst another paper to be read is one by Mr. F. Gowland Hopkins, entitled "The pigments of the Pieridae: a contribution to the study of excretory substances which function in ornament" (*Proceedings Royal Society*), in which "the wing scales of the white *Pieridae* are shown to contain uric acid, this substance bearing the same relation to the scale as do the pigments in the coloured *Pieridae*, and therefore functioning practically as a white pigment. Mr. Kane's "List of the Lepidoptera of Ireland," drags on slowly in *The Entomologist*. It is a great mistake to publish such a useful paper as a magazine article.

Perhaps the most satisfactory sign is the almost entire absence of any really very stupid paper and of papers exhibiting gross ignorance. A few occur, however, perhaps the Editors are led into publishing these from kind-hearted and personal considerations, but their elimination should be absolute. We have to remember that our greatest foe is ignorance, and that an absolute error of fact may be injurious beyond the bound of measurement.

Of individual efforts I can say scarcely anything. Mr. C. G. Barrett's large work has now reached its 18th 5s. part, and has so far dealt with the butterflies and Sphingidæ. Mr. Bateson has published a book on the general subject of Variation, which I must confess I have not seen. I know of no other separate works, bearing directly or indirectly on British lepidoptera, published during the last twelve months, except a so-called popular work *Butterflies and moths* by Mr. Furneaux, F.R.G.S., which reaches almost the lowest depths to which such books can sink.

Such would appear to be the general summary of work done and progress made during the year now past. The year just commencing should inspire us with hope, and our united efforts will, I trust, show at least as good a record of scientific advance as the year which has so recently disappeared into the dim vista of the past.—*Dec.* 1894.

CURRENT NOTES.

In a recent number of a contemporary, Mr. Pool of Marchwood, states that on "Aug. 18th, about 6 p.m., whilst on the way with a friend to his potato patch, I was looking about the hedges for Coleoptera, when I caught sight of a specimen of *P. podalirius* settled on a twig. I very carefully secured it between my thumb and finger, and as I had only a laurel bottle and tubes with me, I had to return to the Magazine for a more suitable receptacle for such a prize. It was fortunate that the insect was not on the wing as I had no net with me." The specimen was almost certainly an escape. Thousands of pupæ of this species are imported from the Continent every year, and undoubtedly many imagines are set free. The true home of this species is in Central and Southern Europe, and it is not a migrant.

In the *Ent. Mo. Mag.* for December, is a notice by the Editors, "Congratulatory to John William Douglas, on the occasion of his 80th birthday, with the best wishes of his colleagues, in which they will be joined by a large number of friends. Nov. 15, 1894." Our readers will, we are sure, heartily concur in this tribute of respect to the veteran entomologist.

Mr. C. G. Barrett concludes, in the *E. M. M.*, his excellent paper on "The British species of the genus *Psyche* and its allies." Of *Fumea*, he writes:—"The easier plan would be to lump the majority of the species together, as Mr. Stainton has done under the name of *nitidella*," but he does not do this, and in fact, excludes the name *nitidella* altogether. Our British species appear to be:—*F. crassiorella*, "taken at Hornsey Wood and Bishop's Wood, Highgate." *F. intermediella*, "with a bright golden or bronzy gloss over its dark brown colour, well and generally known, its case being found on fences, palings, and tree trunks in woods all over a large portion of the country. It occurs also both in Scotland and Ireland." *F. roboricolella*, "colour darker, bronzy, blackish-brown, shot with purplish, not so smoothly glossy as in *F. intermediella*. Found on lichens on oak, pine, and birch trunks, sometimes on rocks." Reading, Leatherhead, Portland, Haslemere, Cannock Chase, South of Ireland are recorded localities. *F. betulina*, "in which the fore-wings are larger than in the two preceding; colour, very dark glistening bronzy-brown, smooth and opaque; has been taken in Bishop's Wood, Hampstead, Box Hill, Epping Forest, New Forest." *F. salicolella (salicicolella)*, "a curious little species, the fore-wings forming a long slender oval, and being shining brownish-black in colour; only one British specimen known, taken by Mr. E. G. Baldwin at Bishop's Wood, Hampstead. *F. tabulella*, with "a thick ovate case, which stands perpendicularly from the plane of its position." Mr. J. E. Fletcher, of Worcester, is the only British entomologist who appears to get it, and from a case obtained by him Mr. Stainton bred a moth which is in his collection. We should like to know whether reprints of this paper are obtainable.

Messrs. Deyrolle of Paris, are attempting to solve the question of "a perfect pin" for entomologists. Some years ago, Mr. Thurnall suggested in our pages a nickel pin, and this is what the French firm have produced. Their nickel pins are "not of absolutely pure nickel, but of an alloy, of which nickel is the principal component part."

Vision of Insects.—Mr. A. Mallack (*Proc. Roy. Soc. Lond.*, lv.) concludes from various observations and calculations that "Insects do not see well—at any rate, as regards their power of defining distant objects, and their behaviour favours this view. They have, however, an advantage over single-eyed animals in the fact that there is hardly any practical limit to the nearness of the objects they can examine. With a compound eye, the closer the animal the better the sight, for the greater will be the number of lenses employed to produce the impression. In the single eye, on the other hand, the focal length of the lens limits the distance at which a distinct view can be obtained. Of the various forms of insects examined, the best eye would give a picture about as good as if executed in rather coarse woodwork, and viewed at a distance of a foot."

VARIATION.

Variety of Agrotis segetum.—I captured this year what I presume to be a variety of *A. segetum*, although the form is quite new to me. It is of silvery light French-grey tone, and has, practically, no markings on the fore-wings beyond a very slight trace of the claviform. I took the specimen on the N.E. coast of Ireland.—Cecil Thornhill, The Lodge, Annagassan, Dunleer, Ireland. *Nov. 2nd*, 1894.

Dicranura bifida ab. aurata: New var.—On June 27th, 1894, I bred a very remarkable aberration of *D. bifida*. It is a male in which the ground colour is as white as in *D. bicuspis*; the central band is also broken as in the latter species, and, instead of being grey, is, as well as the apical spot, of a bright golden yellow. I found the eggs, from which this aberration was reared, on *Populus niger* in the spring of

1893. I propose to call it ab. *aurata*. From the ground colour, as well as the broken band, it might be almost a distinct species.—F. B. Newnham, Church Stretton, Salop. *Dec. 3rd*, 1894.

Colias edusa var. helice at Clifton.—As records of the occurrence of *Colias edusa* during the past season have been few and far between, it may be of interest to note that a fine specimen of the var. *helice* was captured by Mr. G. C. Thompson on Clifton Down, on 29th September. In Mr. Hudd's *List of the Lepidoptera of the Bristol District* (1877), this variety is mentioned as "not recorded from Gloucestershire," and I am not aware of any capture in this district since the publication of the list until the one above noted.—Geo. C. Griffiths, 43, Caledonia Place, Clifton. *Nov. 29th*, 1894.

NOTES ON COLLECTING, Etc.

Notes of the Season of 1894.

Short notes from the exchange baskets.—Mr. W. F. de V. Kane (Monaghan) writes on September 10th:—"When I last wrote (from Kerry), the improvement in the weather was just commencing to show results. I had a week or ten days' good sport in the hunting grounds within ten miles radius of Kenmare. But, with the exception of *Agrotis exclamationis*, I cannot say that I saw any crowds of moths at sugar. I took a few good things in scanty numbers, but failed to get *Notodonta bicolor*. I however took *Stauropus fagi* (the second Irish specimen). *Erastria fasciana* was locally plentiful, as also was *Euthemonia russula*, but I did not meet with *Hydrelia uncula* or *Bankia argentula*. I think that this season the *Agrotidae* have been as numerous as usual, but arboreal feeders have suffered from the inclement weather."——Dr. Riding (Honiton) writes on Sept. 22nd:—"Capt. Robertson writes of the slow growth of sleeved larvæ this season. I had noticed the same fact here, with *Moma orion*, *Smerinthus tiliae*. *Cidaria silaceata*, *Eugonia fuscantaria*, *Spilosoma lubricipeda*, &c.; indeed, those kept in cages indoors throve much better, fed up more rapidly, and with less mortality. *E. fuscantaria* did worse than the others; indeed, some of the larvæ were still feeding at the beginning of this month, and those that pupated produced a much larger proportion of crippled imagines than usual. I think with him, too, that the abundance of birds and insects is in an inverse ratio in my locality. I have always thought this one cause of our small bags in Devonshire. The autumn moths are late in appearance in the breeding-cages. *Hoporina croceago* and *Xanthia aurago* are only just beginning to emerge—five or six weeks later than last year."——Mr. Moberly (Southampton) writes on Sept. 23rd:—"At Wicken, in the third week of July, insects were not to be found in such quantities as is usually the case. *Helotropha leucostigma* was plentiful, but the commoner insects, such as *Agrotis segetum*, *A. nigricans*, *Tryphaena pronuba*, &c. did not crowd on the sugar, indeed, there never was a crowd of moths to be seen. *Agrotis obscura* was taken in about the usual numbers. At Freshwater, the week after, where last year *Agrotis puta* was swarming, there was literally nothing. For three weeks in August I was near Romsey. In the garden, last year, I took *Tryphaena subsequa* and *Noctua rhomboidea*, whilst *A. segetum*, *N. c-nigrum*, and other commoners were there in plenty, and in the woods, in addition, were many *N. dahlii*. This year the only insects I saw in the garden were *Hydroecia nictitans*, *Boarmia rhomboidaria* and *Hepialus lupulinus*. Five nights sugaring in the woods (one with the Rev. G. M. A. Hewett), produced five *Amphipyra pyramidea*, and nothing more. So much for imagines. Larva-beating has been equally unproductive. Can anyone tell me how to deal with *Taeniocampa miniosa* in its *final* stage as a larva? I had several dozen of them this year bred from ova, and I have sent many more dozens to correspondents, but I find that nearly all our larvæ have shared the same fate. Just before pupating they die off on the surface of the earth or among the leaves of the food-plant, going off in the eleventh or twelfth segment, which have the appearance of having been sharply nipped. They had abundance of good food and plenty of room and air. They have been taken in all stages in the New Forest by Tate, who has had exactly the same experience with his larvæ. I should be glad to know how this might be avoided?"——— Mr. A. Adie Dalglish (Glasgow) writes on Oct. 19th:—"Insects are still scarce in this district; I paid a visit to Milngavie one Saturday afternoon in September with the intention of obtaining larvæ of *Eupithecia helveticata*, and after three hours' hard work beating junipers I returned home with about a dozen larvæ. Last year, I took nearly double that number in half the time. *Phibalapteryx lapidata* has been discovered in the South of Scotland this year, and a good number have been taken. I obtained a nice series in the autumn holiday."———Capt. Robertson (Coxhorne) writes on Oct. 20th:—"Entomology is still a failure here, nothing comes to light or ivy. The only insects I have seen lately are crowds of *Oporabia dilutata*, which are very common near here, and which fly around the oak trees when one is shooting in the woods."———Mr. W. Christy (Emsworth) writes on Oct. 29th:—"In the exhibition box I have put a *Notodonta trepida*, with scalloped hind-wings, together with a normal one for comparison. The scalloped specimen is one of several that I bred of the same shape, but this one is the most curious. It came out with others in late November and early December in an open-air temperature. The pupæ had been forced during the previous winter, and had been turned out into the open air in the early summer they having refused to come out by forcing. They were inbred once, the parents had lain in pupa for two years."———Rev. E. C. Dobrée Fox (Castle Moreton) writes on Nov. 1st:—"I captured a fair number of *Cidaria miata* in its old haunts in a friend's house."——— Mr. Williamson (Slough) writes on Nov. 5th:—"I found larvæ plentiful during the late autumn, but very little on the wing or at sugar."———Mr. A. Robinson (9, Red Hill, Chiselhurst) writes on Nov. 19th:—"I have always been told that black treacle is much better than golden syrup for treacling, but this year I tried both on the same nights, and the moths certainly seemed to prefer the latter. Perhaps my black treacle was not of the proper kind, but it certainly was black, and was similar in taste to the correct article. I got very little, however, at treacle. The moths were late in coming out, and there were none but common species about. I received a few days since, by post, some insects pinned into some material nailed to the bottom of a cigar box. It held the pins very tightly (much more so than cork), and at the same time the pins appeared to penetrate it easily. On enquiry, I was informed that the material is a kind of linoleum floor-cloth, and my informant says, 'It is much better than cork, you never come across a hard or soft spot in it, and the pins will not come out unless well pulled.' It certainly seems deserving of further trial."——The Rev. C. R. N. Burrows (Rainham) writes on Nov. 23rd:—"There is now very little to record. The extremely mild weather is encouraging; the winter lepidoptera seem to enjoy their brief lives, and as I cycle home on Wednesday evenings my path seems sometimes beset with males of *Cheimatobia brumata*. *Poecilocampa populi* I have not seen this year, but I was somewhat surprised to see a good specimen of *Plusia gamma* at sugar a fortnight ago."—Mr. Finlay (Morpeth) writes on Nov. 24th:—"On Nov. 17th I took over forty pairs of *Cheimatobia boreata*, which were *in cop.*, hanging on the stems of rushes, or on the small leafless branches of birch: also a few *Hybernia defoliaria*, *H. aurantiaria*, *Himera pennaria* and *Peronea autumnana*."

Castle Cary, Somerset.—The season here has been very unproductive as regards Lepidoptera. *Hecatera serena*, *Aplecta adrena* and *Eupithecia venosata*, came in fair numbers to the flowers of *Silene inflata* in June. *Ephippiphora turbidana* appeared on June 16th, flying sluggishly among butter-bur. I found *Mesotype virgata* plentiful in July, on the sandhills at Burnham. *Glyphipteryx equitella* came freely to yellow stone-crop in my garden, in 1892 and 1893; but, as the food-plant had been destroyed, I only saw one specimen this year (on July 20th), in a window of my house. *Eubolia cervinata* came to light on October 4th, and *Diloba caeruleocephala* on November 3rd. Ivy, owing to the wet weather, has attracted but little; *Orrhodia spadicea* and *Phlogophora meticulosa* are the most abundant species. Wasps are still seen.—W. MACMILLAN. *Nov. 18th, 1894.*

SOCIETIES.

The ENTOMOLOGICAL SOCIETY OF LONDON met on Nov. 7th. Colonel Swinhoe exhibited a female of *Papilo telearchus*, Hewitson, which he had received by the last mail from Cherra Punji. He said that this was the only known specimen of the female of this species, with the exception of one in Mr. L. de Nicéville's collection, and which he had described in the *Journal of the Bombay Natural History Society* of 1893. He also exhibited a male of the same species for comparison. Herr Jacoby exhibited two specimens of *Blaps mucronatus*, with soft elytra, taken on a wall at Hampstead. Mr. H. Goss exhibited a specimen of *Periplaneta australasiae*, received from Mr. C. E. Morris, of Preston, near Brighton. Mr. McLachlan said the species had been introduced into this country, but was now considered a British insect. Mr. McLachlan exhibited for Mr. G. C. Bignell, of Plymouth, two new species of Ichneumonidæ, from Devonshire, *viz.*, *Pimpla bridgmani*, Bign., a parasite on a spider, *Drassus lapidicolens*, Walck., and *Praon absinthii*, Bign., a parasite on *Siphonophora absinthii*, Linn. Mr. C. O. Waterhouse stated that the *Acridium* received from Capt. Montgomery, and exhibited by Mr. Goss at the last meeting, was *Acridium septemfasciatum*. Mr. Ridley made some remarks on *Formica smaragdina*, which makes its nest on the trees, joining the leaves together by a thin thread of silk at the ends. The first step in making the nest is for several ants to bend the leaves together and hold on with their hind legs, and one of their number after some time runs up with a larva and irritating it with its antennæ makes it produce a thread with which the leaves are joined; when one larva is exhausted a second is fetched, and the process is repeated.——At the meeting on Dec. 5th, Mr. F. Merrifield exhibited hybrids belonging to the genus *Saturnia*, obtained by Dr. Standfuss, of Zürich; *viz.*, a male and female hybrid from a male of *Saturnia pavonia* and a female of *Saturnia pyri*, to which he had given the name of *Saturnia emiliae*; also a mongrel form from what Dr. Standfuss describes as "a male of *Callimorpha dominula* var. *persona*" (received from Tuscany) and a typical female of *Callimorpha dominula*, to which he had given the name of *romanovi*. Mr. Merrifield remarked that the so-called var. *persona* differed entirely from the type of *Callimorpha dominula*. Mr. J. W. Tutt exhibited and read notes on specimens of a very small form of *Euchloë*, taken in Shropshire by the Rev. F. B. Newnham, which that gentleman thought was distinct from *E. cardamines*. He pointed out that it was much smaller than the latter species, and that the discoidal spot was placed as in *E. turritis* and *E. gruneri* at the juncture of the orange and white spaces, and not as in *E. cardamines*, well within the orange tip. Mr. Tutt also exhibited and read notes on specimens of *Noctua dahlii*, from Cheshire (captured by Mr. G. O. Day), Essex, Yorkshire, Aberdeenshire and other counties. The variation in the specimens was said to be due partly to sexual dimorphism, and partly to their geographical distribution. Herr Jacoby read a letter received from Mr. Buxton Forman, one of the Assistant Secretaries of the Post Office, to the effect that the Postal Union had decided to make a rule not to admit natural history specimens by sample post, and consequently that the forwarding of such specimens at the sample rate would in future be irregular. Lord Walsingham stated that he had a long correspondence with the Post Office authorities on the subject, and that the late Mr. Raikes, when Postmaster-General, promised him in 1891 that such specimens should, so far as the British Post Office was concerned, be transmitted at the sample rates; and a letter to the same effect, from the late Sir Arthur Blackwood, when Secretary to the Post Office, was published in the proceedings of the Society for 1891. Mr. C. G. Barrett exhibited, for Mr. A. J. Hodges, a specimen of *Hydrilla palustris*, from Wicken Fen; also specimens of *Caradrina ambigua*, from the Isle of Wight. He remarked that of the latter, one specimen has the hind margin of right forewing indented, and the wing broadened as though from an injury to the pupa; in this wing the margins of the large orbicular and reniform stigmata had become so joined that the dividing lines had disappeared, and the stigmata were fused into one irregularly formed blotch. Mr. McLachlan exhibited, on behalf of Mr. G. F. Wilson, F.R.S., of Weybridge, a "grease band" which had been tied round trees to prevent the females of *Cheimatobia brumata* from ascending the trunks for the purposes of oviposition; the band was thickly covered with the bodies of females, together with a few males. Surgeon-Captain Manders exhibited a pair of *Chelura bifasciata*, from the Shan States, and called attention to the "assembling" habits of the males, some hundreds of which were attracted by the numerous females which emerged from the cocoons at sunset. Mr. B. A. Bower exhibited a beautiful variety of *Zygaena lonicerae*, having the spots confluent, taken at Chattenden Wood, North Kent, in June last; also a specimen of *Incurvaria tenuicornis*, taken at Chislehurst, in May, 1893. Mr. H. Goss exhibited, for Mr. F. W. Urich of Trinidad, a series of males, females, and workers of *Sericomyrmex opacus*, Mayr, a species of Fungus-growing and Fungus-eating Ant.

At the meeting of the South London Entomological and Natural History Society, on Nov. 8th, 1894, Mr. H. Moore exhibited a turnip, the rootlets of which were extensively clubbed by the action of a fungus (*Plasmodiophora brassica*). Mr. Fremlin: a varied series of *Emydia cribrum* from the New Forest; also a series of *Dasycampa rubiginea* from Berks. Mr. C. A. Briggs: varieties of *Lycaena bellargus* from Kent (a) with the black spots on the underside much elongated (b) with most of the black spots absent on the underside (c) with a considerable increase in size of all the paler markings on the underside. Mr. Trenerry: a light variety of *Chrysophanus phloeas* from North Cornwall. Mr. Manger: a very large *Pyrameis cardui*, in the unusually fine band of which was a white spot. Mr. R. Adkin: bred series of *Dicranura bifida* from Bucks, and of *D. furcula* from Hants; he said that he could not discover any of the more prominent markings that were sufficiently constant to be relied upon for differentiating these two species, and that it was therefore a difficult matter for him to identify all examples with certainty; nevertheless, the general appearance enabled him to pick out each species, although he could not describe by what means he did so; he suggested that the case was parallel with that of *Acronycta psi* and *A. tridens*.———*Nov. 22nd.*—Mr. Barrett exhibited (for Mr. Sydney Webb) a grand series of varieties of *Arctia villica*, ranging from a specimen with very few black markings, to one almost wholly suffused with black; also (for Major Still), specimens taken on Dartmoor this year, illustrating the apparent influence of the extreme humidity of the season; among them was a black *Plusia gamma* a deep-toned *Cidaria siterata*, with a green marginal border on the hind wing, a much suffused black form of *Chrysophanus phloeas*, and dark vars of *Pararge egeria* and *P. megaera*. Mr. R. Adkin (for Mr. R. E. Dillon): a number of Irish Lepidoptera, including *Taeniocampa gothica* var. *gothicina*, a red var. of *T. gracilis*, a dark *Aplecta nebulosa*, and an almost black *Boarmia repandata*. Mr. Fremlin: a fine specimen of *Chaerocampa celerio*, captured at the South Foreland lighthouse, on Aug. 12th, 1894. Mr. Mansbridge: a female *Selenia bilunaria*, in which only the central band was developed. In connection with a statement made by Mr. Adkin to the effect that *Hipparchia semele* after settling on stony patches and similar spots, often rapidly sought the shelter of the surrounding herbage, Mr. Tutt mentioned that, in order to conceal itself, *Erebia tyndarus* drops down, falls over sideways, and wriggles along the cow-paths of the high Alps, until it reaches some overhanging tuft of grass, under which it rests.

The Birmingham Entomological Society is notable for the number of students of other orders than the favourite Lepidoptera and Coleoptera who take part in its meetings. The meeting on Oct. 15th was almost entirely occupied with exhibits by them as follows:—Mr. R. C. Bradley: Aculeate Hymenoptera from the New Forest, including *Pompilus spissus* and *Myrmosa melanocephala*. Mr. A. H. Martineau: a few insects taken at Nevin, N. Wales, in September; three specimens of *Syrphus annulipes*, the species which was introduced to the British list by Mr. Wainwright on the strength of a single specimen taken by him on the Cotswolds in June last (*vide*, vol. v., p. 155); *Arctophila mussitans*, which Mr. Martineau stated he had had great difficulty in distinguishing, when on the wing, from *Bombus muscorum*. Mr. A. W.

Walker: insects collected this summer at Morthoe and Woolacombe, in Devonshire, among others being *Epeolus rufipes*; also *Psithyrus vestalis*, from Trench Wood. Mr. Bethune Baker remarked upon the unusual abundance of *Syrphidae* in his garden this autumn; Mr. Wainwright had had the same experience, *Syrphus balteatus* and *S. corollae* being specially plentiful; Mr. Bradley testified to the same fact, and said that *S. selenitica*, which he had never seen in the district before, had been quite common this autumn in Sutton Park. Mr. W. Harrison had succeeded in breeding *Trochilium apiformis* from larvæ obtained at Artey, in April last; he had on several previous occasions obtained larvæ in the autumn, but had not been successful in rearing them; he had found the larvæ taken in April, after hybernation, much easier to rear.

City of London Entomological and Natural History Society.—*Oct. 16th*, 1894.—Exhibits:—Mr. Battley: a drawer containing most of his *Agrotidae*; also a copy of "The Photogram," having as a supplement a plate of colour photo-prints of *Chelonia caia*, *Vanessa io* and *V. atalanta*, the likeness to the originals being extremely good. Dr. Buckell: a ♀ *Epinephele ianira* and a ♀ *Satyrus semele*, both captured at Folkestone Warren, on September 2nd, last; the specimens were in perfect condition, and he raised the question as to whether the *ianira* was part of a second brood, or whether that species continued to emerge over a period of two months. Mr. Bate: a specimen of *Arctia fuliginosa*, bred from a ♀ taken at the end of June, the rest of the brood being still feeding. Dr. Dudgeon: a young slow-worm (*Anguis fragilis*) and its mother; the latter was captured at Herne Bay, and the young one was one of a brood of five; it was about five weeks old and very snaky-looking, being longitudinally striped with pale yellow. Mr. Clark: *Zeuzera pyrina* from London Fields. Mr. Southey: a long series of *Xylophasia scolopacina* from Highgate Woods, bred by himself, and preserved larvæ and ichneumons of the same. Mr. Smith: *Scodiona belgiaria* and *Asphalia ridens* from the New Forest. Mr. Bacot: a series of *Bombyx trifolii*, sembled near Liverpool; he remarked that the species did not seem to be very closely allied to any of its congeners, most of which he exhibited with their preserved larvæ. Mr. F. J. Robinson, of Brixton: an androgynous specimen of *Crocallis elinguaria*, bred from the New Forest. The antenna and wings on one side were distinctly male, and on the other side, female. Capt. Thompson, on behalf of Mr. Mutch of Hornsey: a series of *Agrotis cursoria* from Morayshire, N.B. He also exhibited series of *Agrotis vestigialis* from Co. Sligo and Pembrokeshire, and *Melitaea aurinia* from Co. Sligo; also an unset series of *Dasypolia templi*, taken at light by Mr. E. Halliday at Halifax, where he found them common, having obtained eighteen in this way. Mr. Bayne: *Hydrelia uncula*, *Tholomiges turfosalis*, *Hypenodes costaestrigalis*, and others from the New Forest; he reported the capture of both sexes of *Hybernia defoliaria* at Epping Forest, early in the month. Mr. Pearson: an onion stem, having about half-way up a small onion, which had begun to grow in that position, when the seeds had commenced to develop. Mr. Tutt: *Emydia cribrum* from the New Forest, and for comparison its var. *candida*, taken by himself and Dr. Chapman, near Courmayeur, on the Italian side of Mont Blanc. Mr. Prout: *Tryphaena subsequa*, from Sandown and the New Forest; also *Noctua c-nigrum*, *Aporophyla australis* (with dark vars.) and *Caradrina ambigua*, from Sandown. Mr. Prout read the following notes:—

On Caradrina ambigua from Sandown.—"As the species exhibited to-night has already been recorded as *C. superstes*, it seems desirable to say a few words in explanation of my present announcement of it as *C. ambigua*. I am inclined to doubt whether our two British forms, that have been hitherto supposed to be, the one *C. ambigua*, and the other *C. superstes*, are distinct, indeed from what has come under my notice I feel sure they are not. It will be remembered that Mr. Tutt in 1889 (*Entom.*, vol. xxii., p. 235), recorded the Isle of Wight specimens as *C. ambigua*, but in 1891 (*Brit. Noct.*, vol. i., p. 148) he introduced *C. superstes* as also British, and referred the Freshwater specimens to the latter species. Looking at Herrich-Schaeffer's figures last Saturday, I felt no doubt that the insect I had taken at Sandown, and had received from Mr. Hodges from Guernsey, was the one there figured under the name *plantaginis* = *ambigua*; but, in order to get further light on the subject, I, this morning, visited the Natural History Museum, and examined the specimens from Zeller and Frey, which are in the collection there. These agreed with the testimony of Herrich-Schaeffer and all the other Continental authors, in that the more testaceous species was labelled *C. ambigua*, the more ochreous one *C. superstes*—exactly reversing Mr. Tutt's differentiation (*Ent. Rec.*, vol. iv., pp. 98-9). But *C. superstes* has the stigmata and the rows of transverse spots darker than in the figure (*l.c.*, No. 2, pl. c, fig. 4), of Mr. Tutt's Deal example, so that I suspect that even that is only a variety of the Continental *ambigua*. The true *C. superstes* has also a very distinct row of black spots on the margin of the fore-wing. Another little point that is not without significance is, that Fuchs, who knew both species well, and had reared *C. superstes* from the egg, says (*Stett. ent. Zeit.*, vol. xlv., pp. 261, *et seq.*) that *C. superstes* is single-brooded, and occurs contemporaneously with *C. taraxaci* in July, being worn by the middle of August, while *C. ambigua* is double-brooded, the 2nd brood being about from August 20th, on into September. This latter date agrees accurately with the time of appearance of most of our British examples."

Mr. Tutt, after referring to the original articles in the *British Noctuæ and their Varieties*, said that Mr. Prout's statement as to the more ochreous species being *C. superstes* and the greyer one *C. ambigua* was perfectly correct, and that this differentiation agreed with that in the *British Noctuæ*, &c., Vol. i.; the names were transposed in the Plate (c), and also in the short account of the species (*Ent. Rec.*, iv., pp. 98-9). It was, of course, quite possible that Mr. Prout might be correct in uniting the two forms, but without going fully into the matter, he did not think the two forms as described in *The British Noctuæ*, &c., were other than two distinct species, nor did he much doubt but that they were identical with the two European species. The matter, however, would have to be looked into. One thing was evident, and that was, that on the differentiation of the species, as proved by the original type description in *The British Noctuæ*, the Guernsey specimens which had been captured, and most (probably all) of the Isle of Wight specimens, were *Caradrina ambigua*.

The Rev. C. R. N. Burrows of Rainham, then read the following paper:—(See vol. v., p. 281).

Mr. Tutt proposed a hearty vote of thanks to Mr. Burrows for his paper. He stated that, strangely enough, the first specimen of *Agrotis obscura* he saw on sugar, almost deluded him into the belief that the insect was *Noctua augur*. The longitudinal streaking near the outer margin of the wing seemed to be quite a general (although rare) character among some Agrotids. Referring to the unusual variation that Mr. Burrows had found in *Agrotis exclamationis* this year, he remarked that excessive variation in this species appeared to be somewhat connected with meteorological conditions (probably extreme wetness), as he found the species to vary remarkably in the wet and cold summer of 1888. The peculiar aberrations in shape which frequently occur in this genus had previously been discussed, and malformations appeared to be not uncommon in many Agrotid species. *Xylophasia scolopacina*, as seen in Mr. Southey's exhibit, had a mottled form exactly parallel with *X. hepatica* var. *characterea*. Visitors at sugar, who appeared as poachers, were now a rather numerous family—mice, toads, frogs, &c. The series of *Agrotis nigricans* exhibited, was a very fine one, and illustrated well the range of variation which a polymorphic species could attain in a single season in a given locality. The vote of thanks was carried by acclamation.

Nov. 6th, 1894.—Exhibits:—Mr. Nicholson: a series of five ♂ and four ♀ *Trichiura crataegi*, bred from twenty larvæ, beaten from blackthorn in Epping Forest; the remaining eleven were either cripples, or were sacrificed for ova, of which he obtained about 200. Mr. Clark: a brownish specimen of *Vanessa urticae* from Tottenham. Mr. Bate: *Boarmia repandata* var. *conversaria*, and a fine banded form of *Oporabia dilutata*, from the New Forest. Mr. Bacot: *Colias electra* and var., from S. Africa, with *C. edusa* for comparison; the variety closely resembled *C. edusa* var. *helice*, but was much suffused with blackish. He also exhibited 84 specimens of *Orrhodia vaccinii*, which varied a good deal in colour though the female parent (also in the box) was of a uniform purplish-brown. Mr. Southey: some very fine specimens of *Acheta domestica*, the house-spider, one of which had legs measuring about 2½ inches in length. Mr. Tutt: a box of Lepidoptera (mostly Rhopalocera) from Grésy, near Aix-les-Bains, representative of those caught during a stroll on the morning of Aug. 21st, and comprising among others *Satyrus dryas* (both sexes), *Hipparchia arethusa* exhibiting considerable variation in the depth of the orange colour and extent of the transverse band, *Colias edusa*, *C. hyale*, second brood of *Leucophasia sinapis*, *Pieris daplidice*, *Argynnis latona*, *Melitaea cinxia*, *M. athalia*, *Lycaena argiades*, *L. bellargus*, *L. corydon*, *Satyrus briseis*, with a fine male variety of the latter, which the central band was much restricted and clouded with fuscous, in together with many other species. He exhibited also *Zygaena carniolica*, and vars. from Courmayeur and other localities in Savoy and Piedmont, on which he read notes relative to their habits and variation. Dr. Sequeira exhibited samples of wood naphtha, and Mr. Clark applied some to the bases of the wings of a dry specimen of *Spilosoma lubricipeda*, with the result that in less than five minutes, the specimen was sufficiently relaxed to allow of its being reset. Dr. Sequeira extols the virtues of the spirit thus:—

A RHYME OF RELAXATION.

It's bother'd many an Ento' when he's had a valued moth,
With wings set unsymmetric'ly, how best to get them both
As even as a plumb-line, without the laurel jar
Or sand that's wet and mucky—too troublesome by far.

I'll give you my experience of something new and strange,
That's said to do just all you want, within a certain range.
You get some *pure* Wood Naphtha—"syn" Pyroxylic Spirit,
And then you get a tiny brush and dip the end within it.
You next take up your lovely moth by the pin that's through his chest,
And turn him straightway upside down, and so expose his breast;
Most carefully the brush apply, unto each shoulder joint,
Let it soak in, for minutes three, the parts that you anoint.
You now must take the little moth, and pin him straight and smooth
Upon a proper setting board, the body in the groove.
Then, with a needle fine and curved, you raise his little wing;
You'll find it move quite easily, you'll say it's just the thing.
'Tis best to put a bristle on while you are at the work,
And last of all you brace it down—the wing will never shirk.
When four and twenty hours have passed, you take it off the board
And place it in your cabinet, its symmetry restored.
I've tried it on *Pronuba*, that was very old and dry,
And *Polyodon* also, whose wings were all awry;
And now they shine resplendent, with wings both straight and true,
I hope that these instructions will act the same with you.
But whether unset specimens will answer in this way,
I really cannot tell you, and history doesn't say.

EDITORIAL NOTICE.

The large amount of material in hand, some of which has been standing over for several months, will necessitate an alteration in our mode of publication. Vol. vi. will, like its predecessors, consist of 12 numbers, but these will be published as follows:—January 15th, February 1st and 15th, March 1st and 15th, April 1st and 15th, May 1st and 15th, June 15th, July 15th, August 15th. By this means alone will it be possible to work off the large accumulation of papers in our possession. It is impossible to do without the "Notes on Collecting" and the "Current Notes," which are such a distinctive feature of our magazine. The reports of Societies are now carefully edited, and all mere notices of exhibits without any useful information attached to them are omitted; we also decline all papers which are to appear in other magazines. We feel, however, that "Notes on Collecting," "Current Notes," and "Reports of Societies" lose much of their value unless they are quite up to date, and this has been impossible of attainment under our previous conditions of publication. The magazine, too, has become so largely the recognized medium of exchange, that collectors will undoubtedly feel it a boon to be able to offer their duplicates more frequently than has been possible in the past. Should our subscription list continue to show the steady increase which has characterised it during the last two years, we hope to make a reduction in the subscription for succeeding volumes. The subscription for Vol. vi. will, however, remain at six shillings, and should be forwarded to Mr. H. E. Page, 14, Nettleton Road, New Cross, the official connection of Mr. A. J. Hodges with the magazine having ceased with 1894.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

No. 2. Vol. VI. February 1st, 1895.

A Day's Pupa-Hunting in October.

By J. W. TUTT, F.E.S.

A soft south-east wind, a warm orange glow in the east before the sun breaks through the distant early-morning haze, are signs not to be neglected by the entomologist on pupa-digging intent, when the usually dull days of late autumn are actually here.

The trees are getting bare now, but the birch still hangs out its yellow leaves, whilst the brilliant autumn tints clothe the bramble with tiny flames of scarlet, the oak with a thick rich dress of gold. The sun's rays are cheerful, and chequer the green sward with the shadows of elm and birch, of beech and oak, or with the shadows of the more thickly-set bushes which run by the fields yonder. Beneath the feet the turf is springy, and not so wet as might have been expected from the recent heavy rains, whilst the murmuring brook runs noisily, bearing a rich supply of mud to the low levels in its now swift current, whilst yonder pool reflects the sunlight, and forms a clear mirror of purest gold.

With trowel in hand, the entomologist sets off across the fields; not to the woodlands, where the close-growing trees will yield but little reward for his labour, but to the single trees by hedgerow or in park, where he is sure of a rich harvest. An ash-tree attracts him. Only a few straggling leaves are left, but he walks up to it, lays down his trowel and boxes, and carefully passes his hand over the cracks in the lichen- or moss-covered trunk. A hard knotty lump is felt, with care the lichen is picked off, a strong chisel called into requisition, the knot secured, and he has scored his first pupa of *Bisulcia ligustri*. It takes him some time to complete that anxious search, but at last he is satisfied, and then proceeds to scrape away the turf and to feel carefully on the surface of the ground in all those strange little angles which a tree-root makes where it enters the ground. All the rubbish is passed through the fingers, and presently, a hard little mass, spun up in dead leaves with a few strands of silk, is brought to light. Then, in the protected nooks around the roots, the soil is turned over, but evidently there is not much here. Away to yonder oak, where the nooks and angles are legion. Diligently the fingers work round the line where the tree meets the earth; with delicate touch each cranny is carefully searched, and then the trowel is slipped down by the side of the tree, and the friable earth is slowly turned over. Through the fingers the earth is passed. Little solid lumps of earth, not larger than good-sized peas, are one by one picked out and put by. They are probably only the cocoons of *Cheimatobia brumata*, but the sanguine lepidopterist always hopes they may be something better. A smoothly rounded bit of earth shows the inside of a broken cocoon, and as the tree is worked round others appear, and, as the earth is passed through the fingers, the contents of the box are increased again and again by the brown Tænocampid pupæ. What marvellous variations these Tæniocamps show! Yes, they are common enough as species, but some of the varieties are exceedingly rare. One of the pupæ is accidentally broken. There, snugly coiled inside, is the fully-formed moth, the wings covered with scales, and we know that its relatives are only waiting for the cold winter days to pass, and the first warm breath of spring to bring out the luscious catkins of willow and sallow, when they will emerge from their snug retreats and bring joy to the hearts of many an entomologist who goes in search of them. The larger pupæ yonder are probably those of *Phalera bucephala*, whilst the blunter black ones are *Notodonta chaonia* or *N. trimacula*—one scarcely knows which.

The smooth trunk of the birch next attracts attention. No crannies here, but the eager eye scans every mark with intent and careful gaze. A sudden move forward occurs again and again, the chisel is brought into requisition, but the searcher is doomed to disappointment, and *Cerura bicuspis* remains undiscovered. It is there, though. That nicely curved depression in the smooth bark has been taken possession of; the little particles of wood and silver skin are combined so exquisitely by the hard glue-like saliva, the depression is so exactly filled up, that not the slightest inequality of surface remains. The hand is passed over the spot again and again, but no inequality is noticed; but in the spring may-be, you will see a tiny hole in the trunk exposing the inside of that snug retreat, and you will know that an eye, keener than your own, followed in your wake, and that, instead of *Cerura bicuspis* becoming an object of admiration to you and an object of envy to your friends, it has formed a small portion of a day's meal to a passing woodpecker, who, probably, has obtained more than that one *bicuspis* pupa, as a part of his morning's breakfast. But you may be lucky. Some people are—or, perhaps, they are more persevering. However, let us say it's luck, and remember the old proverb that "it's better to be born lucky than rich." I firmly believe it's luck, for I have never found *bicuspis* pupæ, and some of my friends have. Among the rubbish at the foot of the birch tree, spun up among the loose sticks and dead leaves, many pupæ are waiting for the diligent searcher, and round its roots are to be found, sometimes, a marvellous hoard. Notodontas—does not *bicolor* feed on birch? and does not *Endromis versicolor* pupate in its leaves? Do not numberless Geometræ and not a few Noctuæ almost defoliate them in some seasons? Yes, a rich harvest is often to be found here.

To yon elm-tree we now wend our way. A large hole in the trunk, some six or eight feet from the ground, filled with the collected dead leaves of scores of years, must be reached. From the dead leaf-mould there, a large rugose pupa with a spiky tail is fetched, and then another and another. A favourite corner for *Smerinthus tiliae*, you say; and, as you look at the unsightly dark pupa, visions of a lovely insect, with beautiful green wings, surmounted in their centre by a delicate rosy flush across which a dark band runs, float before your eyes. Yes, it will be yours some day. The enjoyment of a day's pupa-hunting does not end with the delights of the day itself. It reaches its fulness when the lovely moths emerge ; but it does not end even then, for the sight of them in after years calls to mind glorious autumn skies, bursts of autumn brilliancy, of crimson and gold, when "autumn spends her gold, freehanded as a harlot," beautiful sunsets, which would fade from memory over and over again, were it not that the trophies of the day's work refuse to let memory slumber or to forget the beauties which they recall.

The sunset is a glorious one. The deep purple clouds lift above the horizon in the west, and below lies a sea of pale blue, fading into yellow or amber. Crimson streaks run along the banks of dark cumuli and flashes of orange shine out with brilliancy, as the sun sinks below the clouds into the pale blue sea below. The crimson hues spread from the western sky and fade upwards into purple, which blends insensibly with the ever-deepening azure which looms above us, whilst the silent flocks of starlings hurry to their roosting places. The plovers show their snowy breasts, and fly with halting and uncertain movement. The starlings settle, and Babel is let loose at once. The westering sun will soon disappear ; but ere it does so, the slanting rays burnish with gold the trees and hedgerows, or make the cottage windows there sheets of crimson beauty. The gentle breeze scarcely rustles among the last yellow leaves of the birch, or the crimson leaves of the beech, the light steals in ever-lengthening shades down the woodland vistas, whilst the entomologist pockets trowel and chisel, and steps blithely out for home, rejoicing over his newly-acquired treasures.

Generic Names in the Noctuidæ.

By A. R. GROTE, A.M.

The interest which is felt in ascertaining the oldest name for species does not manifest itself to the same extent when genera come in question. Perhaps for the reason that there is less agreement as to generic characters and less practical value attached to the combined name. The proposal of Guenée, that no two species of Owlet Moths should retain the same specific name, while a very sensible one, indicates the greater importance which attaches to the specific title. In reality, the law of priority must regulate also the application of generic names, so that, for the past quarter of a century, I have been insisting on the adoption of the oldest titles in the *Noctuidae* in North American literature ; and, since the changes proposed by me affect European nomenclature, I take the liberty of publishing some of them in this Journal.

The fact that most of the generic names proposed at the beginning of the century by Hübner, Ochsenheimer and Treitschke, and now in use, are catalogue names, originally published without a description, suffices to show that such names are entitled to be considered under the law of priority. In an opposite view, no criterion exists by which we can decide how much or how little of a description is sufficient to authorise a generic name. A catalogue name, proposed for certain described species, sufficiently designates what is intended. The generic descriptions in the *Verzeichniss* (1816–1818?) are really only infinitesimally better than nothing, while Mr. Walker's, in the British Museum Lists (1856), are quite as useless for purposes of identification of structure, and infinitely more mischievous and misleading. The *Tentamen* is, as I have proven, admitted by Ochsenheimer as authority, and has then equal value with the catalogue names of Ochsenheimer and Treitschke. All, or nearly all, the generic names of these latter authors are proposed for mixed assemblages, and the task before us is to ascertain how the subsequent use and restriction of the name affect its value and enable us to fix upon the precise type. Neither Hübner or Ochsenheimer appear to have had any idea of an individual type of their mixed genera, and seem never to indicate any species as such. The first species they list is no more the "type" of their genera than the last. It is the subsequent use and restriction of the generic name which guides us in ascertaining the type; while the disposition made of the contents of a mixed genus leaves us finally some one of the original species to which we can apply the original name with exactness. The fact that the American Noctuid fauna is largely of the European structural type makes an agreement in nomenclature very desirable, and it is to this end that I offer the following results of some of my researches. Where my facts cannot be disputed, I may be allowed to consider that my conclusions should be respected.

I may say, that, in the *Noctuidae*, the difficulty of finding out the generic type is added to by the fact that modern genera are founded on structure, and that species, very similar in appearance, colour and pattern, may be very dissimilar in structure. In Ochsenheimer's genus *Xylena*, for which he quotes Hübner, and which is the original of the "*Xylina*" of later authors, are arranged species belonging to half-a dozen, often widely separated, modern genera. Colour and pattern, and even size, are often a guide in the Butterflies, where the ancient and modern genera more nearly cover each other. How could the older authors even approximately arrange the *Noctuidae* correctly, knowing hardly anything of the structure of the eyes, front or feet of their specimens? Even Guenée's acquaintance with the decisive characters of the material he arranged was quite fragmentary. In the same genus he places species with hairy and with naked eyes and the armature of the tibiæ, the characters drawn from the vestiture are too often entirely neglected. All these considerations make a study of the generic synonymy of the *Noctuidae* a necessity, so that we may be finally agreed, all over the world, upon what is meant by a generic name, and what types alone it should cover. When I came to study the American *Noctuidae*, I found that some of Guenée's *Hadenas* were *Mamestras*, or *vice versa*, and my main work has been directed to bringing our described American species into generic correspondence with the European, as determined by modern authorities, such as Lederer and those who have followed this method of arranging the material. Only in this way can the geographical distribution of the *Noctuidae* be studied with comparative exactness.

Diphthera, Hübn., 1806.—Type: *D. orion*.—1806. Hübn., *Tent.*: *aprilina* (*orion*); only species, therefore type. This name is incorrectly accredited to Ochsenheimer, though the latter quotes Hübner, correcting, at the same time, Hübner's mistaken identification of *aprilina*. *Orion* is therefore type. One American species: *fallax*, H.-S.—1816. Ochs., 4, 63: *coenobita, ludifica, orion.*

TRICHOSEA, Grt., 1874.—Type: *T. ludifica.*—MOMA, Hübn., 1816.—1818. Hübn., *Verz.*, 203: *ludifica, aprilina* (*orion*), *astur*. *Astur* is the type, since the restriction to *orion* by Herrich-Schaeffer and Lederer cannot be followed. For *ludifica*, referred by Lederer to DIPHTHERA, the generic name TRICHOSEA, Grt. should be used.

APATELA, Hübn., 1806.—Type: *A. aceris.*—1806. Hübn., *Tent.*: *aceris*; sole species, and therefore type.—1816. Ochs., 4, 62, refers *aceris* (Fam. B.), with 13 other species to the genus *Acronicta* (since written *Acronycta*), and cites Hübner's *Apatelae* as synonymous. Afterwards, the genus is incorrectly credited to Ochsenheimer or Stephens.

JASPIDIA, Hübn., 1806.—Type: *J. algae.*—1806. Hübn., *Tent.*: *spoliatricula* (*algae*); only species, and therefore type.—1816. Ochs. 4, 63, adopts *Poecilia*, Schr., for *glandifera* and eight other species, (including Hübner's type) and cites Hübner's name as synonymous.—1874. Grote, 6th *Peab. Rep.* 24, states, on Treitschke's authority, that *Poecilia* is pre-occupied, and adopts *Jaspidia* over the later *Bryophila*, Tr., and criticises Boisduval's use of *Jaspidia* for *celsia*; which latter species is the type (sole species) of *Diacope*, Hübn., *Verz.*, 204. 1816.

AGROTIS, Hübn., 1806.—Hübn., *Tent.*: *segetum*; only species, and therefore type.—1816. Ochs., 4, 66: *rectangula* and 42 other species—among them Hübner's type. Credits the name to Hübner ("*Agrotes* et *Graphiphorae*, Hübn.").

GRAPHIPHORA, Hübn, 1806.—Type: *G. gothica.*—1806. Hübn., *Tent.*: *gothica*; sole species, therefore type.—1816. Ochs., 4, 68: *ravida* and 16 species, apparently all referable to *Agrotis*. Credits the name to Hübner but excludes his type. Guenée afterwards takes *gothica* as the type of *Taeniocampa*, a name which accordingly must fall before *Graphiphora*, Hübn. This latter generic name has been, since Ochsenheimer, used for species of *Agrotis*, but incorrectly.

GORTYNA, Ochs., 1816.—Type: *G. micacea.*—1816. Ochs., 4, 82: *micacea, flavago*; a mixed genus.—1818. Hübn., *Verz.*, 232: *micacea*; sole species. Hübner thus restricts the name *Gortyna* to this type. In my Buffalo Check List, I incorrectly cite the *Tentamen* instead of the *Verzeichniss* for the restriction of the name. But the facts are not influenced by this error, while the name must be credited to Ochsenheimer, since the *Verzeichniss*, although dated the same year, is held to be, in part at least, of later issue. Lederer is, therefore, wrong in using *Gortyna* for *flavago* with mucronate clypeus. Guenée takes *micacea* for the type of his genus *Hydroecia*, which must thus fall before *Gortyna*, Ochs.

OCHRIA, Hübn., 1816.—1818. Hübn., *Verz.*, 233: *aurago, oo, flavago*; a mixed genus. The first is a *Xanthia*. The second species is taken by Guenée as the type of *Dicycla*. The name *Ochria* is thenceforth, and in future must be, restricted to the type *flavago* (*rutilago*). In 1876 I proposed this restriction, but incorrectly stated that *flavago* is the only species referred to *Ochria* in the *Verzeichniss*. This mistake was probably caused by the name being printed by itself on the top of Hübner's page, but does not alter the fact that *Ochria* must have as its type *flavago*. Two American species: *buffaloensis*, Grt., and *sauzalitae*, Grt., both externally resembling our N. Am. species of *Gortyna*, but sharing the clypeal modification of *flavago* (*rutilago*).

XYLENA, Hübn., 1806.—Type: *X. lithoxylea.*—1806. Hübn., *Tent.*: *lythoxylea*; sole species, therefore type. The name *Xylena* has, therefore, precedence over *Xylophasia*, Steph. proposed for the same structural type. At the moment, I have not the information as to the particular species Stephens designates. Lederer considers this genus as not different from *Hadena*. Other writers consider it as a section, or as an independent generic type. If the latter view prove correct it must be called *Xylena*, and the later *Xylina*, Tr., must fall as a nom. bis. lect., or as used in a wrong sense.—1816. Ochs., 4, 85: *vetusta* and 29 other dissonant species. Cites Hübner, and includes his type.

Lithophane, Hübn., 1816.—Type: *L. socia*.—1816. Hübn., *Verz.*, 242: *petrificata* (*socia*) and four other dissonant species; a mixed genus.—1874. Grote, 6th *Peab. Rep.*, 31, takes *socia* as type, and refers *Graptolitha*, Hübn., as synonymous. This name should be henceforth used instead of *Xylina*, Tr. The reason is, that Hübner's type of *Xylena* is a Hadenoid form mixed by Ochsenheimer with Lithophanoid forms. Later authors take out of Ochsenheimer's genus the latter as the types of *Xylina* (Ochs. writes *Xylena*), instead of taking out the Hadenoid forms, which contain the true type of *Xylena*.

Lampra, Hübn., 1816.—Type: *L. fimbria*.—1816. Hübn., *Verz.*, 221: *fimbria*; sole species, and therefore type. This name should be used for Speyer's first section of *Triphaena*. In America we have but one yellow-winged *Agrotis* (in sensu Led.), *gilvipennis*, Grt.; but we have a number of other species which appear to have the same structure with *fimbria*. I do not find any difference, and, if my opinion is correct, *Rhynchagrotis*, Smith, is a synonym of *Lampra*. *Georyx*, Hübn., *Verzeichniss*, 1816, must, I think, be regarded as a synonym of *Agrotis*, Hübn., 1806.

Amathes, Hübn., 1816.—1818. Hübn., *Verz.*, 222: *litura*, *baia*; a mixed genus; *litura* is an *Orthosia*. The name *Noctua*, used by Guenée and other writers is, as I understand the matter, pre-occupied in the Birds and, although it is somewhat of an anachronism to have a family *Noctuidae* without a genus *Noctua*, it would seem that we must use *Amathes* with the type *baia*, for the genus usually called *Noctua*. Lederer and German authorities do not recognise the various genera erected at the expense of *Agrotis*, and the structure of our very numerous North American Agrotidians must be yet compared with the European. The types of Hübner's genera, in the *Verzeichniss*, referable to the Agrotidians, must be all ascertained and applied so far as they are warranted. The term *Amathes* has priority by a page over *Ochropleura*, which contains *plecta* and *musiva*, species apparently agreeing in structure with *baia*. Later authors have used *Ochropleura*, and the type of this latter may be held to be *plecta*, and the generic name, *Chersotis*, Bdv., would be synonymous.

CURRENT NOTES.

As a rule, entomological writers are anxious that their writings should be read, but the excess of zeal in the science of names makes some of us doubtful occasionally, as to what we are reading about. Here is a paragraph about *Halia wauaria*, Linn. (*wavaria*, Fab.):—"*Heterophleps atrosignata*, Walker, is, I think, a synonym of *Thamnonoma wavaria*, L. It is nearly the normal form of *T. wavaria*, as found in America, though this differs somewhat from the ordinary European form, the lines being more distinct and blacker, and the colour a clearer, less smooth cinereous. *Thera ? peracutata*, Wlk., is a synonym of *Halia subcessaria*, Wlk., while *Thera ? bitactata*, Wlk., is a more heavily-marked form of *T. wavaria*, L. I have little doubt that intergrades between *T. wavaria*, L. and *T. subcessaria*, Wlk., will eventually be found, and the species thus connected, as are *T. subcessaria* and *T. coortaria* " (Hulst, *Ent. News*, v., p. 306). Information about any insect common to Europe and America is always interesting, but I must confess that I read the above twice, before it struck me that it referred to our common V-moth, and then I determined the matter by reference to Staudinger's *Catalog der Lepidopteren des Europäischen Faunengebiets*, where on p. 171 *Thamnonoma*, Ld., is given as a synonym of *Halia*, Bdv.

Mons. Germain Beaulieu suggests (*Le Naturaliste Canadien*, Nov., 1894), that the maxillary and labial palpi of insects are organs of taste.

In the *Entom. News*, vol. v., p. 326, there is an interesting account of the breeding of hybrids, from the pairing of a female *Smerinthus ocellatus*, with a male *Paonias astylus*. Pupæ of the first-named species, imported from Germany, by Mr. Rix of New York, disclosed, among others, a female, which Mr. Rix tied to a twig of syringa, to see whether she would attract an American " beau." The next morning, a male *P. astylus* was found in copulation with her. The eggs which she afterwards laid were fertile; many of the larvæ from them pupated in the autumn of 1893. In the summer of 1894, 25 male imagines emerged, whilst some 20 more, apparently healthy pupæ, appear to be going over a second winter. The imagines that have emerged " look remarkably alike. They are all nearly of the normal large size of *S. ocellatus*, measuring from 67 mm.—73 mm. across the wings. The shape of the primaries is more of the peculiar cut of *P. astylus* on an enlarged scale, while the secondaries are those of *S. ocellatus*, with less dentation of outer margin near anal angle." *Smerinthus ocellatus* is an insect of easy morals, as proved by the large number of hybrids which exist between it and *S. populi*, but species rarely pair fruitfully, except with their nearest congeners, and I should like to ask in what way the larvæ, pupæ and eggs of the genus *Paonias* differ from those of *Smerinthus*. Who created this genus, and on what characters was it differentiated ?

Das Naturalien Cabinet for September, 1894, contains an article on " A supposed new species of *Anthocharis* " (*Euchloë*), by Ernst Albert. The author has been led by breeding experiments to the conclusion that " *A. cardamines* has a variety which differs from the type in the larval and pupal stages, as well as in the colour of the imago ; this variety occurs in connection with a different food-plant." The larva is found on *Turritis glabra*, and differs from larvæ feeding on *Cardamine*, in that its colour is blue, instead of blue-green, and the lateral stripe is of an intense white, instead of a bluish-white colour. The male butterfly has all the markings on the upper-side more intense, the orange is more fiery, and the black deeper. The chief difference, however, is found on the under-side of the fore-wings, which are shaded with sulphur-yellow from the base as far as the orange blotch. The under-side of the hind-wings shows less white than in the type owing to the greater extent of the green marbling, which is dotted with black. In the female, the markings are also more intense, and the upper-side of the hind-wing is slightly yellow. The food-plant, *Turritis glabra*, occurs more abundantly in elevated localities, and in consequence, the variety is more abundant in such localities. The Harz mountains are mentioned as affording typical instances of the form. On the plains where *Turritis glabra* grows more sparingly, transition forms between it and the type occur. The editor, Hr. Hoffmann, considers that the difference between this form and *A. cardamines* at all stages of the life-history, is sufficient to establish its specific distinctness, and proposes for it the name *Anthocharis alberti*. From the above it would appear that the supposed new form is what the late Mr. Walsh called a phytophagic variety or species. It is probable that collectors are familiar with this variety, but it has not yet been correlated with its peculiar food-plant. The new form is as large as *A. cardamines*, and is not identical with the var. *turritis*.

In the same publication, there is an interesting contribution under the title "Where are butterflies to be found on rainy days?" A collector in Teplitz, whose June holidays were spoiled by wet weather, nevertheless persisted in his search for butterflies, but found nothing on the wing. His perseverance was, however, rewarded by the discovery of *Argynnis aglaia*, *A. selene* and *Erebia ligea*, sitting on grass, quite close to the ground. They were easily taken by hand, and seemed too stiff to fly up on being approached. The same collector found that *Melanargia galatea* took shelter in a field of oats on the approach of night, and he obtained a number of specimens from the stems close to the ground. It would seem that butterflies seek similar sheltering places upon the advent of a storm or the approach of night, and a study of the night-habit—the roosting places as one may say—of the different species, might be attended with satisfactory results to the collector, who might thus be spared much of that frantic exertion, which has so often been humorously described, both by the actors and by outside observers.

The City of London Entomological and Natural History Society will hold a Conversazione in the Library of the London Institution, Finsbury Circus, E.C., on Tuesday, February 5th, 1895, from 7.30 to 10.30 p.m. An exhibition of entomological and natural history specimens will take place; there will be music at intervals during the evening, and tea and coffee will be provided. Admission is free by ticket, to be obtained from Mr. C. Nicholson, 202, Evering Road, N.E. The President and members of the Council ask the cordial co-operation of naturalists outside the Society by the exhibition of interesting natural history specimens of all orders, and invite friends to spend what is hoped will be a very pleasant evening with them. The Society (one of the oldest Natural History Societies in the country) is to be congratulated on its energy, and deserves, as we have no doubt it will attain, an unqualified success in this new departure.

SCIENTIFIC NOTES & OBSERVATIONS.

Perils of egg life.—While searching some sallow bushes near Hickling Broad last July, I found three or four batches of eggs on the underside of the leaves. They were, I believe, eggs of *Arctia caia*, or of some nearly related species. One batch was already of the livid hue which generally precedes hatching, and the others underwent the changes usual in fertile eggs during the ensuing week. As they did not hatch, I put the box on one side, and did not look into it again for two or thre weeks. I then found that a number of small flies had emerged from the eggs through small circular holes near the top. The whole of the eggs appeared to have been attacked; not one yielded a larva, and they retained the dark livid colour after the emergence of the parasites. Mr. Nicholson, who has seen the flies, is of opinion that they belong to the same species as those which he bred from the eggs of *Bombyx rubi*.—A. Bacot, Clapton. *Oct. 30th*, 1894.

Eggs of Bombyx rubi "ichneumoned."—Seeing that Mr. C. Nicholson, in his note under this heading (*Ent. Rec.*, vol. v., p. 253), offered specimens of the ichneumon, I applied to him for some and received four (in about a hundred pieces). However I was able, after a deal of trouble, to determine that they are *Telenomus phalaenarum*, and belong to the family *Oxyura*. Some years ago I received about two hundred eggs of *B. rubi*, from which I bred two thousand one hundred of these flies; each egg yielded from six to eight.—G. C. Bignell, Plymouth. *Nov. 7th*, 1894.

Notes on Hadena dissimilis.—Mr. J. H. Pickering of Hull, who has bred this species rather freely this year, informs me that the larvæ hatched two days after the eggs were laid, and began to pupate on the twenty-first day, all having pupated by the twenty-fifth. The larvæ are very voracious. Bred specimens of the moth are larger than captured ones.—Wm. Hewett, 12, Howard Street, York. *Nov. 4th*, 1894.

Catocala nupta ten months in pupa.—Last year I obtained a batch of eggs from a female, which emerged rather early. I lost most of the larvæ through being away from Cambridge a great deal, but one pupated about the end of October and remained in that condition until August in the present year.—Albert H. Waters, B.A., Cambridge. *Oct. 26th*, 1894.

Polygamy and Polyandry in moths.—In *Psyche* for 1894 (vol. vii., p. 167) is a note to the effect that a male *Actias luna* emerged on the night of April 29th, 1894, and paired the same night, the couple remaining together until after 10 a.m. on the next day. On the night of the 30th, the same male paired with another female. The eggs laid by both these females proved fertile. The same observer also records that in 1893 a female *Callosamia promethea* attracted about 40 males, no less than 7 of which paired with her, when she was placed outside on a low branch of an ash. The eggs laid by this female hatched in due course.—J. W. Tutt.

With reference to Mr. Burrows' note on Lepidoptera pairing more than once (*Ent. Rec.*, vol. v., p. 275), I may say that I have several times taken very worn female *Charaeas graminis* paired; this I think suggests strongly that they must sometimes pair more than once in nature, as the insect is usually abundant here.—A. W. Mera, Forest Gate. *Nov. 16th*, 1894.

Some unusual food-plants.—*Thecla w-album*.—About the middle of June, 1894, I got a nearly full-fed larva of this species off an *ash* tree. I fed it for some days on ash until it pupated. The imago (a ♀ which measures only $\frac{7}{8}$ in.) emerged on July 10th.———*Trichiura crataegi*.—During the earlier half of June I found a larva of this species sunning itself on the bark of an *apple* tree in the orchard here. The usual white dorsal lines were in this specimen represented by light-blue spots.———*Poecilocampa populi*.—I met with the larva of this species on the same trees; it feeds here on nearly every forest tree as well.—(Rev.) F. B. Newnham, Church Stretton, Salop. *Dec. 3rd*, 1894.

Larvæ of Bombyx quercus, &c.—I do not think it is generally known what omnivorous creatures the larvæ of *B. quercus* and of its var. *callunae* are. I have had an experience with them this season that I think interesting. Having bred a quantity of the imagines of both of the above insects this summer, I allowed a few that remained, after I had secured a quantity of good specimens, to fly about in the cages and pair, with the result that I had plenty of eggs of each. The larvæ of var. *callunae* hatched a good fortnight before those of *B. quercus*. I fed both on white-thorn at first, but introduced plum with the white-thorn after they had accomplished their first moult. They fed on thus until about the end of September, when I began to consider what I should do with them in the winter. Having a quantity of raspberry canes in my garden, I began giving them the leaves, with a view of more easily getting them to take to blackberry later on, knowing that I could find a few blackberry leaves in sheltered nooks in the hedge-rows all the winter through. They evinced a decided liking for raspberry from the first, the whitethorn being almost untouched so long as any raspberry was left in their cages. Thus things went on until the beginning of November, when my canes began to shed their leaves. Then I thought of rather a queer food-plant, on which, last season, I had reared *Lasiocampa quercifolia* with some success—laurel leaves. On the day on which I first introduced the laurel to my larvæ, they had eaten up all their raspberry, and were racing round their cages, evidently with good appetites. As soon as I had laid a few nice sprigs of laurel among them, they were on to it at once, and in a few minutes every leaf had circular patches cut out all round its margin. I vary the laurel with ivy and they eat both impartially, but they are getting very quiet and sleepy as winter draws on, only exerting themselves to eat for a few minutes at a time whenever the sun shines brightly. I ought to add that I keep them under glass, in a cold green-house; so, up to the present, they have had no experience of frost. Should I succeed in bringing them through the winter, I shall certainly feed them upon laurel, as I believe it to contain very strengthening properties for hybernating larvæ, and it will be interesting to see if the imagines of these omnivorous broods differ at all from their cousins who hybernate in the wild state. I will report how I get on with them next year, if successful.—M. A. Pitman, 11, Park Lane, Norwich. *Dec. 8th*, 1894.

Note on Argyresthia illuminatella.—In the *Ent. Record*, vol. v., p. 73, is a note mentioning the addition of *Argyresthia illuminatella* to the British list, from specimens taken at Forres, by Salvage, among *larch*, and the capture of a series of very similar specimens at King's Lynn. The *larch* environment did not strike me at the time, but I would now state, that in 1891, one of the Scotch collectors (Mr. Horne, I believe) sent me some cones containing *Retinia resinana*; from the fir-shoots on which the cones were, I bred an *Argyresthia illuminatella*, and put it by as an unknown species. Noting this fact in one of the books of the Exchange Club recently, Mr. Horne writes, on Nov. 26th, 1894:—"If Mr. Tutt bred *Argyresthia illuminatella* from the shoots bearing *R. resinana* cones, the species is undoubtedly a native of Morayshire. *R. resinana* is only found in Scotch fir, but I remember Lord Walsingham urged Mr. Atmore to search for larvæ of *A. illuminatella* on larch. I spoke to Mr. Salvage as to his capture of *illuminatella* at Forres, but he knew nothing whatever about them."—J. W. Tutt.

Fossil Tipulidae.—In a paper on Tertiary *Tipulidae*, by S. H. Scudder, the author describes twenty-nine new species distributed among ten genera of *Limnobinae*, and twenty-two new species distributed among five genera of *Tipulidae* from Florissant, Colorado. From facts now known, Dr. Scudder concludes that the three principal insect localities in Western Colorado and Wyoming are deposits in a single body of water, the ancient Gosiute Lake. To the fauna of these deposits he applies the term Gosiute Fauna, in distinction from the Florissant or Lacustrine Fauna in Central Colorado. No single species of the Lacustrine Fauna occurs in the Gosiute, and among the few genera found in two of the localities of the Gosiute Fauna, the species of each locality are distinct from those of the other. Mr. Scudder is fortunate in having such beautifully preserved specimens with which to illustrate his paper. The delicate appendages, the markings and venation of the wings and even the facets of the compound eyes are shown. (*American Naturalist*, Nov. 1894).

Discussion on the Nature of certain Colours.

I should like to raise the question as to the nature of the "white" in *Hepialus humuli* ♂ and *Euchloë cardamines*. My experience of the action of ammonia on the former, and on the females of the latter (both Cornish and Devonshire specimens), tends to show that the colour is pigmentary. All my insects killed with ammonia are left in a box, with several drops of Liquor Ammoniæ Fort. for about 12 hours. I find in both the above species that the action of the alkali, though perceptible in all immediately after removal, varies considerable in intensity and permanency, being in some comparatively slight and fugitive. Is the original statement (*British Noctuæ and their Varieties*, vol, ii., Introduction, p. vi.) as to the "nonpigmental nature of the colour of *H. humuli*, *Anthocharis*, *Pieris*," &c. to be accepted as correct, generally? If so, are the insects in certain localities in a transitional stage as regards the pigment? The variability in the amount and permanency of the change by the alkali in different specimens might suggest such a possibility.—W. S. Riding, M.D., Buckerell Lodge, near Honiton, E. Devon.

I have noticed the yellow tinge produced by ammonia in male specimens of *Hepialus humuli*, but it has never been permanent with me. The yellow of *Rumia luteolata* is considerably deepened by the same re-agent. If the scales of a male *H. humuli* or of any white insect be examined under the microscope, a certain percentage will be found to contain plenty of pigment granules. These latter are peculiar, as under a high power they show a bright spot, apparently a hole, in each granule; but this appearance, I think, is due simply to the reflection of light from a spherical surface. The microscope, I take it, is a much better witness to the presence of pigment than the reaction of chemicals, which might mean anything, and I certainly am sceptical as to the yellow coloration being evidence of pigment. The chitin itself, under certain circumstances, might be so coloured.—R. Freer, M.B., Rugeley. *Sept. 4th*, 1894.

Dr. Freer's note puzzles me. He states that the pigment granules can be seen with a microscope, and yet is sceptical as to the yellow coloration being evidence of pigment. Absolutely white coloration is due to the complete reflection of the light that falls upon the surface; a yellow colour is due to the fact that, of the light which falls upon the wing, the yellow only is reflected to the eye, the rest being absorbed. Now, in the very nature of things, white bodies cannot be pigmented, that is, they cannot contain a substance which absorbs part of the light and returns the other part to the eye, for the light is all reflected. But, in some of our white insects, there is undoubtedly a substance which is not pigmentary in itself, but which, under certain chemical re-agents, becomes such. Now, when it does this, it is a pigmentary substance, but until it does it should not be called so. We want, however, a name for this substance rather better than "pigmentary" white, and Dr. Riding has already suggested that we should term it "potential white," a very useful and suggestive term. Now that whites are either "potential" or "absolute" is certain; which are "potential" is a matter for enquiry. In *The British Noctuae, &c.* (Introduction), vol. ii., I instanced cases which I considered fell under these heads. In some, I probably erred, but the essay contains a full account of what was available at that time. The matter requires, however, to be gone over again very carefully. Dr. Freer says, "The reaction of chemicals may mean anything." How? I would enquire. I feel satisfied that when the white is a recent derivative from yellow, we shall get results in the direction of "potential" whites. It seems that there must be in such instances some trace, in a loose chemical form, of the pigmentary matter so recently lost. I have, however, so much work on hand now, that I cannot possibly give the necessary attention to the matter, and Dr. Freer and Dr. Riding will, I have no doubt, come to a common understanding as a result of the discussion.—J. W. Tutt. *Oct. 20th*, 1894.

I am afraid that in my last note I was neither explicit nor clear, with regard to the white-pigment question. The matter really seems to depend on a definition of pigment. My idea is, that we call anything pigment which absorbs any colour rays. Transparent substances evidently contain no pigment; nor do those colours and metallic appearances which are due to the *refraction* of light through innumerable transparent films of different refractive indices come under this head. Such are the metallic colours in pupæ, in which the chitinous film is alternated with fluid, and such I deem the cause of the metallic coloration in most insects. The component parts of the metallic scales may be of different refractive indices, yet no striation be visible in the scale under the most powerful microscope. This metallic coloration disappears with transmitted light, which seems to bear out this theory. My reason for mentioning the pigment granules was, that in them there is a visible expression of pigment analogous to the pigment found in the higher animals. The granules are too few in light-coloured insects, to influence their coloration in any way, but are exceedingly numerous in the black parts of some insects, and in all melanic specimens; in fact, there seem to be two kinds of black—one, the black of *Pierinae*, *Colias edusa*, and all butterflies which I have examined in which pigment granules are comparatively scarce; the other, in most moths in which they are plentiful, especially in the case of *Amphidasys betularia*. In a paper I read before the Birmingham Entom. Society, I suggested that this pigment might be an expression of energy. With regard to the coloration of insects, I cannot conceive that their behaviour towards chemical re-agents can be of any phylogenetic importance. For example, Mr.

Perry Coste (*Entomologist*, xxiii., p. 371) gives as "a good instance of retrogressive metamorphosis," or change to original type, the fact of the green under-side of *Thecla rubi* being changed by every reagent to the brown of the upper side; if he had gone further he would have found that when wetted with water the same effect was produced. The green, in fact, is what Dr. Riding calls a "potential" colour, produced by the refractive properties of the upper layer of scales, but that is no proof that the original colour of the underside was brown, nor that because ammonia turns some whites to yellow and some greens to the same colour, that those greens and whites are in any way connected. In fact, I do not see that anything can be deduced from the behaviour of chemicals towards the colour of insects, until the colour has been dissolved out and isolated. All other true animal and vegetable pigments are capable of isolation (such as the various blood pigments, and their derivatives), and until this is done, I think we must consider all colours in an insect's wing "potential," "physical," or what you will, but not pigmentary. Even my pigment granules have slender grounds to be called pigment, but how much less have those colours whose sole claim to be considered pigments, rests on their naked eye appearances. The very scales of an insect's wings may be of different refractive indices, and by their super-imposition may produce the various colours. The upper layer of scales being wetted and otherwise damaged may cause them to have refractive powers, and the under layer would then shine through. Again, mineral acids act as dyes on many substances, and may so act on the chitin.—R. Freer, M.B. *Oct. 30th*, 1894.

I cannot say that I agree with Dr. Freer that "the microscope is a much better witness to the presence of pigment than the reaction of chemicals." We do not go through the world with our eyes looking through a microscope, and we must and do trust our own unaided sense of sight when we speak of colours. After all, when we use the word "pigment," are we not forgetting that there is, in reality, no such thing as colour at all—no material, tangible pigment—and that the word is merely a convenient one for describing a process that has three essential factors—(1) a substance observed, (2) certain rays of light with various rates of vibration per minute, (3) the eye of an observer—*all* of which are wanted to produce the sense of colour in us? Indeed, what we call pigment should rather be called "pigment-factor," and with that meaning I use it. I do not think I have anywhere stated that the action of chemical re-agents on the pigments of insects has a phylogenetic value. What I wrote was, that I had observed the action of ammonia to vary in different specimens of ♂ *Hepialus humuli*, in intensity and permanency (and presence according to some), and suggested it as possible, that we may find such change taking place in certain localities only. I have, as yet, formed no opinion on the subject, but at the same time I cannot admit there is anything unreasonable in the supposition. Are not the colours of insects influenced by locality (natural selection transmitting the varieties)? Why should not the chemical constituents of soil, absorbed by plants and eaten by larvæ with their food, influence the imago? or the moisture and emanations from vegetable and other surfaces, &c., of their environment? What do we know of the essence of variation? Why, no two people are alike, and probably no two insects—the Dromios wanting careful differentiation only? How the chemical re-agents act on the pigment to produce change of colour is another question.

I think the definitions, clearly explained in Mr. Tutt's notes, are as good as any we can give in our present state of knowledge—always premising the limitation of the word pigment, to that of a pigment-factor. As Dr. Freer says, we see pigment granules in the scales, under the microscope, but I fail to see that the instrument throws any light on their nature, save as to structure. When we view them, especially by transmitted light, all the conditions are altered, and we get iridescence due to interference from one of its special causes—diffraction of thin films; but this is not the pigment we are attempting to define. All the metallic colours of insects—imagines and pupæ—and their iridescence are of course due, as Dr. Freer says, to these latter causes and not to pigment, but I very much doubt whether Dr. Freer is right when he writes of "water changing the green of *Thecla rubi* to brown" as a refractive process. Does he mean that he considers it an example of interference through thin films? If so, surely it would be iridescent! I should call this change simply a chemical one, caused by the direct action of the water on the pigment.

I am afraid Dr. Freer will have to wait a long while for "colour to be dissolved out and isolated." We may dissolve and isolate the material that helps to give us the sense of colour—the pigment-factor—but not the essential, unobserved vibrations of ether that strike the nerve expansion of our eyes. This, Dr. Freer more or less admits in his next paragraph (apparently contradicting the preceding), "even my pigment granules have slender grounds to be called pigment, but how much less . . . . . . those colours . . . . . . whose claim rests on their naked eye appearance." Why less?—W. S. Riding. *Nov. 3rd, 1894.*

With regard to Dr. Freer's last note, does he really mean what he says at the commencement of the note—"nor do those colours . . . . . come under this head"? Does this mean that these metallic colours do not come under the head of transparent substances, or what? or should "come under this head" be deleted, as "nor" introduces the sentence? Is it a fact that the chitinous covering of the pupa is formed of alternate layers of fluid and chitin, *i.e.*, the structure=chitin, fluid, chitin, fluid, and so on, just as an oyster shell equals a lamina of carbonate of lime, then a lamina of membrane, carbo. of lime, membrane, &c., or does Dr. Freer simply mean that the fluid contents of the pupa lie directly in contact with the outer pellicle, which consists of a single layer? I believe the pellicle is transparent where metallic patches occur, and, if I remember rightly, the emergence of the imagines from pupæ of *Vanessa urticae* leaves the previous metallic areas quite transparent. It is some years now since, in my essay on *The genetic sequence of insect colours*, printed as the Introduction to *British Noctuae*, &c., vol. ii., I discussed two kinds, or rather degrees, of black coloration one more or less pigmented by granules in the scales, the other absorbing light rays by means of the peculiar structure of the cell wall. That this should be so, when one observes the slow transition through highly pigmented purples and reds to black, by every possible gradation, is to be expected, but I am much in doubt whether the blacks of butterflies will, as a general rule, come under one head more particularly than under the other. Instances of both kinds will occur I doubt not, both in butterflies and moths. I do not doubt either that Dr. Freer is quite correct, considering the modern view of science, in stating that pigment is an expression of energy. It really has been put down as this for a long time now; I may say, ever since Darwin first commenced to work at secondary sexual characters; but although I grant this in both my papers, "The genetic sequence in insect colours" (*Brit. Noct.*, vol. ii.) and *Secondary Sexual Characters* (*Brit. Noct.*, vol. iii.), I have, as is well known, not accepted wholly (nor even largely in part) Darwin's conclusions thereon. In fact, I have preferred Wallace's explanation (with some slight modifications), in preference to that of Darwin. With regard to Dr. Freer's note on *Thecla rubi*, is he sure that this green is one of the "potential" colours. I have had a suspicion lately that, like *Lycaena adonis*, *L. corydon*, *Procris statices*, and a few other species which change colour in the presence of water vapour, that the scales themselves may hold the vapours externally, and thus alter their reflective power, and influence the ordinary diffraction. Try any of these species in a damp box for a short time, and what I mean will, I think, be clear; but it may be a "potential" colour, and then, the rapid change, even when absorbing the water-vapour, is remarkable. So far as the phylogenetic significance of chemical reaction goes, it appears to amount to this:—Certain species have natural varieties; the influence of certain chemical reagents produces these varieties; *ergo*, the pigmental change brought about in natural varieties can be brought about by chemical reagents. Other species, not given maybe to variation, similarly under chemical reagents, give certain definite changes; the generic relations often show that this change is the normal colour of allied species. Certain allied species give under chemical reagents a common result; surely such of these as have been definitely worked out, tend strongly to suggest that they may have a real phylogenetic significance. If not, why not? Dr. Freer's notes *re* "white" and "green" as derivatives of yellow, are not altogether clear. If ammonia turns some whites "yellow," is it not clear that there is in the white some substance—pigment-factor—in the insect which has probably been converted into its present form from yellow, and which is being changed back, as it were, by the reagent; or, on the other hand, that there is some substance in the insect's scales, that under some slight natural change may develop yellow, and if we accept either of these alternatives with regard to green, does not the fact that the white and the green both have a yellow base, show that they are connected through the yellow? I ask this in all innocence. It seems to me the only logical position to take up. Nor do I understand *why* nothing can be deduced concerning the behaviour of "chemicals towards the colours of insects, until the colour (? pigment, J. W. T.) has been dissolved out and isolated." Nature works on the pigments as they are, and does not dissolve them out, nor isolate them to do so. Does Dr. Freer assert that no insect's colours are pigmentary? If so, what becomes of his "pigment granules," which are seen so abundantly under the microscope? Are these pigment granules then to be considered the normal expression of physical colours due to interference and diffraction? If not, why must we consider all colours "potential, physical, or what we will, but not pigmentary?" What again does Dr. Freer refer to, when he talks of colours whose "sole claim rests on their naked eye appearance?" I remember my friend Mr. Coverdale dissolving out the red pigment-factor in *Vanessa io*, but I cannot lay my hand on the note with the details. What Dr. Freer says is quite true about the possibility of the scale structure, but it does not alter the fact that anyone not blind can see in scales the great round pigment cells, in which the pigment-factor resides. Destructive criticism is, of course, much easier than finding something to take the place of that which is destroyed, and in the place of pigments which can be dissolved out by various reagents, Dr. Freer has nothing better to tell us than that scales "may be of different refractive indices." What, too, is the idea to be conveyed by the phrase "the under layers would then shine through?" Shine through what? I am rather puzzled as to what this can mean.

I like Dr. Riding's term "pigment-factor" much. It is an excellent one. One point, however, touched on by Dr. Riding, shows that he has a better hold on some points than I had, for I was once fixed (by Mr. Grote, I believe) by being asked to explain why "colour," being an "acquired character," was hereditarily transmissible, and it took me some time to see the simple fact, that colour is not in this sense an acquired character, but as much structural as legs, thorax or antennæ. Dr. Riding's query as to "Why should not the chemical constituents of soil, &c., absorbed by plants, and eaten by the larvæ with the food, influence the imago?" leads me to suggest that, although there appears to be no reason why it should not do so, yet, in cases in which the larva is particular as to its food, and restricts itself to one food-plant, there is but little chance of chemical variation of soil taking effect, because chemistry has shown us that whatever the composition of the soil, the percentage of substances required by, and taken up by the same plant as food, is very constant. When, however, a larva will accept several different plants as food, belonging to different Natural Orders, and built up of vastly different constituents, I fail to see why such should not influence the imago. Little enough, indeed, we know, and "the more we learn" the more strongly the old adage comes home to us that "The more remains for us to learn."—J. W. Tutt. *Dec. 2nd*, 1894.

NOTES ON COLLECTING, Etc.

Lepidoptera taken and bred in the Swansea district in 1893.—In Vol. iv., of the *Entomologist's Record*, page 44, is a list of insects taken or bred by me in 1892. Having made several additions to that list during 1893, I thought it might interest some of your readers to know what a good locality Swansea is, as I think very few places can show a total of 381 different species in two years, and there is very little doubt that I could have increased this number if I had been there during June and July; unfortunately I was absent, both years, for about six weeks at this time. Among the Rhopalocera new to 1893, were:—*Vanessa polychloros*, one seen on 23rd March, near Clydach, Swansea Valley; *V. antiopa*, one seen, Langland Bay, June 2nd (?); *Lycaena astrarche*, fairly common at Deurch Bay; and *L. argiolus*, a few seen at Peullergare and Sketty, round holly. Among the Heterocera, were:—*Smerinthus ocellatus*, one found dead on the sandhills at Port Talbot, May 9th; *Sesia sphegiformis*, one taken by Mr. Stafford, Peullergare, May 11th; *Nudaria mundana*, scarce at light, near Sketty Park; *Nemeophila russula* (♀) taken flying among heath, June 7th; *N. plantaginis*, common in woods and rough meadows near Peullergare; *Spilosoma* *fuliginosa*, a few females taken in Sketty Park and Peullergare, from which I got several eggs, and bred some very nice forms; some of the larvæ ceased feeding in Sept. (the same batch from which I obtained imagines in August), and all died during hybernation; *Hepialus sylvinus*, several came to moth trap in Park, the males going inside, the females preferring to stop outside at the edge; *Bombyx neustria*, several larvæ beaten off white-thorn at Oxurch Bay; *B. quercus*, seven or eight males taken by Rev. A. Nash at Langland Bay, some "assembling" round a female which was discovered in a hole in a rocky hedge; *Drepana lacertinaria*, scarce at light, Sketty and Puellergare; *Stauropus fagi*, one ♂ at moth trap, May 14th; a few at rest at Port Talbot, May 9th, from which I obtained eggs and bred some very nice darkish forms, not however equal to the Reading ones. Mr. Vivian took a very nice melanic form of *Cymatophora duplaris* in his moth trap, at Port Talbot, in May; I have never been fortunate enough to take this moth. On March 3rd, I took a single specimen of *Asphalia flavicornis*, but although I hunted hard for more, I failed to find any; *Acronycta megacephala* was not rare at rest on trees in Park; one *Leucania impudens* came to light on 10th June; *Coenobia rufa* came also on the same date, and again a few days afterwards; pupæ of *Nonagria arundinis* were to be obtained in reed stems, on lakes at Peullergare; *Axylia putris* occasionally put in an appearance at sugar, but was decidedly scarce; *Mamestra sordida*, one only at sugar, on sandhills, June 1st; I also took one *Apamea unanimis* flying over flowers; *Agrotis puta* came to sugar now and then, and *A. cinerea* only once to light, on May 11th; one *A. lucernea* was taken at light, by Rev. A. Nash, at Langland Bay, on 7th July, and I took one *Noctua depuncta* at sugar, at Sketty Park, on 25th of same month; *Tryphaena fimbria* came pretty regularly to sugar about the same date. Among the sallows I added *Taeniocampa opima* and *T. populeti* to the list, but neither was common; *Orthosia upsilon* came to sugar on sandhills. The larvæ I collected from various lychnis, only produced *Dianthoecia nana*, in addition to those already mentioned, but *D. carpophaga* came into the trap on May 14th, and *D. capsophila* on Aug. 26th. Mr. Vivian took several *Hadena glauca* at light, at Port Talbot, during May, but I have never turned it up at Swansea. A single specimen of *Cucullia chamomillae* came to light on April 16th, and I took one *Brephos parthenias* at Clyne, on 28th March, and saw several at Peullergare afterwards, but they flew too high for capture. Among the Geometers, *Ephyra punctaria* was scarce at light at Sketty Park, as also were *Acidalia imitaria* and *Macaria notata*. *M. liturata* was taken sparingly in fir-woods, at Peullergare. At Port Talbot, *Aspilates citraria* was fairly common on sandhills; *Cheimatobia boreata* I forgot to record in the last list; it was rather scarce; *Larentia multistrigaria* and *Emmelesia affinitata* both came to light, the former commonly. Of the genus *Eupithecia*, I added eight more species, namely *E. nanata*, *E. indigata*, *E. lariciata*, *E. exiguata*, *E. coronata*, *E. virgaureata*, *E. albipunctata* (and var.), *E. assimilata*—the last three, kindly identified by Mr. S. Webb. *Hypsipetes ruberata* occasionally came to light, and was netted at dusk. *Triphosa dubitata* (hybernated specimens) were attracted by the moth-trap, and *Cidaria corylata* was taken at rest in woods below Park, and at Peullergare. This finishes my list, but I am sure that if the place was properly worked, it would yield much better results, as, except when accompanied by Mr. Holland, I very seldom tried beyond the immediate neighbourhood of Sketty Park.—R. B. Robertson, Coxhorne, near Cheltenham.

Occurrence of Caradrina ambigua in the Isle of Wight.—The autumn of 1894 which, so far as my own experience goes, has, in the Isle of Wight been a most successful one, will be further memorable by the capture of a comparatively large number of that rare and little-known Noctua, *Caradrina ambigua*, whose first acquaintance I made so long ago as 1888, when I was fortunate enough to take two specimens at sugar during July or August. The species was then quite unknown to me, but the specimens were identified for me by Mr. Tutt the first time he examined my collection, and are recorded in *Ent. Record*, vol. i., p. 249. Although I have worked the same locality ever since, I have not met with the species again till this year (1894); in the meantime, however, Mr. Prout obtained a single specimen at sugar at Sandown on Aug. 15th, 1893, and another single one this season about the same date. Some degree of uncertainty has prevailed as to the correct identification of this *Caradrina*, which, whilst very distinct from our common British *C. taraxaci*, yet presents a great similarity to an allied Continental species, *C. superstes*, to which my own previous specimens (as well as those of Mr. Prout, *ib.*, iv., p. 279) were afterwards referred by Mr. Tutt, and under which specific name my capture of the same species in Guernsey in 1893 was recorded (*ib.*, iv. pp. 255, 337). It is remarkable that, in 1893, I found this *Caradrina* unusually plentiful during August, at sugared flower-heads, on the Coasts of Guernsey; in fact so plentiful, that for several evenings it out-numbered the other common Noctuæ. The duplicates I then took have been subsequently distributed amongst a large number of my correspondents, who will, I trust, not appreciate them less under their now assured identity. It is possible that the occurrence this autumn in the Isle of Wight of as many as two dozen captured specimens may be the natural sequence of an abnormal abundance of the species in its usual localities, and in support of this view, it is a fact that I have worked for the insect in Guernsey two or three seasons in succession, and have only taken it singly, and have regarded it as a great prize. The first specimens captured this season were two, by Mrs. P. W. Abbott of Birmingham, on Sept 11th, and, during the next week, single specimens were again captured by Mr. and Mrs. Abbott, by a young friend who was with them, and by myself, the total for the week being seven. A continuance of warm evenings, unusual at this time of year, evidently suited their emergence, and further specimens were taken, including eight by Mr. R. Tait, junr., of Manchester, bringing the total up to twenty-five for a party of five workers. The last three were taken as late as Sept. 29th, thus prolonging the emergence of the species to almost three weeks, as nearly all the specimens have been in the finest condition. A remarkable asymmetrical variety was captured by Mr. Tait on Sept. 26th. Mr. L. B. Prout, who has been at much pains in elucidating the matter, informs me that *C. ambigua* is normally double-brooded on the Continent, which confirms my own knowledge of the species in Guernsey, where I have taken specimens, as recorded (*ib.*, iv., p. 302), from the middle of June to the end of October, and, on referring to my series, I find the June specimens (which were captured in either 1891 or 1892) are far worse in condition than the later August ones, and this is further supported by the rather worn state of the two Isle of Wight specimens taken in 1888, which were taken either late in July or quite early in August, as they were in company with *A. lunigera*, which was in fine condition. It would appear that, under favorable circumstances, a few immigrants of the first brood may prove the parents of a brood appearing towards the end of September, as is the case with these now recorded.—ALBERT J. HODGES. *Oct.* 1894.

NOTES OF THE SEASON 1894.

Enniskillen.—Possibly, as my collecting has hitherto been in good localities, *viz.* Portland, New Forest and Folkestone, I may expect too much, but in my opinion this place is a very unproductive one, and the present season is the worst in my experience. It may be of some interest if I give a general idea of this season's captures. LARVA-BEATING, in May (alder, birch, hawthorn), produced only *Himera pennaria*, *Miselia oxyacanthae*, *Oporabia dilutaria*, *Cheimatobia brumata* and other common "winter" moths. In August I tried again, but only filled the beating-tray with dead leaves, earwigs and bugs of different kinds.—SEARCHING FOR LARVÆ AT NIGHT, in March, produced only a few *Hadena oleracea* and *Boarmia repandata*; in June a series of *Tethea subtusa* off aspen, and *Paedisca ophthalmicana*; in July, on mountains, off sweet gale, a few *Saturnia carpini*, *Melanippe hastata* and *Calocampa vetusta*; in September, off dwarf sallows in a bog, a few each of *Cerura vinula*, *Smerinthus ocellatus*, *Notodonta ziczac*, *Acronycta rumicis*, with *Pygaera curtula*, *P. pigra*, *Anarta myrtilli* (1); and *Bombyx rubi* off aspen, a few *Cymatophora or* and *Smerinthus populi*. In July, a few *Dianthoecia cucubali* and *D. conspersa* off *Lychnis flos-cuculi*. PUPA-DIGGING in August produced two *Cirrhoedia xerampelina*, *Noctua xanthographa* (22), *Cidaria siterata* (3), and *Agriopis aprilina* (about 50, of which, however, I only set five, there being no good varieties as last year), *O. dilutaria*, and about 300 yet to emerge, which will probably produce *C. brumata*, *Taeniocampa stabilis*, *T. instabilis*, with a few *T. munda*, and odd specimens of other species.—SALLOWS IN SPRING. I saw only six *Taeniocampa gracilis*, and a few *T. stabilis*, *T. gothica* and *T. instabilis*. SUGAR. Here are a few nights from my diary: "May 18th, nothing; saw one *M. fluctuata*, one *Rumia luteolata*, two *Eupithecia vulgata*, on wing." "June 26th, two *Leucania comma*, one *Noctua rubi*, seven *Miana furuncula* (saw two *Agrotis exclamationis*, three *Grammesia trigrammica*, one *N. plecta*, one *T. pronuba*, all worn)." "July 18th, one *Acronycta rumicis* (and saw two *A. exclamationis*, two *X. monoglypha*, one *T. pronuba*)." "August 4th (saw only three *X. monoglypha* and one *N. augur*, all worn)." "Oct. 4th, nothing whatever."—FLOWERS. Scabious, ragwort and rushes. Have seen only a few worn *H. nictitans*, *N. xanthographa*, *Tapinostola fulva*, and one *Cidaria immanata*.—GAS LAMPS produced two good *C. xerampelina* (several others seen *inside* the lamps), and *M. fluctuata* with one *Emmelesia albulata* (2nd brood). Butterflies have been very scarce, with the exception of *Epinephele ianira* and *E. hyperanthus*. As regards NOCTUÆ, see sugaring note above. GEOMETERS have also been very scarce. The following list of TORTRICES comprise what I believe I have met with:—*Penthina ochroleucana*, *Stigmonota perlepidana*, *Cnephasia musculana*, *Phoxopteryx lundana*, *Teras contaminana*, *Argyrolepia hartmanniana* (3), *Sericoris lacunana*, *Ephippiphora pflugiana*, *Paedisca corticana*, *Carpocapsa pomonana* (3), *Symaethis oxyacanthella*, *Dichrorhampha plumbana* (*ulicana*), *Grapholitha penkleriana*, *Dictyopteryx bergmanniana*, *Aphelia osseana*, *Rhacodia caudana*, *Sciaphila* *conspersana*, *Tortrix ribeana*, *Penthina picana* (*corticana*), *Bactra lanceolana*, *Tortrix viburniana*, *Paedisca ophthalmicana* (a dozen, bred from aspen), *P. semifuscana* (a few, bred from *Myrica gale*); several afternoons' beating hawthorn hedges in September, produced a number of *Peroneas*—*variegana* (very plentiful), *schalleriana* and *comparana*, about a dozen of each, and a few *hastiana*. I had only two days collecting away from here, and netted about forty *Emmelesia taeniata* in two days, out of which only one is in good condition, the majority being so much worn, as to have been released at once. I was evidently too late for them.—(Capt.) E. W. Brown, Enniskillen. *Oct. 6th*, 1894.

Short Notes from the Exchange Baskets.—The Rev. R. McClean (Sligo) writes on Oct. 31st:—"This year has been very bad for collecting, and no larvæ were to be got. The best thing that I turned up was a very nice variety of *Taeniocampa munda*, with a black band across the wings. I hope next year to take a good series of them. Last June, in Co. Kerry, I took a fine series of *Leucania littoralis*, but I am not certain whether they differ from the English type. *Stilbia anomala* and *Epunda lutulenta* were very scarce this year."———Mr. F. G. Whittle (Southend) writes on Nov. 10th:—"The following insects visited my sugar.—Sept. 10th: *Cirrhoedia xerampelina* (one only), *Catocala nupta*, *Plusia gamma*, *Agrotis ypsilon*, *Mellinia circellaris*, *Noctua c.-nigrum*, *Pterophorus monodactylus*, *Depressaria arenella*, and *Teras contaminana*; Sept. 13th: *Amphipyra tragopogonis*; Sept. 18th: *Anchocelis pistacina*, *Xanthia fulvago*, *X. flavago*, *Calymnia diffinis*, and *Depressaria subpropinquella*; Sept. 20th: *Xanthia gilvago* var. *palleago*, *Agrotis saucia*, *Anchocelis litura*, *A. lunosa*, and *Cerostoma radiatella*; Sept. 23: *Hadena protea*; Sept. 26th: *Agrotis segetum*, *Orthosia lota*, *O. rufina*; Oct. 6th: *Scopelosoma satellitia*, *Orrhodia ligula*, *Endrosis fenestrella*; Oct. 8th: *O. vaccinii*, *Miselia oxyacanthae*. At light, the following have occurred, *viz.*: *Eubolia cervinata*, *Cidaria miata*, *Orgyia antiqua*, *A. pistacina*. Until this year, I had never taken more than one or two *A. litura* in any one season. Visiting my sugar rather earlier than usual on Sept. 23rd, I saw many specimens flying round and settling near the patches, and was able to box 18 in a very few minutes. I suppose the species flies very early, for on my second round not a single specimen was to be seen."———Mr. E. A. Atmore (King's Lynn) writes on Nov. 14th:—"I have recently been into some Scotch-fir woods here to look for pupæ of *Bupalus piniaria* and *Panolis piniperda*. I found both very abundant—far more so than I have found them for years, but a large number of the former species have not yet assumed the pupal state!"———Dr. H. H. Corbett (Doncaster) writes on Dec. 5th:—"At the end of September, and throughout October, sugaring was, if possible, more unprofitable than ever, but, at the end of October and during the greater part of November, things were much better; moths swarmed at the treacle. They were, for the most part, common, but some nice forms turned up, perhaps the best being *Orrhodia ligula* var. *polita*, *Scopelosoma satellitia* (dark forms), and vars. of *O. vaccinii*, *Phlogophora meticulosa*, and *Calocampa exoleta* were abundant, but of the genus *Anchocelis* I only saw three or four individuals. Mr. Horne's *Scoparia ambigualis* (?), in the exhibition box, is a very curious form. Where I have seen any melanic tendency in this species, it has been towards a darkening of the central shade, and not of the basal and hind marginal areas. If I had to name this specimen

I should call it *Scoparia atomalis* var. *suffusa*. From a somewha limited acquaintance with *S. atomalis*, I am inclined to consider it distinct from *S. ambigualis*. I have taken them in Cumberland, where they appear to be quite distinct in appearance and in habit. *S. ambigualis* (with *S. ulmella*) I found in quantity on larch trunks, while, within a few yards, *S. atomalis* swarmed in a small peat bog. This was in 1887. I exhibit a *Lithocolletis*, which I call *L. dunningiella*, and which I occasionally breed from mines in the undersides of the leaves of *Alnus glutinosa*. Is this the real *dunningiella*? If so, it is distinct enough from *L. nicellii*, both in colour and food-plant."———Mr. N. M. Richardson (Weymouth) writes on Dec. 11th:—"Dr. Corbett's *Lithocolletis* is, as far as I can judge, just like a dark *L. nicellii*, but as that seems to be in agreement with the description of *L. dunningiella*, it may be that species—I have no specimen of the latter in my collection—or it may be a new species, or only a dark var. of *L. nicellii*, caused by a change of food-plant. Are the mines like the rather peculiar ones of *L. nicellii* on nut? I doubt if *L. dunningiella* has been recorded as bred; I see nothing about it in the *E. M. M.* or the *Ent. Annuals*, and in *Insecta Britannica* the references are to *Ent. Ztg.*, 1852, p. 88, and *Zool*, 1848, where it was described or referred to as *frolichella*. Stainton says, among oaks and nut-bushes, but, as one knows, such hints are sometimes very misleading as to the food-plant. Dr. Corbett's specimen is a curious variety, having three costal streaks on the right side, but only two on the left. I should think, with Dr. Corbett, that Mr. Horne's *Scoparia* is an *atomalis* var. Dr. Corbett's note about *ambigualis* and *atomalis* is of great interest, for I think that most entomologists look on them as merely varieties."

PRACTICAL HINTS.

A CURE FOR MITES.—I have found that painting the inside of store-boxes with white-lead, diluted with turpentine into which a few drops of corrosive sublimate have been poured, is a thorough cure for mites, as well as all other similar pests. I have found that such insects as the *Hepiali* and the *Leucaniidae* show no signs of grease, and retain their natural appearance, when placed in boxes so treated.—(Rev.) F. B. NEWNHAM, Church Stretton, Salop. *Dec. 3rd*, 1894.—[Practical hints, such as the foregoing, would be much more useful if our correspondents would indicate the quantities of the several ingredients they use. We are puzzled by the injunction to pour "a few drops of corrosive sublimate" into the mixture, inasmuch as corrosive sublimate is a solid.—ED.]

NOTICES AND REVIEWS.

BUTTERFLIES AND MOTHS (British), by W. Furneaux, F.R.G.S. (London: Longmans Green & Co., 1894); Price 10s. 6d. net.—When we had read a few pages of this book, a slight recollection of a story, concerning certain razors which were made to sell, dawned upon us; as we read on the recollection became clearer, and by the time that we had finished the first 119 pages, we were perfectly convinced that, like those well-known razors, this book was made to sell. There is not one of these pages that does not bear convincing and startling proof that the author has no real practical acquaintance with the subject of which he treats. Old and obsolete explanations, which have been copied and re-copied by various authors of so-called popular entomological works until the very name of "popular entomology" has been made to stink in the nostrils of all practical and observant men, are again dished up here in the old, old forms; and, although there are no quotation marks in the book, anyone who read in his childhood's days Coleman's *British Butterflies*, Rev. J. G. Wood's *Common British Moths*, Newman's *British Butterflies* and Merrin's *Lepidopterist's Calendar*, will recognise old friends (and often deceitful and misleading enemies), in the contents of this volume. Who, for example, does not recognise the following:—"The framework that supports the thin membrane we have spoken of as consisting of a system of rays, but to these the terms, veins, nerves, nervures or nervules, are more commonly applied by various naturalists. We cannot do better, however, than adhere to the name originally used, for the structures in question do not perform the functions of veins, though, at first, they contain blood?" This will be read with interest by entomologists who have long learned to look upon the nervures as tracheæ, outside and around which the blood circulates. We would refer the author to *Ent. Record*, vol. ii., pp. 101-104, 153 and 274, for an explanation of what a nervure really is. The structure of an insect's eye is the subject of a discourse, wholly (from a scientific point of view) imaginative. The author says that the "sense of vision depends on other conditions besides the size of the eye, and as these conditions are not understood in relation to the eyes of insects, any attempt at an explanation would be quite useless." Concerning this again we would refer our author to Dr. Sharp's article on the eyes and vision of Arthropods, in a recent volume of the *Transactions of the Entomological Society of London*, where he will find that the conditions are better understood than he imagines. There is also a remarkable comparison between our own sense of sight and that of insects. After having supposed that each facet forms a distinct image, the whole of which are "blended together to form one continuous picture," the author goes on, "Still there remains this difference: while in our own case the two images formed by the two eyes are practically the same, in the case of insects, every one of the little conical tubes of a compound eye forms an image of an object that cannot possibly be formed by any one of the others." Here, even the elementary principle of the theory of vision is wrong, for the images formed separately by our eyes, differ as essentially as would the picture on each facet of an insect's eye; but even this theory of vision in insects has long been discarded by scientific entomologists. Mr. Furneaux leads one to believe wonderful things concerning the power of vision in a butterfly, for, after graphically describing how he has unsuccessfully "quietly circled round one to approach it from behind," he concludes that the cause of his failure was that "the position and construction of its eyes enabled it to see almost all ways at once." These are only samples of the erroneous and misleading statements that one finds in every page, and about every organ touched upon. The life and death scene of a butterfly, depicted on pp. 12–13, would be more interesting if it were generally true. In very many cases the female does not "deposit her eggs on the leaves or stems of the plant a few days after emergence from the chrysalis case," but leaves the operation for weeks or even months. Our author, too, while giving insects the reputation of having a wonderfully keen development of the sense of smell and discrimination of scents, illustrated in the familiar phenomenon of "assembling," says, with regard to the selection of the food-plant by the perfect insect on which to lay her eggs:—"Our only solution of the problem is, to attribute the whole thing to that inexplicable quality which we are pleased to term *natural instinct*." The "we" here would probably include some of the old Latin and Greek philosophers, and even some of the British sages of the middle ages. But such an explanation as this is out of place in a book published at the end of the nineteenth century, circulars concerning the sale of which have been sent to the Fellows of the learned Societies. The chapters on the "Egg" and "Larva" are full of the well-worn platitudes which every fairly educated man, without any special knowledge of the subject, picks up; but the way in which a Nymphalid pupa is able to wriggle out of the larval skin and suspend itself by its anal segment is characteristic of the book. Our author writes:—"The thing is managed in this way. As the skin slowly splits through the wrigglings of the apparently uncomfortable occupant, it is gradually pushed backward—that is, upward—till it is in a shrivelled condition and the body of the insect is nearly free. But the chrysalis thus brought to light is provided with little hooks on the end of its 'tail,' by which it can attach itself to the irregularities of the crumpled coat. Its conical abdomen is also very flexible, and it can, by bending this, seize hold of a ridge in the skin, holding it between the segments. Thus, although practically quite free from its old garb, it never falls to the ground. . . . . . The newly-formed chrysalis desires to be entirely independent of its cast-off skin, and to suspend itself directly from the silky carpet it has prepared. To this end it works steadily for a time, alternately bending its supple abdomen from side to side, gripping the folds of the skin between the segments, pulling its body a little higher at each movement, and securing itself at each step by the little hooks at its extremity. So it climbs, and at last it reaches the network of silk fibres, and thrusts the tip of its abdomen among them till some of the hooks have taken hold." Quite interesting this *if* it were true. We are quite aware that this was the explanation given by Kirby and Spence three-quarters of a century ago. We are quite aware that it has been copied, paraphrased, and translated, with or without quotation marks, by writers of books for three-quarters of a century. But it is *not* true, as our author will discover if he examines the phenomenon next summer for himself, or looks up the remarks of Dr. Osborne and others in the back numbers of the *Ent. Mo. Mag.* On p. 47, the author states that experiments have been performed in which pupæ have been placed "in an ice-house, and the emergence of the perfect insect has been delayed for many months and even years, and then . . . . . the winged insect has made its appearance as if nothing unusual had happened." We would like to have the references to these experiments. Prof. Weismann's and Mr. Merrifield's are the most successful experiments of the kind that have been carried out, and their experiments certainly prove that such insects as do emerge show remarkable signs of something very unusual having happened, as may be seen from the Plates in the *Trans. Ent. Soc. of Lond.* accompanying Mr. Merrifield's papers. We take leave to doubt the fact that any pupa has been exposed for "years" to a low temperature and has emerged at all. Our author, describing how newly emerged butterflies try their wings before they essay their first flight, writes:—"They vibrate their wings, sometimes with such rapidity that they are lost in a kind of mist, and with such power that their bodies would be carried suddenly into the air were they not firmly anchored by three pairs of hooked claws." This is probably very picturesque, but what is the kind of mist, and what is the exact preventive of a disappearance based on these Jack-in-the-Box propensities? To us the whole of this, and pages of similar matter, are pure verbiage and unmitigated drivel. The descriptions of the butterflies, their larvæ and pupæ, are skeletons obtained evidently, although there are no quotation marks, from a few well-known sources. The good old story of how to catch Purple Emperors with "a large net mounted on the end of a pole twenty or thirty feet in length," and "the difficulty of wielding such a cumbersome implement," is served up as if quite new. The original writer of this canard knew nothing of the subject he was writing about, and those who copy him appear to know less, and to desire to know no more; but for all that, we can assure Mr. Furneaux, that far from "few falling a prey" to the use of a long-handled net (not twenty or thirty feet), we know well three collectors from Dartford and the neighbourhood (two of whom, happily, have long since died), who used to take some thirty to forty *A. iris* a day between them, until they practically exterminated the insect in its well-known haunts in North Kent. The whole volume is a parody on entomology. The errors it contains cannot but work the greatest possible harm to any youngster into whose hands it may be put, and the somewhat gaudily-coloured plates of the British butterflies and of some of the more showy moths, are likely to produce an impression on kind-hearted but ignorant people, that it would serve well as a gift-book to children. The fact, too, that the publishers are scholastic publishers, increases the possibility of the evil. To them we appeal most earnestly, for the sake of education, to have the book thoroughly overhauled by a competent specialist, and not to do untold injury to a generation of children by the dissemination of wholesale error. We earnestly entreat the author to read the current entomological magazines and recent publications, and not to believe that anyone who has strolled about a museum or library can write a book on the manifold wonders of Nature, which, indeed, can only be learned by river and hedgeside, in wood or on moor, by him who has had a life-long training, and has, besides, an intuitive love of natural objects.

We see from the preface that "The favourable reception with which the 'Out-door World' has been greeted, has encouraged the publishers to issue a series of volumes, dealing with the various branches of natural history." Such a series, if written in the style of *Butterflies and Moths*, will be, educationally, nothing short of a calamity. If, however, the publishers put such a series into the hands of competent specialists, each book into a master's hand, we shall welcome the advent of each volume. Popular science is not necessarily a mixture of fiction and imagination; there are writers who can deal with facts, in a much more interesting and literary manner, than the author of *Butterflies and Moths* treats of fiction.

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A Morning at Bourg St. Maurice.

By J. W. TUTT, F.E.S.

The silvery sweetness of the Sabbath bells is borne on the still air into the little Swiss village of Bourg St. Maurice, through whose narrow streets the jingle, jingle of the mule bells passes, beyond the houses, into the fields just beyond. A typical Swiss village, I have called it little, although it is large compared with many of the Swiss villages that dot the slopes of the Isére Valley, in which Bourg St. Maurice stands. Swiss villages I have termed them, for are not all these charming little places on the Alps essentially Swiss, whether they are in Savoy (and thus belong politically to France), in Piedmont (and thus belong to Italy) or in Switzerland itself. It is one of the last three days of July. A large white cloud floats along, changing its fantastic shape as it sails across the deep blue sapphire sky, but the mountains around are free from cloud, and show no signs of any possible atmospheric disturbance for some time to come.

The village is situated at no great distance from the entrance to the Little St. Bernard Pass, on the French side of the frontier. Along the road which leads towards this we go for a few hundred yards, the emerald green of the fields showing, by the luxuriance of the crops, how carefully they have been irrigated. A few butterflies only are observed near the village—*Pieris rapae*, *Epinephele ianira*, *Coenonympha pamphilus*, with here and there, scudding along at a tremendous pace, *Colias edusa* and *C. hyale*. These of course we observe from the road, but presently a White butterfly, of pronounced habit and flight, appears, and settling on a flower by the wayside, shows us the first *Pieris daplidice*. A glorious insect (evidently just emerged from the pupa) its marbled green underside discloses at once its identity, whilst its abundant dark spotting on the upper side bespeaks it a female. This is but the advance guard, for in a meadow to the left, where a row of trees makes a grateful shade, the delicate and slender lady of the woods,—the Wood-white butterfly (*Leucophasia sinapis*)—flutters so gently, that it looks the embodiment of delicious coolness. We reach a flower-covered bank only some ten or twelve feet in height, on which the rays of the sun, with their ever-increasing heat, beat down pitilessly. It is just such a flower-bank as one might meet in hundreds of byways in Britain; but here, butterflies and moths innumerable haunt the chosen ground. Lovely *Argynnis paphia* spread their wings to catch the rays of the sun, whilst *A. adippe* and *A. aglaia* dash from flower to flower, hustling off the smaller creatures. An exquisite piece of molten silver set in a golden frame on yon knapweed flower, shows the beautiful *A. latona*, and soon many others are detected. The Red Admiral (*P. atalanta*), the embodiment of warmth and richness, fans its glowing wings, and keeps intruders to its own domain at a very respectable distance. *Gonepteryx rhamni* adds colour to the scene, its yellow contrasting strongly with the rich orange of *C. edusa*, which frequently pauses to join in the luscious banquet that this bank affords. A potato field skirts the top of the bank, and along this I slowly pass, to watch the aerial sprites in their gambols. Two Chalk-hill Blues (*Lycaena corydon*) rush at each other, and all the passions of a life pent up in their frail bodies seem let loose, as they fight with apparently virulent fierceness. An interesting little Copper (*Chrysophanus dorilis*) with brown wings and scarcely a tinge of the brighter colour, is not at all infrequent, whilst the female is so much a Blue in shape and general character, that the relationship of Coppers and Blues is manifestly illustrated. A small moth bundles head-first off that flower into the potato field and settles on the ground. I mark it down, and soon discover many *Agrophila trabealis* taking an early nap, with one eye very widely open. An epitome of black-and-white loveliness hovers over a flower, and reveals itself as my Kentish favourite, *Acontia luctuosa*. Bright green and scarlet *Zygaena minos* boom along, stirred to unwonted exertions by the heat, whilst other Blues join *L. corydon* in its combats or play. A rapid rush, and *Heliothis armigera* is seen diving its long tongue deep into the nectaries of a flower. A wonderful instrument is that long flexible tube, made of two longitudinal halves, fitted as it were by joints all the way down to make a sucker, whilst the globular expansion at the top into which it opens, by alternately expanding and contracting, causes the nectar to flow up into it, and then forces it down its throat. The Browns, too, are prominent; there are plenty of *E. ianira*, with some striking varieties among the males exactly like the ordinary form in size, general build and appearance, but with a marvellous supply of silky androconia. Yes, one of the specimens has two spots, the second half-way down the wing, and here is another. "Another species," says my companion laconically. "I think not; where are the corresponding females if it is?" is my reply. "Not out yet," is the prompt answer, and so it turns out; our varieties are *E. lycaon* a near ally of *E. ianira*, who haunts the same ground. Four other species of Fritillaries occur here besides those we have named, among which the rich coat of *Argynnis dia* is noticeable, but we regretfully leave the bank behind and soon reach a bridge crossing a rapid stream.

We bear to the left without crossing the bridge, and sit down by the side of the stream, where, under the shadow of the trees, we wipe our streaming brows and take in large draughts of the purest ozone. A lovely bank of bushes grows luxuriantly by the water's edge, and a piece of waste ground, on which *malvæ*-like Skippers skip, *Colias hyale* hesitates, and *Pieris daplidice* stays to sip the honied sweets of the flowers, is followed by a clover field which leads to the foot of the mountains. *Ilythyia carnella, Acidalia rubricata, Euclidia glyphica, Eubolia mensuraria, Spilodes cinctalis*, and many other species haunt the edges of the waste ground and clover field, whilst as we skirt the edge of the field by the side of the bush-margined stream, a tall thistle head discloses a magnificent specimen of *Erebia aethiops* fanning its wings. It is but just out of pupa, and exhibits not one line, one mark of difference from those which may be found inhabiting the Argyleshire hills at the back of Coulport. Very low we think this, considering the latitude, for what is generally considered a northern species, although it is true that it comes down almost to the sea-level in the Durham denes. At any rate here it is; and now, as we reach the foot of the mountains before us, we might almost fancy we were on a chalk bank in Kent. Not altogether though, for the surroundings dispel the idea as soon as formed, although some of the insects are remarkably suggestive. At the corner, where the stream skirts the hills, *Leucophasia sinapis* is not uncommon; the clean white colour and well-defined round apical spot on the males inform us that they belong to a second brood, for there is a very well-defined seasonal dimorphism in this species, not so frequently seen in British specimens where the second brood is only partial and comparatively rare. But on this bank there is a perfect wealth of insect life. Blues in profusion, are here—*Lycaena corydon*, *L. bellargus*, and *L. icarus* among our British species—whilst the charming *Zygaena minos* is altogether outnumbered by the still more beautiful and variable *Z. carniolica*. A grand insect is this latter species, with its crimson streak running transversely near to and parallel with the outer margin of the wing, besides having the usual five spots, with which many Burnets are alone ornamented. *Acidalia humiliata*, *A. ornata*, *Eubolia bipunctata*, *Mimaeseoptilus plagiodactylus*, *Aciptilia tetradactyla*, and numberless other species strongly suggest a limestone or cretaceous fauna, and the flora is decidedly of a similar nature. A few minutes' observation soon makes us return again to the welcome shade, and by the side of the stream *Crambus culmellus* and *C. perlellus* are in considerable numbers. As we have already been on the move three hours, we slowly return to Bourg St. Maurice. The insects have increased in numbers since the morning, and are flying wildly about in the hot sun. This walk home in the sun settles our stay at Bourg St. Maurice, and, my companion objecting to being burned in the Tropics, the afternoon sees us *en route* for the pass of the Little St. Bernard, on our way to a more Alpine spot, where the sun's rays are tempered by the pleasant coolness which accompanies in these delightful places a rise of two or three thousand feet in altitude.

Notes on a Specimen of Orrhodia erythrocephala var. glabra, recently taken in Devonshire.

By Wm. S. RIDING, M.D., F.E.S.

In the earlier part of November, 1894, my son took a fine female of *O. erythrocephala* var. *glabra*, at ivy in our garden. As it varied somewhat from Mr. Tutt's description of Hübner's figure of var. *glabra* (*British Noctuae*, vol. iii., p. 6), I forwarded it to Mr. Tutt, who wrote, "There is no doubt it is a slight modification of var. *glabra*." The head palpi and thorax are reddish-brown, the palpi are porrected and are not visible beyond the head. The antennæ are apparently simple (with a lens they can be seen to be very finely ciliated). The fore-wings are purple with a slight tinge of brown, and are more or less suffused with bluish-grey scales; the fringes are reddish-brown, dotted with darker opposite the intervals between the veinlets. Expanse of wings, 1″ 6‴. Near the base there is a transverse line not reaching the inner margin. Half-way between this line and the orbicular a second transverse line, edged externally with reddish-brown and slightly oblique, runs across the wing. The elbowed line is obtusely angled near the costa, sinuous, and edged internally with reddish-brown. Mid-way between it and the outer margin is a narrow bluish-grey band, in the centre of which are seven reddish-brown spots. All the transverse lines, as well as the outlines of the stigmata and the nervures, are bluish-grey. Between the outer margin and the pale bar the veinlets are dark, especially the third median veinlet, which appears as a short black streak. Both stigmata are unicolorous with the fore-wing, edged internally with bluish-grey, and externally, except above and below, with reddish-brown. The orbicular is nearly round, and the reniform somewhat oblong with three black dots at its lower and outer portion. The external reddish-brown edging of the reniform is prolonged as a narrow shade to the internal margin. Along the costa, from the base as far as the reniform, there is a very conspicuous, pale, slightly ochreous line, edging the costa; beyond it are three distinct spots of a similar colour, and a fourth, less conspicuous, is placed at the commencement of the pale bar. The hind-wings are blackish-grey, with an indistinct central spot and two paler transverse lines—one, mid-way between the spot and the hind margin, and faint; the other, close to the latter, and more distinct. The fringes are pinker and much paler than those of the fore-wing, and are almost unspotted. The body is blackish-grey, becoming reddish-brown on the sides and towards the extremity.

There is a general similarity between this variety of *O. erythrocephala* and some of the varieties of *O. vaccinii*. The chief points of difference seem to be the following, which, however, must only be accepted for the specimen described—at all events, until a further comparison of other British and foreign specimens is made:—

O. erythrocephala.	*O. vaccinii.*
1.—Large size, 1″ 6‴.	1.—Average size, 1″ 3‴, rarely 1″ 4‴.
2.—Head, palpi, thorax, forelegs, and fringes of fore-wings, reddish-brown, contrasting strongly with the purple of the fore-wings.	2.—Head, palpi, thorax, fore-legs, and fringes of fore-wings, unicolorous with the fore-wings.
3.—Fore-wings purple with a tinge of brown, and more or less suffused with bluish-grey scales.	3.—Fore-wings; out of some 70 specimens, with many varieties, there are none with a purple colour. Some of the reddish-brown varieties suffused with bluish-grey and ochreous scales, have a general and superficial resemblance to the specimen of var. *glabra*.

4.—The second basal line is equidistant from the first basal line and from the orbicular. The first angle, formed near the costa, is not very acute. The transverse lines are only slightly defined by the edging.	4.—The second basal line is two-thirds of the distance from the first basal line and one-third from the orbicular. It forms two successive angles near the costa, both of which are very acute. The transverse lines are generally distinctly defined by the edging.
5.—A conspicuous edging to the costa, appearing as a pale slightly ochreous line, ceasing opposite the reniform.	5.—The pale line occurs in some varieties of *O. vaccinii*, but is much less conspicuous, inasmuch as it more nearly approaches the ground colour of the wing.
6.—The orbicular stigma, nearly round and very slightly oblique. The reniform stigma has three black dots at its lower and outer portion.	6.—The orbicular stigma, oval and oblique. The reniform stigma has the lower portion filled in with black in most specimens, in a few the black is absent, but in none is represented by dots.

It will be interesting to ascertain how far these differences hold good for other specimens taken in England or abroad. My specimen seems to differ from Hübner's figure of the variety, chiefly, in the transverse lines and outlines of the stigmata being bluish-grey, instead of ochreous, in the venation being paler than the ground colour, and in a blacker hind-wing having two paler transverse lines.—Buckerell Lodge, near Honiton, E. Devon. *Dec. 13th,* 1894.

Notes on Caradrina ambigua and C. superstes.

By J. W. TUTT, F.E.S.

I am indebted to Mr. Prout for calling my attention to the fact that the specimens from the Isle of Wight, which we have recently been calling *Caradrina superstes*, are in reality, *C. ambigua*. This blunder is all the more inexcusable, because I have diagnosed them quite correctly in *The British Noctuae and their Varieties*, have taken what I suppose to be both species at Deal and *C. ambigua* in the Isle of Wight, and have seen a fair number of Continental specimens (including a large part of those captured in 1893, by Mr. A. J. Hodges, in Guernsey). I have had but little leisure to give to the NOCTUÆ since the above work was completed, and hence, trusted to memory rather than to reference. As is stated in *The British Noctuae*, &c. (vol. i., pp. 148-149), *Caradrina ambigua* is the greyer and *Caradrina superstes* the more ochreous species. The Guernsey and Isle of Wight specimens belong most distinctly to the greyer species—that is to *C. ambigua*. This only leaves as *C. superstes*, five of my Deal specimens, but Mr. Prout's remarks will make a fresh examination of these, in the light of Continental material, absolutely necessary. The remainder of my Deal specimens (a few scattered from 1885-1892), as well as my captures in the Isle of Wight

(1889), must be looked upon as *C. ambigua.* I exceedingly regret this blunder, as it is one that ought not to have occurred, and I can only console myself with the reflection that "accidents will happen in the best regulated families."

Mr. Hodges sends us a notice of the capture by Mrs. Abbott, Mr. Abbott, Mr. Tait, and himself of a fair number of specimens of *C. ambigua* in the Isle of Wight this autumn, where Mr. Prout also obtained it; I obtained some nine specimens, spread over nearly as many years, at Deal, and five in 1889, in the Isle of Wight. The original British specimens came from Brighton. I have no doubt that the species occurs over a long stretch of our southern coast. It appears to be at least partially double-brooded, and to emerge earlier or later in different seasons, depending largely on meteorological conditions. It is, probably, only single-brooded in some cold years, but wet does not appear to have interfered with it in the present year.

In the *Entomologist's Record*, vol. iv., Plate c., fig. 4 (the ochreous form) is what is believed to be *Caradrina superstes.* I will confirm or refute this as soon as I get the necessary time and material, as Mr. Prout thinks it may prove to be only an ochreous form of *ambigua*, but this, until the necessary material is obtained, must be looked upon as a matter of opinion; fig. 5 (the greyer form) is *Caradrina ambigua.* In vol. iv., pp. 98–99, the characters distinguishing *superstes* and *ambigua* are reversed.

It is an unfortunate error, spread, too, over a considerable time, and has done, I am afraid, a considerable amount of damage. With the exception of the Brighton, Deal, Sligo (?) and Isle of Wight specimens, however, there are, I believe, no British specimens extant, so that the amount of actual error is small. Those, however, to whom Mr. Hodges refers as receiving Guernsey specimens from him last year, must bear in mind that they are types of *ambigua*, not of *superstes.*

I have more than once had the grey form of *ambigua* sent to me from Continental collectors as *superstes*, so that there is a general mixing elsewhere than in Britain.

CURRENT NOTES.

Probably the purest British collection of lepidoptera ever offered to the public is that made by Mr. Machin, which is to be dispersed on Feb. 26th at Stevens' Auction Rooms. The Micro-Lepidoptera are probably unequalled in condition by those of any other collection in the United Kingdom.

Mr. F. J. Hanbury, F.L.S., F.E.S., contibutes to the *E. M. M.* for January, a very interesting account of his trip last summer to West Sutherland, the Orkneys and Shetlands, in search of rare species of the genus *Hieracium*, to which genus he is devoting considerable study. Mr. Hanbury did not neglect entomology; his paper is a model of what such papers should be.

Honour to whom honour is due! Evidently Dr. Knaggs is not a "progressive" entomologist, and so does not read *The Entomologist's Record.* Had he done so, he would have seen that the credit of introducing "rectified wood naphtha" for the purpose of relaxing insects is due to Mr. J. P. Mutch of Hornsey Road, and not to Mr. Clark, as Dr. Knaggs (*E. M. M.*, Jan.) makes out.

Mr. W. F. H. Blandford has recently strongly recommended caustic potash for cleaning Coleoptera. The usual substances for cleaning dirty, greasy or mouldy insects—chloroform, ether, benzine, alcohol, soap-and-water, &c.—are all useful in their way, and for ordinary greasy specimens chloroform is considered the most valuable. But for really dirty insects caustic potash is said to excel. Two stoppered bottles are required; one, for methylated spirit; the other, for a strong solution of potassium hydrate in distilled water (two drachms to the ounce). The other requirements are, a vessel containing distilled water, sable brushes (which must be dipped into the solution), sheet cork, and blotting-paper. The insect should be dipped into the spirit, then immersed in the potash solution for about half-a-minute, or less; the superfluous moisture should afterwards be drained off and the insect pinned on the cork for three or four minutes. It should then be held under the distilled water, and the dirt and potash brushed out. When cleaned, the insect should be allowed to dry, and pubescent insects should be placed in alcohol, the moisture removed by blotting-paper, and the insect quickly dried.

Prof. Pabst of Chemnitz, has published a little pamphlet on the occurrence of that migratory species, *Acherontia atropos*, on the Continent. Fuchs, in 1890, showed that it had become acclimatized in Lower Austria and the neighbourhood of Vienna, and Dr. Pabst believes that a large number of migrants from this Austrian colony have spread over Germany. In several of the warmer parts of Germany, such as Aschaffenburg (*Stett. ent. Zeit.*, 1887, p. 257), Coblenz (*Ent. Zeit.*, Guben vi., 82), and even near Meissen in Saxony (*Iris.*, v., 396), the successful hybernation of the species has apparently been demonstrated; but it is not thought that it has established a permanent hold on these portions of its annected territory, for it seems probable that very cold winters will in time always finish it, and then the continuance of colonies in these localities will depend on fresh immigrants. Dr. Pabst is of opinion that a long continued or permanent occupation of German territory has not yet been proven. In North Germany the species is never found so early as May or June. With regard to its flight, Dr. Pabst thinks that *A. atropos* exceeds *Choerocampa celerio*, *C. nerii*, or *Deilephila livornica*, in strength and power of endurance. Its short tongue enables the insect to feed on exudations from wounded trees, to say nothing of its predatory habits in connection with bee-hives, and *A. atropos* can supply itself with sustenance in this way more readily than its long-tongued allies. Pairing, probably, always takes place at the locality where the moth emerges from the pupa; the more northern captures seem to be always of females, urged by the necessity for depositing their eggs to their lengthy journeys. The males seem to be exhausted by the act itself, and consequently to perish at their homes (N.B.—The sex of captured migrants should always be noted). In addition to the potato and *Datura*, Dr. Pabst enumerates ash, carrot, lilac, jessamine and apple besides *Enonymus europaeus* and *Rubia tinctorum*, as food-plants of the species, and records the finding of a arva in a cabbage-field; the said larva was reared on cabbage leaves, pupated, and finally the moth emerged. Dr. Pabst notes the fact that, in northern regions, the species enjoys immunity from the attacks of ichneumons or *Tachinae*.

The Rev. E. N. Bloomfield (*E.M.M.*, Jan., p. 24), adds *Sciopteryx consobrinus*, Kl. to the British Tenthredinidæ. It differs from *S. costalis* in having "'the mouth, orbits of the eyes, and stigma quite black, and the wings hyaline,' whilst *S. costalis* has the wings fuscous, the base of the costa and stigma ochreous-yellow, and the orbits of the eyes more or less white." The specimen was taken at Guestling, by Mr. W. Bennett, on April 3rd, 1893.

It is with great regret that we have to record the death, at the age of 61, of Mr. J. R. Wellman, which took place on Nov. 12th last. He was one of the founders, and the first President, of the South London Entomological Society, and several times afterwards occupied the latter post. He had been in failing health for some time.—Still more recently (Dec. 3rd, 1894), occurred the death of a well-known scientific entomologist, Dr. F. Buchanan White, F.E.S., of Perth. He was born at Perth, on March 20th, 1842. Although educated for the medical profession, he had no need to practise, and devoted all his time to the study of Natural History. Some quarter-of-a-century ago, his remarks on melanism in British Lepidoptera proved him to be a man far in advance of most of the entomologists of the day, and, as a collector, he is best known, perhaps, by reason of his addition of *Zygaena exulans* to the British list. A kind and genial companion, he could nevertheless hold his own in scientific discussion, and his seathing remarks when he was under the impression that the *Zygaena exulans* ground would probably be closed to collectors, owing to what he considered had been a misuse of his name, will be within the recollection of all lepidopterists. In 1871, he started the *Scottish Naturalist*, and continued to edit it for some years, taking at the same time lively interest in *The Annals of Scottish Natural History* with which it was finally incorporated. He was better known as a botanist than as an entomologist. His death leaves a decided gap in the scientific circles of Scotland.—The great collector Hugo Theodore Christoph, who for the last fifteen years has been curator of the entomological collections of the Grand Duke Nicholas of Russia, died on October 24th, 1894, at the age of 63.

Professor Trail points out in *The Annals of Scottish Natural History*, that a statement made by Mr. W. Reid, in a "List of the Lepidoptera of Aberdeenshire and Kincardineshire," to the effect that *Retinia resinella* did not occur in Aberdeenshire, is erroneous, as he found the well-known resinous masses on a Scotch fir-tree, near Bridge of Ess, west of Aboyne, on September 8th, 1894.

NOTES ON COLLECTING, Etc.

Short Notes from the Exchange Baskets.—Mr. Mason (Clevedon) writes on Oct. 30th:—"The weather at present is very much against collecting at ivy. So much rain falls that the flowers are scarcely ever dry in the evening, nor have insects been as numerous as usual; the only good things I have taken up to date being a pair of *Xylina semibrunnea* and an odd specimen of *Epunda nigra* at ivy about a fortnight since. *X. socia* is as scarce as it was last autumn. *Dasycampa rubiginea* I have not yet seen, but it may put in an appearance shortly. *Phlogophora meticulosa* is the most abundant insect at ivy this season; you may see three or four to a square foot of ivy any fine evening, and you may bring down a dozen into the umbrella with every stroke of the beating-stick. *E. nigra* used to be tolerably abundant at sugar here seven or eight years ago, but since then it has become gradually scarcer, odd specimens only being taken now and then at ivy."——

Dr. Riding (Buckerell) writes on Nov. 8th:—"Ivy has been giving us a few more insects, but mostly common ones. *Orthosia macilenta* has been plentiful, fine and variable; so have *Orrhodia vaccinii* and *O. ligula*. Several female imagines have been boxed by my son, but as yet none have favoured us with eggs; these, with one *E. nigra* and one *X. socia* have been our most aristocratic visitors. I have put into my box, with others, four *Orrhodias*—the upper two will be Mr. Tutt's *O. vaccinii* var. *rufa*, the lower two *vaccinii* var. *spadicea* (I presume). I cannot think the question of identity of *O. vaccinii* var. *spadicea*, at all settled, as regards these—the upper var. *rufa*, even, I cannot feel sure about, as the forewing has the hind margin taking the form of *ligula* (though not very distinctly); on closer examination, too, it varies considerably from the second specimen of *rufa*. The last two I personally consider to be a form of *O. ligula*. The hind margin is characteristic. I shall try to breed some, but find difficulty in getting eggs. Do these species lay eggs in spring or before hybernating? Can any member tell me from his own experience?"———Mr. C. Fenn (Lee) writes on Nov. 10th:—"In answer to Dr. Riding's enquiry respecting the deposition of eggs by the *Orrhodia* species, I can say from my own experience that they lay in the spring. Some years ago I obtained ova of *O. vaccinii* (of Stainton), and reared the larvæ. None of them produced the *spadicea* form, but as I did not have a great number, this evidence only goes for what it is worth. Personally, I have no doubt of the distinctness of the two species, but, of course, this is only my own opinion. *O. vaccinii* here is of universal distribution, but *O. spadicea* (*ligula*) is much more local, and though not scarce, is by no means as abundant as its congener."———Capt. Robertson (Coxhorne) writes on Dec. 5th:—"With regard to the egg-laying of *O. vaccinii* and *O. spadicea* (*ligula*), I can confirm Mr. Fenn's experience. I have bred both for the last four or five years, and find very little difficulty in separating the two species. If the females are taken in spring at sallow and placed in large chip boxes, which have been previously scored with a penknife, or cracked, so that they can find some place to hide their eggs, they will readily oviposit. I think the "cut-out" appearance of the forewing is the principal way of distinguishing *O. ligula* from *O. vaccinii*. The only good things I have taken this autumn are *Cirrhoedia xerampelina*, at rest on an ash-tree, on Aug. 30th; a few *Luperina cespitis*, in the moth-trap, on Aug. 30th and Sept. 1st; a female *Petasia cassinea*, at rest on an apple-tree in the garden, on Nov. 1st; a *Xylina semibrunnea* on Nov. 18th, at ivy. The weather for the past month has been remarkably mild, but nothing comes to light, with the exception of one *Poecilocampa populi* on Dec. 2nd."———Mr. N. M. Richardson (Weymouth) writes, on Dec. 15th:—"The two larvæ of *Plusia ni*, found at Portland, were certainly very like *P. gamma*, which makes it improbable that anyone would take much trouble to collect them unless they had some reason to believe them different. The capture of the species at Portland this season makes its occurrence at Penzance more probable. I have little doubt that had the larvæ been much worked for at the time of the capture in July more might have been obtained from Portland, and it seems easy to breed, so that if the Penzance collector got it at all he might have taken a fair number. At Portland the larvæ were quite small in July, and emerged at the beginning of September."

SOCIETIES.

At the meeting of the South London Entomological and Natural History Society on Dec. 13th, 1894, Mr. Brooks exhibited a long series of *Polia chi* from Rotherham, particularly remarkable for the general suffusion which many of them presented, the suffusion tending largely to obscure the ordinary markings; also, from the same locality, melanic forms of *Phigalia pedaria, Boarmia repandata* and *Hybernia defoliaria.* Mr. McArthur: *Coleophora laricella* from North Devon.—On Jan. 10th, 1895, Mr. W. A. Pearce exhibited a bred specimen of *Acherontia atropos*; it was stated that the pupa of this species had no free segments, and was thus unable to work its way through the earth. Mr. R. Adkin: a bred specimen of *Vanessa urticae* from Sunderland, in which the central costal blotch was united to that on the inner margin.

The Birmingham Entomological Society met on Nov. 19th, 1894, when the following, among other exhibits, were made:—Mrs. P. W. Abbott: *Sesia sphegiformis,* from Wyre Forest. Mr. H. J. Sands: living *Grapta c-album,* which had emerged two months before; some of the same batch were still in the pupal condition. Mr. R. C. Bradley: the following Diptera:—*Idioptera pulchella,* from Sutton, with its semi-apterous female; *Limnobia nigro-punctata,* from Sutton and Wyre Forest; *Trimiera pilipes,* from Tring.

City of London Entomological and Natural History Society.—*Nov. 20th,* 1894.—Exhibits:—Mr. Battley: *Anchocelis pistacina* and *A. lunosa,* showing the strong resemblance between the species. The most evident difference in the specimens shown, lay in the subterminal line, which, in *A. pistacina,* consisted of a series of crescentic spots, similar in colour to that of the wing, whilst in *lunosa* these spots were *black.* Mr. Clark: *Taeniocampa gracilis* from the New Forest, one specimen being light reddish, and the other dark purplish-brown. Mr. Bacot: *Gortyna ochracea,* bred from burdock-stems from Ponders End; two of the specimens had a light blotch on one of the fore wings, which Mr. Tutt believed was caused by pressure on the pupa during development. Mr. Prout: *Orthosia lota* from Hale End and Sandown; the former were all typical, the latter nearly all var. *rufa.* Mr. Tutt: *Zygaena achilleae* and vars from Courmayeur, Piedmont. Mr. Battley gave a short account of a recent visit to Charmouth, Dorset, from which it appeared that although Lepidoptera were scarce by reason of the inclement weather, 111 species of plants were observed which were actually in flower; these included the primrose, cowslip, dog violet, wild strawberry (also in fruit), and privet. The principal insects captured at ivy were: *Xylina socia* (one, about the middle of November, in perfect condition); *Epunda nigra* (5, three of them bad); *Orthosia macilenta* and *O. lota* (mostly var. *rufa*), also a few *Xylina rhizolitha* and *Cidaria siterata*; two specimens of *Dasypolia templi* were taken at light at Lyme Regis on November 5th, and one specimen of *Pararge egeria* was seen on October 25th, on which date, *Orrhodia vaccinii* began to appear.

The following gentlemen were nominated as Officers of the Society for 1895:—President and Treasurer, Mr. J. A. Clark; Vice-Presidents, Mr. J. W. Tutt and Dr. Buckell; Curators, Messrs. Bayne and C. B.

Smith; Librarians, Messrs. Gurney and Prout; Secretaries, Messrs. Nicholson and Battley; Council, Messrs. Lewcock, Newbery, Oldham, Bacot and Capt. Thompson. Mr. Bacot and Mr. Prout were appointed Auditors for 1894.

Annual meeting, *Dec. 4th*, 1894.—Exhibits:—Mr. Battley: *Xylina socia*, *Epunda nigra*, *Cidaria siterata*, *Orthosia lota*, *O. macilenta* and *Dasypolia templi*, all from Dorset. Dr. Sequeira: *Paraponyx stratiotalis*, *Spilodes palealis*, *Hydrocampa stagnalis*, and *H. nymphealis* from Folkestone. Mr. Prout: *Noctua plecta* and var. *andersoni*, Lampa, *N. glareosa* and var. *rosea*, Tutt, and *N. rubi* and var. with transverse lines obsolete, all from Sandown. Mr. Taylor: a variable series of *Orthosia suspecta* from Wimbledon, and a fine specimen of *Xanthia ocellaris* from the same locality; only some half-dozen [? only two, Ed.] specimens of the latter have been recorded for this country. Mr. Bate: two specimens of *Danais chrysippus*, which had been satisfactorily reset, after having been relaxed with wood-naphtha. Mr. Clark: *Hypochrysops delicia*, a rare butterfly, and *Selidosema lyciaria*, a beautiful moth, which appeared to be much more closely allied to *Boarmia* than to *Selidosema*; these two good species were captured recently by Mr. E. Anderson, at Melbourne.

All the gentlemen nominated at the last meeting as officers for the ensuing year were elected, except Dr. Buckell, who declined re-election; Mr. F. J. Hanbury was elected Vice-President in his stead. Captain Thompson, however, became Curator, and Mr. C. B. Smith was elected on the Council.

The Secretaries' Report for 1894 showed, that although the average attendance had fallen off somewhat, yet the papers, exhibits, &c., were, if anything, rather above the average; the membership roll was practically stationary.

At the invitation of the President (Mr. J. A. Clark), Mr. Tutt read the following address, in the place of the usual presidential discourse:—

ADDRESS BY THE VICE-PRESIDENT TO THE CITY OF LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

It is difficult to know what subject to select for an address to a body of entomologists at an annual meeting. There are two things, however, which perhaps, beyond all others, interest every entomologist; these are—our subject and ourselves, and to these I will direct your attention.

The study of entomology, like that of almost all the other sciences, has been a matter of very slow growth. Carried on by a few enthusiasts, usually living far away from one another, entomology was at first considered as only a branch, and a very unimportant branch, of natural history; but during the present century the subject has been taken up by an ever-increasing number of students all over the world. The first three-quarters of the century were occupied more especially in the systematic arrangement and correct naming of specimens, but the last two decades have seen a great advance in the study of the philosophical side of the subject, and this is due in a large measure to the tremendous impetus given to the philosophical study of natural history by Darwin.

During this latter period, the old manner of studying entomology has to a great extent died out. Entomologists, in the exact meaning of the term, may be said hardly to exist now. The subject has become so wide and comprehensive, the material collected so vast, the impossibility of any one student ever grasping the details of the whole subject so evident, that entomologists have long since given place to dipterists, coleopterists, etc. But, even though a man may become a proficient systematic dipterist or lepidopterist if he have leisure and ability, yet, as a rule, the study of an entire Order, if the study is to be really worthy of the name and to be something more than the mere naming of specimens, is soon recognised as impossible. Accordingly, we frequently find men who restrict their attention to one small family of the larger Orders, and all their energies are needed to deal with even this small part of the subject.

Almost every scientific entomologist, however renowned he may afterwards become, began his career as a collector either of butterflies and moths, or of beetles. Darwin was a keen collector of British Coleoptera, as a lad; McLachlan, the great authority on dragonflies, revelled in butterflies and moths, and I believe that the Lepidoptera were Sir John Lubbock's first love. It is from collectors of this kind that our scientific naturalists are made—men who understand the living creatures they study, and who are not misled so easily as are those to whom the dried bodies alone are of interest. It must be borne in mind, that on the younger generation of naturalists—lads now actively pursuing Red Admirals and Clouded Yellows—will devolve the carrying on of the work which we of the present generation are now doing our best to further and to consolidate. It is the duty of our Societies and of their individual members to foster a love of natural objects, and to direct it, if possible, into channels where it will bring forth good fruit.

It has long been a popular opinion that an entomologist is a person who collects insects, rather than one who studies them. That this conception is based, even now, not so much on prejudice as on real observation of the ways and customs of so-called entomologists, is only too sadly evident. How many of our lepidopterists know anything of the anatomy of insects? How many know anything of the wonderful organs by which the small insect, which they ruthlessly pinch and thrust out of the net because it is not sufficiently fine for the cabinet, sees, tastes, smells and probably hears; or of the way in which the honied drops, distilled in Flora's dainty recesses, are converted into the blood, muscles and other parts of insect structure; or, how the crawling caterpillar becomes metamorphosed into the charming fly, beetle or moth, which so interests us?

The collector of insects in times gone by appears to have supposed that the science of entomology consisted in systematic arrangement; but since that time a vast field has been opened up to thoughtful entomologists, a field unknown and unthought of by the old school of collectors and collection-makers. The systematising stage in the evolution of our science was, however, a very necessary one, for until we have approximately correct and complete lists of the insects of different countries, their comparison is impossible. Only when this work had been done, could the more philosophical side of the study be taken up with any advantage. Collections of insects are, indeed, the storehouses of the facts on which philosophical naturalists can build up theories, make deductions, and speculate with some remote possibility of certainty on the dim vistas of the past which rise up spectral-like to haunt and yet to fascinate the enquiring mind.

I would not have it supposed for a single moment that I think the work of the systematist is finished; on the contrary, a vast amount of systematic work yet remains to be accomplished. It has been calculated that about 2,000,000 insects exist, of which only some 200,000 have as yet been described, so that there is still plenty of room for the collector and for the species-namer. We cannot say, however, that the student of insects allows the collector of insects now-a-days to have it all his own way quite so much as was the case some forty years ago. Writing in 1856, Sir John Lubbock says:—"I find that in the last four volumes of the *Transactions of the Entomological Society of London*, 818 pages are devoted solely to description of species and genera, while all the other departments of the science occupy only 244, of which 208 treat of the habits of insects, and there is not a single paper on physiology or internal anatomy." If the last four volumes of the *Transactions* of the same Society contain but few articles on the physiology or anatomy of insects, it must at the same time be admitted that a comparatively small amount of space is given to the descriptions of new genera and species, whilst a comparatively large amount is devoted to experimental entomology and philosophical deductions therefrom. In fact, students now are breaking up rapidly into systematists, who still continue to describe genera and species, and biological entomologists, who combine with their biological studies a study of the relationships of the insects to one another and to their environment. With the general spread of scientific education during the last quarter of a century, there can be no doubt that a large number of entomologists, who, in the days when Sir John Lubbock penned the above extract, could never possibly have hoped to be anything more than collectors, or, at the most, systematists, are now really good and earnest scientific students.

Of all the Orders that come within the ken of entomological science, the Lepidoptera have furnished the greatest amount of material for philosophic study. The coleopterist still works away at his species; but scarcely any coleopterist of repute has written a deeply philosophical paper on the Order which he has made his special study. The marvellous habits of ants, bees and social wasps have brought the hymenopterist to the fore, but the students of the other orders rarely write anything of general interest. The young and well-educated individual, who to-day takes up the collecting of Lepidoptera as recreation and study combined, usually puts enough energy into his work to name the Macro-lepidoptera of his native country in two or three years, and the Micro-lepidoptera in three or four more, and then he usually commences to look about for varieties. True, one here and there may do this from the most mercenary and unworthy motives, and with no desire to learn what the diversities and differences expressed by variation mean, just as he *may* have collected Macro- and Micro-lepidoptera without wishing to understand their habits, anatomy or physiology. But, in such cases, the collections are the end instead of the means, and we, I am sure, shall all agree with the sentiment expressed by Sir John Lubbock, that "to collect merely for the sake of collecting, has a direct tendency to narrow the mind. To aspire only to be able to say that one has in one's cabinet a certain number of species, or some rare sorts which nobody else possesses, is surely an ambition quite unworthy of a true entomologist."

Although collecting, then, must always be considered as a legitimate part of an entomologist's work (nay, up to a certain point, as a necessary and important part), yet if a person's pursuit of entomology stops short at collecting, he is about as much a scientific entomologist as a butcher is a comparative anatomist or a physiologist. In the pursuit of his study the entomologist will find a great part of his material in the living insects which are the objects of his tender care and solicitude. The habits of species may be well known, but what relationship do these habits bear to the environment of the species? The colours of larvæ may have been well-described, but what is the meaning of a particular mark or a particular spot? The differences between two closely allied butterflies may have been very carefully worked out, but what has brought about these differences? Two different forms of the same insect may be known, but what is the cause of the difference? The polymorphism of a moth is exceedingly interesting, but what inherent factor has produced the polymorphism? And here even the best stop at present. What are the inherent factors that produce, determine and guide the forces which result in variation? We theorise; we think that we have solved a puzzle, only to find that some one detects an error in our data, a defect in the foundation of our theory, and down comes the super-structure to the ground. But destructive criticism is much easier than the formulation of a new theory to put in the place of what we destroy. Nevertheless, we find, in spite of the searching criticism to which every new theory is subjected, that a great deal of solid headway has been made. When a man observes a phenomenon, his first question should be—What is the cause of it? When he attempts to answer the question and starts his theory he must ask himself—Can I knock a hole in the bottom of it? If he cannot, and if other scientific students cannot, then the theory must stand as an explanation of the fact until something better can be put in its place. This, in truth, is the basis of all scientific study, which makes men, if they will, find—

> "Books in the running brooks,
> Sermons in stones, and good in everything."

The excellence of British collections of Lepidoptera has always been conceded, and the extent of the insect fauna of the British Islands, in comparison with that of other countries of equal or greater area, is very noticeable. The known Tortrices of the Palæarctic area, total up to about 650; of these, above 350 are British. Almost 50 per cent. of the known Palæarctic Tineina (taking this group in its old and widest sense) are to be found, and so on. We have in Britain two-thirds of the number of insects to be found in the whole of Germany and Switzerland combined. It is not at all difficult to understand why this is so. No country in the world of equal area presents the same diversities in its geological characters as do the British Islands, and I need not point out how intimate is the connection between the geology of a country and its flora, and between the flora and the insect fauna. The varying geological conditions give us a flora, large both in the number of genera and relatively in the number of species, and this is sufficient to account for the fact that we have so large a percentage of the Palæarctic insects existing in our midst. This fact helps to explain why the insularity of British entomologists has never been so fatal to their scientific aims as would have been expected, and at the same time, why a thorough study of the British fauna has often formed an admirable education for those who have afterwards made their names as entomologists or naturalists of the world.

This variety of geological conditions has combined with the isolation of the British Isles as a whole and the still greater isolation of some of the smaller islands, to give us a fauna unequalled, probably, in its range of variation, by that of any other part of the Palæarctic area. The combination of two strong influences—that produced by natural selection acting on differences of environment (geological), and that produced by isolation—has resulted in the variation of many species which in other parts of the Palæarctic area are but little subject to change. These varietal differences were but little noted until a few years ago; but the writings of Darwin have largely changed this, and our learned biologists of to-day have gathered from a study of the variation of insects the facts on which have been founded some of the most important theories that have ever yet been formulated by the human mind. Wallace, Weismann, Poulton and others are essentially entomologists and biologists combined, and we all know how large a place entomology takes in their work. The ease with which insects may be obtained, and the rapidity with which generation succeeds generation, make them particularly suitable subjects for experiment, and this is sufficient in itself to explain why there is such a strong tendency to rest the proof of the theories advanced on the facts connected with our favourite study. But this phase of our subject leads me again to point out what a gap there is between those people who collect for the mere sake of collecting, and those who study what they collect. The latter, if I may so put it, have passed from ignorance to knowledge, from darkness to light. Can anyone tell the vast gulf that has been bridged here, or how greatly the enjoyment of life has been increased? Can anyone define the exquisite change of feeling with which an entomologist regards an insect once the barrier has been passed?

I have before pointed out the value of collections, and therefore the *bonâ fide* position of collectors. I have shown how necessarily limited is the range of the collector compared with the whole field of natural science. I have suggested that a collector may be a mere cumberer of the ground, but have also indicated how, under favourable conditions, he may take a humble place among the scientific workers of his age, and aid in unravelling some of the many tangles and puzzles, the many mysteries of Nature which everywhere surround us.

This leads me at once to the value of entomology as a subject of study. There are people who think that the only value of a thing is the money that it will fetch, utterly forgetful that money itself is only of use in so far as it adds to happiness. The value of the study of a scientific subject cannot be gauged in this way. An old philosopher once said, "Whatever it has been worth God's while to create, it must be worth man's while to study." The mental pleasure which the subject gives must be the rule by which its value is measured. The constant and continuous pleasure afforded by entomology, the industry required in separating the wheat from the chaff in the more philosophical branches of the subject, can be pointed out as bringing about a condition of mental happiness, of which nothing can rob us and to which only an individual of the highest mental type can attain; then one may add the health-giving exercise necessitated by field work, the mental and bodily exercise combined tending to produce the coveted "*mens sana in corpore sano.*" Indeed, the charms of entomology are such, that one wonders not so much how it is that many with a love of investigation, or curiosity as to how the present natural conditions have been brought about, have taken up seriously and enthusiastically its study, but rather, considering all things, how few there are who have done so. Once the true course has been opened out before our eyes, and the true philosophical spirit tasted and appreciated, the charm and interest are unequalled.

Probably, the fact that average men and women look upon us as a body of somewhat harmless lunatics, has had something to do with the slow progress that entomology, in company with other branches of science, has until recently made. That any sane man or woman should be interested and, as the uninitiated would say, should "waste his or her time" over bugs and insects, appears unaccountably strange to many. The fact that when much-read writers endeavour to portray an entomologist, they generally idealise him as being widely different from other men, totally immersed in his subject, and stupid to the highest degree in all matters else, has probably had much to do with the popular fallacy. On the other hand, the stupid ignorance which so-called educated men display; the absurd blunders and errors into which they fall; the ridiculous errors which high-class papers and magazines allow to pass unchallenged in their pages; all these lead scientific men to wonder oft-times whether such people are not really deficient of a certain section of their brains. These frequent errors, too, appear to be so utterly beneath contempt, that the well-informed man allows them to pass unnoticed, knowing that to correct them he must explain to adults as he would to little children. The task appears so Herculean that he desists from the attempt.

Whatever depths of general ignorance still exist in the popular mind on matters entomological, it must be owned, however, that the interest recently exhibited in the more philosophical side of the study, together with the general spread of education and intelligent culture, have left their mark, and we are glad to find that many individuals do now-a-days express their surprise at the prevailing ignorance about natural history matters. Some such have suggested that, in its simple forms, natural history should be made a compulsory subject of instruction in the State schools. I suppose there is no Oxford or Cambridge graduate, a master in one of our Public schools, who corrects a boy for telling him that a whale is not a fish; nor perhaps is there a certificated teacher in our State schools, who would be guilty of the same or a similar error. With regard to that still great army of "private adventure" schools, however, on which Max O'Rell so glowingly descants, those "seminaries for the sons and daughters of gentlemen," which compare so unfavourably in their results with their compeers, can as much be said? As a teacher, however, it is my most decided opinion that the making of such a subject as natural history compulsory in our State schools would be ridiculous in the extreme. Our system of primary education, compared with what intelligence and a little insight might make it, is now (owing to the superfluity of subjects which have been rendered compulsory if the maximum Government grant is to be earned) largely a huge sham. Interest a lad in pond life, by showing him the marvellous wonders, the thousands of tiny inhabitants that a drop of such water contains; show him the beauties of a butterfly, its marvellous tongue, its wonderful eyes; and if he has any taste in this direction, depend upon it the taste will soon exhibit itself.

Some little thing or other made most of us active naturalists. At the age of thirteen, a friend called one day and asked me to go and see a case of butterflies made by a youngster a year or two older than myself, who had just come up from Newbury in Berkshire to my native town. I went; the next day my mother lost a window-blind, and I bought a cane. In this way, in 1871, I provided myself with my first net. Large pins, small pins, anything that would spike a butterfly or moth, were brought into requisition. I became the nuisance and horror of an orderly house. At the age of 15 my craze had become a settled form of lunacy, and everyone was enjoined to leave me in peace. Of books I had Coleman's *British Butterflies*, Wood's *Common British Moths*, a few odd numbers of Stainton's *Manual*, and afterwards to complete my treasured library, Newman's *British Moths*. How I cherished that book! Living within three miles of Chattenden Woods, and within twenty minutes' walk of the breezy chalk downs and the charming oak and beech woods of sunny Kent, I soon grew to love out-door life with a marvellous passion. The most serious blow I received was in 1875, when an odd copy of *The Entomologist's Monthly Magazine* came in my way. I spelt out its Latin with slow and laborious care, and read with wonder and horror those terrible descriptions of insects from some unknown regions with which it was filled. My heart sank within me, and was only lightened by the facts that it was a marvellous *Colias hyale* year, that I was in boisterous health, and born I veritably believed to do nothing but catch those charming Pale Clouded Yellow butterflies. At seventeen, we soon forget our first rebuff, and I soon forgot those Latin descriptions, for during the next five years I was hard at work. Among other things, I learned to read Latin with ease, and to understand, in a way, what Science was. About 1881, I first met my friend Mr. Coverdale. We were both essentially studious, as well as rabid collectors. He had gone in for a stiff course of scientific training, and I had done the same. We had been the only two students who passed in the higher stage of Animal Morphology and Physiology, at the South Kensington examinations of the previous May. We agreed to work together, and for a time did so; but a year or two afterwards he went abroad, and, after about nine months, passed into the great unknown, whence no word of him has ever reached us—his last letter expressing the anticipation that his wife was dying and that malarial fever had got its grip on him. From that time onwards, all I can say of my entomological work is—Is it not chronicled in *The Entomologist*, *The Entomologist's Record*, *The British Naturalist*, and even occasionally in that erstwhile dread *Entomologist's Monthly Magazine*?

I did not intend, gentlemen, to write an autobiography, but one's pleasures are written oft-times in one's self. And do not the inmost feelings of many of you respond to mine? Did not the exquisite pleasure of collecting, the charm of a country life, or the chance observation of one of Nature's beautiful productions first cause many of of you to collect? And if the exciting pleasures of youth have calmed down into the more tranquil pleasures of manhood, is not the same fulness of pleasure ours? The old feeling is engendered by the woods and trees. The exquisite sense of enjoyment recurs when we see the Purple Emperor fan his iridescent wings on the same branch of the old oak-tree on which we caught our first specimen. Do we not love our old haunts, our old nooks, our old friends? I love the old flowers, the old spots, and so I ween do all of us. If science grows out of collecting so much the better, but, with the feelings we possess even the charm of collecting cannot be altogether in vain. Gentlemen, I hope I have not bored you with these personal reminiscences, I trust I have not disappointed you if you came in the expectation of hearing a learned peroration. I feel that science may, nay must, go largely to the winds for once, and that we will recapitulate our old experiences, fight our old battles, and enjoy the remembrances of the entomology of early youth, at least for a part of to-night.

But let us not forget, in the glowing reminiscences of our youthful experiences, that there is a deeper and more lasting passion in middle age for him who wishes to drink of it. The scientific enquirer leads a life which the multitude know not of. He has friends whom his most intimate acquaintances have never seen; occupation that leaves no time for lassitude or ennui; thoughts that carry him far away from the worries and cares of life. He leads, indeed, a double life, the peculiar part of this second existence being that no one who has not been admitted into the brotherhood of this supplementary life can understand its interest or its charm.

I have previously stated that I believe the best means of increasing the general interest in entomology, is for each and all who have the chance to point out the interesting side of the subject to those who show signs of taking an interest therein. But to leave the educational phase dealing rather with recruits, I would turn to that phase of it which affects the more advanced portion of the entomological community.

I have already pointed out that the systematic arrangement and naming of specimens was for many years the principal occupation of scientific entomology. But, side by side with these, there has always been an attempt to classify, as well as to name, the insects collected. As, however, until very recent years, the early stages of comparatively few insects were known (in many countries even now they are almost altogether unknown), it is evident that such attempts as were made (and in some countries are still being made) had to be based almost entirely on the colour, shape, form and general appearance of the perfect insects. What conclusions were drawn from these methods you all know. True it is that the conspicuous Sphinx larva; the peculiar method of progression of the Geometrid larva, and the leaf-rolling habit of the Tortrix larva gave the family names to at least three large groups; but at the same time almost all the references to old works make it only too sadly evident that the details of larval structure and their meanings were either unknown, or if known, were not looked upon as essential. As, however, the larger species became more and more intimately studied and certain characters became recognised as important, a new era of classification sprang up. This was instituted by Denis and Schiffermüller, and since then many have followed their lead.

It has, for a long time past, happened that the great mass of material collected has found its way into the hands of the authorities of our Museums, and hence a very large percentage of insects have been named by the entomologists attached thereto. It happens also, that, owing to the nature of such appointments, the persons selected for the work have usually had no special training. Prentice hands are therefore always at work on subjects requiring a skilled workman, and the Museum apprentice rarely ever becomes a skilled workman, for his whole time is taken up in examining the dried bodies of insects, so that he has none to spare for the study of living insects. He may learn to name specimens; but when the naming *is* done, the real difficulties begin, for then the insects have to be classified, and how can this be done by a man with only a Museum training. The general characters of the imago have been all that such have ever had to go upon, and these alone, therefore, can by them be considered in deciding where any given species should be placed. Now such a method is at best but a poor makeshift, and must lead to a vast amount of error; and when the later philosophy began to gain ground, and it was shown that the general resemblance of many insects was due to outside forces and had no real meaning in so far as structural relationship was concerned—that colour as a character was unreliable because two specimens of the same insect might be, the one white, the other black; that the antennæ were untrustworthy because they varied in the sexes; that the marking varied endlessly in different individuals of the same species; that even the differences in leg structure, tufts of hairs, etc. were often but secondary sexual characters, in fact, that the real relationship between species was often obscured by dozens of matters of but little import in classification—then it became clear that a system of classification based on imaginal characters alone was necessarily a hotch-potch and not worthy of the name of science.

Our inability to prove some of the theories which have almost passed into axioms of belief, removes entomology from among the number of the exact sciences. We assume a special centre of creation for each species, and cannot conceive any other reasonable explanation; but yet, the fact, that such a fundamental point has not been proved, is fatal to the exactitude of the science we profess. Similar cases will occur to many of you. But if, in its philosophical aspect, entomology may not be considered an exact science, nevertheless, its philosophical bases are as sound as those of any other branch of biology, and in connection with the soundness of the biological facts, I will say my last word on classification.

The object of classification is, to place together those species which have most recently developed from the same stem, working back as far as may be through the most recent stems to those less recent, and so back to that from whence all have arisen.

At present we see but darkly. We ourselves hardly know what we want. We are like blind men groping for the light. We do not really know what are the essential characters in our insects which will enable us to trace back their origin, and hence we move in mist, and only emerge now and again from our confusion. But the physiologist and embryologist have come to our aid, and we find that certain broad axioms hold good through the various stages of development of all living things. Biological students have formulated certain generalisations, based on broad and comprehensive data, and these generalisations apply to all branches of animal life. The biologists tell us that the only system of classification which can be natural, must be based on those stages in which we may read the past history of the insects, so that the system of classification becomes, when thoroughly worked out, as it were a genealogical tree of the insects. The linear arrangement, they say, is evidently unsound to the most cursory observer. The embryological conditions, *i.e.*, all those which precede maturity, say they, are those which point out to us most strongly the changes through which animals have developed in the far past, and unless entomologists are to fall outside the line of biological advance, they must accept the dictum. But this entails enormous work. Where is the material on which such a classification can be built? We have not got the material yet, we have it to collect; we know that the work will be slow, but in such an important matter it is necessary to progress slowly. *Festina lente* must ever be the naturalist's motto. Then vested interests step in. Classification has always been considered the special perquisite of namers and describers of new species. The family and generic names (which represent in a large degree our classification) may want changing, and then the synonymy bogey steps in. What is the advance of science, compared with the erroneous use of a name? says the stickler. Are not names a part of the science, indeed are not names the science? asks bogey; and if we don't agree, the synonymy man says what fools we are. Our catalogue-makers and synonymy men, as a rule, know nothing of embryology or of the deeper parts of biology. The very nature of their labour prevents them from getting the necessary information, or making the necessary observations on the early stages, which would enable them to work out a system of classification on the new lines. They do not offer active resistance as a rule, but go steadily on in the old groove, perversely overlooking the overwhelming facts that should show them at once that they are nothing but obstructionists to science, that they are even belying their scientific existence and becoming propounders of error, preferring to live in darkness rather than in light.

But this passive resistance is not all. Occasionally one hears the wail from a conscience-smitten individual—"Well, we are biologists after all, are we not? Do we not study nervures, palpi, genitalia, wings, etc? How dare anyone say we are not the elect, that we are not fitted to continue as prophets to our generation? From such, one question only needs an answer: "What is biology?" They entirely overlook the fact that biologists are agreed that it is the embryological, the immature stages of the animals, which must give us their true history through time. So they go on, until at last there is almost open war between the closet naturalist who studies nothing but dried bodies, and the practical man who rears, observes and experiments on the living insects in all their stages. What the final end must be is evident. Truth must conquer prejudice. We shall look to the Museum men to name our insects, to the biologist to classify them. The superficial, one-sided, slip-shod work of half-a-century ago, will not do for the go-ahead scientific spirit of to-day. The truth must ultimately prevail, the foes of progress must be defeated.

I feel strongly on this matter. It is high time that someone took up a strong line thereon. So far as the imaginal characters confirm the biologist's work, well and good; so far as any individual, for his own personal glorification tries to supplant biological work with superficial imaginal characters, small mercy must be meted out to him. Entomologists, if they wish to be considered other than dilettanti scientists, must fall into line with the workers in other branches of biological science. The characters of half-a-century ago may or may not be of service; at any rate, they must be considered in the light of the progressive science we know to-day. Progress, as I have said, must necessarily be slow, but the clogs which retard progress want gently but firmly removing to a region, where, if they can do no good, they can do no harm.

Gentlemen, if any word I have said to-night leads one of you to take a more serious view of the work in which we are engaged, I shall have been well repaid. The City of London Entomological Society is obtaining a name for scientific work, second to none in the kingdom. The fact that we are numerically weak, that our subscriptions are kept low on purpose to attract the humble worker, at the same time militates greatly against us, in attaining a position in which more work can be given to the entomological public. For what we are able to do at present, we are largely indebted to the generosity of our worthy President, under whose guidance the Society has reached a recognised position in the entomological world. You have been reminded to-night that the "Fauna List of the London District," which, two years ago, you authorised (with some enthusiasm) certain members of the Society to draw up, requires printing. I have no doubt that many entomologists outside our ranks would willingly subscribe if they knew that the list was ready, and that the obstacle to printing was mainly financial. However, I trust that all will aid the committee, who have the matter in hand, to the best of their ability, and that its publication will be persevered in. If it be, I am quite sure that it will bring you further renown, and gain you the further respect of the entomological world.

And now, gentlemen, I leave you in the hands of our kind President, for another, I hope for many other years; under his genial rule, I do not doubt that the wheels of this Society will move with as little friction, and the work done be of the same high character, that has marked the preceding years.

NOTICES AND REVIEWS.

Catalogue of the Lepidopterous Superfamily Noctuidæ found in Boreal America, by J. B. Smith, Sc. D. [Published at the Government Printing Office, Washington]. This bulky volume of 424 pages, is "Bulletin No. 44" of the United States National Museum, and is quite a monument of bibliographical labour. Professor Smith, who is well known as a hard working lepidopterist, refers in his preface to the American material in the British Museum, and his condemnation of Walker's work is perhaps well deserved, although, we think, it would have been better not to have published Mr. Butler's disparaging remarks about Walker. We quite agree with the author, that "Mr. Butler's knowledge of our (American) fauna is altogether too slight to make his notes conclusive in the case of obscure species," as also with his description of the arrangement of the Noctuæ in the British Museum collection as "an utterly unscientific hotchpotch." The definition of a "type" given by Prof. Smith may serve very well for the present, whilst the American specialists are determining their species; but, when this process is completed, and the variation of the species, together with the philosophical bearings of entomology come to be studied, something much more definite in the way of a "type" will be needed.

When a man, who has specially studied some particular group of Lepidoptera, takes up a systematic work on that group, he expects to be able to understand what the work means. If we look over systematic works produced in any part of the Continent of Europe, we feel that we know where we are; but with American works it is often very different. One may turn over page after page of some American publications without recognising a single name as having any connection with the objects one has studied, and one is made to feel that with the authors of such works names are not a means to facilitate the study of the science, but are themselves the science. This attempt to substitute a study of names for the study of entomology is the bugbear of modern entomology in America. Such an unsatisfactory state of things seems to be due to the American competitive system, under which, unless a man does something to astonish his fellows, he is not considered to be doing anything. The wading through a catalogue of this kind, which ought, in the ordinary course of things, to give a student in any part of the world the greatest pleasure, becomes from this cause a source of annoyance. This result appears to be largely due to the fact that Americans have never troubled to take into account the most recent systematic work done by Europeans. Much of the best of this is the product of leisured amateurs with deep scientific tastes, who have been only too conscious of the utter worthlessness of a great deal of the work done by European museum-workers, which the Professor himself attacks so fiercely in the case of Messrs. Walker and Butler. Museum work is criticised in Europe by the leading scientific men of the day as soon as it is made public and, according as it is good or bad, is accepted, or relegated to oblivion. There appears to be much of this museum type of work, too, in America, although work of a very different kind is also done there, for a European worker can read most of the American magazines with pleasure, and without being bored by an attempt to wade through material which is intelligible only to the author. The manufacture of separate genera for almost every species (often on the simplest specific characters), the substitution for the world-wide and well-known names of old but newly unearthed names, often of doubtful definition, may be to the honour and glory of the resurrector from his own point of view, but is a grievous error from a scientific point of view. There is not a lepidopterist from England in the west to Japan in the east, nor perhaps from Japan in the west to England in the east, who would not know what *Cymatophora* means, and to whom a certain value would not at once be pictured by it; but who knows what *Bombycia* is intended for? The obsolete position of *Demas* among the NOCTUÆ is retained, whilst *Arsilonche albovenosa*, which is really almost undifferentiable from *Acronycta* (sub-genus *Viminia*) *rumicis*, is retained in its old genus. Why does not Professor Smith really study *albovenosa* by the side of the American species belonging to *Viminia*? Not their dried bodies, which "natural selection," owing to the great differences of their habits, habitats and environment, has made to take such different facies, but the living insects, their eggs, larvæ and pupæ. Then he will be able to get over the great "facies" question, and place the species rightly. It is not the first time that we have noticed the quaint phrases in which American entomologists sometimes indulge when they wish to point out to us that they hope soon to prove that a species, hitherto considered identical with a European species, is really distinct. It always appears as if they were on the look-out for a deformed leg, a mummified antenna, or something of the kind. Such a phrase as: "The species has not been critically studied, and the true relation of the form is yet in doubt. The American form may yet prove distinct, though a very close ally to the European insect," will bear no other construction. Why not get the larva and pupa and prove it, instead of looking so far into futurity? *Bryophila*, which has much less affinity with *Acronycta* than has *Mamestra*, still maintains its old position, whilst the genus *Agrotis* has proved a gold mine to the worthy Professor. One does not mind so much the names of the sub-divisions as the grouping of the species therein. Fancy a European collector being confronted with *Rhynchagrotis*, *Adelphagrotis*, *Platagrotis*, *Eureptagrotis*, *Abagrotis*, *Setagrotis*, *Chorizagrotis*, &c. We wonder what he would think of them. One of the best known sub-divisions of *Agrotis* is *Peridroma*. In this sub-genus (or as Professor Smith prefers it—genus) are found *Aplecta occulta*, Linn. and *P. saucia*. Will the author tell us a single character in the egg, larva, pupa, or even in the imago, which associates them? The very imaginal characters themselves condemn this position, especially when *P. saucia* and *Agrotis ypsilon* get placed in different genera. But we are pleased to see that Prof. Smith uses *Noctua* as it undoubtedly ought to be used. Our *tritici*-like Agrotes come under *Feltia*, a resurrected name of Walker's; resurrected for what purpose? Will Mr. Smith tell us that there is as much difference between *Feltia* and *Peridroma* as between *Acronycta* and *Bryophila*. Surely, *Feltia* and *Peridroma*, at the best, are but sub-generic names for the use of the specialist. On p. 81, Prof. Smith refers to Haworth's *subgothica*. He says that he has not seen Haworth's work, but this is undoubtedly only a variety of the European *Agrotis tritici*, and is fully dealt with as such, in *The British Noctuae and their Varieties*, vol. II., p. 51. Considering the fact that Prof. Smith considers the *Agrotis* sub-divisions as sub-genera, it reads very ingenuous on page 131, where he says "This genus (*Hadena*) will probably stand sub-division into several genera. Two rather well-marked groups or sub-genera, *Xylophasia* and *Luperina*, have been monographed by me. . . . It is likely that, eventually, both of these sub-divisions will take generic rank." Does Prof. Smith really not know that *Luperina* and *Xylophasia* are now, and have been for a large number of years, used as representing groups of generic rank, at any rate in Britain, and that something more than a note of this kind is required, to explain to British entomologists why they are wrong? The onus of proof surely rests on Prof. Smith, and it is much to be regretted that old land-marks are swept away (or, as happens here, re-introduced, as if the author had never heard of their use in the sense he mentions), without explanation. Our *exulis* gets into this sub-genus *Xylophasia*, according to Prof. Smith. It would be interesting to Britishers to know how it is that their generic usage is here so far wrong. Again, on p. 155 a characteristic phrase occurs, showing the tendency to separate the European and American records of common species, the reverse of the spirit which is seeking to bring into uniformity the work of the two areas. Only so far as this is done, is the catalogue-maker rendering the slightest service to progressive science.

If Prof. Smith always acted on the same lines, we should welcome his statement on p. 173, that in his use of *Hydroecia* he is following European precedent. *Helotropha reniformis*, Grote, too, is treated as distinct from our *H. leucostigma*, although it is apparently inseparable. On p. 182, we still find the good old method of making *Leucania* (an Agrotid group), follow *Nonagria* (an Apamid group), although their early stages show no relationship whatever. No one who knew the early stages of the species could possibly fail to separate these divergent groups. The early stages of all our British *Leucanias* and *Nonagrias* are known; would it not be better for Prof. Smith to be guided by British work, done in a really scientific manner, rather than to go on perpetuating this palpable blunder? True, the imagines are of the same colour, but the Professor must know that among the Crambidæ, *Chilo* and its allies have the same facies, but this superficial resemblance, produced evidently by natural selection under the same environment, has no scientific basis. Here is something, too, for our systematists to digest—the genera *Cosmia, Cleoceris, Anchocelis*, placed following each other, whilst *Pyrrha umbra* (our *Heliothis marginatus*) is sandwiched between *Anchocelis* and *Orthosia*. Here, too, is a strange combination: *Xanthia, Cirrhoedia, Scoliopteryx* (*libatrix*), *Scopelosoma*, followed by *Xylina*, nor does our author apparently attempt to separate *Xylina* and *Calocampa*. *Xylina* is placed in close contact with *Calocampa*, a course which has been everywhere perpetuated and adopted, although proved by recent observation to be entirely erroneous. The *Plusiidae*, as a whole, are placed before the *Heliothidae*.

We sat down to this *Catalogue* with the intention of having a few hours' interesting study; we rise from its study with a feeling somewhat akin to pain. A most industrious production, it yet lacks that touch which convinces the specialist that the workman has clinched his subject. Nay, he feels lost repeatedly, he recognises no land-mark to help him, or, if he thinks he does, it is only to find that the compiler is out of touch with the more advanced thought of to-day. Such pioneer work is very necessary. The collecting together of synonyms must be done, but at the same time, an attempt to classify should not show such an utter break-down, such a want of information as to what has been done. If the early stages of nine-tenths of the American Noctuidæ are unknown, whilst those of nine-tenths of the European Noctuidæ are known, and if the Noctuidæ of America have their representatives in Europe, surely it is the work of the compiler and classifier to apply the sum total of knowledge obtainable to such work as this. It has been the curse of our British Museum work on Lepidoptera for years and years, that the work done has been (as a rule) performed without the slightest knowledge of contemporary science, with the result that not a single lepidopterist of repute really troubles about the great mass of the Museum work at all. I would especially exclude Kirby and Hampson's work from this animadversion. This *Catalogue* is what I should call a real Museum production, a compilation requiring herculean labour and immense industry, but one that, when finished. is a stumbling-block to the intelligent workers of the world, that separates still more the entomologists of Europe and America, that makes science utterly subservient to names, and not names to science. The compilation of synonyms is probably perfect. Then let Professor Smith see what in Europe are the representatives of genera, and tell us why all this mystification.

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An early Winter's Stroll.

By J. W. TUTT, F.E.S.

The south-west wind brings up the vapour that gives a misty appearance to the late autumn and winter sun which yet radiates a considerable warmth that adds pleasure and comfort to an outdoor stroll. The bracken lies here dead and beaten, there, where it has been less exposed under the sturdy oaks which are loth to part with the last remnants of their foliage, in the last golden decay of early winter. Here and there, too, the hawthorns stand out black and grim against the pale and fitful blue of the November sky, whilst great masses of snowy cumulus fade in their lower depths to the watery-grey tint which tells of water ready to be precipitated almost without notice at this uncertain season. The young gorse attempts to adorn itself with its spring beauties and bears an occasional cluster of golden bloom. The tall herbaceous plants by the hedgeside now brilliant with the red leaves of the bramble which forms a magnificent garland, are bedraggled and dying, and, although—

"The banks that wore a smiling green,
Bewail their flowery beauties dead"—

yet the marvellous autumnal beauties of the fungi arising from the dead ashes of twig and leaf and root, rival in many ways the fairest beauties of summer. Magnificently vivid is this after-glow of Nature's brilliance—palest yellow and delicately tinted heliotrope, charming blue, brightest orange, or a broad table of blood-red crimson growing from the old oak-stump yonder. Brilliant, but fleeting is their little day. Rapidly they pass back to the decay and putrescence which gave them birth.

The vistas of the oak trees in the park attract the entomologist in these late autumn days. They stretch away over the rising ground in masses of fading gold until lost in the grey of the horizon. With trowel and chisel, and a piece of macintosh to sit or kneel upon, he sets forth to pursue his peaceful avocation. What nooks and crannies there are at the surface where an oak-tree enters the ground! What rugosities and scarred seams, what hiding-places and secret nooks the rough bark presents! What cunning is required to find out all the entomological mysteries hidden there, what patience to explore the crannies which one meets!

Under the spreading branches the dead leaves lie. These are often traversed with sinuous windings of delicate intricacy, or disfigured by pale blotches and patches of varying shape. These must be selected, for from them numberless species of the marvellously beautiful *Lithocolletidae* and *Nepticulidae* are to be bred. The moss that clothes the trunk near its base must be carefully searched as well as the crannies at the foot of the tree. All the rubbish there must be examined, and what a wealth of insect life one may find—*Eurymene dolobraria*, *Selenia lunaria*, *Tephrosia consonaria*, *T. biundularia*, *Hybernia leucophaearia*, *H. marginaria* and *H. defoliaria* may all be found in their cocoons, spun up among the moss on or at the base of the trunk of the tree. Then some of the summer caterpillars have changed to pupæ, and are to be found among the fallen leaves; we may find *Ephyra porata* and *E. punctaria*, with their girdled butterfly-like pupæ attached to the leaves; whilst *Iodis lactearia* is snugly esconced within the spun-up leaves. In the crevices of the bark, especially where the wood is soft and readily pierced, the cocoon of *Moma orion* is snugly hidden away. But it is in the loose friable earth at the foot of the tree that the greatest harvest is to be made. Where the earth meets the trunk of the tree, search with the fingers first, for there many treasures rest. Then carefully insert the trowel and spread the earth on a paper and pass it in review. *Selenia illunaria*, *Amphidasys strataria*, *Tephrosia crepuscularia*, *Hybernia rupicapraria* and *Phalera bucephala* are to be found in their cocoons an inch or two below the surface. Deeper down the pupæ of *Nyssia hispidaria*, *Amphidasys betularia* and *Notodonta trepida* rest; almost on the surface *N. chaonia* and *N. trimacula* greet the seeker's eye, whilst oftentimes thousands of pupæ of Taeniocamps are obtained by the diligent worker. These are only some of the entomological treasures to be found in the oak park, but they are sufficient surely to set the enthusiastic collector wondering how it is that with an oak wood so near him he still has yawning blanks in his collection where many of the raıer of these species ought to be.

But let us leave the oak-trees and go to the birches. We cross a field from which the larks rise on tremulous wing, whilst the army of fieldfares that scud rapidly near the surface of the pond yonder tell us that the winter visitors are here. The blackbirds with their noisy chatter scurry out of the hedgeside as we approach, and the flocks of impudent chaffinches fly up into the bush only a few yards from us, to return again as soon as we pass. The breeze is sufficient to hurry the ragged clouds along helter-skelter across the sky, whilst, as we enter the woods, we hear it surging among the highest branches. How it sighs and groans in these autumn-winter days, weeping, as it were, a dirge for the glorious summer days that have gone. Here and there by the path-side a ruddy spot tells of a sprouting acorn, whilst the dead gold bracken stretches like an autumnal sheet under the birches yonder, whose drooping twigs sough in the breeze.

The silver-stemmed birches are reached at last, and the entomologist can commence his labour again. Many of the species found at the foot of the oak tree may also be found here. *A. betularia*, *T. consonaria*, *T. crepuscularia*, *H. marginaria* and *H. defoliaria* will be perhaps in even greater abundance than beneath the spreading oak-tree, whilst, in addition, pupæ of *Tephrosia biundularia*, *T. punctulata* and *Notodonta carmelita* are often to be obtained. Among the *débris* beneath the tree, spun up in leaves or twigs, are to be found many rare species of which *Endromis versicolor*, *Cymatophora duplaris*, *C. fluctuosa*, *Asphalia flavicornis*, *Notodonta dictaeoides*, *N. dromedarius*, with an occasional *Stauropus fagi* are among the chief; whilst *Ephyra pendularia*, with silken girdle round its waist, is belted to a dead leaf. But in the crannies and hollows of the bark is the rarest entomological prize. There the carefully-constructed cocoon of *Dicranura bicuspis* is to be found. It cannot be really rare (though so few entomologists ever obtain it), for its empty cocoons, robbed of their contents by woodpeckers, are not at all uncommon in many places where birches abound, but acumen, skill and patience are absolutely necessary to the entomologist who would own this charming study in dove-grey "kittens," with its dark central band.

Beneath the fir-trees yonder, from the leaf-mould formed by the pine needles, the pupæ of *Macaria liturata*, of *Bupalus piniaria* and of *Panolis piniperda* are to be found; but we will wend our way to that distant row of tall, straight poplars and polled willows that edge the churning stream. The robin sings his plaintive song as the sun flecks with gold his bright rosy breast. His tremulous outbursts of melody, his quick, sharp, twitting notes, cheer beyond words the quiet woodland and hedge-rows now that our vernal songsters have departed. The fluffy fruit of the clematis combines with the crimson leaves of the bramble and the bright red berries of the hawthorn to engarland the stream side. What care we, with the fresh air blowing round our faces, that the path is little more here and there than pools of water! But the poplars and willows are reached. Their trunks are carefully searched, and soon the hard cocoon of *Dicranura vinula* is detected, and maybe the somewhat similar but smaller ones of *D. bifida* and *D. furcula*. These want finding though, especially the latter, on the smaller twigs. At the very foot of the poplars careful search must be made, for there are spun up the cocoons in which repose the pupæ of the rare *Cymatophora ocularis*, with its charming figure of 80, and its delicate rosy tinge. In the crannies the cocoons of *Cuspidia tridens* and *C. psi*, of *C. leporina* and *C. megacephala* are to be found; whilst spun up among the fallen leaves or on the surface of the ground, the pupæ of *Clostera pigra* and *C. curtula*, of *Pterostoma palpina*, *Notodonta dictaea* and *N. ziczac* are to be had for the seeking. Now we can turn up the soil. The large pupæ of *Smerinthus ocellatus* and *S. populi* with those of *Phalera bucephala* often abound, whilst deep down rests the pupa of the local *Taeniocampa populeti*.

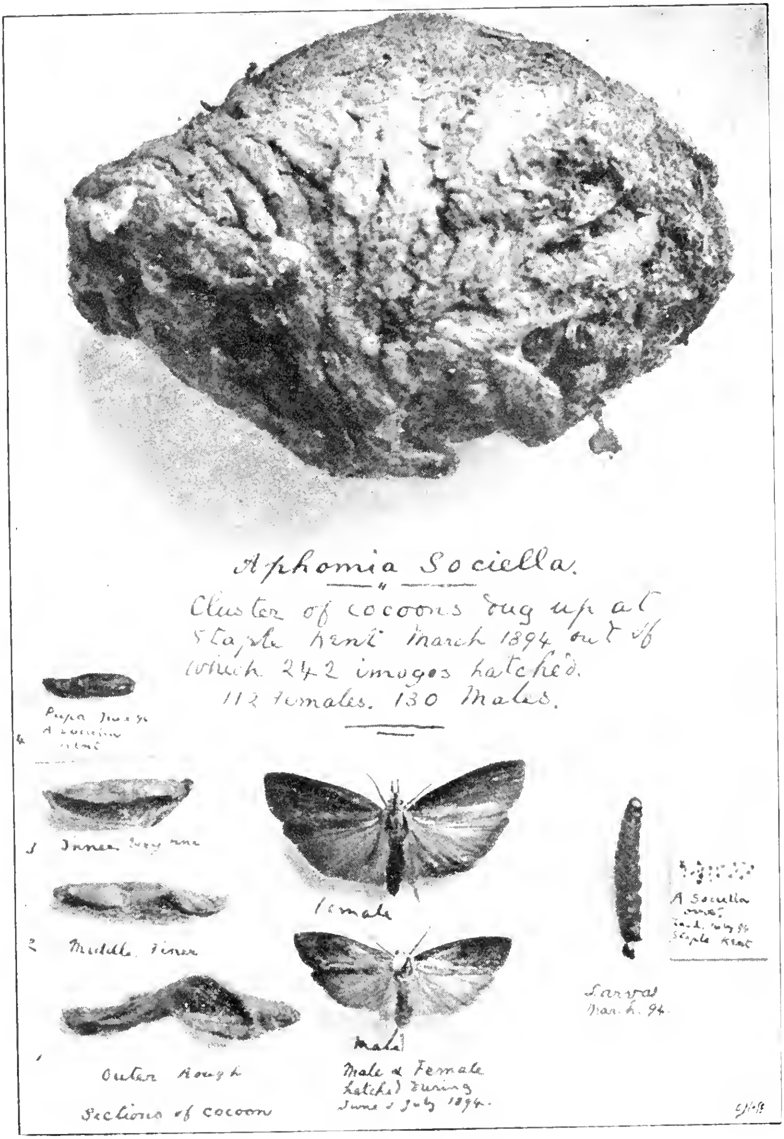
But the day is dying. The slanting rays of the setting sun are broken up by the cloud-like haze into arrows of light, which filter through to us, touching up the moist earth with an appearance of warmth it does not yield, and tinging the woods with a lingering finger of rich gold. The harsh cry of the jay is less frequently heard, and, as we rise from the moist ditch side to the higher ground, we pass, ankle-deep, through the chestnut-leaves. The hazels are throwing out their catkins, hard and solid yet; the last clouds have been driven along at rapid pace; the wind is falling; and now only the gentlest breeze rustles among the slender branches of the trees. The expiring sun intensifies the golden warmth of the oak trees, brightens the last yellow leaf which hangs clinging to the birch tree, or touches with radiant finger the bright-tinted fungus in crimson on the gnarled and twisted boles of brown or grey. But the light fades; the flocking birds hurry home to roost; the rooks and starlings leave the fields and seek the shelter of the woods; whilst the chaffinches and fieldfares nestle in the thick hedgeside. The radiant glory of the bright day slowly departs; the pale blue of the sky above changes into a dome of ever-deepening azure looming above us; the western horizon fades from crimson to orange, from orange to amber, from amber to the palest green, which slowly blends into the blue of the sky that deepens above; and the night gathers swiftly "to banish Even from the sky." The silver stems of the birch begin to look ghost-like in the increasing gloom; whilst the oak wood yonder takes on a cloak of deepest brown, then sombre grey, until it fades into the darkness of the night, which has now really come.

Notes on Aphomia sociella.

(WITH PLATE.)

By W. P. BLACKBURNE-MAZE, F.E.S.

The following is a short account of the accompanying plate, which is from a photograph that several of the readers of *The Entomologist's Record* have already received from me. In March, 1894, I received from a nursery gardener at Staple in Kent a cluster of cocoons which he had come across whilst digging in the garden. I put the cluster in an ordinary large flower-pot and damped it occasionally. The cocoons were very firmly woven together, and the whole cluster was very compact. I detached several cocoons in March and found a larva in all of them; this had evidently hybernated in that state, and had turned to a pupa during the spring. On dissecting the cocoons, I found that in each one there was an outside covering of silk, which was rough and not very thickly woven together. Within this was a second covering, which was finer and more closely woven. Then followed a third covering, which was very fine and was tightly woven together, the inside of it being very smooth, greyish-white in colour, and rather shiny. Then came the naked PUPA, measuring exactly half-an-inch in length. Its colour was a light reddish-brown, but it became darker before the emergence of the imago. The LARVA was of a light yellowish-green, with a dark brown spot on each side of each segment. The head and the three pairs of true legs were light yellowish-red. The EGGS (which I may mention were infertile, as I could not get the insects to pair) were dirty white in colour and round; but they dried up and so changed in shape before I had the photograph taken. The IMAGO needs no description, as every one knows it well, but I may mention that among all those I bred there was no variation, with the exception that some were a trifle darker than others, and there was a little difference in size, more especially among the males. The first imago emerged on June 15th, 1894, and on that day 26 emerged. On the following day, June 16th, 10 emerged; 17th, only 1; 18th, 5; 19th, 9; 20th, 11; 21st, 10; 22nd, 10; 23rd, 8; 24th, 5; 25th, 5; 26th, 5; 27th, 5; 28th, 10; 29th, 15; 30th, 12; July 1st, 23; 2nd, 18; 3rd, 12; 4th, 12; 5th, 14; 6th, 4; 7th, 2; 8th, 4; 9th, 2; 10th, 0; 11th, 1; 12th, 1; 13th, 1; 14th, 1; 15th to 21st (inclusive) 0; 22nd, 1; 23rd to 29th (inclusive) 0; 30th, 1, and that was the last one.



THE LIFE HISTORY OF "APHOMIA SOCIELLA."

I noticed, when they commenced to emerge, that males were in the majority, but during July just the reverse was the case, as during the latter month 77 females appeared and only 18 males. Only two came out cripples after the first day, but on that day 12 of the 26 were cripples, which I think I can account for by the fact that I had neglected to damp the cluster for some days before. Not a single Ichneumon appeared. The total number that emerged was 242 (112 females, 130 males), and this does not include a small bunch that I sent to Mr. Richard South, out of which he bred 20 males and only 3 females. I watched the process of emergence on several occasions. The insect struggled out of the cluster, and, when free, ran down the side of the cluster and then rested on it, head upwards, until its wings were developed, which took but a short time. They commenced emerging each day about 4 or 5 p.m., and continued to do so at intervals till I went to bed, and in the morning when I came down I usually found one or more had emerged during the night. I cannot remember any emerging before the evening. As to the food on which the larvæ fed, I know that in books we are told that they feed on the wax found in the nests of Humble-bees; but why should they not feed in the wasps' nests? I ask this, because in the garden where the cluster was dug up there were fourteen wasps' nests during the summer of 1893 (at which time the larvæ would have been feeding) and this makes me think that very probably they feed in wasps' as well as in Humble-bees' nests. This is only my own idea, and, of course, there might have been plenty of Humble-bees' nests in the garden, though unobserved by the gardener. With these few remarks I shall end, and only hope that my feeble efforts to explain, as far as I know it by my recent experience, the life history of *A sociella* will interest some of the readers of this magazine.—Shaw House, Newbury, Berks. *Feb.* 1*st*, 1895.

Generic Names in the Noctuidæ.

By A. RADCLIFFE GROTE, A.M.

(*Continued from page* 30).

Cosmia, Hübn., 1806.—Type: *C. affinis*, Hübn., *Tent.* Sole species, and therefore type.

Enargia, Hübn., 1816–18.—Type: *E. paleacea.* Sole species, and therefore type. *Calymnia*, Hübn., *Verz.*, appears to be a synonym of *Cosmia.* With the type of *Cosmia*, Hübner includes *trapezina*, apparently a congeneric species. Hübner, in the *Verzeichniss*, distributes the species referred by Ochsenheimer in 1816 to his genus *Cosmia*, among the genera *Enargia* (*paleacea*), *Calymnia* (*trapezina, affinis*), and *Enstegnia* (*diffinis, pyralina*).

Helioscota, Grt., 1895.—Type: *H. miselioides.* I take for the type a well known species of *Hadena*, Smith, Lederer partim, nec Schrank. Of *Celaena* the type is probably *C. haworthii.* *Miana*, Steph., *Oligia*, Hübn., and perhaps, *Callierigis* Hübn., are applied to Lederer's and Staudinger's section C, containing *ophiogramma* and *sectilis.* *Haworthii* seems distinct from the rest of Lederer's *Luperina*, none of which are contained originally (1829) in *Luperina*, of which genus I have not been able yet to find the type. For *Luperina*, Led. (excl. *haworthii*), the term

Ledereria, Grt., 1874, is proposed. The type, *miselioides*, is an average Hadenoid form, with naked eyes, unarmed tibiæ, tufted dorsum, and with the shape of the wings different from *Xylena* (= *Xylophasia*) and much as in *Mamestra*, somewhat squarer and broader. The name may be used for all the species included by Smith under *Hadena*, until they can be compared with the European species and the real types of all synchronous names exactly designated.

Hadena, Schrank, *Faun. Boica*, II., 2, 158, 1802.—Type: *H. cucubali*. Certain names now in use in European works have attained in process of time an entirely new and conventional use, quite at variance with the original intentions of the authors. Not a single one of Boisduval's original species of *Luperina* (1829) is contained in *Luperina* Lederer (1857); consult Grote, *Bull. Buff. S.N.S.*, 2, 54 (1874). Lederer's first species, *haworthii*, is the type of *Celaena*, Steph. (1829). But the most striking case is that of *Hadena* Schrank (1802.) Mr. Smith cites incorrectly 1804, but if, instead of copying the citation, he had opened and studied the page he cites, he might have been staggered. Schrank gives no definition of his genus; indeed, no description could have been drawn up from such heterogeneous material. Schrank cites his families M. and N. as belonging to *Hadena*, and translates the name into the vernacular as "Trübeule." He further says, that the male antennæ are more or less fringed, but he says that this is shared also by the males of his preceding genus *Noctua*, his families K. and L., *Faun. Boica*, II., 2, 158. There remains then the word "Trübeule," as the sole definition of *Hadena*, Schrank, so glibly quoted by authors whose genus *Hadena* contains not one single species originally included by Schrank. Let us search for the generic type of *Hadena*, the genuine "Trübeule." Hübner, in the *Tentamen*, does not allude to *Hadena*. He takes the species *lithoxylea*, a *Hadena*, (*in sensu* Lederer), as the type of *Xylena*. This genus is re-named *Xylophasia* by Stephens. Ochsenheimer in 1816, has, however, the genus *Hadena*, Schrank, and a study of the mixed contents shows that he excludes all the species of Schrank's family M., but includes (and therefore restricts the genus in this sense), the three species of Schrank's family N. These are *meticulosa*, *lucipara* and *cucubali*. The last is a *Dianthoecia* (with hairy eyes), *Ind. Meth.*, 124 (1840). *Lucipara* is the type of *Euplexia*, Steph. (1829). There remains then *meticulosa*, which is the type of *Brotolomia*, Led. (1857). Hübner, *Verz.* (1816–18), 216, includes under his genus *Hadena*, two of Schrank's original species: *typica* and *cucubali*. The first is excluded by Ochsenheimer's prior exclusion in 1816. Therefore, *cucubali* seems to be the genuine "Trübeule," and *Dianthoecia* to be a synonym. Hardly any two of the original twelve species included by Schrank belong to the same modern genus. Of the nine in family M.: *typica* belongs to *Naenia*; *atriplicis* is the type of *Achatia*; *pisi*, *oleracea*, *chenopodii* belong to *Mamestra*; *praecox* and *xanthographa* are referred to *Agrotis*; *piniperda* is a *Panolis*; *deaurata* (?) belongs to *Plusia*. In another case I have shown that *Xylina*, Tr., is constantly used for *Xylena*, Hübn., that the original type is a Hadenoid form, and that Ochsenheimer's mixed genus, which includes Hadenoid and Orthosian types, has become erroneously applied to the latter, and that the true title of the Orthosian genus is *Lithophane*, Hübn., with my restriction of the type in 1875. I have with patient study ascertained the types of the genera of the Noctuidæ; they will mostly be found in my *Buffalo List* of 1874. I think, then, that, if a sure literary basis is a desideratum, my conclusions, where my facts cannot be disputed, should be followed.

ACONTIA, Ochs., 1816; 4, 91.—Type: *A. malvae.* Originally Ochsenheimer propose the genus *Acontia* for *malvae*, *aprica*, *caleris*, *titania*, *solaris*, *luctuosa*. It is thus a mixed genus, including at least two generic types. Hübner (1816–18), *Verz.*, 257, accepts Ochsenheimer's term, and restricts it solely to his own species *malvae*. This becomes, through this restriction, the true type of *Acontia*. For the second generic type included by Ochsenheimer, Hübner proposes the genus *Tarache*, *Verz.*, 261, and I have adopted this term, with the type *aprica*, correctly in 1874, for the species usually catalogued under *Acontia*. The genus *Xanthodes*, Guen., is thus the true synonym of *Acontia*, and must fall.

EUSTROTIA, Hübn., 1816–1818; *Verz.*, 253.—Type: *E. unca.* The name *Erastria*, Tr., used for this genus, must be abandoned, because *Erastria* was previously employed by Hübner, *Tent.*, for the Geometrid *E. amataria.* The necessity of this change must then be apparent to every intelligent and unprejudiced person acquainted with the subject.

GRAEPERIA, Grt.—Type. *G. magnifica*, Neum. The generic name *Heliodora*[*e*] is pre-occupied in Hemiptera (1867), and this North American genus must receive a new name accordingly.

OLIGIA, Hübn., *Verz.*, 213.—Includes *strigilis*, *erratricula*, and three others. This would seem to correspond with Lederer's group C. of *Hadena*, and to have been named *Miana* by Stephens. *Ophiogramma*, referred to this same group, is placed by Hübner in a different genus, *Callierygis*. It is clear that the whole of the European and North American species must be re-studied. It must be ascertained whether the species we in America refer to *Oligia* are congeneric with *strigilis* or *erratricula*, and to what genera our species, referred by me to *Hadena*, other than those excluded by Smith under *Xylophasia* (= *Xylena*), really belong. *Hadena* must be rejected entirely. The true type of *Oligia* I am not able to give with certainty at the moment, nor that of *Luperina*. These matters can only be properly arrived at with all the literature and material at command. It is evident that the catalogue which is written by a systematist knowing the actual objects intended by the Latin terms, not a mere cataloguer of names—I had almost written a "philologist"—must be the more correct and useful. I know of no one who is competent to undertake the revision of the Palæarctic Noctuid fauna who, at the same time, has the time and material to do so. It has seemed to be the policy of the British Museum to exclude specialists on the NOCTUIDAE and lower moths from employment. Nevertheless, the time is coming on when a new edition of Staudinger will be necessary. I hope that the attempt I have made here to purify the generic synonymy will be considered. Such a state of affairs as I have shown to exist, in which a genus like *Hadena* is quoted, author and page, where if the book were looked at not a single species of our modern genus could be found in the original, demands enquiry.

COPIMAMESTRA, Grt., 1883.—Type: *C. brassicae.* In 1883 I took this as the type of a new genus, describing a new American species with armed fore-tibiae. Hübner's genus *Barathra* is mixed, including also *albicolon*. This latter is usually referred to *Mamestra*, but it is shown to belong to a distinct structural group of the modern genus

Mamestra, and for which the term *Barathra* must be retained under the law of priority, which authorises a describer to take a species out of a mixed genus and make it the type of a new one, restricting the original term to one of the original species. In the absence of any designation by Hübner of the typical species, Mr. Smith's assertion that my genus has the same type with *Barathra* is gratuitous.

Bombycia, Hbn., *Verz.* 1816-18 ?—Type: *B. or*. *Cymatophora*, Tr. is preoccupied by Hübner in the Geometridae. For a paper on the genera consult Harvey, *Bull. Buff. Soc. N. Sci.*, I., 276. The family must be called *Thyatiridae*; consult Grote, *Pro. Am. Phil. Soc.*, 138, 1883. I have examined two North American species, *improvisa* and *semicircularis*, both from the West. The occurrence of the genus in Eastern North America is not satisfactorily proven. *Candida*, Sm., from Florida, is not improbably incorrectly generically determined. Mr. J. B. Smith would apparently include also my *Eunystalea indiana*, which, according to Dyar, is a Notodontid. Also *C. magnifica*, examined by me in 1882, and determined then as a Cossid; finally my *Ellida gelida*. It is hardly worth while to criticize such a mixture.

The date of the *Tentamen*, an undated sheet, is variously given at from 1806 to 1810; that of the *Verzeichniss*, dated 1816, from 1816–1822. The exact date of the *Tentamen* is not of consequence; it is later than Laspeyres, but earlier than Ochsenheimer's 4th volume (1816), since it quotes a name of the former and is throughout quoted by the latter. Names not published by Hübner in the *Zutraege* until 1822, are quoted in the *Verzeichniss*, but they were probably anticipatory of publication; on the other hand, names published by Ochsenheimer in his 4th volume (1816) are apparently taken and made use of, restricted in their application by Hübner, in the *Verzeichniss*. In the *Tentamen*, Hübner does not seem to know Schrank, (1802), but he restricts Ochsenheimer's use of *Hadena* (See Scudder's *Historical Sketch*).

For those lepidopterists who may feel averse to any change in generic that have titles become familiar, I may say that I have discussed in these two papers the most radical of the necessary restitutions. They have heard what has to be sacrificed for the sake of getting on the right line. I may say that for most of the generic names in Staudinger no alteration is required. The titles of certain more extensive genera, such as *Polia*, *Mamestra*, *Xanthia*, *Orthosia*, *Cucullia*, *Plusia*, *Catocala*, and others, will remain. The names of genera of small extent such as *Demas*, *Dipterygia*, *Naenia*, *Coenobia*, *Senta*, *Meliana*, *Dicycla*, *Cirrhoedia*, *Scopelosoma*, *Calpe*, and many others, are untouched. On the other hand, several of Boisduval's generic names, such as *Hoporina* and *Plastenis*, which now usurp the place of Hübner's titles, will have to go. *Glaea* must be used instead of *Cerastis* or *Orrhodia*, as long ago pointed out by that excellent entomologist, Stephens. Many of the necessary restitutions have been made by me in listing the North American Noctuidae. I gave in 1874-6 the exact types of most of the genera. In now going over this work again I find, so far, little to change. The type *xerampelina* which I gave in 1874 to *Atethmia*, belongs to *Cirrhoedia*, since Hübner's is a mixed genus. Those using my North-American Lists enjoy at least the comfort of being able to employ the oldest generic titles upon occasion.

An experience of more than thirty years with the NOCTUIDAE, the literature, and contemporary people, gives food for much reflection, so that many unwritten chapters arise in my mind. From a scientific standpoint I could show at length the necessity of revising the classification of the English Owlet Moths upon a structural basis. Historically, so far as the names are concerned, I could show, in another chapter, how the chauvinistic spirit fostered the growth of peculiar names in the different European entomological circles, gathered around this or that prominent but passing authority. Sometimes the difference in language has impeded, but most often personal assumption has prevented the quiet comparison of results attained in studies of structure and nomenclature. The law of priority found at times a national barrier to its application. Again, the characters of the different systematists impressed itself often upon the nomenclature adopted. Here is vindicated the truth of my aphorism that "we are men before we are entomologists." Not all systematists are gentleman in the sense that Don Quixote was one, willing to forget themselves and to break a lance for that which is and which must seem to them everlastingly right. For entomology presents, not only a field for the exercise of mental activity and practical manipulation, but for the display of light and education also. Finally, I might devote an entirely new and lengthy chapter to a systematic and well-deserved abuse of the British Museum Lists, which chapter, indeed, I commenced as long ago as 1851, but *cui bono*? Against much more deliberate and flagrant injustice in this world one beats one's wings in vain. Perhaps such a chapter might abruptly terminate with the conclusion of the farmer, when his applecart upset and the neighbours gathered to hear him swear: "It's no use, boys, I give it up, *I can't do justice to it!*" and my readers, with the farmer's hearers, might be in the end disappointed. All these chapters I might put on paper, but now I fear the patience of the EDITOR and the interest of the READER is exhausted, and I come to a full stop.

The Life-History of a Lepidopterous Insect,

Comprising some account of its Morphology and Physiology.

By J. W. TUTT, F.E.S.

(*Continued from page* 8).

CHAPTER V.

THE LARVA OR CATERPILLAR.

PART I.—THE NEWLY-HATCHED LARVA.

1.—ON THE HATCHING OF THE LARVA.—In the previous chapter we reached that point at which the embryo is fully-formed inside the egg-shell. The next stage in the life-history of the insect is the hatching process. This may take place almost immediately on the completion of the development of the larva inside the egg-shell, or be delayed for a considerable time. When the time arrives for the larva to escape, it gnaws a hole from the inside through the cell-wall and thus liberates itself, after which it frequently eats the remainder of the egg-shell. It has been asserted that the larvæ of the *Hesperiidae* take a day or two to perform the operation of eating their way out of the shell, but generally much less time is occupied. In those cases in which the fully-formed larva remains in the egg-shell for a very considerable time, it usually passes the winter thus before hatching. It is on record that, in certain parts of Continental Europe, *Leucoma salicis* hybernates as an egg ; in the South of England it hybernates as a very small larva. If the climatic conditions were such as to preclude autumnal hatching, one can readily understand that species, which normally hybernate as larvæ of exceedingly small size, might still hybernate as larvæ—but inside the egg-shell instead of outside it. The adult larva of *Stauropus fagi* is, perhaps, the most peculiar of all lepidopterous larvæ ; the hatching of the young larva, and its appearance when newly hatched, are equally striking and peculiar. Mrs. Bazett, writing of this hatching (*Ent. Rec.*, vol. ii., p. 210), says :—"Presently a minute black spot appears, it gets larger, and with a glass you can see the head of the insect eating round the shell till the hole is large enough, when out bursts the head and two pairs of long prolegs like those of an ant, and with this it wriggles about till one segment after another comes out, and it then looks far more like an ant than anything else ; these legs are for ever on the move, and the head rocks from side to side. First it eats its egg-shell, then sleeps, and walks about in search of food."

2.—On the newly-hatched larva.—At the time that the lepidopterous larva escapes from the egg, it possesses true insect characters. Its body is made up of a series of rings or segments, containing the muscular, digestive, circulatory, respiratory and nervous systems. It breathes by means of tracheæ, which are fine tubes composed of an elastic membrane, and kept open by a spiral structure which passes throughout their whole length. The number of the segments in the head is not at all distinctly marked, the four, which are seen pretty distinctly in the early embryonic stage, being now welded together into an almost inseparable whole. Although the first three body-segments are assigned to the thorax, there is no well-marked separation between the thoracic and abdominal regions. A close inspection of the segments comprising these parts of the body, however, usually discloses some distinct characters in the appendages, either as to structure or arrangement, or both. The skin of the newly-hatched larva is very soft, but it quickly becomes harder, owing to the solidification of the horny substance called chitin in the outer cuticle. Most newly-hatched larvæ have a somewhat colourless and transparent skin when just out of the egg, and the rapid hardening of the cuticle is frequently accompanied by the production of a difference in colour, and by the development of the distinct markings which are characteristic of the larval cuticle, so that an almost colourless larva may, within an hour of hatching, become almost black. This hardening does not affect the sutures, and the intersegmental membranes allow the segments to move freely on each other. The almost (or quite) complete obliteration of the sutures of the head segments has already been referred to, and this makes the head appear superficially to be only one segment. Still, the newly-hatched larva of *Pararge megaera* shows a peculiar development, the last head-segment bearing four typical trapezoidal tubercles, arranged as a trapezoid and with the usual hairs. The marks on the other segments appear to have the same significance, and there can be no doubt, I think, that this points to the segments of the head as having consisted originally of tubercle- and hair-bearing segments. It would be interesting to know whether the newly-hatched larvæ of such species as *Limenitis sibylla* and *Vanessa polychloros*, in which the posterior head-segment of the adult larva bears fleshy spikes, give us characters which tend to show the latter to be of the same origin and significance as the spines of the thoracic and abdominal segments, that is, whether they bear tubercles on this head-segment which have a similar morphological value. The body-segments are usually sub-divided into subsidiary rings, or sub-segments, which move more or less freely upon each other, and in some cases these sub-segments prove of great classificatory value. The sub-segments are sub-divided again into still smaller solid portions which have a certain amount of freedom. These are technically termed sclerites (skleros, Gr. = hard). The sub-segments themselves are frequently separated by ill-developed membranous rings, somewhat like, but generally less clearly defined than, the intersegmental membranes.

SCIENTIFIC NOTES & OBSERVATIONS.

Discussion on the Nature of certain Colours.

(*Continued from p.* 40.)

I think a great many of our respective arguments have been wasted because we did not start from any fixed basis (the whole matter having arisen from Dr. Riding's remarks about *Hepialus humuli*), and it will perhaps make things a little clearer if I state my opinion:—Pigment is used generally as a term for the colouring matter of insects, and I want to confine its use to such colouring matter as may be isolated. Those substances which by their colour impart a hue to animal and vegetable tissues, and which I consider pigments are: Hæmoglobin and derivatives from blood; bile pigments; melanin, and others of a similar nature; the pigment of the human skin and retina, and also that of other vertebrates. It is merely a matter of definition, but an outsider would think, if reading any of the various articles on this subject, that the so-called pigments of the butterfly's wing are as tangible bodies as those above-named. To Dr. Riding's question, "When we use the word pigment, are we not forgetting that there is in reality no such thing as colour at all?" I would reply that pigment = paint, or that with which any object is coloured; and that as to colour, it is the result of the visual judgment, which varies considerably, as evidenced by colour-blindness, and is as real as any other subjective sensation. Dr. Riding objects to my refractive theory with regard to the change of the green in *Thecla rubi*. There is an insect whose green is almost similar to, though more iridescent than, that of *Thecla rubi*—I refer to *Miselia oxyacanthae*. The green part of this insect behaves in a similar manner to that of *T. rubi*, and Mr. Tutt (*British Noctuæ*, vol. ii.) has quoted other instances. When I called the green a "potential" colour, what I meant was that, as I understood Dr. Riding's definition of the term, it would fall under that head. Personally, I should call it a colour resulting from refractive powers of the superficial layers of scales. If it were a substantive colour, water would not make any difference, or at any rate would only make it appear a little darker; but in this case, a totally different colour appears, and the same colour (brown) appears if the superficial layer of scales be removed. When the insect is dried again, the green colour returns.

With regard to the metallic spots in lepidopterous (Vanessid) pupæ, the appearance is due to alternate layers of water and chitin, and, according (I believe) to Poulton, these are arranged in cubical cells. This arrangement was discovered by a German observer whose name I now forget.

With regard to black colours, I quite agree with Mr. Tutt, that there are two kinds of black. My idea is, that one is a black that is always associated with a pattern, as in the *Pieridae*, *Papilios* and other butterflies; the other black being a more or less diffused black not associated with a pattern, which, if increased, gives a melanic insect. *Limenitis sibylla* has a black form, produced by the extension of the black colour, but this is not what I call melanic, and I am beginning to doubt whether the time-honoured var. *doubledayaria*, of *Amphidasys betularia*, is not also an extension form, and, although the extension may serve the same purpose, it is not the result of the same process as that of true melanism, which arises from suffusion.

I find that I have not answered Mr. Tutt's question about pigment granules. I have always considered that the pigment granules do not contribute to any great extent to the colour of the insect, for, as far as I could make out, the colour seemed to be dispersed throughout the scale and not confined to the pigment granules, and I think it possible that these granules have no special colouring function, although they may be impregnated with, or perhaps only surrounded by the scale colour. I am convinced that these granules are present in very much greater abundance in melanic, and what I may call quasi-melanic specimens, *i.e.*, those small brightly-coloured specimens one gets occasionally when breeding insects. Perhaps it would be more correct to call them more deeply coloured. I have some specimens of *Panolis piniperda* which show this very well. Possibly these granules may be expressions of waste energy only, and have nothing to do with the colour. With regard to what I wrote in my last note about the different refractive indices and "the shining through of the under scales," I will try and put it more clearly. In the case of *T. rubi*, when the scales are dry, the superficial layer of scales being of a different refractive index from the brown scales beneath, a green appearance is produced. When wetted, the refractive index is changed, or more probably its power of refraction is lost, then it becomes a mere transparency through which the brown shows. I do not know of any pigment whose colour is altered by being wetted. I think I have written enough on pigment this round, and will wait and see what my betters have to say.—R. Freer, M.B., Rugeley, Staffs. *Dec. 13th*, 1894.

In my notes on pigment (*Ent. Record*, vol. vi., No. 2, p. 38, line 9), "diffraction of thin films" should read "diffraction *or* thin films." In the next line, I fear my meaning is open to misinterpretation. I ought to have written "all the brilliant iridescent colours of insects . . . . are due to interference &c.," instead of "all the metallic colours and their iridescence . . . . are due," &c. What we call metallic blotches, as we know them in the genus *Plusia*, &c., seem to be caused both by the pigment and the scale structure. A large amount of white light is reflected in mass from the surface (as in metals), and this carries with it some coloured light that comes back after penetrating the pigment in the scales. The pigments in these blotches, are those that have the greatest brightness or luminosity—*viz.*—some shade of orange-yellow. This pigment reflects, not only the yellow rays freely, but also some of the other very luminous rays, which all added together, make up yellow. (If the luminosity is put down as 100, that of chrome-yellow will be 75 or 80—vermilion, 25—emerald-green, 48—blue, 35—ultramarine, 7). This highly luminous yellowish-white, mixed with the reflected masses of white light (instead of very scattered white light) gives the metallic appearance. The scales in these blotches are seen (under the microscope) to have no teeth, or virtually none (merely slightly rounded elevations) so that the white light is reflected in mass, so to speak, and not scattered by the teeth as in the rest of the wings. The effect is also heightened by darker, only slightly luminous patches, surrounding the blotches more or less, just as the parts in shadow on a polished metallic surface look almost black, and so help to increase the brilliant appearance.

The side issues in our discussion on the action of chemical re-agents on the colour of pigments, seem to me, not merely relevant, but necessary. We must have a clear understanding of the meaning of terms used, or, we shall only wander in a maze of our own creation. The word "pigment" is apparently the rock on which we are splitting. I endeavoured to give a simple definition, according with present scientific knowledge, which might help to clear that popular but erroneous one, which makes pigment a material collection of atoms or molecules. The late Professor Tyndall described the granules, etc., producing colour, as having a sifting or selective power over white light, which enabled them to extract from it what he described as "the luxury of colour." He expressly stated that such power is not "creative" but "selective," and further went on to say, "There is no colour generated by any natural body whatever." How then about Dr. Freer's suggestion of the "isolation of pigment?" Dr. Freer may fairly retort that all text-books speak of bile and blood-pigments, melanin, etc., but I think I am not hair-splitting when I suggest caution in an acceptance of the word in its popular sense, without conceding the scientific limitations which ought to qualify it. I must join issue with Dr. Freer and Mr. Tutt as to there being any such thing as "black pigment." Blackness is produced by the absorption of all the constituents of light penetrating an object, so that none are reflected (except, of course, from the surface before the light penetrates, which has nothing to do with colour). How few of our insects are really black! What we call melanic specimens are for the most part somewhat coloured, some few rays of light (more or less) are reflected through the object from its internal surfaces (the majority being absorbed) and it is these few reflected rays that determine the amount of colouring. Did such a thing as black pigment (in our qualified sense) exist, it would mean black rays amongst the constituents of light, together with the red, green and violet! Blackness is simply a "quenching" of light. Of course, there is the quenching due to interference of light, as well as that due to absorption. There seem to me to be two objections to Dr. Freer's theory about the change of colour in *T. rubi*, when wetted:—(1). The refraction caused by water and the scale, must be in the same direction, because both are denser media than air, and therefore, there can be no neutralisation as

I understood Dr. Freer to suggest. (2). The scales are not arranged in superficial and deep layers, but overlap like the tiles of a roof, and the lower portion of each scale contains less pigment than the upper, and the green colour is confined to a little more than the upper half of each scale, roughly speaking. I have recently examined the scales of *T. rubi* (which I had not previously) and have been surprised to find the green much more brilliant than I anticipated. By reflected light each green scale looks as though dusted over with minute brilliant green scales for a little more than its upper half and somewhat further down on the sides—below it is pale brownish. When wetted, the green becomes a complementary brilliant red by reflected light. When the same scale is examined by transmitted light the green vanishes and there is a pale brownish scale, redder and yellower, where the green had been. Under a quarter-inch power, the scale is seen to be finely striated vertically, and behind the striations the coloured portion is divided into masses by irregular lines, which when wetted seem to swell and become much more distinct, giving a reticulated appearance and the colour is somewhat paler. I can find none of these reticulations in the brown scales, so cannot help thinking that there must be some connection between these and the green colour, especially as they are actually seen to change when wetted, and at the same time the green changes to its complementary—red. These points, I think, both Dr. Freer and Mr. Tutt will be able to corroborate if they examine the scales, and perhaps they may be able to suggest an interpretation, which at the present minute I cannot find. The data seem to be—(1) brown scales, pigmented, slightly paler when wetted; striated, (2) green scales with a redder and yellower pigment (on the green parts), apparently collected in masses with intervening spaces through which water can pass, giving a brilliant green reflection when dry, and a brilliant red when wetted; striated. It looks an interesting problem, but certainly seems connected with pigment and structure. I have written so much that I must only briefly allude to the question of the "alteration of pigment by wetting." I would suggest the following points—the invariable solution of some chemical agents in rain-water; the change of colour in the leaves of spring, producing autumnal and winter tints, in which it is highly probable water plays some part; the darkening of surfaces by humidity: the action of moisture in the production of melanism and melanochroism. I would add that I noticed in the hot summer of 1893, that insects were much more damaged by the fumes of liquid ammonia and vapour of water than by the alkali alone. I kept blotting paper saturated with water in my killing-box for some months to prevent the insects drying up. Tyndall wrote:—"The question of absorption (of light) considered with reference to its molecular mechanism is one of the most subtle and difficult in physics. We are not yet in a condition to grapple with it (1882), but we shall be by-and-by." I am afraid the "by-and-by" has not been reached in 1894.—W. S. Riding, M.D., Buckerell Lodge, Honiton. *December 22nd*, 1894.

Secondary sexual characters.—I would call the attention of entomologists to the presence of male tufts on the underside of *Mellinia circellaris*, a species in which they have not yet, I believe, been recorded.—J. G. Johnson, Norfolk Square, Brighton. *Nov.*, 1894.—[A somewhat full account of "Scent Glands and Patches" and their uses, under the heads of (1) "Extensible Glands on the Abdomen;" (2) "Tufts or pencils of hairs found on various part of the body, including legs and wings;" (3) "Clusters of scales etc." may be found in *Brit. Noct.*, vol. iii., pp. 6–8; also in "Scale patches in the male," with an account of abdominal plumes of hair, *l.c.*, p. 14.—Ed.]

Apterous females and winter emergence.—I trust that the interest of the subject may induce you to give me room for a few further remarks on the connection between apterous ♀ s and winter emergence.

First, I would thank Mr. Prout for his courteous answer (*Ent. Rec.*, vol. v., p. 147) to my comments (*id.*, p. 96) on an opinion expressed by him (*id.*, p. 86), and for his reference to Mr. Tutt's observations in *Brit. Noct.*, vol. iii., pp. 8–9.

It certainly does seem, from the reasons there given by Mr. Tutt, that the apterous or semi-apterous state of the ♀ may be due to distinct causes in the case of winter and summer moths.

I think that there can be no doubt that all moths, ♂ and ♀, were originally amply winged, and that, in the case of all apterous or semi-apterous ♀ s, three, or possibly four causes have been at work to reduce them to their present state, *viz.*: (1) disuse; (2) the survival of the fittest or more atrophied forms, these being less liable to be seen and attacked by their natural enemies; (3) the increased tendency to atrophy thus inherited by the offspring of a constantly increasing number of atrophied forms; and (4) possibly increased fecundity due to the difficulty of the species to exist, and the consequent tendency of the wing to become less developed as a set-off; though my own view is rather that the increased fertility of the ♀ may be the result, and not the cause of less expenditure of energy in wing development. At all events, after the first start, the two processes would go on side by side, mutually encouraging each other. The suggestion of Mr. Prout, as I understand it, is that, in the case of winter moths, the cold of the winter season may have a *direct* influence on the wing development of the ♀, by affecting her full vitality and fertility, which "might only be maintainable at the expenses of the not-indispensable organs of locomotion." It is the difficulties that I still feel in the way of this view—that cold has any *direct* influence—which leads me to make a few further remarks on the subject.

Though both Mr. Prout and Mr. Tutt (*loc. cit.*) give very good reasons why the particular groups in question may, during the winter and leafless season, require more facilities for hiding, and consequently have less use for their wings, none of the observations of either of them suggest any reason why they alone of the winter moths should be *directly* affected by cold; while, as I indicated in my former remarks, if the order of appearance of the *Hyberniidae* is considered in connection with the greater or less wing development of the ♀, it seems hardly possible that the cold *per se* affects them in this way. It must, I suppose, be admitted that there is a turning point, which I should put somewhere about the middle or latter part of January, up to which, in normal years (for we are not concerned with abnormal seasons), the winter gradually advances, and after which it gradually retreats. One ought then, according to this theory, to find the ♀ s becoming more apterous with the advancing season, till in January a truly apterous form is reached, and from January the ♀ s becoming less apterous till March or April, when they would again become fully winged.

Now, applying this to the *Hyberniidae* and *Cheimatobia,* we find that the facts do not bear out the theory. The first to appear, towards the end of October, is *H. defoliaria,* with a truly apterous ♀ (and how wonderfully the various colours of the ♂ s of this species harmonise with the autumnal tints of the various trees in a mixed woodland!); this is followed in a few days by *H. aurantiaria,* with an almost apterous ♀; this again is shortly followed by the *Cheimatobias,* also with nearly apterous ♀ s; then in January, *H. rupicapraria* appears, with a very similar ♀; the next to appear, early in February, or, if mild, at the end of January, is *H. leucophaearia,* with a strictly apterous ♀: followed in a day or two by *H. marginaria*, whose ♀ has the wings most fully developed of all the *Hyberniidae*; then later in the month comes *Anisopteryx aescularia,* with a truly apterous ♀. Thus the series begins and ends with the most apterous forms. Mr. Prout's experience is that *H. marginaria* and *A. aescularia* are contemporaneous. In the sense of both being out together no doubt they are, but still, here at all events, the former precedes the latter to an appreciable extent; I give the dates of first captures of each for 1893 and 1894. Having had an illuminated trap set every night each year in the same place, had either been about earlier, I should certainly have taken it. *H. marginaria*—1893, Jan. 28th; 1890, Feb. 3rd. *A. aescularia*—1893, Feb. 16th (this seems to have been an abnormally early specimen, as no more were taken till Feb. 28th, though the nights were favourable, and *H. marginaria* taken regularly); 1894, Feb. 24th.

Turning now to the *Amphidasydae,* Mr. Prout still thinks that the wings of ♀ *A. strataria* are less developed than those of ♀ *A. betularia,* and is inclined to suspect that the former is "entirely unfitted for flight." I do not think that the ♀ s of either species fly much, but that they both can and occasionally do fly is proved by my having taken them both in my trap. To sum up, it seems clear that the increase and decrease of the wing development of the ♀ s does not coincide with the increased and decreased severity of the season, and this seems to me a great difficulty in the way of the theory that cold has any *direct* influence; indirect no doubt it has, as producing the causes which, as pointed out by both Mr. Prout and Mr. Tutt, probably lead to disuse and so atrophy of the wings.

Looking at the *Hyberniidae*, especially at the remarkable similarity in the variation of *H. aurantiaria* and *H. marginaria,* it is difficult to resist the conclusion that at all events the *Hyberniidae* and the *Cheimatobias* are descended from some common parent form, and it is not improbable that this form was already partially apterous. The principles of selection and survival of the fittest in each generation would tend to preserve and intensify some special character, till the original varieties became so far divergent as to be entitled to rank as new species, gradually differing more and more from the original stem form which, in accordance with Darwin's theory (*Origin of Species*) has probably long since become extinct. This would account for a group of moths, in many ways related to each other, all possessed of apterous or semi-apterous ♀ s; for this attribute of the parent form, being useful for the preservation of the species, would never be lost, though some members of the group might and probably would become more specialised in this direction than others. If this be so, it would only remain to find some reason why the ♀ of this parent form ceased to use her wings, and Mr. Tutt's reasoning seems to give as satisfactory an explanation of this as we are ever likely to get.

It may be said that this supposition of a common ancestor with a semi-apterous ♀ minimises the difficulty which I felt in the way of *direct* influence by cold weather owing to the non-coincidence of the greatest cold and the most apterous forms, but I do not think it does; and even if it did, there would still remain the difficult question why the other contemporaneous winter species are not so affected, which difficulty does not exist if we accept Mr. Tutt's suggested explanation, coupled with the observations of Mr. Prout himself as to the different habits of this group and the other winter species.—E. F. Studd, Oxton, Exeter. *Dec.* 19*th*, 1894.

P.S.—Since writing the above, *viz.*, on Christmas morning, I found in my trap a rather worn specimen of *H. marginaria*. This is probably an abnormally early specimen, like the *A. aescularia* of Feb. 16th, 1893, only rather more so.—E. F. S.

Parthenogenesis in Taleporia bombycella.—Parthenogenesis occasionally occurs in *T. bombycella*. I have bred a large number of males and females during the last four or five years. In 1891, the cases were scarce and, being gathered too late, I got nothing but females. Two or three of these laid eggs, which I did not detect at the time; but, happening to look into the box (a large 4-ounce, clean chip) about a month afterwards, I found innumerable young larvæ all over it. The cases of these larvæ when young are cocked-hat shape, and the material was apparently obtained from their parent's cases. I transferred them to a lichen-covered apple-tree, but they came to nothing.—R. Freer, M.B., Rugeley. *Jan.* 12*th*, 1895.

CURRENT NOTES.

Captain Bower, in his recently published *Diary of a Journey across Tibet*, states that the following "six species of butterfly were found, at elevations varying from 15,500 to 17,600 feet. These were collected by Dr. Thorold, and so far as we know, included every butterfly seen by us in Tibet":—*Aeneis pumulus*, *Vanessa ladakensis*, *Synchloë butleri*, *Pieris chloridice*, *Parnassius acco*, *P. jacquemontii*. Locusts were met with in numbers at an elevation of 14,000 feet, and some were seen even as high as 16,000 feet. At 17,000 feet a colony of bees was observed living underground, with little holes on the surface, through which they passed backwards and forwards.

In a paper entitled "Denizens of an old Cherry-tree" (*Inter. Journal of Microscopy*, Jan., 1895), Mr. C. J. Watkins of Painswick, Gloucestershire, gives a list of insects found in the rotten wood of a cherry-tree stump, during April, May and June, 1893, in which are included:—Coleoptera, 8 species; Orthoptera, 1 species; Hymenoptera, 14 species; Lepidoptera, 1 species: Hemiptera, 2 species; Diptera, 11 species, including *Brachycoma erratica*, Meigen, added to the British list by specimens captured in this stump, and described by Dr. Meade, *E. M. M.*, 1894, p. 110. Numerous species of Diptera were taken from the larders of the four species of *Crabro* found.

In early October, Mr. Albert Lahmann, of Bremen, discovered full-grown larvæ of *Choerocampa celerio* on the grape, and was fortunate enough to breed several imagines therefrom, which emerged (in the room) early in December of last year. Bremen seems to be one of the most northern points where this pretty migrant from the south has yet been observed.

Dr. Ottolengui contributes to *Entomological News* (vol. vi., pp. 7 et seq.) an interesting paper on "Aberration, variety, race and form." He quotes, in the current number, the opinions and remarks thereon of the Rev. G. D. Hulst and Prof. J. B. Smith. The summary of the former is worth repeating:—"Genus—Species distinguished by a type different in structure. Sub-genus—Differing in structure, but less. Species—Breeding true to self, but not intergrading. Sub-species—Breeding true to self and rarely intergrading. Race—Breeding true, except in intermediate localities. Variety—Forms distinct, but intergrading more or less in any locality. Sub-variety—Forms distinct or not distinct, but the name applying to a variety comparatively infrequent or not marked. Form—A seasonal or sexual variation somewhat permanent. Variation—An individual variation, infrequent and not generally distinct and not permanent. Aberration—An individual sport or variation, very distinct, without intergrades."

The following is an interesting note on Ants' nests found in trees in the Amazon Forests. Mr. F. Knab writes (*Ent. News*):—"Nests are very common on the Lower Amazon; those I examined appeared to be made of mud, and were inhabited by a species of large black ant. Sometimes the nests are high up in the crutch of a tree, sometimes quite near the ground. Few probably know that the common parroquets rear their young within these ant nests—a most interesting case of intimate relations between widely different animals. The bird drills a hole into the side of the ant-hive, like a woodpecker's in a tree . . . . . . the eggs are laid and hatched out without annoyance from the ants, which continue in possession of their home . . . . . . Why do ants suffer these intruders? Once I obtained a set of parroquet's eggs from one of these nests. An Indian climbed a neighbouring tree, and, reaching over, with his tercado broke open the nest; immediately the tree and ground below were black with ants. The eggs were taken out, and caught successfully in my insect net, but not until many of the little demons had buried their jaws in our flesh."

Some amazing statements were recently made by Mr. Arkle of Chester in *The Entomologist* as to the sight of insects. He evidently has not read Dr. Sharp's recent paper, "On the Vision of Arthropods" (*Trans. Ent. Soc. Lond.*), but it really is high time that off-hand opinions based on want of knowledge should be excluded from our so-called scientific magazines. In his recent address, as President of the Biological Society of Washington, Dr. Riley (*Insect Life*, vii., p. 33) says of the sense of sight:—"Much has been written as to the picture which the compound eye of insects produces upon the brain or upon the nerve centres. Most insects which undergo complete metamorphoses possess in their adolescent states simple eyes or ocelli, and sometimes groups of them of varying size and in varying situations. It is difficult, if not impossible, to demonstrate experimentally their efficiency as organs of sight; the probabilities are that they give but the faintest impression, but otherwise act as do our own. The fact that they are possessed only by larvæ which are exposed more or less fully to the light, while those larvæ which are endophytous, or otherwise hidden from light, generally lack them, is in itself proof that they perform the ordinary functions of sight, however low in degree. In the imago state the great majority of insects have their simple eyes in addition to the compound eyes. In many cases, however, the former are more or less covered with vestiture, which is another evidence that their functions are of a low order, and lends weight to the view that they are useful chiefly for near vision and in dark places. The compound eyes are prominent and adjustable in proportion as they are of service to the species, as witness those of the common house-fly and of the Libellulidæ, or dragon-flies. It is obvious from the structure of these compound eyes that impressions through them must be very different from those received through our own, and, in point of fact, the late experimental researches of Hickson, Plateau, Tocke and Lemmermann, Pankrath, Exner, and Viallanes, practically established the fact that while insects are short-sighted and perceive stationary objects imperfectly, yet their compound eyes are better fitted than the vertebrate eye for apprehending objects set in relief or in motion, and are likewise keenly sensitive to colour. So far as experiments have gone they show that insects have a keen colour sense, though here again their sensations of colour are different from those produced upon us. Thus, as Lubbock has shown, ants are very sensitive to the ultra-violet rays of the spectrum which we cannot perceive, though he was led to conclude that to the ant the general aspect of nature is presented in a way very different from that in which it appears to us. In reference to bees, the experiments of the same author prove clearly that they have this sense of colour highly developed, as, indeed, might be expected when we consider the part they have played in the development of flowers. While these experiments seem to show that blue is the bee's favourite colour, this does not accord with Albert Müller's experience in nature, nor with the general experience of apiarians, who, if asked, would very generally agree that bees show a preference for white flowers."

Dr. F. Werner has compared (*Biolog. Centralbl.*, xiv., pp. 116-9) the relative length of the intestine in vegetarian and insectivorous Orthoptera. The result was unexpected. The plant-eating *Acridiidae* have a short almost straight gut, rarely larger than the body; whilst the *Locustidae* have a larger gut, usually spirally coiled, especially in *Barbitistes* and *Phaneroptera*. Werner believes that the length and coiling of the intestine have nothing to do with the diet, but are correlated with the shape of the body and the habits of life.—*Journal Royal Microscopical Society*.

NOTES ON COLLECTING, Etc.

SHORT NOTES FROM THE EXCHANGE BASKETS.—Dr. Gunning (Montrose) writes on Dec. 7th:—" Sugaring was an utter failure here from the last week in July until the middle of November, when *Orrhodia vaccinii* and *Scopelosoma satellitia* appeared in fair numbers, and continued to do so until quite the end of the month. Last year *Calocampa vetusta*, *Noctua glareosa* and *Anchocelis litura* simply swarmed at sugar, but this year I have not met with a single specimen of the two latter, and only one or two *C. vetusta*."———Mr. J. J. F. X. King (Glasgow) writes on Dec. 10th:—"My experience of the season (1894) has been that insects were very scarce. I spent from the middle of June until the end of August in Ireland—Dublin, Athlone, Cong, Westport and Ballinesloe—but found that, owing to the prevailing high winds and the absence of sunshine, imagines of all orders were wanting. This applied not only to the Lepidoptera, but also to the Neuroptera and Orthoptera. I have spent my holidays in Ireland before, but never with such a poor return. In Scotland the work has been just as bad. Collecting in this district has been very poor, if I except captures of *Phibalapteryx lapidata*, of which I took a grand series in three widely separate localities."———Capt. Robertson (Coxhorne) writes on Dec. 11th:—"There is nothing to report except the capture of a female *Petasia cassinea* at rest on Nov. 1st, and *Xylina semibrunnea* at ivy on Nov. 18th."———Mr. W. B. Thornhill (Castle Cosey) writes on Dec. 14th:—"I have only had two season's experience of collecting here (or indeed anywhere), but the absence of certain insects during the past season which I took commonly the season before (without working nearly so hard as last season), appears to me curious, and I shall be glad to know whether others met with the same experience with regard to the same insects. In 1893, I took *Macroglossa stellatarum*, *Hepialus velleda* var. *gallicus*, *Charaeas graminis*, *Helotropha leucostigma* and var. *fibrosa*, *Chortodes arenosa*, *Agrotis saucia*, *Noctua triangulum*, *N. brunnea*, *N. baia*, *Tryphaena fimbria*, *Hadena dentina*, *Plusia pulchrina*, *Ellopia prosapiaria*, *Cleora lichenaria*, *Melanthia albicillata*, *Cidaria fulvata* all in more or less numbers. This past season I have not taken any of them, although I worked this locality twice as much. Comparatively speaking, *Tryphaena pronuba* and *Xylophasia monoglypha* did not show themselves this season; while several others showed in fair numbers, which did not appear in 1893."———Mr. W. F. de V. Kane (Monaghan) writes on Dec. 14th:—"I should be glad of information as to the inland distribution of *Miana literosa* or *Miana bicoloria* and its vars. Are they ever found in hilly districts or wet moors inland in Great Britain?"———The Rev. E. C. Dobrée Fox (Castle Moreton) writes on Dec. 17th:—"With regard to the appearance of *Zygaena trifolii* at Swanage during the first week in August, I was surprised myself when I first took it at this date. This was in 1892, in the same locality where I found it again this year. On both occasions I took pupæ, which emerged a few days later."———Mr. F. G. Whittle (Southend) writes on Dec. 24th:—"I received on October 15th, from a friend at Wandsworth, a few adult larvæ and one pupa of *Abraxas grossulariata*, from which, within the last week or so, I have bred four moths."———Mr. Mason (Clevedon) writes on Dec. 31st:—"I have seen no specimens of *Dasycampa rubiginea* this autumn, neither has *Poecilocampa populi* visited the gas-lamps. *Dasypolia templi* and *Petasia cassinea* seem to have deserted this locality also. Single specimens of *Eugonia tiliaria* and *Himera pennaria* are the sum total of the "thorns," a pair of *Hybernia defoliaria* appeared at the lamps, which have also attracted scores of *Cheimatobia brumata*. I noticed a pair *in copulâ* there. I presume the male had carried his mate from an adjoining hedge to enjoy the light."———Mr. Mera (Forest Gate) writes on Jan. 5th:—"A few days ago, I took larvæ of *Boarmia gemmaria* from a small, thick-growing geranium, which had been standing outside the window all the summer. The larvæ had been eating the woody part of the plant and also the few leaves that have escaped the frost ; no doubt they had selected it as a convenient place wherein to hybernate."———Mr. J. C. Moberly (Southampton) writes on Jan. 9th :—"All seem to agree as to the badness of the season which is just over, though occasionally, in some districts, there has been a flash of success. Why was it so bad? I am still inclined to think that it was not only that the imagines would not appear at light or sugar, but that they actually did not emerge. I am led to this conclusion by two reasons. (1.) Because home-bred insects are lying over in pupa in unusual numbers. (2.) Because, even when the season has been for a time favourable in point of weather—as for instance during autumn sugaring and the ivy bloom—they were no more abundant than during the windy and cold weeks of the summer. We know that birds and other creatures have warnings of coming bad weather which we ourselves cannot recognise. Why should not insects, even in the pupal stage, have warning that the inclement season bids them wait? A small brood of *Melanthia ocellata* which I have had this autumn have interested me much. I took a female at the end of August, and in the second week of September thirteen eggs which she had deposited hatched. I had no *Galium verum* at hand, so fed them on *Galium sexatile*, to which they took readily, preferring it, in fact, to some *G. verum*, with which I tried them for a time. Eventually, at the end of October, eleven out of the thirteen spun up, the other two having come to an untimely end. Four of them spun their webs on the side of the glass jar in which they were confined, making a web of sufficient size to enable them to move freely inside. From that time to the present they have remained as they were, but they are evidently alive because they constantly change their position. They are generally coiled in a semicircle. I have never before had the opportunity of observing this stage of any species in this genus. Can anyone tell me whether it is usual for the larvæ to remain so long in their webs before pupating. I know, of course, that some NOCTUÆ do so, *e.g.*, *Hoporina croceago*, but I have never before seen it in a Geometer.—The only locality in which I have taken *Miana literosa* is Wicken Fen. It occurs occasionally there, but my specimens from that place hardly vary at all in colour from those from Forres, which are next them in my cabinet. *Miana bicoloria* I have taken freely on the Downs at Freshwater at sugar. They vary there greatly; some specimens are very pale, this being perhaps the characteristic variety of that locality, but I have taken a few there which are of the unicolorous fuscous form.———The Rev. C. R. N. Burrows (Rainham) writes, on Jan. 11th :—"Why was last year so bad entomologically? Probably because the preceding winter was not favourable to the insects in the particular stage which they had attained. If I remember rightly the winter of 1893-4 was a very mild one, with just a snap of very great cold once or twice. The larvæ and pupæ (possibly) had been advancing too much and were caught. Perhaps, also the damp caused mildew, and the mild weather stirred up the mice, voles, &c., and kept them active. Also we must not forget the extreme summer of '93, which must have upset the domestic arrangements of a very large number of insects. Notice its effect upon *Vespa vulgaris*, &c. 1893 was a wasp year with a vengeance. Queens without number swarmed in the winter, and appeared in thousands in due course. I netted twenty, one morning, without moving two yards. Yet for all that, in the summer of 1894 I scarcely saw a wasp. On the other hand is it not possible that the winter which killed off immense numbers of larvæ and pupæ may have helped species rather differently constituted, and enabled them to appear in unusual numbers. I take it that the common species are those best suited to the seasons usually occurring in the particular locality; the uncommon species may be delicate or less suited to endure the same usual conditions. Reverse the conditions and the fauna will be affected. Our yearly experience shows, I think, that there is something in my suggestions. What entomologist does not know that no two seasons are alike? One species comes to the front, another retires. What is usually rare with us, turns up in hundreds, while even *Mamestra brassicae* is for the time being quite a rarity. So no two winters or summers are exactly alike—in temperature, moisture, &c.—while, of course, following seasons react upon one another and supply all the requisite conditions for our varied experiences. Mr. Moberly suggests, it appears to me, that many insects which might have appeared in 1894 are still in pupæ, and may or ought to appear this year. I wish someone would take up the subject of this retarded appearance seriously. I have a great many notes accumulated in the course of years, and have come to the conclusion that instead of asking what insects do lie over, we should be nearer the mark if we were to inquire—what do not? I will make only one more remark—What constitutes an unfavourable season? Damp or cold east wind or north? I once almost "boiled" a pupa of *Acronycta alni* at 80° F. (kept moist) for twelve weeks and then it came out (in March I think). It *was* hastened; it was *not* killed. A continuous cold is not so easy to secure. Will someone try to learn how many months or years, Lepidoptera can be retarded by say a mean or average winter temperature?"———Mr. E. A. Bowles (Waltham Cross) writes on January 17th:—"By the way, under what heading should the misdemeanours of the members of the Exchange Club appear? Captures (of victims for slating)? Variation (from rules)? or, following a certain fashionable journal, are we to have a 'pillory'? It will undoubtedly be very spicy reading. Will Mr. Tutt gives me a post as slating editor? I'm rather good at it.—*e.g.*, 'We regret to note that Mr. A. has taken to drink; the absence of bodies from two insects in his box seems to point to a shaking hand. Drink is the curse, &c., &c. Mr. B. (not dis nigger, of course) has again detained the basket! We must request him to give up at least half of his old friends, and cease to visit them at periods when a basket is likely to arrive. The love of society is the root, &c., &c.' Can any one tell me about *Zeuzera pyrina*? I fancy this gentleman is busy among a neighbour's apple trees. Does it pupate above the hole in the bark whence the frass is cast out? Can the spot be in any way detected? How long do the eggs remain before hatching?"———Mr. A. Robinson (Chiselhurst) writes on Jan. 22nd:—"I have done very little lately with the exception of attending to the wants of a brood of *Callimorpha hera*, which so far have done very well. I know that many people lose these larvæ, but mine have always been very healthy, and I have hardly found a corpse in the brood, though, of course, one is nothing like out of the wood yet. Talking of the ups and downs of insect life, I think we get them in their most extreme limits in the Fens. *Laelia cœnosa* vanishes at Wicken, apparently never to return. *Cidaria sagittata*, the larvæ of which was nothing accounted of when Mr. Bowles and I were there some years ago, is now, I understand, almost extinct. Then there is *Agrotis subrosea*, burnt out and destroyed, *Chrysophanus dispar* long gone, *Tapinostola concolor* not long rediscovered, etc. Even the insects which occur every year, vary enormously in their numbers. Some years (even nights) you may catch dozens, other years only odd ones. I have been several times to Horning, but I never found *Leucania brevilinea* common, though it is so in some years.——Mr. E. A. Atmore (King's Lynn) writes on Jan. 22nd:—"I cannot now be sure as to whether the recorded captures of *Argyresthia illuminatella* are from Aberdeenshire or Morayshire. I certainly thought the former when writing my last note. My *Argyresthia*, which is either *illuminatella*, or comes very near it, seems to be attached to larch, although Scotch fir grows alongside the larch trees where I take the insect."——Dr. Riding (Buckerell) writes on Jan. 25th:—"As to 'favourable seasons' and the reverse, I think Mr. Burrows gives the clue as to one condition, when he writes 'the larvæ (and pupæ) had been advancing too much and were caught.' The more undisturbed both are the better the chance of success, and so a prolonged cold winter, when the former have nothing to tempt them to look about, and keep in winter quarters, is generally followed by an abundance of insects the following season. Is not an unusual amount of wet also injurious? Larvæ cannot stand a soaking, and the torrents and floods find out their favourite snug corners, even though we cannot, and would be most felt where the "cover" is least, as in the fens (which would agree with Mr. Robinson's statement, that there is a greater variability in numbers there, than elsewhere). No doubt each insect is a law to itself, and conditions suiting some are fatal to others, but as a rule, I think, winters with continuous cold and frost, and no intervening warm weeks, and with only a moderate amount of rain, are those most likely to be followed by a season favourable to entomologists."——Mr. Tutt writes on January 30th:—"The drought of 1893 undoubtedly very injuriously affected such larvæ as fed up in the summer, and ought to have gone underground to pupate. To find a suitable spot necessitated crawling about a considerable length of time, and increased the chances of injury, discovery, &c. Probably many never did find a suitable spot for pupation. Hybernating larvæ must hybernate at a certain age (different of course for different species); if they get beyond that age, they must go on to maturity, or die. The heat of 1893 would tempt or force hundreds of larvæ to go beyond this stage, and the autumn weather would kill them off. Double broods were common in 1893. The larvæ from such would hardly have reached the stage for hybernating, before winter was on them. Hence they would die. These appear to me to be some of the reasons why 1894 was such a bad season entomologically."

An act of vandalism.—The difficulty with regard to the extreme localization of certain species of lepidoptera is one on which everyone may hold his own view, but who can say that we thoroughly understand it? That beautiful little moth, *Eustroma* (*Cidaria*) *reticulata*, which is as fragile as it is rare, appears to have but one home in Britain, occurring, as it does, in the vicinity of Windermere. Its sole food-plant, the wild balsam (*Impatiens noli-me-tangere*), is indeed in itself a local plant, but in this district it grows abundantly. I was fortunate enough to discover the insect three summers ago; but, though I have searched carefully in several places where the plant grows, only one has ever yielded any reward to my labours, and it is about this that I now write. I have been unable this year to continue my search, being away in Scotland during the season, but it appears that other hands have not been idle, though the place is, I believe, known only to a few. As a result, I entertain serious fears that the insect is on the verge of extinction. My ground for so thinking is this. A rumour, not without good authority, has lately reached me, that a certain insect-hunter, well known by name in the north of England, has, in accordance with a threat expressed to some collectors who purposed going to search for the larvæ, wantonly destroyed every plant he could find. This spiteful act is not that of an entomologist, and indeed such an one is not worthy of the name: for, granted that he be an expert in his art, entomology to him is no more than a money-making trade, and he would sooner see the species exterminated than endanger the sale of the specimens which he has already in stock, as, I have reason to believe, in considerable number. Whether or no the evil is already irremediable or whether anything can be done I do not know, but I feel that it is only right that such a state of things be made publicly known, and it is indeed hard to speak in strong enough terms about the wantonness of such an act. It recalls, very forcibly to my mind, the words of Burns on seeing the destruction of some woods on the banks of the Nith, near Drumlanrig. The Duke of Queensberry, a dissipated wretch, had caused the beautiful wood to be destroyed for the sale of its timber, and the poet thus expresses his indignation through the mouth of the genius of the stream :—

"Alas!" said I, "what ruefu' chance
Has twined ye o' your stately trees?
Has laid your rocky bosom bare?
Has stripped the cleeding o' your braes?
Was it the bitter eastern blast,
That scatters blight in early spring?
Or was it the wil'-fire scorched their boughs,
Or the canker-worm wi' secret sting?"

"Nae eastlin' blast," the sprite replied;
"It blew na here sae fierce and fell;
And on my dry and halesome banks
Nae canker-worms get leave to dwell.
Man! cruel Man!" the genius sighed,
As through the cliffs he sank him down—
"The worm that gnawed my bonnie trees,
That reptile wears a ducal crown!"

—Arthur Miles Moss, Ellerthwaite, Windermere. [After this was in type it was discovered that the facts were printed elsewhere. We wish contributors would not send us communications appearing in other magazines. If our correspondent would get the name of the individual here referred to and some very definite evidence against him, we feel inclined to open our pages for a public subscription, so that we may see what the law has to say to him.—Ed.]

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Collecting Noctuidæ by Lake Erie.

By A. RADCLIFFE GROTE, A.M.

Vieni, pensando a me segretemente.

Upon the inner of the two over-lapping, high and wooded, sandy ridges which run parallel with the south shore of Lake Erie, I set up my canvas tent at the end of April, before the new green had fully clothed the trees. These broad ridges were covered with a strong growth of hemlock, oak birch and chestnut trees, while willow, alder and American poplar (*Liriodendron*) grew along the brook which flowed between them. The large trees on the outer ridge sheltered my camp from the winds off the lake, which sometimes, in the earlier part of the year, blew hard, threatening the canvas walls and reminding me that I held my place merely on sufferance. The brook or creek itself found its outlet to the lake just beyond and beneath the camp, where the outer and less elevated ridge sloped away to let it escape. The hemlock trees on the ridge are all so blown upon by the winds, that their branches grow towards the land. They look as if they were stretching their arms towards safety from some great danger. The waters of Lake Erie are comparatively shallow and, like all shallow waters, are easily moved. There the waves promptly answer the wind and fly before it, like a pack of hungry wolves, falling on the beach with a quick sharp bark. From the noise in stormy weather on the beach, one turns gladly away across the outer ridge, the sand under one's feet made slippery by the needles, and strewn with the wind-torn tassels of the pine. Once across the ridges, the force of the wind is broken; behind them nestles a farm-house, and over the level country beyond stretch meadows and fields of corn. When the wind has blown on shore for some days, quantities of insects are washed upon the beach. The wind has beaten them into the water, and they may have come from the Canadian shore, which is faintly visible in the far distance. Later in the summer I found in this way *Calosoma wilcoxi*—water-logged, but still alive. Quantities of potato beetles (for it was a "good" year for them) were washed ashore, and many seemed to be dead and would probably go no further on life's voyage. But, under a warm sun, many recovered and, spreading their rosy wings, went nosing their way to the next potato patch, forgetting their shipwreck and their near escape. They had no time to let their experience tell upon them, and seemed satisfied with the fact that they were dry once more. For some distance from its mouth, the sides of the outer and inner ridges form the banks of the brook. Here, over the winding course, the trees and bushes obscured the view so that, passing upwards in my boat, new beauties were disclosed at every turn, and the voyage seemed made into an undiscovered country. It was a natural harbour from the lake; but, towards midsummer, a bar formed across the mouth, when it grew dumb, and answered no more to the greater water beyond. Pools formed here and there, and I could step the fords, needing the boat to reach the outer ridge no longer. Nestled between the ridges, with fern-clad woods on either hand, the brook seemed to me often stillness itself, so that I would not disturb it with my oar.

> "No other noyse, nor people's troublous cries,
> As still are wont t' annoy the walled towne,
> Might there be heard; but carelesse Quiet lyes,
> Wrapt in eternall silence farre from enimies."

It was rather my intention to give a short description, to write out, as it were, a mere extended locality label, but I have plainly wandered. If I were to pause and ask the solemn question: "Is it scientific?" I should have to answer in the negative, and even the weak defence that there exist writers, considering themselves scientific, who are neither honest nor entertaining, will avail me nothing. Perhaps it would have been as well to have begun with some general and beautifully objective remarks on entomology. As thus: men (and women too) catch insects in order to eat them, to sell them, or to study them—*et quaelibet alia causa*. This latter will cover the cases where an insect is caught and destroyed from momentary fear or anger, or where one puts one's foot upon it for the mere satisfaction of smashing or exploding it; as also where it is exterminated at the expense of Government to save the crops. As a proof that everything degenerates at the hands of man, I might further show how the study of entomology is used as a vehicle for breaking such commandments in the Decalogue as are possible, especially that one forbidding us to bear false witness against our neighbour. I could then be at the pains of formulating a theory to account for the avidity with which insects are studied. As thus: that the human mind falls into two spheres of action, the intellect and the emotions. That the intellect is stimulated to action by observing the minute differences between various species of butterflies, for instance. That entomology may thus be reckoned among the intellectual pleasures, since pleasure arises from the exercise of function. And, finally, that the different races of mankind have different specialities (as the French say), and that the speciality of the Indo-Germanic race is the treatment of facts and the facts of Nature *par excellence*. We are an intellectual rather than an emotional race. It is not that we have no hearts, but that we have such tremendous minds. We unceasingly want to know, you know, etc. Truth is one, and even a butterfly conceals it, though not, like man, intentionally. And it is the pursuit of truth after all which Lessing tells us constitutes the happiness of thinking man. Again, I might show that entomology has its æsthetic side, although we are aware that the beauty is not in the object itself, but in the effect which we perceive in it. I have never been able to see a Milk-weed Butterfly drooping from the flowerets of *Asclepias* without a thrill of pleasure. We are all searchers after perfection, and each one finds a fragment of what he believes to be truth. This is one of the enchanting deceptions of a world we none of us can really understand, though most of us believe that we have understood it, and many even that they have succeeded in it.

I might have spared myself the trouble of writing all the preceding. I could have simply given my latitude and longitude, and stated that I was there to catch moths. But everyone who has a story to tell makes the most of it, and this is a very little one and I must make much of it. Early in the morning I had left Buffalo with my traps; but it was nearly evening before I had found a spot on the ridge which pleased me, and had pitched my tent and dismissed my helps. It is true the farm-house was not far off, but here I was to all intents and purposes alone, *seul avec mon âme*, in the woods. I had hardly time to arrange my things and cook my supper when night fell with its American suddenness. I was too tired to read by the lamp I trimmed, so wrapped myself in my blanket and quickly fell asleep to the distant moaning of the lake. Shortly after midnight some noise or other awoke me. I lay awhile considering matters. A tent is a sort of a trap that the owner is caught in. You can even be prodded at through the canvas walls. You can see nothing. Through which end will you escape? After coming to this view of the case it occurred to me that, instead of staying inside and frightening myself, it would be better to go outside and frighten somebody else. I stepped out of the door of the tent. What a lovely night! There was no moon; but the radiant floor of heaven was trimmed with stars, "thick inlaid with patines of bright gold." In America it would have been easier to have written such beautiful things because the skies are fairer there. The wind rustled from time to time through the tree tops as I carefully made my way down the side of the ridge upon which my tent was pitched. In the dark I crossed the creek in my boat and, fastening it again, made my way over the outer ridge to the lake side. The leaden waters reflected what light they could borrow from the stars, and broke gently over the shingle at my feet. If, at that hour, I could only surprise some sleeping secret of nature! I sat down and listened. In such moments the outside world seems to contain elements inimical to man. It becomes a mystery; it threatens us with the unknown; it is out of sympathy with us. There is something in me which is not in this outside world, which is alien to it, and which I can find again only in my friend. But soon the night itself soothed me, as it looses all prisoners' bands and stays the crying for the dead. I went back to my tent again and fell asleep in quiet. I rose early, before the sun.

The night was thinning, drawing back its mantle to let us see how it had been labouring with the promise of the year. In the saffron-coloured east the bud of morning lay ready to unclose; but all about me the spring was bringing out leaf and blossom. The blue-bird was already on the wing, a bit of heaven on its back. A kingfisher sat watching by the brook, and an early chipmunk eyed me curiously to see what manner of man had ventured into his realms. Afterwards he and his kind were to become my friends, and eat crumbs from my table at the door of the tent. Thus I set up my housekeeping when the trees were budding, commencing with the new year as proclaimed by the season itself, having left my almanack and newspaper behind, and resolving to live by the weather and the sun.

The first day in camp there was enough to do in getting my traps in order. My setting boards were made after a pattern suggested by my friend Mr. W. W. Hill, fixed in wooden boxes with a high cover, so that the specimens, while still on the board, could be safely transported. Here was my large cyanide "store jar," and three or four smaller "collecting bottles." I had some trouble at first with the wide corks, often dropping them in the dark, when trapping my moths. But I surmounted this difficulty at last, by fastening the cork to the neck of the bottle with a longish string. The old story of Columbus and the egg! I prepared my "bait" of beer and molasses with a care quite thrown away, for I afterwards found, the dirtier looking the mixture, the more the moths seemed to like it. 'Sweet and strong' seemed to be their motto. And then I walked down the ridge prospecting for trees. In a camp in the woods one has to consider the direction of the wind, the situation of the tree in a partial clearing, its general accessibility, and freedom from surrounding bushes. The kind of tree does not seem to matter much. I avoided hemlock and pine, whether rightly I did not discover. I awaited that first night with the nervousness of an artist on his first appearance. I commenced to "sugar" before the time, and I had to repeat the operation. The mixture was rather thin, and after a little while I could not be sure I had "brushed" the trees at all. Impatiently I awaited the dropping of night's curtains, smoking my cigar before the tent door. At length the right moment seemed to have arrived. I stole cautiously along the route which I had so often traversed during the day, taking the trees in a certain succession, one "collecting bottle" in my hand, another in my pocket, a bull's eye strapped to my waist. And there they were, *Agrotis*, *Lithophane*, *Scopelosoma*, looking a bit shabby from their wintering. The first specimen I successfully induced to enter my bottle was a *Scopelosoma walkeri*, reminding me of my old friend of the British Museum Lists. I took one after another, on the different trees that night, several species of *Scopelosoma—walkeri*, *tristigmata* and *morrisoni*, the latter plentifully. We have in North America nine species of this genus. Of these, three belong to different groups from the English *satellitia*, but six, *viz.*: *ceromatica*, *tristigmata*, *walkeri*, *morrisoni*, *sidus* and *devia*, "represent" more or less nearly with us the single European, to which latter species our *tristigmata* perhaps bears most resemblance. I wish to interest the English collector in our Scopelosomas. Are they not Noctuids and "brothers"? Of a truth; and they well illustrate the preponderance of Palæarctic forms among our North American *Noctuidæ*, and the greater number of species that we possess. Probably all nine occur in Canada; but so far we know none from California. In England, *satellitia* stands a little by itself: in America, our nine species give the genus quite a different expression, the three aberrant forms favouring a little *Xanthia* and *Orthosia*. Our handsomest species are, perhaps, *ceromatica*, *moffatiana* and *sidus*; *walkeri* is rather dingy, and *devia* a little peculiar. After paying the customary American tribute of one synonym to M. Guenée, and another to Mr. Walker, I am to be credited with the remaining seven. The number reminds me of the poem " We are seven," for the unreason that there were originally nine perhaps, or because there is something pathetic in the way our names for our species, described during the past twenty-five years in America, are disappearing through a comparison with the " types " in the British Museum collection. At last accounts the particular seven are saved, and I confess I would not lose *ceromatica* and *devia* for a good deal. That night I took a number of our grey *Lithophanes*, and when, towards ten o'clock (the moths had ceased flying), I turned in for the night, which was getting chilly, it was not without a satisfactory glance at the "store jar," promising myself the pleasure of sorting and setting my captures on the morrow, when the wings would be relaxed. At least I had come for Noctuids and had not been disappointed. That night I dreamed of new species to be discovered. There was at that time and there still exists for the collector in America the advantage that he may hope for the possible known, as also for the possible unknown, for I myself caught the first discovered specimens of the butterfly *Calephelis borealis*, and many an undescribed moth has dropped into my 'collecting bottle.' However, in collecting butterflies, as in other affairs, Brag is a good dog, but Holdfast is a better.

Notes on Butterfly Pupæ, with some remarks on the Phylogenesis of the Rhopalocera.*

By T. A. CHAPMAN, M.D., F.E.S.

The object of this paper is to furnish an analysis of certain details in the structure of the pupæ of the Rhopalocera. These details have been found to be very interesting in the case of the Heterocera, where they appear to give indications of the lines of evolution of the different groups and families at least as plainly as any other details of structure that have been studied with a view to tracing these relationships, and in the main to point to phylogenetic arrangements very similar to those which have been elucidated in other ways by various authorities, and so to lend valuable support to the change which has been made in the position of some of the families.

I may say that, with the butterfly at least as much as with the moth, I have found it necessary actually to handle the pupa, or pupa-case, in order to understand it, as hardly any description or figure gives the requisite information. It is true that from a figure, the pupa of, say, *Callidryas* (an American genus between *Colias* and *Gonepteryx*) can be seen to present a similar form and structure to that of *Colias* or *Gonepteryx*; but one is, so far as the figure goes, left quite in the dark as to precisely what that form and structure are, and can only judge

* A paper read before the City of London Entomological Society on April 17th, 1894.

thereof by one's knowledge of the pupa of *Colias* or *Gonepteryx*, or some similar pupa. But in any family of which one has not actually handled a pupa, a figure or description is generally of very little use. Further, a great many descriptions deal only with general form and coloration, and not with minute structure.

I must here express my indebtedness to Scudder's *Butterflies of New England* for much information on the morphology and classification of butterflies. The classification which he adopts is a modification of that first proposed by Bates, and is one which my observation of pupæ confirms, not only broadly but in considerable detail. This fact gives me great confidence that the view which I take of the value of certain points in pupal structure must be largely correct.

In Scudder's book much light is thrown upon almost every point relating to butterflies, and it is unquestionably the profoundest and most able work yet published on this section of the Lepidoptera. Yet it is remarkable that throughout his classification, where founded on pupal characteristics, as well as in his descriptions of individual pupæ (with the exception of a vague reference under *Hesperidae*), there is no allusion whatever to the question of free segments, no statement as to which incisions still retain power of movement in individual species, no mention of the remarkable limitations of this movement in Pierids and Nymphalids, and reference is made to one only of the "Micro" characters preserved in the *Hesperidae*, and then without any apparent recognition of its significance. At least I have failed, after close study of the book, to find more than this, and could hardly have overlooked such allusions did they exist. I mention this in order to illustrate the defectiveness of descriptions and figures generally. If in a work of the highest class, such as Scudder's undoubtedly is, so little assistance is afforded in some important directions, it is obvious that in less scientific works still less help is to be looked for; it also seems to point to the fact that the lines of evolution followed by the lepidopterous pupa have not only been unnoticed but, one might suppose, have hardly been regarded as existing.

It follows from this, that the material on which this paper is based —*viz.*, such butterfly pupæ as I have myself been able to examine—is extremely meagre, not amounting to more than 2 or 3 per cent. of the ten thousand and odd species of butterflies that exist; again, while it has been abundant in some families, there are other families of which I remain entirely ignorant. The material at my disposal is, however, sufficient to bring out some important points very distinctly, but others are still obscure and untouched. It is necessary for me, therefore, to say emphatically at this point that where I make any statement broadly or dogmatically, I do so always with the proviso understood (but which it would be wearisome continually to repeat), that such statement is correct only so far as my observations have extended.

To lay this paper before you with such a narrow basis for its foundation, may perhaps require an apology; if so, the apology would be, that valuable conclusions may be reached even from this narrow basis, and that the basis is not likely to be materially widened at any early date unless attention is called to the subject by some such paper as the present.

I shall refer to various characters of the pupæ and, in support of the conclusions to which these appear to point, to a few matters outside pupal structure; but I desire to direct attention chiefly to the progress which is evident in the pupæ of the RHOPALOCERA, as in those of HETEROCERA, from a condition of greater to one of less freedom of movement of the segments; to the progress from a greater number of exposed appendages (a decided "Micro" character) to a less number, though this is not illustrated amongst butterflies except, perhaps, as between Hesperids and Papilionids; and to a general progress towards a smoothly rounded, solid form, which, however, is greatly interfered with amongst the butterflies by the exigencies of the development of protective resemblances.

I am not aware of any instance in which a pupa appears to have been derived from an ancestor which possessed a less number of movable parts and, provisionally, I take it, as a rule, that MOVEMENT IS NEVER REGAINED BY A PUPA WHEN IT HAS ONCE BEEN LOST. That this should be so, is by no means self-evident but, as a matter of observation, it appears to be the case.

In the course of my study of pupæ and of some other matters in connection with Lepidoptera, the conclusion has forced itself upon me, that a circumstance in the progress of evolution which I had believed to be rather rare is really very common. This is, that similar structural characters (sometimes one might almost say identity of structural characters) have been reached along different lines by descendants from a common ancestor, who did not present any indication of them.

One of the most notable instances of this is to be found in the form of pupa which I have described (*Trans. Ent. Soc. Lon.*, 1893, p. 97) as characteristic of the MACRO-HETEROCERA; that is, a pupa in which the first four abdominal segments form part of the thoracic mass, the 5th and 6th being free to move on their neighbours, whilst the 7th, 8th, 9th and 10th form another solid piece. One might look upon this arrangement as one, the attainment of which was regarded (if we may use such language) as an object of ambition by the earliest Lepidoptera, which as yet possessed freedom of movement of a majority of their abdominal segments, and in which the 7th was still movable in the male although not in the female pupa. Setting off along several different roads, the structural arrangement mentioned above has been arrived at more especially by the MACRO-HETEROCERA. Whether it has been reached by one or more routes I am not at all certain, but I am disposed to think that amongst the BOMBYCES will be found groups that have attained this condition of development independently of one another; I am not at all sure that the PYRALIDES do not represent a separate line; but, at any rate, it seems certain that the butterflies have taken an entirely independent route.

Like the pupa of the MACRO-HETEROCERA, that of *Papilio* (Figs. 1, 2) has got rid of nearly all "Micro" features; there is no dorsal head-piece; there are no maxillary palpi; the antennæ separate from the head-piece on dehiscence (*i.e.*, when the imago emerges); only the 5th and 6th segments are free, and these possess the power of movement in all directions. There are, however, two earlier features retained by the Papilionids which the MACRO-HETEROCERA have lost; one of these is the possession of a waist, caused by the narrowing, chiefly by dorsal depression, of the last thoracic and 1st and 2nd abdominal segments; the other is a certain amount of opening, on dehiscence, of otherwise solidified incisions, which is observed in some species. There is another noticeable difference which may possibly be associated with the retention of these early features; the Papilionid pupa is capable of further evolution, as evidenced by the fact that additional features appear as we pass from it to the higher families, whilst the "Macro" pupa among the HETEROCERA seems to be a terminus not yet at least over-passed (*Spilosoma* may seem to be an exception).

Ephyra Zonosoma is interesting as an illustration of the fact that habits and structure very nearly identical may be reached by quite distinct paths. Just as the pupa of *Papilio* is, in its general structure, nearly identical with that of one of the MACRO-HETEROCERA, so that of *Ephyra* comes even closer still to that of *Papilio*, with which it is nearly identical in general form and in manner of suspension. Yet it is as nearly certain as anything of the sort can be, that we must go back as far, or nearly as far, as *Hepialus* to find a common ancestor. Wherein then does the pupa of *Ephyra* differ from that of *Papilio*? It is smooth and rounded; still it has a well-developed ridge near the inner margin of the wing similar to that in *Papilio*, and this is very unusual in a Geometer pupa. This ridge originates at an anterior spine that, in *Papilio*, usually gives off a ridge to the middle of the wing, the inner marginal ridge starting from a spine situated farther back. Yet there are pupæ of *Papilio* in which there is little or no trace of the ridge running to the centre of the wing, and in which the two spines are connected by a ridge; whilst in *Ephyra* there is a slight break, as if a posterior spine could be distinguished. But there are points of difference between the pupæ which seem to be quite distinctive; the first of these is the entire absence in *Ephyra* of any nose-horn; a second, that the girth is not incorporated in the pupal case across the dorsum; thirdly, in *Ephyra* a portion of the femur is seen between the maxillæ and the first pair of legs, whilst between the apices of the wings the tips of the antennæ, together with the extremities of two pair of legs, are visible. It is certainly very rare for even one pair of legs to reach this point in *Papilio*, and I know no instance of an exposed femur therein. In some Hesperids the girth is loose and the tips of the third pair of legs are exposed beside the wing apices, a feature that does not occur in true butterflies. The fourth difference between the pupæ of *Ephyra* and *Papilio* lies in the frequent opening of closed incisions on dehiscence in *Papilio*; this does not occur in *Ephyra*.

In taking *Papilio* as the simplest form of the true butterflies, and therefore as nearest to the Hesperids, and in regarding the other families as derivatives from *Papilio*, I desire to be understood merely as meaning that *Papilio* still closely represents the primeval butterfly when it had become truly a butterfly as distinguished from a Hesperid, and as regarding the other families as having been derived from this primeval form, and not from *Papilio* itself. The pupa of this primeval form possibly differed from that of *Papilio* in having a single instead of a double "nose-horn," but no doubt *Papilio* very closely resembles it.

I may mention here that Scudder gives the names "ocellar tubercle" and "ocellar prominence," to what I have called "nose-horn." I have preferred the latter as a provisional colloquial name, because it involves no theory. The term "tubercle" is now so definitely appropriated (in Lepidoptera) to certain larval structures, that one does not choose to use it in the case of pupæ, unless one wishes to suggest that the pupal tubercle represents the larval tubercle, as is certainly the case in some pupæ of TINEINA and others, where their disposition and possession of hairs is identical in larva and pupa. In the butterflies, the "ocellar tubercle" is, more probably than the reverse, not identical with a larval tubercle. As to "ocellar"—the position is in front of the eyes, and it no doubt serves for the protection of the eyes, as well as of the rest of the head; perhaps even more for the protection of the bases of the antennæ than of the eyes. But, assuming an ocellar site for the nose-horns of *Papilio*, is it certain that the nose-horn of *Pieris* is the same structure, conjoined in the middle line? In many pupæ there may be seen, between the double nose-horns, two minute prominences, which are possibly those that are developed in the *Pieridae*. These may be seen in most Vanessids, and, in such a pupa as *Doritis*, where the nose-horns are so short that their existence might be disputed, there are between them, two very distinct tubercular eminences. The front of a butterfly pupa has, in fact, an inner and an outer pair of eminences. Is it certain that the inner pair does not form the "nose-horn" in some cases? If it does, it would not properly be termed "ocellar." It is perhaps of more importance to note that the eyes are dorsal structures, whilst the nose-spines are ventral.

From this original form the other families branched off. 1. *Parnassiinae*; this did not progress very far beyond *Papilio*, and is sometimes included in the *Papilioninae*. 2. *Pieridae*; and along with them *Nymphalidae*, the latter leaving the *Pieridae*, whilst only the earliest forms of the latter had been evolved. 3. *Lycaenida*.

In each of these groups, the lowest forms agree with the primeval butterfly in the movability of the 5th and 6th abdominal segments, but, whilst the others progressed, more or less rapidly, to forms with complete immobility of those segments, *Papilioninae* stands alone, constituting an apparently separate family that made no further progress in this direction.

The first of these lines of development, the Parnassian, seems the simplest; an early result is *Thais* (figs. 3–5), which has a truly Papilionid pupa, but one with certain peculiar features which it will be more instructive to return to, when we come to consider the origin of *Nymphalidae*.

In the second line of development, the Pierid, we find a change which does not occur, so far as I know, in the pupa of any of the HETEROCERA. By the development of certain dorsal tubercles at the margins of the segments, (possibly due to the fusion of the anterior trapezoidal tubercles of the larva), antero-posterior movement is lost, only lateral movement is possible; so that whilst a Papilionid pupa can move its tail in any direction, that of a Pierid (figs. 6–11) can only do so from side to side. The peculiar method of suspension adopted by the Papilionid pupa, restricts antero-posterior movement, perhaps even renders it dangerous; accordingly, even in *Papilio*, this is less free than lateral movement, and we can understand how easily it might be lost, and the Pierid form originated. In the Pierids there is also a change in the egg; the hemispherical, smooth form gives place to a taller, ribbed structure.

Among the *Pieridae* further changes in the pupa occur, resulting in a further loss of motility of segments; in *Pieris* (figs. 9–10–11), and in the *Rhodocerinae*, we find only the 5th segment movable, whilst in *Euchloë* the pupa is solid and immovable.

There is, I think, something to be said from a larval, and even from an imaginal point of view, in favour of the notion suggested by the pupæ, that there is at least as great a gap between *Aporia* and *Pieris*, as between the latter and the *Rhodocerinae*.

The third line of development from the primeval, Papilio-like form, is in the direction of the Lycænids. Here my material is so scanty that I have found very little trace of intermediate forms. There is, however, I think, much to be said for the possibility of the Lycænids having been derived from the Hesperids, merely grazing, as it were, the Papilionids on the way.

The Lycænids at least acquired the same method of pupal suspension as the Papilionids; and further, they lost the "Micro" habit of the Hesperids of hybernating as larvæ, and acquired the habit of doing so in the egg or pupa-stage; the egg, likewise, is much farther from a Hesperid egg than is that of a Papilionid. *Parnassius*, at first a very puzzling form, comes in here to give us some little assistance. Its pupa is very much like that of the Lycænids, from which it differs chiefly in lying free in a cocoon, instead of being suspended by a girth; this condition is, however, attained by not a few Lycænids. The egg possesses certain Lycænid features, in particular the depression at the top around the micropyle; hybernation also takes place in the egg-stage, a circumstance very rare in butterflies, except amongst the Lycænids; but I have ascertained that in *Parnassius* the young larva is developed in the autumn, and passes the winter coiled up within the egg-shell.

The Parnassids are a small family and, so far as we know, did not develop such a variety of forms as the parallel Lycænids. Partly, probably, for this reason, and partly because *Thais*, although apparently a Parnassid, is more nearly a Papilionid they have usually been left among the *Papilioninae*. The few forms we have, however, to judge from the pupæ which I have been able to examine, are in reality rather widely separated from each other, and suggest that they are only the remains of a much larger family, of which the intermediate forms have been lost. A few words upon the several forms may therefore be interesting.

1. *Thais* (figs. 3–4–5).—Here the head spines of *Papilio* are either lost or modified into the double central knob which carries the hooks. The front of the pupa is curiously flattened and hollowed, by the falling in of the pro-thorax and front of the meso-thorax. It is to be noted, either as showing that *Thais* is rather a Papilionid than a Parnassid, or as showing the line of Parnassid evolution, that a genus usually left with *Papilio*, containing some half-dozen species, of which *dissimilis* is perhaps the best known, has a very similar form to *Thais*, though its suspension is of the orthodox Papilionid type.

2. *Sericinus*.—Here the form and structure are very similar to *Thais*; but, while the cremastral hooks are lost, the double nose-horns of *Papilio* are retained; both the 5th and 6th abdominal segments are still free; and the dorsal spines of *Papilio*, duplicated on 5, 6 and 9, are present; the egg is quite Papilionid.

3. *Luehdorfia*.—In this, we still find suspension in Papilionid-fashion, and the pro-thoracic spiracles have the same pit-like aspect as in *Thais* and *Sericinus*, but the general form is now squat (like that of *Parnassius*) the surface rough as in *Doritis*, and there is movement only at the 4th abdominal incision; the nose-horns are still quite distinct.

4. *Doritis.*—This much resembles *Luehdorfia* in form and appearance, but has lost the cremastral hooks, as well as all power of movement; the pit of the pro-thoracic spiracle still appears, but is much less pronounced, whilst the nose-horns are reduced to obsolescence. The egg is dome-shaped as in *Papilio.*

5. *Parnassius.*—This is nearly identical with *Doritis*, except that the rough surface is replaced by a very smooth one, which is covered by a resinous bloom; this gives it an extremely different aspect, and is associated, no doubt, with the habit of making a strong, though loose cocoon, often in moist situations. The ventral position of the head indicates the thoracic pitting otherwise smoothed out.

All these forms are evidently related, but they do not admit of being arranged in a linear series. The earlier forms, at least, possess the intersegmental sub-segment, whilst the head gradually assumes an inferior position, almost as pronounced as in the Lycænids.

(To be continued.)

SCIENTIFIC NOTES & OBSERVATIONS.

Discussion on the Nature of certain Insect Colours.

(Continued from p. 86.)

I am exceedingly pleased that Mr. Burrows* has joined in this discussion. His complaint that we have, in our discussion, got out of the depth of ordinary mortals is perhaps well deserved; it is certainly necessary, if our discussion is to be of any service, that everyone should understand at what we are aiming, and we should be indebted to Mr. Burrows for kindly hinting that we are slowly ascending to cloudland, and asking us to explain more clearly what it is that we want the members to understand in less technical language. His own statements are, indeed, a model of clearness.

For a definition of terms our readers must of course go to an elementary text-book on light, but it may be well here to explain a little. Ordinary light is termed "white" light, and is made up of the primary colours—red, orange, yellow, green, blue, indigo and violet, each of these colours in fact representing the effect produced on the optic nerve by the variable rate of vibration of the constituent waves of which white light is really composed. If the number of vibrations produced by the light waves entering the eye be 474,439,680,000,000 per second (each vibration producing a wave 1-39,000th of an inch in length), then the impression produced is that of red colour; if, however, the number of vibrations of the light waves entering the eye be 699,494,400,000,000 per second (each wave being 1-57,500 of an inch in length) then violet is produced; the intermediate colours have intermediate rates of vibration and hence intermediate wave-lengths.

If a substance has the power of absorbing some of the light waves from the white light (all the colours combined) which ordinarily falls upon it, and of reflecting others, only the reflected portion can possibly affect the optic nerve. If the red rays only be reflected, then the colour of the substance appears to us to be red; if blue, then the colour appears blue, and so

* The paper by Mr. Burrows, here referred to, has unavoidably to be postponed until the next issue.

on. Substances which are thus able to select certain light waves for absorption, and to return (reflect) others to our eyes, are ordinarily termed pigments, and the fact that scales of lepidoptera contain largely substances that can do this causes us to term the colours thus produced pigment colours.

Besides this, if white light passes through various media of different degrees of density, the light is bent out of its original path and is said to be refracted; at the same time the light is often not only refracted, but its constituent waves are largely separated, and the light is in this way decomposed. Colours thus produced are termed refraction colours. The colours produced when light passes from air into a glass prism (a denser medium) are familiar to all.

Thin as the walls of a soap-bubble are, yet they have some thickness, and it is evident that if light falls upon its filmy wall and part of the light is reflected from its outer surface, whilst a part also enters the film and is reflected from its inner surface, that, in spite of the thinness, the vibrations of that portion of the light-waves reflected from the inner surface will fall behind those reflected from the outer surface. These two sets of waves then do not fall synchronously, but interfere with each other. As a result of this interference, the light is broken up and interference colours are the result. Everyone has seen the interference colours of the soap-bubble.

Light travels in straight lines, yet it has a slight power of bending round the edges of bodies. Light and shadow are rarely absolutely defined by a strongly-marked line. To this bending of light-waves the term diffraction is applied. Light passing through very fine slits is diffracted, and scratched or striated surfaces act similarly on light. Diffraction breaks up the bent part of the ray into its component parts and, dispersing the waves, gives on the edge of each bright space, between the slits or striations, a fringe of colour. Interference phenomena are sometimes closely connected with diffraction. The beautiful colours of mother-of-pearl are in part due to the finely striated surface thereof, for a wax impression of the part will give the same effect.

It is necessary to bear in mind one other thing, *viz.*—that the combination of differently coloured lights produces far different effects from the combination of differently coloured pigment powders. That coloured light which, when combined with another, forms white light, is termed complementary; thus, blue light and yellow light combined form white light; red and greenish-blue, orange and Prussian blue, yellow and indigo-blue, and greenish-yellow and violet are also complementary colours. If a pigment be prepared by grinding a blue and a yellow substance together a green is produced, not white as would be obtained from a combination of blue light and yellow light, because, in this case, we do not add together the colours which each reflects alone, but we add, by uniting the pigments, their absorptive powers. A fuller explanation of this can of course be obtained from any text-book on light.

These short notes may, perhaps, help the student whose knowledge of physics is nil, to grasp the general principles involved in this discussion, but it is evident that only those who already know, or will read up the technicalities involved from an authoritative text-book, can hope to do so with success. At any rate, these notes should be sufficient to enable readers to distinguish between colours due to the selective power of a pigment contained in the scales or membrane of the wing and those produced by any peculiarities of structure or form of the scale.

It is abundantly evident that we have as yet got but little farther in the general subject than I reached in the *British Noctuae*, &c., vol. ii., *viz.*, that insect colours are the result of (1) refraction, interference and diffraction; (2) the selective power of pigmentary matter. This is granted. The argument so far seems to be (1) whether certain of the examples I instanced were really due to pigment or to refraction, interference or diffraction; and under this head we have had the green coloration of *Thecla rubi* very fully considered; (2) whether certain white insects, which I did not consider to contain what we have since defined as "pigment-factor," but which I spoke of as "an unstable pigment," really do contain such pigment-factor. It is only by criticism that any true result can be arrived at; this being so, I have read with interest and pleasure the remarks made thereupon. Dr. Riding has so far succeeded in showing that two examples that I practically stated to be without such pigment-factor, *viz.*, *Euchloë cardamines* and *Hepialus humuli* ♂, do contain it, although, as shown by my extended notice of the former (*l.c.*, p. vii.) and my remarks on the sexual dimorphism of the latter (*ib.*), it will be seen that I quite recognised that even such whites as these were linked by almost insensible gradations to yellow, and that possibly the amount of differentiation varied in different specimens. One of the most authoritative papers on the typical white scales of *Pieris*, is that by Dimmock (*Psyche*, 1883, p. 66), who states that the white scales of *Pieris rapae* contain air and no appreciable colouring matter. I am afraid I rather carelessly stated my position when I said that the white colour of normal *Hepialus humuli* ♂s, *Euchloë*, *Pieris*, &c., was wholly and essentially due to the surface reflection of the incident rays of light. This, of course, is true as a matter of fact, but, so far as I suggested that these were absolutely without pigment-factor, I was wrong, for I was then aware that there was some small amount of colouring matter present in them. But the doubt expressed in the earlier part of this discussion as to whether certain of these "whites" were in reality due to some pigment-factor hardly exists any longer. The presence of a pigment-factor in at least some *Pieridae* has been set on firm ground by actual chemical experiment and research. The statement made by Dimmock as to the cause of the whiteness of certain Pierid scales which he found to be hollow and to contain scarcely anything but air is undoubtedly true for the individuals on which experiment was made. It is evident, however, that such is not always the case, and from Dr. F. Gowland Hopkins' paper (*Proc. Roy. Soc. Lond.*, 1894), referred to in *Ent. Record*, vi., p. 13, it is clear that a pigment-factor is present in the wings of certain *Pieridae*, and that the substance isolated, which has been found to consist of uric acid, functions as pigment, so that the wish of Dr. Freer to have such pigment-factor isolated has not only been consummated but the actual composition stated. I have no doubt that the pigment-factor of other families of butterflies will have a somewhat similar chemical composition. It appears clear from observations that I have recently made that even individual specimens of the same species of *Pieris* may vary in the amount of pigment-factor present. Female specimens of *Pieris rapae* for example, excel the males in this respect, and vary in the different broods. Dr. Gowland Hopkins practically supports the entire assumption on which that part of my paper (*Brit. Noct.*, vol. ii.) which pre-supposed an ill-developed pigmental matter in certain white insects, was based; since he shows that the "wing scales of the white *Pieridae* contain uric acid," this substance bearing the "same relation to the scale as do the pigments in the coloured *Pieridae*, and therefore functioning practically as a white pigment;" such yellow pigment being "artificially" produced by heating uric acid with water in sealed tubes at high temperatures. This was formerly described as "mycomelic acid," but Dr. Hopkins believes that "the substance described was urate of ammonium coloured by a yellow body, and probably identical with the natural pigment." The most startling remark, however, is, that "the described uric acid derivatives though universal in the *Pieridae*, are apparently confined to this group among the Rhopalocera," followed by the statement that, "when a Pierid mimics an insect belonging to another family the pigments in the two cases are chemically quite distinct." As I have long insisted on the fact that the wing membrane itself functions largely in colour, I am much interested in observing that the existence of pigments other than scale-pigments is for the first time described; substances, namely, which are found between the wing membranes, and "which in certain genera are the basis of ornament." Dr. Hopkins also states that "the yellow Pierids on emergence from the chrysalis are apt to void from the rectum a quantity of uric acid coloured by a yellow substance which exactly resembles the pigment of the wing." Although this may be generally, I doubt whether it is absolutely, correct, the excretory matter being, I believe, frequently milky and at other times red in colour.

How far certain colours in insects are dependent on the selection of certain light-waves by a pigment for reflection, how far on refraction, interference or diffraction, is, however, a matter of the most intense interest, and it is from this point of view that our discussion is likely to prove of value. It is quite possible that many colours are due to a combination of conditions, *i.e.*, that they are partly, and perhaps chiefly, due in some cases to pigment, but that at the same time refraction, interference and diffraction are also partly responsible for the total result. I feel satisfied that this is the case in many butterflies, and that, even in some which only a few years ago I considered as being purely due to refraction, diffraction or iridescence, there is considerable evidence of pigment. I may say at once that I quite agree with Dr. Riding, that there can be no such thing in reality as "black pigment." What I wish to insist upon is, that one form of black found amongst insect colours, appears to have been reached through changes which have taken place in the pigment-factor of the wing, forming in fact part of a well-defined and well-marked genetic sequence, whilst other blacks are apparently entirely independent of pigmental change, and due to some peculiar structure of the scales or membrane. It is quite true that very few so-called black colours are really black, those of the first group I have just mentioned being, indeed, very rarely so; I believe absorption blacks to be usually the result of modified or changed pigment-factor, and hence but rarely pure black; blacks due to interference are probably the most pure, if I may use such a term, of the so-called black colours. The only logical explanation that I can suggest concerning Dr. Riding's remarks on *Thecla rubi* is, that the colour is a compound one, produced in part by diffraction, the result of the striations noted, partly by the presence of a pigmentary material in the scale. These striations and facets when wetted may conceivably lose largely their diffractive and reflective power, and the result is that the brown or red, or brown and red pigments then give the colour to the scale, until the wetted surfaces become dry and pregnant again. This is a hasty supposition, but the only one that comes ready to hand to explain the somewhat complex circumstances. I have often examined the scales of *T. rubi* under transmitted light, and it was this that led me to believe that the scales must be pigmentary. I see that some four years ago (*Brit. Noct.*, vol. ii., p. xvi) I wrote:—"It is strange that the greens of the undersides of certain *Argynnidae*, of *Thecla rubi*, and of the uppersides of the various species of *Procris* are so readily convertible into brown, and yet we have to look upon them in the light of our present knowledge, as probably possessing but little pigment. The mere enclosure of these species in a damp box changes their coloration to a bronzy or red-brown, the original colour being restored by exposure to the air. If these colours are in any way pigmental, the change is quite regular genetically, but if not we must suppose that the presence of the vapour which is deposited on the scales, alters the effect produced when the light falls upon them. However, it is at present rather difficult to deal with these colours." We appear to have got but little farther yet. I can quite corroborate Dr. Riding's statement as to the greater chemical activity of strong liquid ammonia in the presence of aqueous vapour. The little *Acidalia ochrata* killed under the influence of the alkali alone quickly recover their colour, but in the presence of water vapour the loss of colour is both greater and more permanent. It was the careful examination of the show-cases at the doors or in the windows of our London dealers that first convinced me that many so-called metallic colours, usually considered non-pigmentary, were, indeed, highly pigmentary. As Mr. Burrows states (and I believe I long ago made a similar observation) the exposure of such insects to the heat and light of the sun does not alter the form and structure of the scale. Such colours then as are due to scale structure, whether caused by refraction, diffraction or interference, must be permanent; colours, however, which are dependent upon a pigmentary substance, become modified or changed entirely, as the pigmentary matter undergoes dessication.—J. W. Tutt. *Jan. 28th*, 1895.

Phytophagic Species.—In American literature a number of observations are recorded upon what may be called "phytophagic species," where some small change, in larva or imago, is apparently correlated with a difference in the food plant. It is often the larva alone which seems to differ specifically. The late Mr. B. D. Walsh was the pioneer in observations in this direction, and his papers may be found in the *Proc. of the Ent. Soc. Philadelphia* and of the *Boston Soc. Nat. History*. The common *Halisidota tessellaris* appears in two phytophagic, larval forms—*antiphola*, Walsh and *harrisii*, Walsh. These two larval types differ in the colour of the hair pencils; in the first these are black, in the last orange. The moths do not differ, hence the names have no standing as applied to captured imagos. They should only be applied to collections of larvae. In another instance Mr. Walsh believed that he had verified the existence of a phytophagic species in the large moths of the genus *Sphingicampa* (*Adelocephala*, Bdv.); but, as I have shown, in this case the experiments were defectively conducted; the moths of Walsh's *bicolor* came from the same kind of larvæ as the moths of his *distigma*, and not from the presumed larvæ of his *bicolor*. It was a case of defective breeding-cage experiment. Had it been true, we should have been brought face to face with the astounding fact that larvæ, structurally very dissimilar, produced moths generically and specifically identical. Other cases where the larvæ form races, only distinguishable by what we are accustomed to consider specific differences between caterpillars, not generic, are recorded in the genera *Orygia* and *Clisiocampa*. In the latter genus the type form, *C. californica*, Pack., has three larval forms, tabled by Mr. Dyar as follows:—

1. A dorsal pale line, sometimes obsolete:
   Lateral region heavily blue shaded . . . *ambisimilis*.
   Lateral region with no blue shade . . . *californica*.
2. A dorsal row of elliptical blue spots . . . *pluvialis*.

The species inhabits the coast region of California and the Pacific Northwest. In all these cases the names can only be applied with certainty to the larva and bred moths. To consider them distinct species, as species are now understood, is clearly an impossibility. Perhaps the whole subject needs verification and breeding experiment. Do the moths interbreed (they are not in most cases geographically separated, but occur together)? What effect on larval marking is effected by the crossing of the moths produced by the distinct larval types? Are these larval types strictly correlated with the food plant? Undoubtedly the Bombycine type of Lepidoptera would seem to be the most pliable. These Bombycine cells are a matrix which is not yet exhausted in the production of species. A little farther advanced in the fixity of specific characters come those groups of slightly differentiated species which I have called *progenera*. These are, for instance, the Notodontid *Datana*, where a series of forms, all readily distinguished as larval, are already to be certainly (but not readily) diagnostically determined as imagos. Again, a little farther, and we have the structurally identical species of the Saturnian genus *Platysamia*, falling into two series according to geographical distribution, the three species found East of the Rocky Mountains in a progeneric state, closely allied in marking, colour, and even the peculiar smell of the imago, the one on the Californian slope already quite independent and peculiar in all specific characters. Isolation has hardened the specific marks; the branching off of the three Eastern forms over a wider extent of territory is nearer our own day in time; originally there were only two species, the Californian and one Eastern; still farther back the common ancestor diverged.—A. R. Grote, A.M., Bremen.

CURRENT NOTES.

It may be interesting to hymenopterists to know that the season of 1894 was, in North Germany, unfavourable in comparison with former seasons. During the Easter holidays Mr. Diedrim Alfken visited the Badener Berge, the well known Hanoverian Hills, sloping to the River Weser, a favourite collecting ground for apidologists. The hills are clayey and, while at their base, along the river, extensive growths of sallows are found, the higher portions afford numerous kinds of flowering plants attractive to bees. The results show only about half as many species as were collected under the same circumstances in 1893. On March 25th, on willows, occurred: *Bombus pratorum*, L., *scrimshiranus*, K., *terrestris*, L.; *Andrena parvula*, K. ♀ ♂, *praecox*, Scop. ♀ ♂, *apicata*, Smith ♀ ♂ (the species formerly known in England under the incorrect title of *lapponica*, Zett.), *morawitzi*, Ths. ♀ ♂, *fulvicrus*, K. ♀ ♂, *extricata*, Smith ♂, *spinigera*, K. ♂, *albicrus*, K. ♂, *albicans*, Müll. ♂, and *propinqua*, Schenck ♂. Also *Nomada fucata*, Panz. ♂, *Colletes cunicularia*, L. ♂, and *Osmia bicornis*, L. ♂. Upon *Ranunculus ficaria*: *Andrena parvula*, K. ♀ ♂, *Anthophora pilipes*, F. ♂, and *Bombus terrestris*, L. ♀. On the 26th of March the females had mostly disappeared, while males were in profusion. During these two days the females were seldom observed to collect pollen. This occupation is only commenced by them after fructification, which had consequently not yet generally taken place. But on the 31st of the month, on a subsequent visit, the females were noticed industriously working for the needs of the new brood. Their golden-yellow heavily-laden feet could be everywhere noticed, pendulous between the sallow blooms. On the 31st of March *Bombus rajellusk*, and the German *cognatus*, Steph., were captured, as also *Andrena cineraria*, L. ♂, *nitida* Fourc. ♀, and *ovina*, Klug ♀ ♂.

The following note on *Bombus visurgiae*, Alfken, may also be interesting. In the second Part of his valuable "Synopsis of British Hymenoptera" (*Trans. Ent. Soc. London*, 1884, pp. 232–3), Mr. Edward Saunders announced the identity of *Bombus variabilis*, Schmied. and *cognatus*, Steph. But after a renewed examination of Stephens' type Mr. Saunders came to the conclusion (*Ent. Month. Mag.*, 1894, p. 108), that it is an immature *agrorum*, and adds that Stephens' name should sink into the synonymy of the latter species. For the commonly occurring Continental species, the *B. cognatus* of Della-Torre and Schmiedeknecht (but not of Stephens) Mr. Alfken proposes the name *B. visurgiae*. This species is found in the sandy dunes of the Weser, and on the Islands off the Baltic coast. In his *Monograph of the species of Bombus inhabiting Thüringen*, 1877, 419, Schmiedeknecht uses the name *B. muscorum*, Fab. for this species, but later accepts the proposal of Della-Torre to call the Continental species *cognatus*, Steph., on the ground that the identity of Fabricius' species with this form cannot satisfactorily be made out. To use the name *muscorum*, Fab. (nec. L.) for the Continental species (*B. visurgiae*, Alfken, *cognatus*, Auct.) is considered by Mr. Alfken impossible, since the brief diagnosis covers *agrorum* and the colours of *variabilis* (cfr. Schmied., *Apidae Eur.*, 344). To call the Continental species *senilis*, Fab. is out of the question, because the diagnosis: "B. hirsutus cinereus," contradicts. Finally, the name *venustus*, Smith, cannot be applied to the species, because under this name Smith distributed colour varieties of *variabilis*. After this survey of the synonymy, Mr. Alfken concludes that the German species, which shows no variation in colour, and which he has described in his work on the Hymenoptera of the Island Juist under the vernacular name of "Dünen = hummel," must receive a new Latin title. *Bombus visurgiae* makes its nests in sandhills on the banks of the River Weser, and is an attractive object from its bright yellow thorax.

PRACTICAL HINTS.

LINOLEUM AS A SUBSTITUTE FOR CORK.—With reference to my friend Mr. Arthur Robinson's remarks, quoted *ante* p. 17, about linoleum floor-cloth as a possible substitute for cork, I may mention that an esteemed "brother of the net" has had it in use in some of his boxes for several years past, but there are two great objections to it which, to my mind, far outweigh its advantages of holding the pins tightly and being free from flaws. These are (1) its excessive weight (as compared with cork), which will quickly be realized if a store-box lined with linoleum be held in one hand while a similar one lined with cork be supported in the other; this is a decided disadvantage, for our cabinet drawers and boxes, if well and stoutly made, are none too light as it is, when filled with pinned insects; (2) its tendency to cause mould on the specimens, which appears to be due to its being practically air-proof, and so helping to prevent any such slight circulation of air through the box as naturally takes place when cork is used. Owing to its colour forming an equally bad background for the majority of insects, linoleum would, I think, like cork, have to be covered with white paper.—Eustace R. Bankes, The Rectory, Corfe Castle. *Jan. 26th*, 1895.

NOTES ON COLLECTING, Etc.

Coleoptera at Ipswich in 1894.—The normal spring and summer of the past year have been far more advantageous to Coleopterists than was the excessive heat of 1893. During the former especially, Coleoptera of all orders swarmed in our Suffolk woods and lanes. The beating-stick was rarely idle, and the inverted gamp in constant requisition. Later the sweep-net showed up good things, and lastly, moss was proved worthy of transmission from the wood to the study, for the purpose of identification.

A stroll through an adjacent park on 11th January, produced *Badister bipustulatus, Pterostichus inaequalis, Tachyporus hypnorum, chrysomelinus* and *humerosus, Platystethus arenarius, Aphodius fimetarius, Phyllotreta undulata* and *Rhinosomus planirostris*—in all about twenty species. On 20th, bark on poplars and willows by the river was despoiled of *Erirhinus vorax* (galore), *Bradycellus distinctus, Dromius agilis, Xantholinus linearis, Mecinus pyraster, Chrysomela staphylea*, and *Phoedon concinnum. Anchomenus prasinus* was common at the base of elms on 27th, together with *Calathus melanocephalus, Stenus speculator* and *similis, Cholera grandicollis* and *Apion miniatum.* On the 28th *Lema cyanella* was taken, under the bark of a willow, from which I have subsequently taken about sixty specimens, and *Hydroporus palustris* and *planus* from ditches. Another *Mecinus pyraster* and *Hypera fasciculata* from under bark on 29th, and a single *Dromius meridionalis* on 30th, completed the list of the first month.

On February 1st, I took *Crepidodera chloris* from under bark, and a dozen *Cholera tristis* from a dead rabbit on the 3rd; *Orchestes quercus* from oak on 8th. The 13th was rather a good day, the following being among those taken:—*Loricera pilicornis, Bembidium littorale, Olibrus corticalis, Chrysomela polita, Phyllotretra undulata*, a dozen *Erirhinus validirostris, Cis boleti* under bark on a dead willow (together, I may mention, with a nice ant, *Leptothorax nylanderi*); while *Dromius meridionalis, 4-maculatus*, and *quadrinotatus, Tachyporus obtusus, Proteinus brevicollis* and *Coccinella obliterata* turned up on the 21st. Some aspens on the 23rd yielded 43 *Erirhinus validirostris*, together with *E. vorax, Bembidium quadrimaculatum, Rhinosimus planirostris* and *Scaphidema aeneum.*

March 3rd was productive of *Aphodius contaminatus*, *Coccinella mutabilis* and *Carabus catenulatus*; three or four *Endomychus coccineus* were also taken. The locality of Jan. 11th was again visited on March 12th, with the following result:—*Dromius agilis*, two dozen *Clivina fossor*, *Lathrobium elongatum*, *Aphodius prodromus*, and various Apions. The 13th and 14th were spent in a chalk-pit, in which was a little pond about four feet in diameter, and from which I took *Hydroporus dorsalis*, *palustris*, *planus*, *granularis* (?), *lineatus* and *halensis*, *Haliplus obliquus*, *Dytiscus marginalis*, *Acilius sulcatus*, *Colymbetes fuscus*, two dozen *Agabus nebulosus*, and 53 *Agabus bipustulatus*, which swarmed, also *Hydrobius fuscipes*, *Anacaena limbata* and *variabilis*, *Hydrochus elongatus*, *Berosus affinis*, and one *Meloë violaceus*. On the 16th, under oak bark, I took *Rhizophagus bipustulatus* and two *Soronia punctatissima*. The sallows were in blossom this year as early as the 20th of March, on which day I took 40 *Erirhinus maculatus* from them in half-an-hour, and the next evening, *Dromius melanocephalus* and *linearis* and *Oxytelus rugosus*. Gorse appears to be very attractive about this time of year, and *Lathrimæum unicolor*, *Coccinella variabilis* and *22-punctata*, *Apion immune*, *Sitones lineatus* and *regensteinensis* and *Plectroscelis concinna* were all in the umbrella. I have heard many lepidopterists raise an objection to commencing the study of the COLEOPTERA, on account of the want of "sport." Of course there can be, in no other order of insects, the sport—"exhaustive" sport—to be obtained by chasing *Colias edusa* or *Vanessa c-album* for a mile or so (thank goodness !). But all the exciting uncertainty of sport was experienced, when for the first time in my life I turned up *Cicindela campestris* on March 24th, and, as their resting places were being walked over, up they would get, and be off, double, and be off again, like the flash of an emerald in the bright spring sunshine, and so suddenly that it required a very keen eye and supple wrist to take them on the wing. *Silpha rugosa* was common in dead *Talpa vulgaris* and *Anguis fragilis*, *Coccinella 18-guttata* on fir-trunks after dark, together with *Helops striatus*. At Raydon, two days later, I took 4 ♀ *Ptinus fur* and a *Niptus crenatus* from weasels dried in the sun, *Phyllotreta brassicae* and *Notiophilus biguttatus*. *Cicindela campestris*, *Dermestes murinus*, *Nitidula bipustulata* turned up on 28th. At Woodbridge, *Geotrupes typhæus* and *Timarcha coriaria* were seen on the golf links. About now, common things began to come on fast. On the 31st March, I took thirty species (about a hundred specimens), among the best of which was *Coccinella oblongo-guttata*, *Rhynchites betuleti*, *Thyamis brunnea* and *melanocephalus*.

Woods on the 1st of April produced various *Harpali*, *Bembidium lampros*, *Silpha thoracica* and *Necrophorus mortuorum*. I again entered the chalk-pit on the 3rd, and, in addition to most of the preceding, took *Laccophilus hyalinus*, *Helophorus granularis* and *Helochares lividus*, and on the 4th, *Anchomenus albipes*, *Gyrinus marinus* and *opacus*, while *Meligethes rufipes*, *aeneus* and *viridescens* were common on the flowers of the little celandine, *Bembidium brunnipes*, turned up in a sand-pit the next day; *Hyphydrus ovatus*, *Haliplus variegatus*, *Helophorus aquaticus* and *Aphodius granarius* were taken on the 6th. Sixty *Hylastes ater* from pines on the 7th. On the 8th a dead rat yielded *Creophilus maxilosus*, *Philonthus splendens*, *Lathrobium elongatum*, *Hister cadaverinus*, *Saprinus nitidulus* and *aeneus*, *Omosita colon* and *Nitidula bipustulata*. The first *Metabletes foveola* were taken on April 10th, together with *Necrophorus humator* from a mole, and *Cassida obsoleta* flying in the sunshine. *Trechus minutus* and *Olibrus consimilis* on the 11th, and it may be worth mentioning, a fine ♀ *Dytiscus marginalis* at electric light, about 11.0 p m. *Gastrophysa polygoni* turned up among dead grass on the 17th, and *Notiophilus palustris* and *Sphaeridium bipustulatum* the following day. *Cleonus sulcirostris* and a score of *Calandra granaria* were given to me on the 20th, during which day I also took *Micraspis 12-punctata*, *Coccidula rufa*, *Rhizobius litura*, *Phyllobius calcaratus* and *pyri*, *Rhynchites germanicus*, *Anthonomus pedicularius*, *Barypeithes brunnipes*, *Apion violaceum*, and *Sphaeroderma testacea*. During the remainder of the month the following additions were made:—*Anaspis ruficollis*, *fasciata* and *forcipate*, *Silpha sinuata*, *Byturus sambuci*, *Balaninus nucum*, *Dolopius marginatus*, *Adimonia capreae* and *sanguinea*, *Demetrius atricapillus*, *Rhynchites conicus*, *betulae*, *aequatus* and *populi*. *Coccinella ocellata*, *Blaps mucronata*, *Hylobius abietis*, *Gonioctena litura*, *Scolytus pruni*, *Polydrusus undatus*, *pterygomalis* and *cervinus*, and *Limonius minutus*.

At Felixstowe, on the 4th of May, were found *Leistis ferruginea*, *Phyllobius maculicornis*, *Otiorhynchus ovatus*, and under dock leaves on the edge of the cliff on 6th, *Mantura rustica*, and about fifty *Apion miniatum*. On the 7th, I took around Trimley *Agriotes pallidulus*, *Rhynchites pauxillus*, *Crepidodera aurata*, *Timarcha laevigata*, *Anaspis melanopa*, and on the 8th, *Cholera chrysomeloides*, *Malachius bipustulatus*, *Telephorus pallidus* and *limbatus*, *Otiorhynchus scabrosus* and *Grammoptera ruficornis*. *Dasytes plumbeo-niger*, *Luperus flavipes*, *Lema melanopa* and *Pyrochroa serraticornis* on 13th, and *Cholera sericea*, *Telephorus fuscicornis* and *rusticus*, *Melanotus rufipes*, *Athous haemorrhoidalis*, *Apoderus coryli*, and *Attelabus curculionoides*, *Rhynchites pubescens*, *Polyopsia praeusta*, *Salpingus castaneus*, *Cryptocephalus fulcratus*, *Phratora vitellinae*, thirty *Gonioctena rufipes*, and the first *Saperda populnea*—of which, I took in all, five from young poplars, in the clearing of a wood of about three years growth—were taken on the 19th. Three *Ips ferrugineus* turned up under fir-bark on 20th, and *Amara apricaria*, *Notoxus monoceros* and *Crepidodera ferruginea* on 23rd. *Grammoptera ruficornis* was abundant on white-thorn blossom, and I took fifty specimens on 24th, together with *Cistela ceramboides*, *Anthrenus claviger* and *Phyllobius uniformis*. The 25th was productive of *Aphodius fossor* (not common hereabouts), and the 26th of *Omosita discoidea*, *Bruchus cisti*, *Coccinella 14-guttata*, *Elater balteatus* under a log. *Telephorus fulvus*, *Balaninus pyrrhoceras*, *Clytus arietis*, *Strangalia melanura*, and *Dryophilus pusillus*. This was probably the "longest" day in the year, about sixty species being taken. The following day, Wayley and Park Woods contributed *Silpha 4-punctata*, beaten from oak. *Tanymecus palliatus* and *Hypera pollux* were taken on the 30th, with *Phyllobius oblongus* and *Cistela luperus*.

Additional species continued to come on fairly fast throughout June, commencing on the 2nd with *Leistis rufescens*, *Cychramus luteus*, *Phyllopertha horticola* and *Melolontha vulgaris*, which were common. *Grammoptera tabacicolor*, *Haltica coryli*, *Cistela murina*, and continuing on the third with *Magdalinus cerasi* and *pruni*. The 4th added *Cyphon variabilis* and *nitidulus*. On the 7th the *Donaciae* began to appear, with *Nacerdes melanura*. The 8th added *Campylus linearis*, *Malthodes marginatus*, *Coeliodes quercus*, *Cryptocephalus labiatus*, *Phratora vulgatissima*, *Zeugophora subspinosa*, and the 9th *Cassida equestris* and *Chrysomela lamina*. On June 14th *Lasia globosa* was taken, and the next day *Lacon murinus*, *Anobium domesticum*, *Cneorhinus exaratus* and *Leptura* *livida* from umbelliferae. *Anthocomus fasciatus* was taken sitting on umbelliferæ, on the 16th. By the 20th ♀ *Lampyris noctiluca* were common along the paths and among the undergrowth in woods, and I also took one ♂, possibly attracted by artificial light. On the 22nd I took *Cetonia aurata* from umbelliferæ, *Chrysomela hyperici* by sweeping, and *Helops caeruleus* from under a coping-stone in Ipswich.

Few new species were taken in July, and sweeping appeared the more advantageous method of collecting. *Carabus violaceus* was running on a path on the 1st, and *Donacia linearis* and *sericea* were common on the 4th; on which day I also took *Cteniopus sulphureus*, and on the 10th, *Illybius fuliginosus* and *Cercyon haemorroidalis* from cow dung, the former having evidently been swallowed by the animal in the act of drinking, was, of course, dead, but a perfect specimen! *Serica brunnea* made its first appearance on the 12th, and *Strangalia armata* on 13th. *Lucanus cervus* was on sugar, and *Rhizotrogus solstitialis* at electric light on the 14th. The 20th was productive of two dozen *Scirtes hemisphaericus* from water weeds, together with *Lagria hirta* beaten from whitethorn, and the 22nd of *Necrophorus mortuorum* and *ruspator*, *Antherophagus nigricornis* and *Mordella fasciata*. On the 27th *Hypera punctata*, *Thyamis gracilis*, *Apion frumentarius*, *Notoxus monoceros*, *Plectrocelis aridula*, were swept, and *Dryocoetes villosus* was taken from an old gate-post.

Coleoptera always appear to become scarcer in August, at least, so it was this year; the only ones added to the previous list being *Byturus tormentosus* at Norwich, on the 2nd. *Oedemera nobilis* ♀, on the 7th, on yarrow, which seems to supersede in its attractiveness umbelliferæ, which, in its turn, flourishes as May blossom falls, and previously to May, as has been seen, broom and gorse divide the first place among natural sweets. *Ocypus similis* was also seen. *Exochomus bipustulatus* was under willow bark, and *Donacia sparganii* on a reed on the 10th. *Carabus catenulatus* on sugar, and about thirty *Serica brunnea* at light on 14th. On the 18th, *Micraspis* swarmed, together with *Crepidodera ferruginea* and *transversa* on ragwort, and *Endomycus coccineus* turned up on sugar. Two days later *Anchomenus junceus* put in an appearance under a felled fir-tree, with *Aphodius fœtens*, *fimetarius*, *rufipes*, *depressus*, *prodromus*, *scybalarius*, *lapponum*, *rufescens*, *sticticus* and *obliteratus* from dung, and on the 26th, *Broscus cephalotes*, *Platyderus ruficollis* and *Ceuthorynchus litura* from thistles. I was fortunate enough to take *Pogonocerus dentatus* on the 28th. *Liopus nebulosus* has also been taken this year.

In September a great falling off is noticeable. The 19th yielded *Pristonychus subcyaneus*, *Stenus bimaculosus*, *Helophorus granularis*, flying in the sunshine, and *Aphodius porcus* from dung. At Cromer, on 22nd, I secured a few *Bembidium quadriguttatum*, *Laccobius nigriceps*, and several *Limnichus pigmaeus*. The 27th produced *Trechus minutus*, and the 29th *Tachinus subterraneus* and *Bolitobius pygmaeus*. On the 12th October I took a fine *Carabus nemoralis* in Sussex, *Pogonus chalceus* on the 14th, and *Leistis spinibarbis*, which seems fairly common around Brighton, on the 15th. At Ipswich, *Octotemnus glabriculus* was taken from fungi on 20th, and *Carabus granulatus* from sugar on 24th. *Poöphagus sisymbrii* was swept on the 26th. *Agelastica halensis* turned up on the 27th for the first time this year, together with a second *Pogonocerus dentata*, and a couple of *Thyamis tritici*. Under bark on willows, on the 30th, were *Anchomenus albipes*, *Xantholinus atratus* *Prasocuris marginella* and *Phyllotreta brassicae*.

On November 3rd I swept *Aphthona cyanella, Thyamis pusillus, Agelastica halensis, Chrysomela staphylea*, and thirty *C. hyperici*; and on 4th, *Coccinella 19-punctata, Dromius agilis* and *linearis*, and *Apion ulicis* from broom. From moss on the 10th I took *Loricera pilicornis, Anchomenus micans, Notiophilus palustris, Metabletes foveola, Tachyporus pallidus, pusillus, obtusus, brunneus* and *humerosus, Hypera nigrirostris* and *Plectrocelis concinna*, and I also swept more *A. halensis* and *C. hyperici*. Along the river bank, on the 17th, the sweep-net showed up *Anchomenus oblongus, Bradycellus verbasci, Hydraena riparia, Stenus bimaculosus, Lathrobium boreale* and *brunnipes, Prasocuris phylandrii*, and fifty-six *Halticidae, Chrysomela hoemoptera*, and a very late *Donacia linearis* were also taken, together with a dozen *Dyschirius globosus*, under moss on willows. Then the frost set in. *Leistis fulvibarbis*, however, turned up at the base of an alder, and several *Chrysomela polita* with *Hister marginatus* at that of an oak, on the 24th. Poplars near Woodbridge, on the 23rd of December, were productive of *Carabus granulatus, Dromius meridionalis, Bembidium rufescens, Phalacrus corruscus, Mycetophagus quadripustulatus* and *Erirhinus validirostris*, together with *Leptothorax acervorum*, which brought to a close a most successful year's collecting, the result of which is, roughly, about six hundred species—only the more prominent of which have been enumerated, as the space requisite for a detailed account would be too great—a far longer list than that of last year (1893), as recorded in *The Entomologist's Record* at the beginning of 1894.—Claude Morley, London Road, Ipswich. *Dec.* 31*st*, 1894.

NOTICES AND REVIEWS.

A Handbook to the British Macro-Lepidoptera, by B. G. Rye, F.E.S., with hand-coloured illustrations by Maud Norman-Fisher. Published by Ward and Foxlow, St. Marylebone. [Vol. I., Pt. I., Price 2/6].—We *want* a scientific book to replace Newman's *British Butterflies* and *British Moths* and Stainton's *Manual ;* we *get* a plethora of children's and beginners' books that in no way approach either. The letter-press of this part might very well have been written a century, perhaps two centuries, ago. In the 1st Chapter on "Metamorphoses" there is really nothing which an observant child does not learn during his first year's collecting; the only original statement perhaps being, "The structure of the perfect insect is of great importance, as upon it are based the primary characters used in the classification." We are pleased to say that this idea has died a natural death during the last twenty years. In the second chapter, on "Classification," the author states that "The Order Lepidoptera, or scale-winged insects, according to the most recent arrangement, is placed between the Diptera (flies) and the Trichoptera (caddis-flies), a sub-order of the Neuroptera or net-winged insects." Surely it is too late in the day to pretend that any linear arrangement of Orders, Families, Genera, or even Species, is possible which shall show actual relationships. The author classifies mainly on "walking legs" and "neuration," and great is the muddle thereof. Only one species is treated of, *Papilio machaon*. The description of the type, which everyone to whom the book is supposed to appeal must possess, occupies 22 lines; the "variation" of the species three lines (see *Ent. Rec.*, Vol. iv., pp. 100–108); the larva (see Buckler's *Larvae*, &c.)

occupies six lines, and in these six lines the food-plant is incorrectly given; the pupa four lines. The only incidental scientific statement made reads, "when disturbed the larva shoots out a forked orange-coloured appendage from behind the head *which, no doubt, is in some way a protection*" (The italics are ours). The two plates are excellent, but altogether wasted on such letter-press. It would be interesting to know how many parts of eight pages each will be required to deal with the Macro-lepidoptera. We should think at least two hundred, be the accounts never so meagre. As the parts are to be published quarterly, it might be well for intending purchasers to arrange specially for the delivery of the latter parts. The book supplies no want, and competes but poorly with existing cheap works.

SOCIETIES.

The 62nd Annual Meeting of the Entomological Society of London, was held on January 16th, 1895. The Treasurer's report showed a good balance in the Society's favour. Prof. Raphael Meldola, F.R.S., was elected President for 1895, and has appointed Lord Walsingham, L.L.D., F.R.S., Mr. H. J. Elwes, F.L.S., and Prof. E. B. Poulton, M.A., F.R.S., as Vice-Presidents for the Session 1895–6. Mr. Herbert Goss, F.L.S., and the Rev. Canon Fowler, M.A., F.L.S., are the Secretaries. The out-going President, Mr. H. J. Elwes, delivered an address "On the Geographical Distribution of Insects." He remarked that though a great deal had been written of late years on the Geographical Distribution of Plants, Mammals, Birds, Fishes, and Reptiles, comparatively little had yet been done by Entomologists to show how natural divisions of the Earth's surface which have been established for other classes were applicable to insects. Perhaps the proportion of known as compared with unknown insects was still too small, and the classification of the known species still too uncertain, to allow anything like the same methods to be applied to insects that had been used for mammals by Dr. Wallace, for birds by Dr. Sclater and Dr. Bowdler-Sharpe, and for plants by Sir Joseph Hooker, Mr. Thistleton Dyer and Mr. W. B. Hemsley. The President enumerated the genera of the Rhopalocera, and pointed out which of them were characteristic of the various Regions and Sub-regions into which the world had been divided by the Zoologists and Botanists above-mentioned. He also exhibited specimens typical of these Regions and Sub-regions. The President then alluded to the prosperous condition of the Society, and to the increase in its numbers and income. Reference was also made to various Fellows of the Society and other Entomologists who had died during the year, special mention being made of Herr H. T. Christoph, Mr. J. Jenner Weir, Dr. F. Buchanan White, Mons. Lucien F. Lethierry, Pastor Wallengren, Dr. Jacob Spänberg, Major-General Carden, Dr. Hearder and Mr. Wellman.

We are glad to add The North London Natural History Society to the list of the Societies of whose doings we are able, from time to time, to give some account. The indefatigable Secretary of the Society is Mr. L. J. Tremayne, 4, Lanark Villas, Maida Vale, W. At the meeting on Jan. 24th, Mr. Bacot exhibited a specimen of *Nyssia hispidaria*, which had wings, thorax and head of a male, with the body of a female. Mr. Rose reported the abundance of *Vanessa antiopa* on the Continent during the past season. Mr. Nicholson indulged in a retrospective glance at the past season. The outdoor excursions, which are a special feature of the Society's work, had been generally failures, so far as entomology was concerned; that to the New Forest at Whitsuntide was more productive than the others, *Macroglossa bombyliformis*, *Scodiona belgiaria* and a larva of *Apatura iris* having rewarded the ardent seekers. *Noctua diatrapezium* had been turned up at Cromer by a "Limited Company, consisting of the new Curator and the ancient Librarian; whilst *Vanessa c-album* had fallen to the net of the Secretary at Llandudno." Other captures mentioned were:—Larvæ of *Choerocampa elpenor* on the marshes at Ponder's End; *Lobophora viretata* at Eastbourne (Mr. Smith); larvæ of *Trichiura crataegi* in Epping Forest, on June 2nd (Messrs. Woodward and Tremayne); *Agrotis praecox* at Llandudno (Messrs. Robbins and Tremayne).

At the meeting of the Lancashire and Cheshire Entomological Society on Dec. 10th, 1894, Mr. Douglas Walker exhibited specimens of *Philalapteryx lapidata*, captured by himself in Argyleshire.——— The Annual Meeting was held on Jan. 14th, 1895. The veteran President, Mr. S. J. Capper, was again elected to that office. The office of Secretary went a-begging, but Mr. F. N. Pierce, 7, The Elms, Dingle, Liverpool, consented to continue in office *pro. tem.* Mr. Tutt read a paper which will be published in *The Entomologist's Record* later on. Mr. Roxburgh exhibited *Polia nigrocincta* from the Isle of Man.

City of London Entomological and Natural History Society.—*Dec. 18th*, 1894.—Exhibits:—Mr. Hanbury: a specimen of *Choerocampa celerio*, found by a gardener on a potting-shed at Hassock's Gate, Sussex, on Nov. 7th, 1894; the specimen was perfect, except that it was somewhat rubbed by its captor. Mr. Tutt remarked that most of the rare Hawk-moths captured in this country had been introduced with foreign plants, as they were not known to breed regularly in this country. Mr. Hanbury also showed a fine example of *Crocallis elinguaria*, having the central spot very large and dark, and the usual transverse lines almost obsolete and *brighter than the ground-colour*, which was of the normal tint; the insect was bred from a batch of Sutherlandshire eggs. Mr. Prout: continental types of *Caradrina alsines*, *C. ambigua* and *C. superstes*. The Rev. C. R. N. Burrows: *Cerastis vaccinii* vars. *variegata*, Tutt, *mixta*, Stgr., and *suffusa*, Tutt; also *C. ligula*, and vars. *subnigra*, Haw., and *spadicea*, Haw.; all from Rainham. Mr. Battley also exhibited these species from Winchmore Hill and Dorset. Mr. Riches: a specimen of *Caradrina cubicularis* taken about the middle of last month while drying its wings. Mr. Sauzé: an example of "Symbiosis" (or the "living together" of two or more animals of totally different orders, families, or species) represented by *Pinnotheres pisum* (the Pea Crab) and *Mytilus edulis* (the common Mussel), the former amicably sharing the latter's shell with its rightful owner. He read notes on the subject giving other instances of this curious habit. Mr. Tutt: *Colias phicomone* and *C. palaeno* from Mont de la Saxe and the Cogne Valley.

Jan. 1st, 1895.—Exhibits:—Mr. Prout: *Agrotis cursoria* from Aberdeen and St. Anne's-on-Sea, the former being considerably darker than the latter. Capt. Thompson: *Vanessa urticae*, *Epinephele ianira* and *Lycaena icarus*, all from Sligo. The *V. urticae* were somewhat rougher-looking than the English form; the *E. ianira* paler, and more clearly barred on the underside; one of the *L. icarus* had a series of pale blue crescents on the inner edge of the orange spots on the hind-wings. Mr. Clark: *Scoparia cembrae* and vars.

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AND

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Collecting Noctuidæ by Lake Erie.

By A. RADCLIFFE GROTE, A.M.

Vieni, pensando a me segretemente.

The record for the last of April was the thinning out of *Scopelosoma*; but the first of May brought a glad surprise. It had rained a little, and the trees were darkened by the wet. On the nearest tree a tiny three-cornered bit of fluffy pinkness caught my eye, and fell, fortunately for me, into my collecting bottle. It was the first specimen of Gosse's Arches, *Habrosyne scripta*, that I had ever captured. I would not be on record as saying anything against the prettiness of the English *H. derasa*, but our American species lacks that hard tinting, suggestive of orange peel, and does not miss it much. Our *scripta* is all pink and Quaker gray—a lovely blossom, tossed loose from the spray of spring. *Scripta* is the *derasa* we all hope to catch in Paradise. I can't say fairer than that. To come down to earth again, *scripta* is our American cousin, and we ought to be interested, not only because of the relationship, but also for the inherent beauty of the moth itself. All through May and some way into June *scripta* came to my bait, but by no means every night. Its visits were rather like those of angels, and the occasions upon which I caught two and "saw" three, were literally few and far between. It is another reason for accumulating a supply of *Weltschmerz*, that we always "see" more than we "catch." We have in America a second species of *Habrosyne*, *H. chatfieldii*, Grt. (= *derasa*, Hy.-Ed.), from Alaska and the Pacific Coast, which I supposed Mr. Edwards had described, after I told him in New York that it was probably distinct from the European. Mr. Butler told me that there is another species in Japan. Let us be thankful that there are several kinds of Arches moths in the world.

A night or two after my first *scripta*, came another of the *Thyatiridae*. This was the False Coronet, *Pseudothyatira cymatophoroides*. I am only responsible for half the lengthy Latin name; Guenée, with his *tendre* for *oïdes*, is my associate in the crime. Besides the typical form (or at least the form described by Guenée as the male of the species), *Pseudothyatira* has a constant variety, *expultrix*, which was supposed by Guenée to be the female. Both sexes are, however, alike represented in the two forms

In the first, the transverse lines become distinct, blackish, crossing the clearer wing after the fashion of *Bombycia*, or again suffused; in the second, the wing is unbroken by lines, mixed gray and pinkish. I once took a specimen to pieces and compared its structure minutely with that of *derasa*; the two are very closely allied, and I insist that the genera be not separated by the interpolation of the American forms resembling *Thyatyra batis*. I took, from first to last, a fine series of the False Coronet, which came more plentifully to my bait than *scripta* and, for those who may doubt my story, behold the specimens may be seen in the British Museum unto this day. My success so far allowed me to hope for our American Peach Blossom, *Euthyatira pudens*, but I was not to be so fortunate as my Albany friends, Messrs. Chatfield and Hill. As to *Bombycia* (= *Cymatophora*, Auct.), we have no certain Eastern species so far. The only two I have seen are *semicircularis*, Grt. and *improvisa*, Hy.-Ed., both from the far West.

But now the season had set in, and Pan was constantly propitious. *Diphthera, Apatela, Microcoelia, Agrotis, Mamestra, Xylena, Helioscota, Gortyna, Ochria* and *Heliophila* came singly or in troops in increasing quantities. I soon diminished the number of my trees and became chary in my takes. In June, *Xylena lignicolor* and its variety *quaesita*, became especially abundant, but were excelled by the swarms of *Xylena arctica*, which was a decided nuisance. These Xylenas had no self-respect. They appeared in unpresentable condition. With wings torn and thoracic vestiture gone, they buzzed about, knocking better-dressed company from the table to the discomfiture of the host. And then a lot of small fry claimed a place—*Eustrotia, Tarache*, and a goodly number of Deltoids. For the latter I have had a weakness. Our American genera show very curious modifications of structure, in wings, antennæ and feet. The species of *Epizeuxis*, especially *aemula*, were very common, also *Pseudaglossa* and *Zanclognatha*. One night I caught a specimen of the latter genus, which I felt sure, as it sat on the tree, was a new species. But it afterwards turned out to be an extraordinary variety of *Z. laevigata*, in which the middle field was quite yellow. The example is now in the British Museum. I have given the constant characters by which *laevigata* may always be recognised, notwithstanding its great range of variation. Alas, what has become of all my Deltoids! The genera mostly alone remain, like masts above the surface of the ocean, to tell where the species have gone down before the miserable descriptions of the miserable "types" in the British Museum. Species which I named with affectionate care are now to be called by such names as *cacuminalis* and *damnosalis*. I would extend the commination. Yes, *damnosalis*, and somebody else say I! Here are two quotations from the latest work on the British Museum "types":—"Mr. Grote refers *absorptalis* to *Epizeuxis aemula*, and at first sight this appears correct, from the rubbed condition of the specimen; but more careful comparisons show that the species named by Mr. Grote, *nubilifascia*, is represented. The present species is fairly to be considered the type of *Hormisa*, and must replace *Litognatha*, which has the same type." In the first place, according to the rules of zoological nomenclature, my genus must be retained, since it would be a proper restriction of Walker's species of "*Hormisa*," although "fairly" considered the type by an unfair writer. In the second place, *nubilifascia* cannot be recognised from the description of *absorptalis*, and the recognition of a name depends upon literature, not upon a so-called "type." In the third place, I saw the type of *absorptalis* in place, before being shifted by Mr. Butler, and pronounced it to be *Epizeuxis aemula*. What certainty is there that the present "rubbed" example is really Walker's "type" of *absorptalis*? In another case I have positively proved that the specimen, now figuring as the "type" of *Acronycta cristifera*, is not Walker's original specimen seen and described by me, and that, almost as positively, the present specimen, shown as Walker's "type" of *cristifera*, is one he had determined as *Mamestra brassicae* from a different locality! One other quotation and my *Schmerzensschrei*, as the Germans call it, is ended. After discussing the merits, or rather demerits, of Walker's names *Hyamia* and *Legna* (neither of which has a leg to stand on), to replace my *Spargaloma*, Mr. Smith says: "*Spargaloma* is antedated in any case." This shows the animus which has guided the whole enquiry, and which has resulted in cutting down the nearly 800 species of North American *Noctuidae*, originally described by me, to about 650. But I shall retain both *Litognatha nubilifascia* and *Mamestra lubens*, for I have shown the reason.*

Pardon, oh gracious reader, this digression into the battlefield of nomenclature! I will take thee back to my camp and my quiet. Here at least one can enjoy, with Rousseau and Bernardin de Saint Pierre, *un bonheur négatif*. Here we can contemplate, as from a solitude, the storms which shake the rest of the world. Here, between the leaf and the air, opens a vista, of the existence of which few dream. "Cease sighing, Cytherea," says Bion, "and conquer your sorrows for to-day, since the coming year will afresh demand your grief and your tears!" In June, not only *Noctuidae* but also *Sphingidae* came to my lure. There were several species which applied themselves more or less closely to the bait, and fell to my net or bottle. The species which stood off the farthest, and yet had its share, was *Phlegethontius celeus*, with its long tongue. But these were not my largest visitors, for Flying Squirrels (*Sciuropterus volans*) were also surprised by me industriously licking off the "sugar." The light from my "bulls-eye" seemed to blind them. They flattened against the tree-trunk, spreading out their sailed feet, turning their heads, and lifting their bead-like eyes towards the blinding light. I caught two of them in my butterfly net, and kept them in a wooden box-cage in my tent for a day or two. They appealed to me for liberty and I let them go again gladly, giving them ever afterwards free tickets to my sweets. I also had visitors still higher up in the scale of nature. Some Indians, from the Reservation near by, paid me a cold call. These did not come to "sugar," reconnoitering perhaps for whisky. They were of the peaceful, half-civilized kind, who, if we are to believe recent statisticians, are actually increasing in numbers, and whose fate is thus quite different from those of Mr. Lo and his kind, who are being perpetually driven from their hunting-grounds by the pale-face—in the books—and who are undoubtedly badly treated by white contractors in the West. Still, though clad in "store" clothes, with "store" shoes on their feet, having parted with pipe, wampum, tomahawk and moccasins, they belonged clearly to a different race, taciturn,

* We quite agree with our contributor's indignant protest. We need only refer our readers to what we wrote some time ago in *Stray Notes on Noctua*, both on the British Museum descriptions and methods. Who is likely to name insects correctly? The man who has seen and caught hundreds of a species? or the man who got his knowledge from museum types?—ED.

noiseless, moving about by preference in the mist and darkness. One never wants to be introduced to them, they can have no names. I not unfrequently saw at midnight a lighted torch, making as it were its unaided way over the surface of the creek. It was fixed to the prow of a boat, in which were two or more Indians spearing cat-fish by its light. Reading in front of my tent one afternoon, I was startled by a shadow falling across the page, and became aware of the presence of an Indian, standing a few feet away, whose approach I had not heard. Although I knew he wanted something, he did not speak at once and, for my part, I waited. At length it appeared, speaking slowly and with an absent look in his eyes, that he wanted to borrow my boat to fish from. I agreed, provided he would keep it only so long and deliver it again at the tethering place clean and with unbroken oars. He promised and kept his word. As men are, it was an exercise of virtue that he did so.

Towards the end of June, the American genus *Catocala* put in an appearance, and by the beginning of July, fully occupied the field. I say "American" genus advisedly. Somewhere I read that somebody in England had taken an example of *Catocala fraxini*. The particulars of the public reception tendered him on the occasion did not transpire. Why, we have in America one hundred species, more or less, and, from the vicinity where I was collecting, about thirty-five have been listed by my industrious friend Mr. E. P. Van Duzee. The species in America which comes nearest to *fraxini*, is the *relicta* of my departed friend Walker. It is a little smaller than *fraxini*, the fore-wings variably broken up with creamy-white, the narrow band on the black secondaries also white. A species most appropriately named the "widow." But I have noticed, in certain examples, the occurrence of a faint blue tinge on the edges of the white band, a memory of the blue-gray of *fraxini*. A friend of mine in Albany told me that, assisted only by his sons, he had taken 185 specimens of *relicta* in a single night. I asked him to take off one of the numbers, either the 1, or the 8, or even the 5. He firmly declined to do so. I asked him to show me the specimens. He pulled out a drawer full. I did not count them; I merely observed to him that he had apparently only kept the perfect ones. About my camp the *Catocalas* swarmed like bats. It was not even necessary to sugar afresh every night. A tree, forgotten since the night before, still had attractions for numbers frightened from the freshly-baited places. I caught *epione, retecta, insolabilis, residua, relicta, amatrix, concumbens, parta, ultronia, ilia, cerogama, communis, piatrix, habilis, clintoni, crataegi, polygama, praeclara*. Of these, *cerogama* was the commonest. Often I saw at least twenty hovering about or settling on the bait. At light, in the tent, I captured about this time several rare *Noctuidae*, which did not come to "sugar." The best, perhaps, were *Panthea acronyctoides, Oncocnemis riparia* and *Plusia thyatiroides*.

By the middle of July I had to break camp and take my captures home. It had been a happy time, stolen from Death and Bad Luck, full of Life itself strengthened by work. A time to realize the truth of Kepler's assertion that this world itself is heaven in which we live and move and are, we and all mundane bodies. The new species I had hoped for had been gathered. There were half-a-dozen of them; one curious Deltoid, interesting me much, was *Pallachira bivittata*, a species sent me also, at about the same time, by my good friend Dr. Thaxter, from Massachusetts.

I visited the scene of my camp again in the late autumn. It was a lovely late October day, the leaves all ripely floating to the ground amid a stillness broken only by the noise of dropping chestnut burrs. The air itself was saturated with hazy light, the memory of summer days. Some autumn Spanner moths were lazily fluttering about, coloured like the yellow leaves. No weary moral points this story. I am gone, but each year my Noctuids reappear where the trees are mirrored in the waters of the Lake by Angola.

Notes on Butterfly Pupæ, with some remarks on the Phylogenesis of the Rhopalocera.

By T. A. CHAPMAN, M.D., F.E.S.

(*Continued from page* 107).

The Nymphalids agree with the Pierids in two very important points; the egg is ribbed, and the pupa possesses only lateral motion —all antero-posterior movement having been lost, although, from its manner of suspension, free movement in all directions would have been of advantage to it. Since the loss of this movement must have resulted from suspension by a girth, it seems certain that the Nymphalid could not have acquired it independently. It forms a remarkable illustration of the law, that movement once lost is never regained.

If we imagine a Pierid pupa to have got rid of the girth and to hang by the tail, we have substantially a Nymphalid pupa, the duplication of the head-spines and some other changes being of a minor character.

A Nymphalid, then, is a Pierid that has got rid of the girth; and here it is of much interest to note that the Papilionid made an effort in the same direction, but only succeeded in traversing a short part of the distance, evolving the remarkable form we find in *Thais*.

The account given of the method of suspension of the pupa of *Thais* in Scudder's monumental work is only at second-hand, and appears to me to be erroneous. The existence of a double set of hooks on the head-prominence of this pupa is so unusual and extraordinary a phenomenon, that one accepted without hesitation Scudder's statement that this is entangled in a special silken pad. Subsequently, however, the examination of a consignment of pupæ of *Thais* led me to entertain great doubts as to its accuracy, and to think that the nose-hooks and their use, extraordinary as they still are, might yet be so explained as to permit the ranging of the pupal structures and habit with those of the Papilionids, and might enable us to understand how their development was brought about.

According to the account given in Scudder's work, the pupa has three points of attachment—a pad for the tail, a girth for the body, and a pad for the nose. Now we know that in *Papilio*, *Pieris*, etc., there are only two—one for the tail, and the girth—whilst the line of evolution is in the direction of a loss of the girth, and thus of a diminution of the number of points of attachment (Nymphalids). These two points themselves are, no doubt, the result of a gradual modification of the cocoon of the Hesperids; it seems to me, therefore, most improbable that a third point of attachment should be evolved.

An examination of the pupæ referred to, shows that the nose-silk is not a new structure but is the girth slipped forwards; also that the slipping forward does not occur, in many cases at all events, until the girth has had time to impress its marking across the wing-covers. It must occur whilst the pupa is still soft and capable of some activity, but I have not seen how it is accomplished. The peculiar curved attitude of the larvæ of *Euchloë* and *Colias*, after suspension but before pupation, may afford a hint as to how the shift originated. When the girth did so slip forwards, one of two things would happen: either the pupa would swing free, thus leading to the Nymphalid type; or the girth might catch on the projecting nose-horn, and in time lead to the structure and habit that characterise *Thais*. I may note that the pupa of *Thais* has both the 5th and 6th abdominal segments free and with power of movement in all directions; so far, therefore, it is clearly a Papilionid rather than a Parnassid or a Pierid. The nose-thread is a loop, exactly such as the girth slipped forwards would be; it passes forwards from its points of origin to the nose, whilst there is a groove marked on the wing-covers, that is exactly in a line from the same points of origin, backwards (fig. 3). A close examination of a number of specimens shows no trace of any other girth than this nose-loop, either on the pupa itself or in the form of any attachment to the silk pad, which is smooth and finished throughout, and clearly has not had any other loop torn from it or removed. That the pupa is tolerably active when the slipping forward takes place is evidenced by the nose having twisted itself into a second loop of the girth round the hooks in many instances.

Thais, however, did not lose the girth entirely and so become a suspended pupa like the Nymphalids. It is, as we have seen, one of several forms, that do not lead directly to *Parnassius* in lineal order, but appear to have branched off from the Papilionids at the same time. In the Pierid we have a Papilionid that has lost the power of lateral movement, probably in connection with the method of suspension by a girth. The Nymphalid is a Pierid that has lost the girth. This close connection of the Pierids and Nymphalids is one that has not apparently been hitherto insisted on. The form of the egg is the same in both, and differs from that of the Papilionids, which retains the smooth dome-shaped form characteristic of the egg of the Hesperids. Again, the restriction of movement to the lateral direction is very remarkable, for it occurs nowhere else; and, since it exists throughout both these nearly related families, it seems reasonable to assume that it is a common inheritance and not a separate acquisition, especially as it is obviously useful to the Pierid but of no obvious value to the Nymphalid, in which it persists only because movement once lost is never regained (at least this rule holds so generally true, that we may reasonably apply it here in explanation.) But, accepting this explanation, it follows, that the divergence must have taken place whilst the Pierids still retained both the 5th and 6th abdominal as movable segments, as is still the case in *Aporia*, *Delias* (figs. 6-7-8) etc.; and further, seeing that the Nymphalid preserves the double nose-horn of the Papilionid it must have taken place before the Pierid was reduced to a single median one, and it is interesting to note that *Delias*, one of the earliest Pierids, still affords some evidence of the former presence of a double nose-horn in the Pierids. Our own *A. cratægi* does so in a less degree.

A consideration of these pupal characteristics, as well as of those of the eggs, leads me to believe that Pierid and Nymphalid started together from the Papilionid, shortly afterwards separating, and thenceforward pursuing very parallel courses. It would follow that, in spite of the method of suspension of the pupa and of sundry imaginal characters, the Pierids are nearly if not quite as much entitled as the Nymphalids to rank as a separate family from the Papilionids, and to be associated with the Nymphalids rather than with the Papilionids.

As we pass from the *Aporinae* to the higher sub-families of *Pieridae*, we find progressive loss of movement. In the *Pierinae* only the fifth segment remains movable; the same condition obtains in the *Rhodocerinae*, and in the *Anthocarinae* the pupa is solid. I have not obtained any Pierid pupa with only one incision moveable. Whilst I would separate *Aporia* from *Pieris* as distinctly as I would *Rhodocera* from *Anthocaris* (*Euchloë*), it seems incorrect to associate *Pieris* with *Rhodocera* because both happen to have the same formula of segmental mobility. The curved form of pupa, due to the ventral bulging of the wings and the shortness of the antennæ, associates *Rhodocera* and *Anthocaris*, but places them apart from the others. By analogy with other families, I should expect to find the Anthocarine pupa separated from the Pierine, whilst both were still at the Aporine stage, that is with both 5th and 6th abdominal segments movable, and that the genealogical tree would not be thus—1, *Aporia*; 2, *Pieris*; 3, *Rhodocera*; 4, *Anthocaris*, but rather as under, the blanks representing forms that probably exist though unknown to me.

	Early form with 5 and 6 movable.	
	Pupa straight.	Pupa curved.
3 incisions (2 segments) with movement	*Aporinae*	?
2 ,, (1 segment) ,, ,,	*Pierinae*	*Rhodocerinae*
1 ,, ,, ,,	?	?
0 ,, ,, ,,	?	*Anthocarinae*

In the Nymphalids we again find that movement of segments is lost in some tribes. If we assume those with full movement to be the lowest (that is the least divergent from the ancestral form), then we must give this place to the *Vanessidi* (figs. 12–13–14–15), *Argynnidi* (including *Melitaea*), *Acraeidi*, *Heliconidi* and *Apaturidi*. Of these the *Argynnidi* would be the highest, as they have lost the straight form that would result from their derivation from the Pierids. Whether we may attach any value to the very Pierid-like aspect of sundry *Acraea* pupæ as showing them to be the lowest, is more than I am prepared to assert. The *Satyrinae* (usually so-called) would be entitled to be divided into several tribes, the lowest (the Meadow Browns) with freedom of movement preserved, being a tribe some steps in advance of the *Argynnidi*.

One chief reason for looking upon them as near the *Argynnidi* is the pattern of the pupal markings, which is very much the same as in *Argynnis* and *Vanessa*. The remainder form two or more tribes according to the loss of movement to one incision (*hyperanthus*) (figs. 22–23), or absolutely (*semele*, *galatea*). Though contrary to our traditions to place *galatea* as far away from *janira* as *Vanessa* is from *Argynnis*, it is not so shocking on a little consideration as at first sight it appears. The pupa of *Vanessa* has very much the general aspect of that of *Papilio*, but differs in its method of suspension and in the suppression of antero-posterior movement. The *Nymphalidi* and *Apaturidi* have gone beyond *Vanessa* in developing various remarkable forms, but they retain the same degree of segmental mobility. When we come to purely exotic sub-families I am sorry that my material is so small. The *Euploeinae* (fig. 17) develop a remarkable ridge across the third abdominal segment and lose freedom of movement altogether, thus giving rise to remarkable forms as, for instance, in the genus *Euthalia*, where this ridge and others are developed in an extreme degree, forming sharp angles and making the pupa not unlike, among pupæ, what the larva of *Hybocampa milhauseri* is amongst larvae. In some instances of which I have seen specimens and drawings there is apparently a mimicking of some, no doubt unsavoury, Hemipteron, the pupa being fully exposed on a leaf.

Charaxes (fig. 21) is very close to the *Euploeinae*, and has no near relationship to the *Apaturidi* or *Nymphalidi* (White Admirals), which is awkward, as *Nymphalis* is a generic name often used instead of *Charaxes*. *Charaxes* has a very smooth rounded pupa, without movement, and very like that of *Euploea*, deprived of its ridges and angles.

In the *Brassolinae* (figs. 19–20) an even more remarkable condition occurs. There appears to be no movement of any segment; but the intersegmental membrane of the hinder margin of the fourth abdominal segment is much expanded, and forms a portion of the solid surface of the pupa equal to about two-fifths of the whole segment; it looks, indeed, like a separate segment, especially on the ventral surface, where the wing-margins reach to the true margins of the segment but leave the additional portion uncovered. On the dorsal line it is constricted, showing the arrangement characteristic of Nymphalids for checking all but lateral movements, though, as a matter of fact, no movement at all exists in this case. This incision seems to open slightly, in some species, on dehiscence. A similar but less obvious exposure of intersegmental membrane occurs along the hind margins of the four following segments. Remarkable as this structure is in this group, and associated as it is with complete loss of movement, it is to be noted that the same advancement of intersegmental membrane to a permanent and fixed surface position is quite plain, when looked for, even in *Vanessa* and still more in *Pyrameis*; in fact it is, as a constant but not always prominent structural detail, a feature of all butterfly pupae except those of the Lycænids (and Hesperids) (figs. 1–2 *Papilio*). In the Pierids the marginal portion sometimes looks more like a distinct subsegment than like a portion of elaborated intersegmental membrane, and I am certainly not prepared to be dogmatic as to its true nature. It comes, however, as a strong support to the idea that the Lycænids separated from the primitive Papilionid as soon as (or almost before) the latter had evolved from the Hesperids.

Some species among the Brassolids (*Dynastor*, for example) have the wing-cases expanded laterally like some Papilionids.

When we come to the Lycænids, we find that the pupæ best known to us agree with those of the Papilionids in their mode of suspension, but in little else. They differ in being entirely solid, very rounded, and squat; in having the head curled under so as to be ventral rather than anterior in position; in not possessing the intersegmental subsegment; and in having no definite spines, horns, or processes, but in possessing hairs and bristles. The *Lycaenidae* are usually divided into *Lycaeninae* and *Lemoniinae*: I am inclined, however, to think that we should substitute the name LYCAENIDA for *Lycaenidae* and constitute two families *Lycaenidae* and *Lemoniidae*. The latter should then be divided into sub-families. The mass of the *Lemoniidae*, in a character to be presently alluded to, are higher than the *Lycaenidae*: and yet it is amongst the former sub-family (as at present constituted) that we must look to find the forms nearest to the primeval, that is, forms with both the 5th and 6th abdominal segments movable. Some approach to this form I happen to have seen in *Euselasia* from South America (figs. 24–25–26). There we have a pupa unmistakeably Lycaenid in the ventral position of the head, in the squat broad outline, and in the hair-like character of the spines, which latter, however, exist only on the ordinary tubercles and not, as in the *Lycaenidae*, on the general surface also. The second legs reach the eyes as in the *Lemoniidae*, but both the 5th and 6th abdominal segments preserve movement. By this latter feature, as well as by the spinous nature of the hairs, the pupa shows a much nearer approach to the primary Papilionid form than does the solid pupa of the *Lycaenidae* (figs. 27–28). There is no trace of a marginal intersegmental subsegment.

In the *Lemoniidæ*, if we only had the material (apparently abundant enough in S. America), we might expect to find at least certain stages of the progress from the primeval butterfly to *Euselasia* and certainly forms intermediate between the latter and the *Nemeobiidi*, which in solidity, hairs, and general form differs little from Lycænines.

The *Lycaenidae* apparently made a short cut to a high form. This is to be taken less as my view of the facts, than as an expression of my ignorance of any of the possibly still, but no doubt once, existing intermediate forms with mobility of segments. The pupæ of all the genera are very close together, very rounded and solid, but preserve the Papilionid arrangement of the leg-cases; the *Lemoniidae*, so far as the few which I have examined go, have attained the Nymphalid arrangement. This point in the structure of butterfly pupæ, which seems to be of some importance, is one upon which I am sorry to say that I have only a few notes of pupæ that I have examined but not possessed, so that I speak here from a smaller basis even than elsewhere. In all butterflies (including some Hesperids) the area between the head and antennae is occupied by the maxillæ (proboscis) and the 1st and 2nd pairs of legs, and by these only. The point to which I wish to call attention, is as to the relative position of the two pairs of legs. In the Papilionids and Pierids the 1st leg at its base extends from the maxilla on the inner side to the antenna on the outer, and so cuts off the 2nd leg from approaching the head (figs. 2–4). In the Nymphalids the 2nd leg extends upwards and reaches the eyes (head), and so cuts off the 1st from reaching the antennæ (figs. 13, 16, 18, 20). We may here frame a pretty little hypothesis that this is the natural result of the atrophy of the 1st pair of legs in the Nymphalid imago; and that this is no doubt an element in the case, is confirmed when we notice how small the 1st pair of legs becomes in some Satyrids—*hyperanthus* (fig. 22), for example. But when we extend our survey, we find that the reduced size of the foreleg obtains in the Hesperids (figs. 29–33) from which the Papilionids are supposed to have had their origin, and when we come to the Lycænids, we find the reduced size in the *Lemoniidae* (fig. 25), which possess forms nearest to (but also probably more recent than) the Papilionids, whilst in the *Lycaenidae* (fig, 28), where we might also look for a Nymphalid type in this matter, the fore-leg reaches the wing as in the Papilionids, as it does also in Parnassids. This would point to the commencing atrophy of the fore-legs of the imago in the Lycænids as occurring quite independently of the same process in the Nymphalids. Another illustration is thus afforded of a condition of things of which I have already spoken as by no means rare in the Lepidoptera—*viz.*, of similar stuctural developments taking place independently in different families, the common inheritance being, not the structure itself, but a tendency, or at least a capacity to develop it.

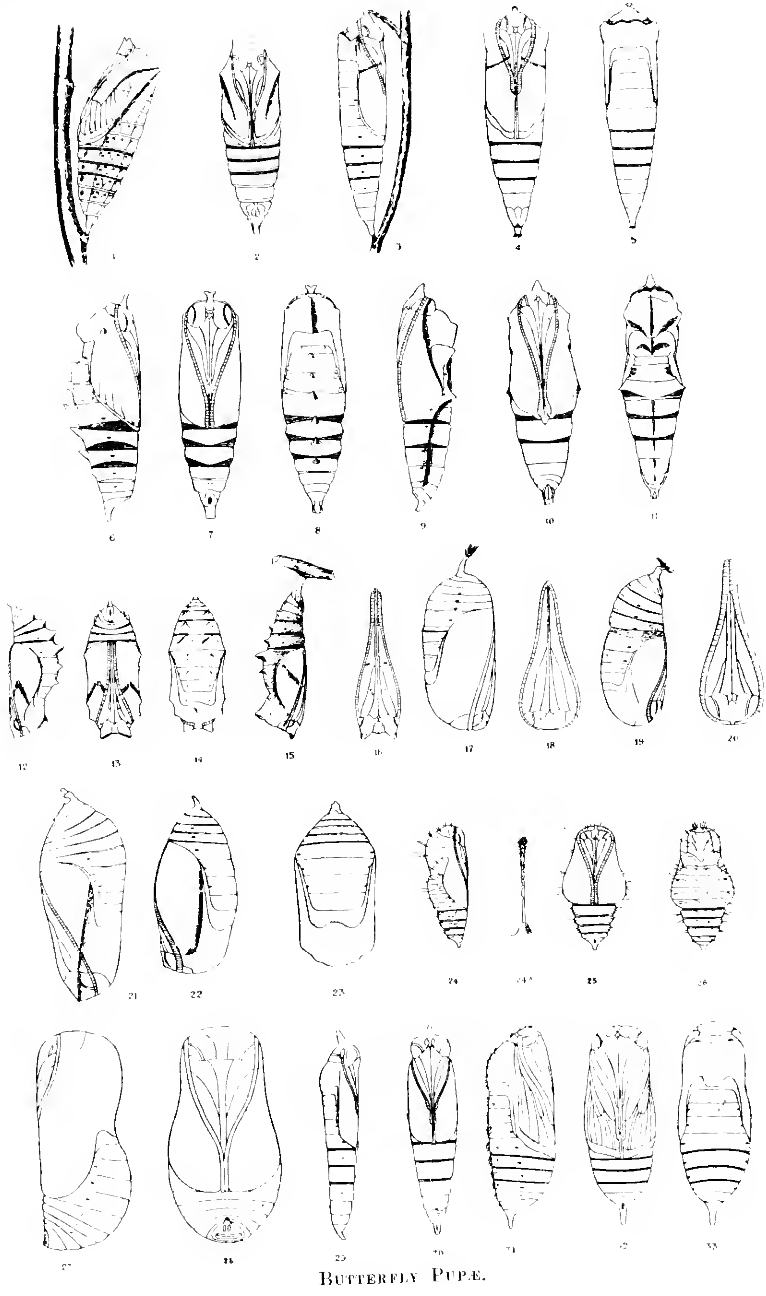
There is at least one other distinction between Lycænid and Papilionid pupæ which is strongly suggestive of their separate origin. The Papilionid and its derivatives, the Pierid and Nymphalid, always have smooth pupæ, that is pupæ which have no bristles or hairs; their spines and processes are developments of the pupa itself, and cannot be injured without opening the general body cavity. Lycænid pupæ on the contrary, have hairs and bristles, that is, cutaneous appendages that can be removed without any substantial damage to the pupa proper. Both these forms occur among the Hesperids.

In the White Admirals (*Nymphalidi*) a few hairs are to be distinguished in the pupa, but they are so minute as to require some magnifying in order to be seen. Perchance a similar close search might reveal them in other tribes. It is curious that it is in this same tribe that the only trace among the Nymphalids of any resemblance in the egg to that of the Lycænids occurs. The White Admirals, no doubt, are really one of the lower tribes of the *Nymphalinae*; they still retain 5 and 6 free and are still especially capable of great variation in general form as well as in their spines and processes; these Lycænid features appear to give a farther confirmation to one of the points which I desire to emphasise, *viz.*:—that the lowest (*i.e.*, most ancestral) forms in all the families are really very close together, and that it is only in the higher tribes that the families are widely separated.

In thus postulating a separate origin for the Lycænids, I think I clear up the great difficulty that has troubled systematists who have desired a linear arrangement, and who have believed from the condition of the fore-legs of the imago, that the Lycænids should occupy a position intermediate between the Papilionids and the Nymphalids, a position absolutely contradicted by egg, larva and pupa, and, I think, quite as much by the general facies and structure of the imago.

The *Lycaenidae* appear to be farther from the Papilionids than the mass of the *Lemoniidae*, but I think from the pupæ I have seen, that the latter are divisible into several sub-families, each of equal value to the *Lycaeninae*, and some of which are farther from the Papilionids than they are.

(*To be continued.*)



BUTTERFLY PUPÆ.

Description of Plate.—With regard to the figures, I would note that they are diagrammatic, but still quite accurate as to all points referred to in the paper, in other matters they may be even imaginative and not to be depended on; the only one of this class, however, of any moment, is as to the antennal articulations, which are put in *ad libitum*, simply to make clear which are antennæ, but without reference to the true number of the joints.

Fig. 1	*Papilio podalirius*	lateral.
,, 2	,, ,,	ventral.
,, 3	*Thais polyxena*	lateral.
,, 4	,, ,,	ventral.
,, 5	,, ,,	dorsal.
,, 6	*Delias aruna*	lateral.
,, 7	,, ,,	ventral.
,, 8	,, ,,	dorsal.
,, 9	*Pieris brassicae*	lateral.
,, 10	,, ,,	ventral.
,, 11	,, ,,	dorsal.
,, 12	*Vanessa levana*	lateral.
,, 13	,, ,,	ventral.
,, 14	,, ,,	dorsal.
,, 15	*Vanessa polychloros*	lateral.
,, 16	,, ,,	face.
,, 17	*Anosia archippus*	lateral.
,, 18	,, ,,	face.
Fig. 19	*Brassolis sophorae*	lateral.
,, 20	,, ,,	face.
,, 21	*Charaxes jasius*	lateral.
,, 22	*Epinephele hyperanthus*	lateral.
,, 23	,, ,,	dorsal.
,, 24	*Euselasia*	lateral.
,, 24A	,,	hair.
,, 25	,,	ventral.
,, 26	,,	dorsal.
,, 27	*Chrysophanus dispar*	lateral.
,, 28	,, ,,	ventral.
,, 29	*Cyclopides palaemon*	lateral.
,, 30	,, ,,	ventral.
,, 31	*Pyrgus malvae*	lateral.
,, 32	,, ,,	ventral.
,, 33	,, ,,	dorsal.

Synonymic Notes on Acidalia humiliata and A. dilutaria.

By LOUIS B. PROUT, F.E.S.

The interesting discovery by the Messrs. Hodges of an *Acidalia*, new, or almost entirely new, to Britain (*Ent. Rec.*, vol. iv., p. 28; *Ent. Mo. Mag.*, vol. xxix., p. 65), may be supposed to have re-awakened the interest of British entomologists in the history and application of the name *osseata*, and of those other trivial names which are synonymically associated with it. With a view to the elucidation of the matter, I have examined very carefully the Continental literature bearing upon it, and have also availed myself of the opportunities for study afforded by the present location of the fine Zeller series in the Natural History Museum at South Kensington. An interesting synonymic note by Mr. Tutt (*Entom.*, vol. xxii., p. 121) was unfortunately rendered futile by the circumstance that in the state of our knowledge at that time (1889) there seemed good ground for supposing that the *A. osseata* and *A. interjectaria* of French authors were merely two forms of the same species—our common British *osseata*, Haw. Considering the amount of work that Mr. Tutt gets through, which certainly shames most of us, we cannot blame him for not looking up every reference when preparing the note referred to; but it is unfortunate that he cited Mill. (*Ic.*, 64, 7), as applying to our species, apparently without verifying Staudinger's reference; had he consulted Millière, he would have found the two species under consideration admirably figured, *together with their early* *stages* * 64, 7–10 (*osseata*), representing the species discovered by Mr. Hodges; 64, 11–14 (*interjectaria*), our long-known "Bone Wave."

The *osseata* of the *Vienna Catalogue*, may of course have been either or both of the species in question, for we have merely the indication "bone-coloured, brownish-striped geometer." Fabricius (*Mant.*, ii., p. 211, No. 221), diagnoses it as "*Phalaena seticornis*: alis albis obscurius undatis: puncto medio nigro, anticis costa ferruginea," and further describes it in such general terms as to leave it doubtful which species he had before him. "Albis" certainly better denotes *interjectaria*, Boisd., than *osseata*, Boisd.; but "costa ferruginea" would rather lead to an opposite conclusion; at any rate, that character would prevent our setting up *osseata*, Fab., as a prior name for the former insect. Nor is Borkhausen (*Naturgeschichte*, &c.. vol. v., p. 326, No. 154), much more definite, though he likewise mentions the rust-coloured costa.

Hübner's figure 100 (*dilutaria*) is, as Mr. Tutt says, a puzzle, and I am half inclined to agree with him that it does not represent either of our British species; but there is certainly no "Continental species which we do not get" to which it could be referable; Treitschke and Duponchel took it for a variety of *virgularia*, Hb., and Geyer (Hb.-Gey., fig. 589) appears to have figured a *virgularia* under this name (*dilutaria*). Boisduval no doubt recognised Hübner's *dilutaria*, but re-named it in order to avoid its being confounded with his own *dilutaria* = *dilutata*, W. V., and all subsequent Continental writers agree that it is simply the form of his *interjectaria* without the dark costa. Hence Staudinger has sunk *interjectaria* before *dilutaria*, Hb., and perhaps we cannot do better than bow to his decision.

But our new species with the red costa is perfectly easy to deal with synonymically. It seems to be common, though local, in central Europe, and to be well known to Continental writers. Some of the specimens from the Zeller collection agree precisely with our small Isle of Wight form,† whilst a glance down the long series will convince anyone that all the specimens belong to the same species, and that a different one from Zeller's *dilutaria*. Besides, nearly all the Continental figures and descriptions point to the same conclusions. Hufnagel describes his *humiliata* thus:—"*Humiliata*, the red border; dirty yellow with pale grey, waved transverse stripes; the other margin reddish; third size; in the woods in grass; June; rather rare." Werneburg (*Beitr.*, I., 266) first resuscitated this name, pointing out that "other" ("andere") in Hufnagel's description must be a clerical error and should read "anterior" ("vordere"). As for *osseata*, Hb. 100, I am compelled, after careful comparison, to differ from my friend, Mr. Tutt, and to refer it to *humiliata*, Hufn. (Mr. Hodges' species) and not to *osseata*, Haw. If I am wrong in this I at any rate err in good company, since Staudinger, knowing the two species better than we in England have until quite recently had the chance of doing, takes the same view. I admit that the ground colour of Hübner's figure is a little paler than in really good specimens, but the red costa *extending to the tip* (in *interjectaria*, Boisd., even when bred, the *brown* of the costa

* Mr. Tutt (*l.c.*, p. 124), treated the larvæ as unknown, whereas Millière's breeding experiments confirm the specific distinctness of Guenée's *osseata* and *interjectaria*.

† Mr. Tutt tells me that he found exactly the same form at Bourg St. Maurice, last summer.

does *not* extend so far) and other characters settle its identity. The Zeller specimens show that no reliance can be placed on the precise width of the wing.

Treitschke's *ossearia* (*Die Schmet. von Europa*, vol. vi., pt. 2, p. 32) is comprehensive: that is to say, he takes the species with red costa as the type, but mentions a variety "which with several collectors passes for a separate species" which lacks the red costa. That may possibly be *interjectaria*, Boisd.; but, inasmuch as the central spots are also lacking, it is probably *holosericata*, Dup.; though, no doubt, *interjectaria* is also included in this one species, as it would hardly have escaped Treitschke's notice. Duponchel's description and figure (177, 5)—none too good—also belong to the species with red costa.

Owing to the influence of Treitschke, it was probably some time before the German entomologists again acknowledged that they were dealing with two or three species under one name; but Herrich-Schaeffer, who adheres pretty closely to Boisduval's nomenclature, introduced *interjectaria* and *holosericata* to their notice; he figures the former (upper and under sides) in figs. 78 and 79 of his well-known work, though, as Guenée remarks, "not in a clearly recognisable manner," and cites *dilutaria*, Hb. 100 ("rough and too strongly marked") and *marginepunctata*, Steph., ? Wood 724 ("too small, too white") as synonyms. Lederer, however, in 1853, reinforced the law of priority, giving *dilutaria*, Hb., as the name, with *interjectaria*, Boisd., as a synonym. Since that time there has been no disturbance of the synonymy on the continent. Guenée, it is true, adhered to the newer name, but the French authors have now yielded to Staudinger's authority (Berce, *Faun. Ent. Franc. Lep.*, vol. v., p. 150).

Mr. Tutt has dealt so exhaustively with the history of the British records of supposed *osseata*, Hb. (as it was called until Staudinger gave in his adhesion to Werneburg's determination of *humiliata*, Hufn., 1871), that I need not go into it again. As he pointed out, our writers were, no doubt, dealing only with one species—*ossearia*, Haw. = *dilutaria*, Stgr., Hb. Mr. Doubleday's last note (*Entom.*, vol. iv., p. 30), after he had seen the Continental species, *osseata*, Hb., was to the effect that he had "never seen any British specimens like them," and it is more than probable that even five or six British examples "which appear to be identical with a pale variety (of *osseata*)" were really also only varieties, with a reddish costa, of our common species.* If so, it seems likely that *humiliata*, Hufn., is, in this country, entirely confined to Freshwater, or, at any rate, to some of the southern cliffs of the Isle of Wight. Mr. Barrett, having in view the small size of our native specimens, suggested (*Ent. Mo. Mag.*, vol. xxix., p. 66) that the species has here reached its extreme limit and "maintains itself with difficulty." This seems by no means impossible, notwithstanding some more northerly localities given by Staudinger; for, with regard to Scandinavia at least, only one of the two allies is recorded; and, though that is under the name of *humiliata* = *osseata*, it is quite possible that that is an error of the same kind as that for which Haworth, in our own country, was responsible. Hofmann, in his recent work, *Die Grossschmetterlinge Europas* (p. 135), says that it belongs rather to Southern Europe, Asia Minor and North

* Since writing this, I have examined two or three of the specimens in question, which still exist in Doubleday's collection, and am confirmed in this opinion.

Africa. But it is more probable that the small size is due rather to the exposed situation and scanty vegetation, and, as already stated, Continental *humiliata* are by no means always so large and fine as those in the Zeller collection, with which, probably, Mr. Barrett made comparison; indeed, Frey (*Die Lepidopt. der Schweiz.*, p. 193) expressly states that Zeller's Bergün specimens were exceptionally large and deeply coloured; and de la Harpe's statement (*Neue Denkschr. Schweiz. Gesell.*, xiii., p. 22) that it varies in size and colour, diminishing in dry and arid places, is, perhaps, to the point.

As my object in writing these notes was to show clearly the relation of our two species to those of the Continent, it is not necessary to go into their history; but I should like to say that it has been admirably worked out, side by side, by Millière (*l.c.*), by Rössler (*Jahrb. des Nassau. Vereins*, Jahrg. 33-34, "Die Schuppenflügler"), and by Dr. Snellen van Vollenhoven, (?) in Sepp's *Nederlandsche Insekten* (serie 2, vol. iv., p. 50, et seq.), the latter being apparently quite ignorant of Millière's work.

Mr. Tutt (*Ent. Rec.*, vol. iv., p. 75) says, "all the German *humiliata* I have received have been our common *interjectaria*;" and, on the following page, says that his "ignorance of this is perfect at present." I have been more fortunate, for the only two specimens I have received from the Continent (from Herr August Hoffmann) are quite correctly named; but, at any rate, if any reader wishes to find out what Continental entomologists understand by *osseata*, Hb. (=*humiliata*, Hufn.), I should recommend him to look up Millière's or Sepp's excellent figures.

Perhaps it will be of interest, by and by, to contribute to the *Record* a brief summary of the work of the authors mentioned in the matter of life-history, etc.; now it only remains to complete this article by giving the corrected synonymy of the recently introduced species. South's list is perfectly accurate as regards *dilutaria*, unless, perhaps, it would be safer to read Hb. (?) for Hb.

Acidalia, Tr., *humiliata*, Hufn., *Berl. Mag.*, iv., No. 89: *osseata*, Hb, 102: Tr., vi., 2, 32: Dup., viii.: Gn., i., 467: Mill., *Ic.*, 64, 7: *non*. Haw.

The Sale of the late Mr. Machin's Macro-lepidoptera.

By A LOOKER-ON.

Stevens' sale-room on February 26th appeared to have been swept and garnished; the air was clear, and the sunlight got through the windows: in short, there was quite a moral atmosphere in the rooms during the afternoon. There were no long series of rarities such as one finds in the collections of men of means. The collection on sale was just a typical British one, made by an honest English gentleman, albeit a toiler with his hands for his daily bread. It was in the very finest condition, the specimens well set, and with reliable data as to where most of them came from. I had heard that the whole collection (Macros and Micros) had been offered to a provincial museum for a sum not much exceeding £200, but had been refused. Probably the price was considered exorbitant by those who had to determine the matter. That the Macros produced roughly £370, whilst the Micros (by far the better part of the collection) have yet to be sold, seems to show that British Lepidoptera with reliable data are worth more at the present than at any previous time.

The careful way in which the collection had been advertised, and the advantages of a good catalogue were not lost. It is really remarkable how little trouble is often taken in these matters, with the result that insects are often disposed of at sums far below their actual sale-room value. A fairly large buying company was attracted, and prices ruled high. At times the bidding was keen and spirited, but towards the end the excitement flagged, and there is no doubt that the last hundred lots would have fetched a better price had their sale been postponed until a later day. One noticed Messrs. W. H. B. Fletcher and E. Bankes in their accustomed seats, whilst Sir Archibald Hepburn found a corner on one of the tables where he could rest comfortably and enjoy a "weed." Messrs. Farn, Sydney Webb and C. Briggs were in evidence, whilst Mr. Sam Stevens, with his weight of years evidently still resting somewhat lightly on his shoulders, occupied his favourite corner. Mr. Janson, with commissions from that prince of lepidopterists, Mons. Oberthür, Mr. Massey, and others, was continually to the fore, whilst the Rothschild commissions were evidently in the hands of the auctioneer. In the floating population around the rostrum were to be seen the Presidents of the City of London and South London Entomological Societies, Dr. Sequeira, Messrs. Bird, Rippon, Keays, Goldthwaite, and others too numerous to mention.

Among the butterflies four specimens of *Pieris daplidice* taken in the neighbourhood of Ashford between 1856 and 1879 went for 18s., 16s., 18s. and 18s. respectively, whilst a lot containing two varieties of *Euchloë cardamines* was sold for 27s. A grand variety (♀) of *Argynnis paphia* with confluent spots on both upper and lower wings realized £1 12s. 6d., whilst another with confluent spots on the underside produced £2 2s. A variety of *Pyrameis cardui* was knocked down for £3 10s. and an aberration (♂) of *Apatura iris* in which there was a failure of pigment in the hind wings, for £3 5s. The *Chrysophanus dispar* realized respectively 40s., 88s., 60s. for the males, 70s., 105s. for the females, and 65s. for an underside, Sir Archibald Hepburn annexing the finer female and one of the males. Then a lot with a fine variety of *C. phloeas* produced 70s.; another lot with varieties of *Lycaena corydon*, 35s.; a pair of *L. acis*, 46s., whilst three others produced 50s.; a lot with a series of nine *L. arion* from Barnwell Wold produced 50s., and other prices ruled equally high. The *Sphingidae* realized good prices; a dark variety of *Sphinx ligustri* brought one lot up to 20s., whilst a *Deilephila euphorbiae* from Boyd's collection fetched 28s.; four *D. galii* at 32s. 6d. and 45s. realized, one would think, more than their full worth, whilst 30s. for a *S. pinastri* with a "personal" history and no locality was quite enough; 60s. for a lot of nine *Sesia myopiformis*, four *S. formiciformis*, eleven *S. ichneumoniformis*, and five *S. musciformis* is totally inexplicable, but all the Sesias reached high figures; 35s., 42s., 20s., 45s., 32s. 6d. were given for small lots of about a dozen specimens which followed each other. But the Hepialids and Zygaenids fetched equally high prices; a var. of *Z. trifolii* with orange spots and orange hind wings and some other vars., 70s.; a var. of *Z. filipendulae*, 50s.; whilst *Nola albulalis* and *N. centonalis* fetched about 3s. to 5s. each, the

Lithosiids also producing 16s., 16s., 18s., 32s. 6d., and 10s. for successive small lots. The *Arctia caia* were not remarkable products (viewed from the pigeon fancier's view, which appears to be the only view we can take of entomological "tigers" and "gooseberry moths," for, no one as yet has shown us a single scientific fact about them) and varieties with yellow hind wings evidently have no great market value; 42s., 40s., 42s., 21s. were paid for four, four, three and two "Tiger" vars. respectively. 40s. was obtained for nine specimens of the "old fen form" of *Ocneria dispar*, including a black var., whilst *Laelia coenosa* went in pairs for 35s., 37s. 6d., 27s. 6d., 40s., and 42s. respectively. Seven *Bombyx trifolii* vars. produced £3 10s., and *Lasiocampa ilicifolia* went in pairs at 45s., 85s., 60s., 60s., respectively. Either this insect is or is not British. There is no doubt a general opinion among collectors that it used to be obtained in some numbers on Cannock Chase, but the few records in our old magazines and the fact that no name of authority was ever attached to such records, make one wonder how the dozens (perhaps scores would be nearer the mark) of specimens extant in good collections of British Lepidoptera ever got a British warranty. These eight were reputed as taken "at Cannock Chase, whence they were sent to Mr. Machin by Mr. Bonny." Cannock Chase is well worked now. Are our present collectors so incapable that they cannot even find a single specimen? *Drepana harpagula* (*sicula*) was also sold in pairs, 18s., 22s., 24s., 32s. 6d., 22s. being the prices obtained. In the same way pairs of *Dicranura bicuspis* went for 22s., 30s. and 27s. 6d. It appears to be high time for the dealers to go to Rannoch again, when 30s. is given for eight specimens of *Asteroscopus nubeculosa* and six *A. sphinx*. No wonder a smile illumines the faces of almost every one as if by mutual consent when 18s. and 16s. are given for two lots because they contain five "bred specimens" of *Pygaera anachoreta* "from Dr. Knaggs." Surely it is utter nonsense to look on this as a British species; however, each one knows his own business best. One would suppose that *Notodonta trimacula* and *N. chaonia* are two of the best of our Notodonts whilst *N. trepida* would not be taken at a gift. Probably nothing has altered so much as the price given for Noctuæ since their variation has been so much studied, and it will be a matter of interest some day when a collection of Noctuæ comes under the hammer, classified according to their varietal peculiarities. Collectors are just learning that the study of these varieties and the affixing of locality labels mean money, and that a comparatively few hours' labour occasionally in properly arranging these insects under their proper forms and adding locality labels, may mean a difference of a hundred pounds or even more in the value of of a small collection. When collectors learn that this is what the more scientific buyers want, they will do it. Two lots with four *Cymatophora fluctuosa* in each of them went for 30s. and 32s. 6d. respectively; 35s. was given for nine *Acronycta strigosa*, seven *A. alni*, and eight *A. ligustri*; 21s. for seven Kentish *A. auricoma*; 40s. for a pair of *Leucania albipuncta*: whilst 21s. for five *L. obsoleta* makes one pause. Of course Messrs. Fenn, Farn, Tutt or any of the regular collectors over the North Kent district could get it; but they have not the energy of a quarter of a century ago, and a night in the marshes between Gravesend and Cliffe, where this species and *Senta ulvae* simply swarm, would be less to their liking than to that of some of the enthusiastic youngsters; but now that two or three British *Nonagria cannae* can be bought for the price of one *L. obsoleta* the latter should be worth working for. *Crymodes exulis*, at 30s., 25s., and 22s. per specimen, were very much bought, whilst *Agrotis agathina* and *A. cinerea* both fetched higher prices than *A. ashworthii*, eight specimens of which, with thirty other Agrotids, produced only 21s. *Agrotis subrosea* still goes up—80s., 105s., 85s. being given for pairs, and 90s., a record price, for a single female. Six *Agrotis hyperborea* went for a guinea; whilst the Taeniocamps, which had not been arranged according to variation, produced a mere nothing; *Dasycampa rubiginea* brought 22s. for five, whilst six *Polia xanthomista* sold for 45s.; a few named varieties of *Epunda lutulenta* produced 42s., whilst collectors have at last begun to learn how rare *Hadena atriplicis* is, 30s. being given for eight with some common Hadenas; 25s. and 42s. for two lots, of four specimens each, of *Xylina conformis* could not be considered dear; whilst Mr. J. A. Clark gave £8 10s. for nine specimens of *Cucullia gnaphalii*, all bred "from larvæ taken at Sevenoaks." Three of the specimens went up to £3 7s. 6d. before they were knocked down, but Mr. Clark would not be denied. Some of our collectors appear to think *Heliothis peltigera* a rare species, but it never fetches more than a few pence in the sale-room, whilst *Anarta melanopa*, *A. cordigera*, &c., are almost given away. *Plusia bractea* still appears to be worth 5s., whilst a specimen of *Catocala fraxini*, previously purchased at Stevens', brought in £1. Then the Geometræ came on, but with the exception of a few rare species and special varieties, the prices bore no comparison with those given for the Noctuæ. The series of *Amphidasys betularia*, including a buff var., produced 30s. Pairs of *Cleora viduaria*, 35s., 65s., and 55s. respectively; *Phorodesma smaragdaria* worked out at something under 5s. each; whilst a double-banded var. of *Ephyra linearia* raised the price of a lot to 24s. "Eight *Acidalia perochraria* " was rather startling, but it was an error for *A. ochrata*. *A. straminata* var. *circellata* was sold in two sets of four, producing 27s. 6d. each set; whilst three finer specimens went for 35s. A specimen of *Sterrha sacraria* was sold for 14s.; the lots containing *Emmelesia taeniata*, *Eupithecia consignata*, *E. ultimaria*, *E. jasioneata*, *E. constrictata*, *E. fraxinata*, all produced high prices; whilst *E. extensaria* sold at about 6d. apiece. Thirteen *Coremia quadrifasciaria*, with a narrow-banded var. of *C. unidentaria*, produced 30s.; whilst Mr. Bankes paid five guineas for fifteen fine *Camptogramma fluviata* from Exeter; and £5 was paid for nine *Phibalapteryx polygrammata* which came from Mr. Bond, and were taken in Burwell Fen. When the auctioneer put these up for sale a red-faced individual bawled out across the room, "Ten shillings apiece, and take the lot," but he did not get them at his price. *P. lapidata* at 1s. 6d. shows how its price has gone down of recent years. This concludes the interesting details connected with the sale.

That there is a good market still left for *bona fide* British specimens is well proved by this sale, and to the crowd of collectors who amass collections which they hope will bring back their money someday, I would, as a looker-on who thinks he sees the way the cat is jumping, offer a word of advice, and that is: (1) Get data with all your specimens, and (2) arrange your varieties in something like systematic order, and, as far as possible, name them.

SCIENTIFIC NOTES & OBSERVATIONS.

Discussion on the Nature of certain Insect Colours.

(*Continued from p.* 111.)

I can hardly take upon myself to join in the discussion of the pigment question. My microscopical work seems now to be pretty nearly over, and I find myself also quite behind the times in the use and even in the comprehension of the highly technical terminology of the subject. May I, nevertheless, offer a few remarks which may, I hope, bring the matter down again to the level of ordinary mortals, without in any way trenching upon the preserves of the "Giants"?

Colour is the result of the action of substances or surfaces upon light, and is produced in various ways—either by the selective absorption of part of the light, and the reflection of the remaining part, or by refraction, interference or diffraction, in each of which cases the light is split up into its component parts, and the reflection of a part or the whole of this decomposed light, gives colour. Therefore, without light, there can be no colour, a fact which, though somewhat difficult to understand, is yet often forced upon our notice. If we walk among our flowers in the evening with our net in hand, we must notice how the colours gradually disappear as the light fails, until almost every flower (the white last of all) becomes of the same uniform shade. Of course in ordinary talk we say 'tis "too dark to see;" but the fact remains that we can see moths and can distinguish form but cannot see colour, because there is no longer light enough to produce colour; or, to put it the other way about, the substances, surfaces, or what not, have no longer sufficient light from which to select their own particular fancy and to reject (reflect) what they do not want and what we ought to see. I have often liked to think that the photograph (negative or positive) gives us an idea of a world without colour. We see then the familiar forms—but not in their familiar colours. All are reduced to the same dead level, *i.e.*, presented correctly as to form, but all in one substance, and everywhere able only to act in precisely the same manner upon the light falling upon it. The whole surface absorbs the same rays and reflects the same rays. The result is a monochrome. The conditions will not reproduce the actual state of things; there is total absence of the substances (surfaces) which by absorption, reflection, &c., go to produce what we call the true colour of the object.

As to colour resulting from the action of substances (or surfaces) upon light, it is certain that these surfaces or substances must have white light to act upon, if they are to select (or reject) all colours, and that light which lacks any constituent will not give what we conceive to be the true natural colour of the particular object under examination; hence the peculiar and unnatural appearance of objects under monochromatic light. Now we come to the point under discussion as far as I understand it. Is colour the effect of "pigment" or of "refraction" in the case of any particular object, *e.g.*, a lepidopterous insect? Pigment stands for matter which exercises this power of absorption and rejection of a part (colour), reflection of the whole (white), or absorption of the whole (black) of the white light, *e.g.* paint, &c. Refraction, interference and diffraction, stand for the power which matter has, by reason of its *form* (striation, fine and minute ribbing, &c.), of splitting up the light which falls upon it, *e.g.* eggs of many lepidoptera, pearls, &c. If the colours of insects fade and disappear, and it cannot be proved that the structure has altered, then it is obvious that that colour cannot result from refraction or diffraction, but must be due to pigment—and *vice versa*. Study the cases of insects hanging up outside the shops of some of our professional entomologists! Look at the beautiful (?) specimens offered there at 1d. and 2d. apiece, and then I think you will be convinced that the original colour in most cases must have been the result of pigment which has lost (probably by decomposition or decay, *i.e.* bleaching) its power of absorption and now reflects (almost) white light, and cannot have been produced by diffraction from surfaces which have remained quite unchanged. The isolation of this pigment can only mean the separation of the substance which possesses this selective power over light, unchanged, and still in a condition to exercise this power, and therefore remaining the same "colour" that it was before isolation. This obviously depends upon the action—chemical and mechanical—of the solvent. The dye "magenta" is, in its dry state, a lovely metallic green. Water does not change it, but alcohol dissolves it at once, and we get the lovely dye; crush the dry mass into a very fine powder, and you will find that when you have done so you will have a pink, almost magenta, dust. Many other substances present two colours according to the way in which they are examined (*dichroism*)—*e.g.* the platinocyanides. I have now before me a specimen of this compound of yttrium. It presents the exact effect which Dr. Riding notices with the scales of *Thecla rubi*, though much exaggerated. By reflected light it is a brilliant green, but by transmitted light a good red. In both instances there can be no doubt but that the red is the true colour. The green is the effect of the dry pigment by way of reflection. I find it hard to believe that the insects which we have dried as far as possible and which have remained for years in our cabinets practically unchanged, owe their colour to retaining water in the form of thin films, alternating with chitin, &c., the removal of which could be the only (to my mind) possible cause of such alteration of form as would put an end to the refractive power of the scales. From thin films of chitin and air, the air could not be removed; yet we know that were we to leave these 10 or 20 years' old insects exposed to light, they would very quickly lose the colour which absence of light has preserved, and we always try and get them as dry as possible before we put them away. Of course, I do not deny that there are amongst the Lepidoptera colours which are the result of refraction, but it is my firm opinion that, as a rule, the colours are due to "pigment," which could be isolated if we could find a solvent which would extract it without alteration. The question of the minute quantity is practically nothing. It would be interesting if some one with leisure would write a short paper on the trade show-cases, stating, if possible, how long these attractive specimens have been exposed to light, and what has been the result on each species. I may further add that simple chitin is clear, and transmits or reflects all light like glass; while minutely cellular chitin, being permeated by air, &c., in a fine state of division, might appear to be what we call white, just as snow, being in itself perfectly transparent, yet, being permeated by air, appears white. Do these white scales show this structure? I see no reason why this structure should be confined to the "white" scales, for they, with pigment, would be very good coloured scales. This would account for two kinds of colour, pigmentary and structural, and seems to me to offer the most reasonable explanation of the difficulty. I do not profess to be up to the times; I do not know what others have published on the matter (except Mr. Tutt): I know I may be very wrong, and perhaps even in a great muddle, but this appears to comprise the gist of the question as far as I understand it.—(Rev.) C. R. N. Burrows, Rainham, Essex. *January 15th*, 1895.

I should like to mention a fact which I have noticed respecting the brilliant metallic colour of certain exotic Lepidoptera, such as the *Uraniae—vulgaris, sloanus, rhiphaeus*, &c.—with a view to eliciting from others more capable than myself their opinions as to the shape of the scale being an important factor in connection with these glistening metallic wings. This is to the effect that these scales are not flat, but concave, and the more brilliantly metallic the more concave are they. This is markedly the case in that most gorgeous of all insects, *Urania rhiphaeus*. Those who have never seen the wings of this moth under the microscope have a new and delightful sensation in store for them, for words fail in describing the glories of it. Parts of the wing resemble bands of molten gold, and there are a few scales near the hind margin of the lower wing, which glow with the brightness of the coloured fires of the pyrotechnist. Some years ago I called the attention of the late Mr. Philip Henry Gosse, who had then in preparation a work on the *Uranidae*—of which, by the way, I have not heard since his decease, which occurred shortly after our correspondence—to the pronounced concavity of these scales, and received a reply that the observation was of scientific importance, and might result in some useful knowledge regarding the colours of insect scales. It is noticeable that although the beautiful blue-green spot of *Papilio buddha* is not metallic to the naked eye, under the microscope, with good light from the condenser, the scales are vividly so, and sparkle with the lustre of gems. The British Lepidoptera afford but few examples of metallic scales, these being confined pretty much to *Miselia oxyacanthae Amphipyra pyramidea*, and the *Plusiae*. The shining brass of *Plusia chrysitis* is very disappointing under the microscope [*vide*, *British Noctuae*, ii., p. xvi. Ed.]: the scales are flat, have a kind of transparent appearance, and are of little beauty.—Joseph Anderson, junr., Chichester. *February 6th*, 1895.

The extraordinary appearance of the "green" scales of *Thecla rubi* when viewed by reflected light under a low power of the microscope induced me to investigate them further, with the result that I found the same appearances that Dr. Riding has described (*Ent. Record*, vol. vi., p. 86). By delicate focussing, it became evident that the curious tortoiseshell-like patches were within the substance of the scale and beneath the ribs. These patches certainly seemed to correspond with the broken-up corruscations of green colour which one sees by reflected light. Under the microscope, the green scales of *Miselia oxyacanthae* do not resemble those of *T. rubi*, the green appearance in the former reminding one of the manner in which the blue scales of the *Lycaenidae* produce their colour, both alike being colourless when viewed by direct transmitted light.—R. M. Prideaux, Newport, Isle of Wight. *Feb. 24th*, 1895.

HYBRIDISM.—Connected with the subject of specific formation is the subject of hybridism. From the point of view of the systematist the different species of *Smerinthus* are generically divisible; that is, they offer characters which in other moths are held to be of generic value, and, so far as we know, are then usually a barrier to hybridism. Not so here, and this is an argument for the Bombycine (Saturnian) origin of the Family *Sphingidae*. The type of *Smerinthus*, Latr. is seemingly *populi*. This moth is structurally different from *ocellatus*, and again from *tiliae*. In America, *Paonias*, Hb., affords another ocellated Smerinthoid type. Hybridism must occasionally occur under natural conditions. The correct view seems to be that hybrids do not harden into species, but gradually die out or are absorbed. Species have not originated by hybridism. The forces which, over longer periods, have moulded the specific type cannot be replaced by a single violent action rendered possible by the hidden or reminiscent affinities of the cells. The systematist has nothing to do with hybridity. The impossibility or the non-occurrence of hybridism in any one case forms no part of his generic diagnosis. He is concerned with certain external structural features, the various visible modifications of which form the characters on which he founds his groupings. He may at a later scientific epoch be corrected by the morphologist; at the present time he cannot be called upon to draw in a genus because one of its members is fertile with a species of another genus upon an isolated occasion. Hybrids between members of distinct genera must be carefully examined to ascertain the relative fixity of structural characters —their ultimate value for purposes of classification. No sequence in point of value is yet established for generic characters in the Lepidoptera. The systematist uses modifications taken from the entire periphery upon which to base his groups. Characters which in the Lepidoptera seem stable—such as the hairiness of the compound eye—seem in other orders, *e.g.* Diptera, variable. The frontal horn seems to be a constant character in the moths; in Coleoptera it is sexual or variable. The gradual fitting of our nomenclature, which is artificial, to natural objects is a process involving time and labour, and will become more intimate than it is to-day. Always are our systems improving, reflecting more accurately the facts. It is not yet two hundred years since Linnæus was with us in the flesh. It cannot be denied that we have occupied much fresh territory since his day. Nomenclature, the organic expression of physiological fact, will follow its own development, unimpeded by momentary and individual expressions of impatience, dependent alone on the conditions of the human mind which gave it birth.—A. R. GROTE, A.M., Bremen.—[We should like to know in what way *S. populi* is "structurally different from *ocellatus* and *tiliae*," *i.e.*, sufficiently different for generic characters, and also in what respects the genus *Paonias* differs from the genus *Smerinthus*?—ED.]

CURRENT NOTES.

The Rev. W. F. Johnson records (*E.M.M.*, Feb.) the capture last year, at Mullimure in the North of Ireland of two specimens of *Hepialus humuli*. According to Mr. Johnson, Mr. Barrett's capture of this moth in Galway seems to be the only other record of its occurrence in Ireland.

He suggests, however, that its appearance at two spots so far removed from one another points to the probability of its occurring in other parts of the country. Mr. Johnson also mentions having seen *Pararge megaera* flying as late as October 22nd, 1894.

Mr. Edward Saunders decides (*E.M.M.*, Feb.) that *Bombus cullumanus*, Kirby, should be restored to the British list. He has recently had occasion to re-examine the type specimen more carefully, and finds that the conclusion at which he had arrived in 1884, that it was only *B. soroensis*, Fb. var. *proteus*, was erroneous. The armature is sufficient to mark it as abundantly distinct from any other British species. Mr. Saunders also decides that the species described by Smith, under the name of *Bombus nivalis*, is not the species to which Dahlbohm gave that name, but is a variety of *B. scrimshiranus*.

Mr. R. C. L. Perkins describes (*E.M.M.*, Feb.) two new species of *Andrenidae*. (1) *Andrena ambigua*, which appears to be intermediate between *A. varians*, Rossi and *A. helvola*, Linn., and which has been obtained from Dartmoor and King's Lynn. (2) *Halictus angusticeps*, which may be distinguished from *H. punctatissimus*, with which it is almost identical in form and sculpture, by the colour of the tarsi, which are not at all yellow, and by the very different form of the genital armature. This species has been recorded from Sidmouth and Weymouth.

Lord Walsingham has been devoting some attention to the generic nomenclature of Micro-lepidoptera, and in a paper (*E.M.M.*, Feb.) on "Preoccupied names and genera in the Micro-lepidoptera" gives a list of many names now in use which will have to be abandoned. The list is confessedly not exhaustive, and is published with the object of urging others to follow up the subject. We notice that Hübner's *Tentamen* is admitted to rank as an authority, but we have very grave doubts (*pace* Mr. Grote) whether it is entitled to do so. We may, however, find an opportunity to recur to this subject. A few instances of the results at which Lord Walsingham arrives are all we have room for. *Aciptilia*, Hb. (1826), is displaced by *Pterophorus*, Geoffr. (1762). *Alucita*, Stgr. *Cat.*, has to give way before *Orneodes*, Latr. (1796). Why "*Alucita*, Stgr. *Cat.*," we fail to understand, as *Alucita* is traceable through the Plume synonymy back to the time of Linné. *Gracilaria*, attributed by Wöcke to Zeller (1839), is shown to be really a name given by Haworth (1812), although he spelt it *Gracillaria*. *Heusimene*, Steph. (1834), is said to be a *laps. cal.* for *Hemimene*, Hb. (1826). These illustrations will be enough to show the importance of this paper to Micro-lepidopterists. We shall watch eagerly for fresh material from the same pen.

The reading of the paper on *Coenonympha typhon*, by Dr. Buckell, at the City of London Entomological and Natural History Society, has had to be postponed indefinitely, owing to the Doctor's ill-health.

Mr. W. Farren of Cambridge contributes to the *E.M.M.* for February some notes "on relaxing and setting insects," which are the outcome of his experience during three months when he dealt with more than 1,000 moths. He considers that no moth is "fit to repin and set unless it has been relaxed in every part, which can only be done by using the relaxing pot." Mr. Farren has tried wood naphtha and regards its use as a very good method of relaxing, but finds it does not obviate the use of watery vapour. Another method which has commended itself to Mr. Farren is the use of a fine jet of steam, applied to the under-surface at the junction of the wings with the thorax. Speaking of his method of using this, Mr. Farren says:—"I had a finely-bored gas-fitter's blowpipe soldered into the lid of a small saucepan, making a miniature steam kettle. I found it necessary to have the lid of the saucepan soldered all round, and a small hole with a screw cap made for putting in the water, as the steam escaped so freely from the lid as to prevent its coming through the fine hole of the blow-pipe. The most convenient way of using it is to have a gas or spirit stove on the table, then set the saucepan half-filled with water, to boil; . . . . The insect to be relaxed should be held not too near the blow-pipe, as the force of the steam may be too strong; nor, too far off, as the larger volume of steam wets the wings."

Mr. C. G. Barrett, at the request of Mr. A. Wyndam Peach, records (*E.M.M.*, February) the occurrence of another specimen of *Xanthia ocellaris* which was taken by Mr. F. Cannon near Wimbledon in October last. [I have twice examined the specimen with care, and am decidedly of opinion that it is only an ordinary variety of *X. gilvago*. J. W. Tutt.] We hear from Mr. W. H. B. Fletcher of another capture of the Simon Pure near Bognor.

Mr. Harrison G. Dyar reviews, in *The Canadian Entomologist* for February, a paper in *Proc. Zool. Soc. Lond.* for 1892, in which "Mr. W. Schaus describes as new, 180 species of 'Bombycid' moths from Mexico and various parts of South America, with three 'new genera.'" Mr. Dyar contends that the generic descriptions are utterly inadequate, and thinks that "the question should be raised seriously whether names founded on such descriptions should be recognised. . . . Surely it is time to call a halt. Some standard of generic description must be adopted, or else what is the use of multiplicating so-called 'descriptions' that do not describe. Better to save puzzling over meaningless sentences and simply say: 'new genus, type in my collection.'"

The President and Council of the Royal Society invited the Fellows of the Entomological Society to attend, on February 28th, a meeting of the former Society, when the subject of "Variation in Animals and Plants" was discussed. Prof. Weldon, Prof. Thistledon Dyer, Prof. Lankester, the French savant, Mons. Agassiz, Mr. Bateson, &c., took part in the discussion.

SOCIETIES.

The annual meeting of the South London Entomological and Natural History Society was held on Jan. 24th, 1895. Mr. T. W. Hall, F.E.S., was elected President for the year, Mr. Stanley Edwards, F.L.S., F.E.S., of Kidbrook Lodge, Blackheath, Hon. Corresponding Secretary, and Mr. Hy. J. Turner, F.E.S., of 13, Drakefell Road, Hatcham, S.E., Hon. Reporting Secretary.———At the meeting on Feb. 14th, Mr. C. A. Briggs exhibited (on behalf of Mr. Carrington) the fruit of *Euonymus japonica* from Ventnor, which locality was stated to be the extreme northern limit of growth of this shrub. Mr. Peach: a specimen, said to be *Xanthia ocellaris*, from Wimbledon. All those present considered the specimen to be merely a var. of *X. gilvago*. Mr. Adkin, in exhibiting vars. of *Vanessa urticae* from Sutherland and Ireland, called attention to their similarity to the Japanese form called *V. connexa*, Bute. Mr. Williams: a series of *Euchloë cardamines*, with forms which seemed referable to the newly-named *E. alberti*.

The North London Natural History Society paid a visit on Feb. 9th to the Horniman Museum, Forest Hill. A fine collection of exotic insects of all orders and a small but almost complete collection of British Lepidoptera were found in the long gallery. The collection of butterflies of the genus *Ornithoptera* from Polynesia is very fine, several of the specimens being unique, others very rare. A case on the tables contains a few examples of mimicry and protective coloration among insects.

On Jan. 14th, 1895, Dr. F. A. Dixey of Oxford, delivered a lecture to the members of the Birmingham Entomological Society on "The growth of mimetic patterns in butterflies." He first of all showed, with the aid of lantern slides, what he believed to be the line of the development of the *Pieridae* from an original uniformly neutral-tinted ancestor; then, with the aid of diagrams, Dr. Dixey indicated the probable process of change from a typical Pierid to one closely mimicking a *Heliconius*, and dealt with many of the difficulties surrounding the theory of mimicry, suggesting some probable explanations.——The annual meeting was held on Feb. 4th, 1895. Mr. G. H. Kenrick was re-elected President, and Mr. C. J. Wainwright, 147, Hall Road, Handsworth, Secretary. Mr. P. W. Abbott exhibited a bred specimen of *Vanessa polychloros*, which was unusually pale, the border very pale, and which had several unusual pale blotches on the disc.

At the Lancashire and Cheshire Entomological Society, on Feb. 11th, Dr. H. H. Corbett of Doncaster, made some "Remarks on some varieties of *Noctuina* from Doncaster," and exhibited illustrative specimens, conspicuous among which were a fine series of melanic *Calocampa exoleta*, and a fine variety of *Asphalia flavicornis* with the dark transverse lines very strongly marked. Mr. Mason exhibited a striking var. of *Agrotis agathina*, in which the ground-colour was rosy. Mr. H. Bickerton Jones has joined Mr. Pierce as Secretary.

City of London Entomological and Natural History Society, —*Jan. 15th*, 1895.—Exhibits:—Mr. Oldham: *Eupithecia subfulvata* from Epping Forrest, *Polia chi* from N. Wales, and dark *Cidaria russata* from Wisbech. Mr. Southey: varieties of *Arctia caia*; one having much brown on the fore-wings and yellow hind-wings, and two having the fore-wings almost entirely brown. Mr. Bacot: a young alligator from the Mississippi, which had lately died in captivity; it was about a foot long. He asked whether anyone could tell him if what he had heard was true, namely, that alligators in captivity will only grow to a certain size if kept in a small pond, but if removed to a larger one they proceed to grow again up to a limit and then stop again, repeating the process if repeatedly removed to larger ponds, presumably, till full-grown. Mr. Clark drew attention to the flap-arrangement in the mouth of the specimen exhibited, which could, at the will of the reptile, be shut over the entrance to the throat, thus effectually preventing the ingress of water when the creature had a large animal in its jaws. Mr. May: *Xylophasia monoglypha* from Tooting Bec Common, two of them taken last year being somewhat unusually dark; he also showed a moderately dark Scotch specimen for comparison.

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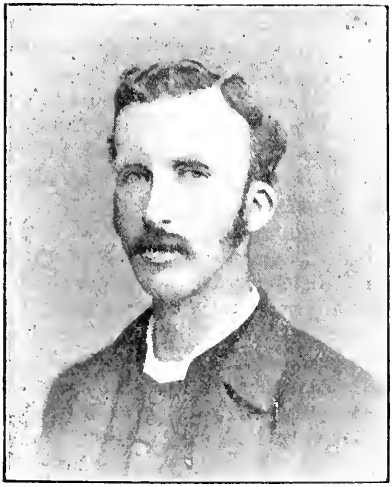
IRIS.

By Rev. G. M. A. HEWETT, M.A.



I am one of the fortunate men to whom the heading, which I have just written, not merely suggests entrancing visions of what might be, but calls up actual memories. Fortunate, surely I may say, for though the splendid insect, which takes its fair name from the goddess of the rainbow, is no great prize, compared with many a meaner and less showy specimen, yet I am inclined to fancy that most of us are boys enough to look with more complacency on its purple splendour than on one of those dull little *Caradrinidae*, which is really so much greater a prize. I know one gentleman, at any rate, who, at a very early date in our entomological acquaintance, wrote to me 'I do like pretty insects.' I wonder if his tastes have since been corrupted and made severer by his own successes with regard to those same dull little *Caradrinidae*. But though I have the luck to live within reach of *Iris*, yet I must at once make the somewhat humilating confession that I have never taken his Majesty or her Majesty in a net. I hope that this confession will lessen the jealousy of less happily situated mortals. I will even go farther, and say that I have never even seen him near enough to swear to his identity. I have seen large butterflies round the oak-tops at Lyndhurst, but what of that? We have all seen large butterflies round the tops of trees, and murmured quietly 'Look at those Fritillaries.' However, the confession pains me. I hope no one will quote my own words against me in parallel columns. I am not a great statesman, but I do like insects which I have caught on the wing, and had some difficulty, too, in catching. I would go a long way to make sure of netting *Iris*. But, though I would go a long way, yet I cannot screw up my courage to carry about high meat or a 30-foot net. The former makes one so very unpopular in a railway carriage, and the latter so very ridiculous. An ordinary net is bad enough. I shrink from unpopularity and ridicule.

But though I have to confess with sorrow that I have never taken on the wing the King of British butterflies, I can at any rate boast of having a fair series of my own getting, gotten, too, with quite as much pains and trouble (though with less unpopularity I hope) as if I had sallied forth with a dead cat in my pocket and a net on the top of a large pole, to be the terror of my neighbours and the delight of small boys.

Let no one think it a light matter to breed *Iris*. First and foremost, in my case at any rate, there is the anxiety. I have bred what I suppose are rarer insects, but never have I felt care for my precious larvæ sitting so near my heart, as when I have had two or three of these splendid larvæ feeding up. Three, four, or even five times have I changed their food during the day, and in the night my sleep has been broken by visions of monstrous earwigs scaling the walls of the pot, patiently gnawing their way through the covering, and finally chewing with huge relentless jaws and fiendish appetite, one after another, my precious infants. I have writhed in agony at the vision, and cried aloud to the monsters to spare my treasures.

But beyond these troubles of the imagination, which really are very imaginary as the larvæ are very healthy and hardy, there is the much more serious difficulty of getting the beasts. Even in an *Iris* country, they are not to be found on every sallow bush, and much patient work has to be done with the beating tray. One every two hours is a fair allowance. Of course, if one comes in the first half hour or so, the heart is emboldened to go on; but after an hour and fifty minutes it is rather difficult to toil through those remaining ten. Nor is there very much else to pick up meanwhile—a few *Poecilocampa populi*, possibly half-a-dozen *Trichiura crataegi*, though this is rather a large allowance. No great bag at the best. But when at last the little green slug is seen on the tray, feeling about with its horns to discover what strange place it has landed in after its unexpected fall, then one remembers no more the hours of hard work, but sits down contemplatively, lights another pipe, possibly even sips a wee drap to the health of the treasure, and seeks out the best and cleanest pill-box, which is carefully perforated and filled with the best of sallow leaves. Who would care to pick up the infant in his fingers, at the risk of squeezing him unduly? Nay, choose with care a clean sallow leaf and let him crawl on to it ever so slowly; then lay him with trembling fingers in the box, to be anxiously looked at at intervals during the rest of the day. Often have I felt inclined to rush for the nearest train and take him home at once, knowing full well that if any box is to be lost or crushed, this is the one which an unkind fate has her evil eye upon.

I once took five in a day—others have done better. I can tell you now where each one was. I began my day about eleven in the morning by a little sulky pond, with a water-hen's nest on a branch which touched the water. I can see the nest and eggs now. After beating round the pond on the outside without result, I determined to reach to the inside branches. My foot slipped as I tried the first, and I was wet to the knee, with a bootful of mud. Being so situated, I utilised the position and beat lustily, with the reward of number one. Of course I at once peopled every branch in imagination with dozens. But though I wet both legs and spoiled my boots, and nearly spoiled my temper, I got no more. It was lucky that I got one, or I might have given up. Number two came in about an hour, out of a little, stunted, shabby-looking sallow in a pine ride, which I was tempted to pass by, as unworthy of the effort of beating. So far I was doing well. Then came a terrible blank of over two hours. So I sat down and rested and refreshed my interior machinery. I had finished the best of my country, full of splendid sallows, so there was nothing to do but to beat gradually homewards. After an hour of fruitless labour I came across the ideal sallow, standing alone in an opening among a grand group of oaks. How many someone else had got out of it, I shall never know. It had been well beaten. I tried it over again with no result, until I spied a little branch in the middle, apparently untouched. I got a corner of the tray under it, shortened my stick, and with some difficulty gave it a vigorous tap. The tray would not come out, and I could hardly see into it. At last I worked it carefully out, and oh joy! there were two little pairs of horns anxiously working from side to side. I will draw a veil over my unseemly joy. Only let me point the moral, 'Always beat little inside branches.' I did not care much what happened now, and beat carelessly homewards; but my luck held, and I got one more out of a small sallow right in among some pines.

So much for what was to me an eventful day: and why should I relate the duller days when I have got only one or none. Let ill memories rest. Only let me exhort any who have the chance, to take their trays in May and work the sallows, whether they be standing high and dry, or in the middle of a marsh. *Iris* wanders very far from its unapproachable haunts among the oaks in search of sallows, and you never know on what stunted little bush may be feeding the horned head, which is so dear a prize, if not to all, yet at any rate to G. M. A. HEWETT.

Notes on Butterfly Pupæ, with some remarks on the Phylogenesis of the Rhopalocera.

By T. A. CHAPMAN, M.D., F.E.S.

(*Concluded from page* 130).

Scudder notes that, among other things, the primeval butterfly hybernated as a pupa. If this be true, then the line separating butterflies from moths must be drawn between the Papilionids and the Hesperids; for only a few, and those of the higher, *Hesperidae*, hibernate as pupæ; the Papilionids and all above them are butterflies, the rest are moths. It is, perhaps, well to assert this in this dogmatic fashion, as it affords an opportunity of referring to the many moth-characters present in the Skippers—characters not of the MACRO-HETEROCERA, but of the "Micros." Of course, the whole matter is only one of words. Butterflies, at and above the Papilionids, are butterflies; *Sesia*, *Cossus* and *Hepialus*, are moths; the Skippers are intermediate, but are so much closer to the butterflies, that it is more correct to call them butterflies than moths. Still, one may choose to draw the line above them; but whoever does so, does not alter the fact, that on the one hand they are much closer to butterflies than are any unquestionable moths, and on the other hand that they possess micro moth-characters that butterflies have no trace of.

Of these, perhaps the most remarkable affect the larval prolegs. In true butterflies, these have the same structure as in the MACRO-HETEROCERA, although no doubt this has been quite independently acquired. The row of hooks exists only along the inner margin of the originally circular pad, and its derivation from a complete circle or crown of hooks is much more frequently recorded here, by means of its persistence in the earlier stages of larval growth, than is the case among the MACRO-HETEROCERA. In the Skippers, the circle of hooks usually remains in the adult larvæ as in the MICRO-HETEROCERA. In a few species (*C. palaemon* for example) there is a simple circle, or rather an oval, with a gap at the inner side, a condition almost identical with that found in *Sesia*; but in many of the species (or chiefly among the *Pamphilidi?*) there is a complete circle, repeated in three rows, the outer row having the smallest hooks; this latter form is met with elsewhere only in *Hepialus*, and is, therefore, a very archaic form of pro-leg.

In the pupa there is one "Micro" character to which I find that Scudder calls attention, though he does not appear to be aware of its significance—the persistence of the dorsal head-plate (cephalo-thoracic piece). In addition to this feature, the pupa presents several others that point to its still strong affinities with the MICRO-HETEROCERA. I have only possessed a few Hesperid pupæ, and those which I have examined from other collections had of course to be respected, so that I am still in some doubt upon some of the points connected therewith.

I think it is the case, that the species belonging to Scudder's tribe *Pamphilidi*, which includes our *sylvanus*, *linea*, &c., possess in a more marked degree the features of the Micros than do those belonging to his *Hesperidi*. I will, however, only say that some, and I think probably a majority of, species present most of the "Micro" characters which I am about to enumerate. I need merely refer to such well-known characters as the making of a cocoon, and hybernation as a full or nearly full-grown larva; both of these are distinctly moth characters, and the latter is a "Micro" habit and does not, I think, occur in any true butterfly. The possession by the pupa of a dorsal head-plate, as noted by Scudder, is also a "Micro" character, and is associated with a still more notable one which appears to have escaped his attention—the separation of the eye-plates (which are dorsal), on dehiscence, from the ventral head parts, and their continued attachment to the dorsal head-plate. Another most remarkable "Micro" character, for which I was not at all prepared, is the persistence in the pupæ of some species of the terminal joints of the maxillary palpus as a minute "eye-collar." This, and the following, however, do not occur in any species of which I have had specimens in my own possession, and I therefore mention them with reserve.

Another character is the persistence of the 7th abdominal segment as a free one in the male pupa: this appears to be the case in some species of *Pamphilidi*, but I do not like to be too positive, as one cannot be quite sure on the point with an empty case, unless one is at liberty to dissect and mount it. It is at least certain that the incision appears so open after dehiscence, that if not actually movable, it can only recently have lost its mobility.

These Micro-characters, together with the larval prolegs pointing to *Hepialus* as a possible ancestor, lead one to ask whether there may be any intermediate forms that mark the steps by the way. *Hepialus* is now often instanced as a very archaic form, even as the possible ancestor of everything; *Hepialus* is, however, a terminal form; that is, it is at the end of its line of evolution and has no descendants. This is tolerably clear from its minute antennæ, but especially from the circumstance, remarkable in so early a form (indeed it is the only instance amongst unquestionable "Micros"), that the male pupa has the 7th segment fixed.

The real ancestor that is intended, when *Hepialus* is referred to, is the common ancestor of *Hepialus*, *Cossus*, &c. *Hepialus* retains sundry archaic features of this common ancestor more persistently than *Cossus*, &c. Although it is a little outside the scope of this paper, yet it is of interest to note that these earliest forms had great variability in respect of antennæ. We find plumose, or at least strongly pectinated, antennæ in some of the earlier Cossids; minute antennæ in *Hepialus*; very long ones in *Adela*. The latter is a good instance of a similar development separately attained; certain Trichoptera have very similar antennæ, and we find the connecting link in *Micropteryx* which has ordinary antennæ, but at the same time possesses the pupal jaws of the Trichoptera and the ovipositing knives of *Adela*.

Now it was somewhere here, amongst these forms with variable antennæ, that the first trace of butterflies with their clubbed antennæ appeared, and some little distance along the road there branched off, as a record thereof, the *Sesiidae*. These latter are unmistakeably "Micros," not, indeed, very far removed from *Hepialus* and *Cossus*, but they have fairly clubbed antennæ. Some considerable distance further on we have *Castnia*, its larva still an internal feeder, and its pupa * still of a *Cossus*-like "Micro" character, but its imagines so very Hesperid-like that they have by some authorities been placed with the butterflies. There are other families that are possibly appendages of this line of evolution, but I know so little about them, and especially about their pupæ, that it is prudent to say nothing further about them at present. Clubbed antennæ are found in SPHINGES and in *Zygaena*; in both cases they appear to have been acquired independently of the butterfly stirps, and of each other. This circumstance seems to lend additional force to the idea that clubbed antennæ are in some way specially useful to diurnal species.

To sum up the points in this paper. My chief aim has been to call attention to the study of pupæ, and especially those of butterflies from a broader and more general point of view, and to bring to bear on them the general principles of pupal evolution that were suggested by my study of the HETEROCERA. The special facts brought out concerning butterfly pupæ are to be taken as largely preliminary and tentative, but it is to be noticed that broadly, and even in some detail, the relationship of the different families to each other suggested, agrees with the ordinary classification. The greatest change of views which appears to be demanded is in relation to the position of the Lycænids, which should no longer be regarded as in any way inter-

* I am sorry that I have to depend on figures for my knowledge of these.

mediate between the Papilionids and Nymphalids. Rather should the *Lemoniidae* and *Lycaenidae* be regarded as a branch which developed from the primeval butterfly (above the Hesperids) in one direction, whilst the Papilionids arose and branched to the Pierids and Nymphalids quite independently.† Another point is that the Pierid separated from the Papilionid at a very early stage of the evolution of the latter, and that the Nymphalid almost immediately thereafter separated from the Pierid, at a time, that is, when each yet retained (as many genera do still) both the 5th and 6th abdominal segments free, and before the Pierid had definitely acquired a single instead of a double nose-horn.

Though, as a matter of fact, the families of true butterflies arose in the order indicated, yet, from our present position in time, we might almost regard them as having arisen simultaneously; each was already separate and distinct, before any of them had made any advance towards the higher sub-families, tribes and genera which are now most characteristic of them.

The primeval butterfly attained by a separate route almost the same pupal structure as the Macro-Heterocera, and gave origin to all the separate families without any substantial change of that structure; but in each family the higher tribes have attained a special and more advanced pupal form, in this respect contrasting with the fixedness of form in the pupa of the Macro-Heterocera and being more in accordance with the manner of evolution of the Micro-Tineina.

The numerous very definite Micro-Heterocerous characters of the Hesperids seem to furnish a clear indication of their derivation, and to enable us to accept the completely micro-characters of *Castnia* and *Sesia* as placing them on the line of butterfly evolution, and not as putting a gulf between them and butterflies. But especially they appear to prove the descent, either by this or by some other route, of the butterflies from the Micro-Heterocera, and to show that, except through the Micro-Heterocera, the butterflies are unrelated to the Macro-Heterocera, with which, however, they are structurally more parallel in many respects; *i.e.*, they are not only as highly, but very similarly differentiated, although quite independently.

It ought, perhaps, to be noted that the Hesperid proper underwent further evolution after the separation of the butterfly stirps.

I have endeavoured to make the relationships of the several forms of pupæ dealt with in this paper more definitely obvious, by using them in the table below as a basis for the general classification of the *Rhopalocera*.

Scheme of Classification of the Rhopalocera founded on the structure of the pupæ.

PAPILIONES.

? (Pupa a true "Micro" = CASTNIIDES).

1.—Pupa broadly a "Macro" but possessing some "Micro" characters = HESPERIDES.

† I do not wish this to be understood as denying that Papilio must nevertheless be taken as the nearest representative we have of the primary butterfly.

2.—Pupa possessing no "Micro" characters, except, sometimes, a waist or the opening of some incision on dehiscence
= **PAPILIONIDES.**

A.—Clothed with hairs, setæ or bristles; no spines; no intersegmental sub-segment; head beneath thorax; waist marked = LYCAENIDA.

a.—Second leg reaches eyes, separating first leg from antennæ = *LEMONIIDAE.*

1.—Hairs confined to tubercles; 5th and 6th abdominal segments both free (*Euselasia*) = *Erycininae.*

2.—(5th segment only free?).

3.—(One free incision?)

4.—Pupa solid; hairs on general surface = *Nemeobiinae.*

b.—First leg reaches antenna, separating second leg from eyes = *LYCAENIDAE.*

1, 2, 3, ?).

(4 ?).—Hairs on general surface; pupa solid = (*Lycaeninae*).

B.—Hairs very exceptional; spines are processes of pupa; intersegmental sub-segments always present, often marked; head in front; waist often lost = PAPILIONIDA.

a.—Segments (when free) with power of movement in all directions. = *PAPILIONIDAE.*

1.—Thorax not hollowed in front; 5th and 6th abdominal segments free = *Papilioninae.*

2.—Thorax hollowed in front = *Parnassiinae.*

α.—5th and 6th free = THAIDI.

1.—Girth as usual = Clytiini.

2.—Girth to nose-horn = Thaini.

3.—No suspension. = Sericinini.

β.—5th segment alone free. ?

γ.—1st incision alone free = LUEHDORFIIDI.

δ.—Pupa solid. = PARNASSIIDI.

b.—Segments (when free) with antero-posterior movement checked =[*PIERO-NYMPHALIDÆ*].

b1. —Girthed; single nose-spine. = *PIERIDAE.*

1.—5th and 6th segments free. = *Aporinae.*

2.—5th segment free. = *Pierinae.*

,, Pupa curved = *Rhodocerinae.*

3.—(4th incision free) ?

4.—Solid. = *Anthocarinae.*

b2. —Suspended; nose-spine double (except in 1) = *NYMPHALIDAE.*

1.—Nose-spine single. = *Libytheinae.*

2.—5th and 6th segments free. Nose-spines marked. = *Nymphalinae.*

Acraeidi.

Vanessidi.

Argynnidi.

			Heliconidi.
			Nymphalidi.
			Apaturidi.
3.–5th segment free	nose-spines rounded	*Satyrinae* (pars)	*Satyrus.*
			Epinephele.
4.–Incision 4-5 free		,, ,,	*Coenonympha.*
			Hipparchia.
5.–Pupa solid		α ,, ,,	*Melanargia.*
			? *Semele.*
		β	*Brassolinae.*
		γ	*Euplocinae.*

There are so many important genera of Nymphalids of which I know nothing, that I do not feel justified in going into more detail, nor in inventing names for the divisions that must unquestionably be made of the *Satyrinae*.

SCIENTIFIC NOTES & OBSERVATIONS.

Apterous Females and Winter Emergence.—With regard to Mr. Studd's interesting note (*ante*, p. 87), I believe that he is right in most, if not all, of his conclusions, and it is quite probable that it will turn out after all that there is no *direct* connection between cold and apterous conditions; as these investigations are somewhat out of my regular line, I will take to heart our Editor's words (p. 90) "it really is high time that off-hand opinions based on want of knowledge, should be excluded from our so-called scientific magazines," and will give in with a good grace. There is only just one little slip in Mr. Studd's note to which I would briefly call attention; on p. 88 he says, "it is difficult to resist the conclusion that at all events the *Hybernidae* and the *Cheimatobias* are descended from some common parent form," etc., and gives as his chief argument the unquestionably close relationship of *H. aurantiaria* and *H. marginaria*. Now there is no doubt that the genus *Hybernia* is at least a fairly natural one; but it is open to serious question whether either *Anisopteryx* or *Cheimatobia* really comes very near it. In Herrich-Schæffer's system, where the *Geometridae* are divided into two great classes, *Dendrometridae* and *Phytometridae*, according to neuration, *Hybernia* belongs to the former, the other two to the latter; in fact, *Cheimatobia* seems to be very close to *Oporabia*, which is but an autumnal division of the *Larentiidae*, associated by Lederer with his *cæsiata*-group of the genus *Cidaria*. At any rate, it is a curious coincidence that so many winter species which cannot possibly spring from a recent common ancestor should in common possess apterous females, and the matter is worthy of investigation.—Louis B. Prout, 12, Greenwood Road, Dalston, N.E. *Feb. 22nd*, 1895.

Parthenogenesis in Ocneria dispar.—While the subject of parthenogenesis in Lepidoptera is to the fore, through Mr. Tutt's carefully collected notices (*Ent. Record*, v., p. 289; vi., p. 4), I venture to send one supplementary reference which has come under my notice. In the *Archives Néerlandaises*, v., 1870, pp. 258-264, H. Weijenbergh, jr., contributes "Quelques Observations de parthenogenèse chez les Lepidoptères," in which, besides citing the records of this phenomenon which he had met with, he recounts in detail some experiments of his own with *Ocneria* *dispar* (*c.f.*, W. S. Pearce, in *Entom. Rec.*, vol. vi., p. 7). I will merely quote Weijenbergh's "en résumé" (*l.c.*, p. 261):—"Fertile eggs of autumn 1866, hatched in April 1867, imagines, August, 1867; from these, without fecundation, eggs hatched in April 1868, imagines, August 1868; from these, without fecundation, eggs hatched in April, 1869, imagines, in August, 1869; from these, without fecundation, eggs *not* hatched in spring of 1870, but dried up."—Louis B. Prout, 12, Greenwood Road, Dalston, N.E. *Feb. 22nd*, 1895.

Errata.—Page 80, line 20 from bottom, for "generic that have titles" read "generic titles that have." P. 81, line 24 from top of page, for "1851" read "1867."

CURRENT NOTES.

The structural affinities of the *Sphingidae* are discussed by Mr. Harrison G. Dyar in his very original classification of lepidopterous larvæ (*Ann. N. Y. Acad. Sci.*, vol. viii., p. 232); the result at which he arrives is that they are probably to be regarded as nearest the *Notodontidae* and *Lasiocampidae.* The apparent structure of the embryonic larva of *Deilephila euphorbiae*, figured by Weismann, would determine this relationship. In the highly specialized larvæ the only trace of the normal tubercles left is the "caudal horn," an unpaired dorsal process on the 8th abdominal segment. Mr. Dyar concludes from the study of the larvæ in later stages of growth that the view that this horn represents the consolidated tubercle i of the *Saturnina* has no more to support it than the other view that the horn represents the base of the unconsolidated pair of tubercles i, the tubercles themselves having disappeared. The tendency to the formation of this latter structure is referred to by Mr. Dyar in the case of the *Notodontidae* and *Lasiocampidae.* According to Grote the line of development within the Family itself has for its generalized or central form the Smerinthoid. From this type the *Choerocampinae* and *Macroglossinae* have deviated in the direction of a specialization of the imago by a narrowing of the wings, a strengthening of the costa of the fore-wings, a reduction of the hind-wings, and an increase in the relative size of the prothorax and mesothorax. In the lower genera of the *Choerocampinae*, as for instance *Amblyx*, the wing-proportion of the *Smerinthinae* is carried over, no less than the soft brown colour, and, in the case of *A. sexoculatus*, Grote, from Brazil, the ocellated hind-wings. While these three groups stand in a nearer ascending relation, the typical *Sphinginae* have probably a different line of development, standing nearer to the *Acherontiinae*, the latter group appearing now somewhat independent. A study of the embryonic larvæ in all the genera would apparently be of the greatest value in throwing light upon the development of this Family. The *Sesiidae* (=*Aegeriidae*) are now generally referred to the Microlepidoptera.

The homology of the elytra of the *Coleoptera* with the *tegulae* of the *Hymenoptera* and with the *patagia* of the *Lepidoptera*, first demonstrated by F. Meinert (*Ent. Tidsk.*, 1880, p, 168) has been again brought forward recently by Prof. J. H. Comstock. Meinert pointed out the fact that in many *Coleoptera* (*e.g.*, *Dytiscus*) rudiments of the front wings exist beneath the elytra. In the *Diptera* the front pair of wings is developed for flight and the hind pair aborted. The converse has taken place in the *Coleoptera*. The petagic position of the elytra is retained during flight in the *Cetonidae*, the true wings being unfolded and thrust forwards and downwards from beneath the closed elytra. A study of the families with abbreviated elytra will more clearly demonstrate the steps in the development of the petagic processes; while Hoffbauer shows conclusively that the structure of the elytra resembles that of the pronotum and differs in every essential feature from that of the wings. It will thus be inexact to call the elytra of the Shard-borne beetle the "front pair of wings."

We have before pointed out that various American species so-called, are nothing but our common *Tephrosia crepuscularia*. Dr. Hulst writes (*Ent. News*, Feb., p. 41):—"*Tephrosia occiduaria*, Gn., i., 266; *Boarmia signaria*, Wlk., 346; *Tephrosia spatiosaria*, Wlk., 403; *Boarmia intrataria*, Wlk., 403, and *Tephrosia abraxaria*, Wlk., 403, are the same as *Boarmia crepuscularia*; *abraxaria* is quite a distinct variety, and has been described by me as *fernaldaria*. *Boarmia cineraria*, Wlk., 488, is another synonym." This is not bad even for Walker. Here is another reference (*l.c.*, p. 43):—"*Cidaria ? frigidata*, Wlk., 1729; *Larentia ? renunciata*, Wlk., 1187, and *Ypsipetes pluviata*, Gn., ii., 378, are synonyms of *trifasciata*. Mr. Moffatt tells me *Cleora divisaria*, Wlk., 489, is the same species." On the same page we read "*Petrophora truncata* var. *thingvallata*, described, I think, by Stephens†, is the insect afterwards described by me as *Cleora atrifasciata*. The Museum specimens are very much smaller than mine, expanding scarcely one-half as much." Again, we read "*Larentia cervinifascia*, Wlk., 1184, is a variety of *populata*. It is very close in appearance to the variety *comma-notata*, Haw.* *Cidaria remotata*, Wlk., 1388; *C. molliculata*, Wlk., 1390; *C. propulsata*, Wlk., 1389, and *Pelurga similis*, Wlk., 1425, are all forms of the same species, the American *populata*, called by Prof. Lintner *packardata*. The variations are very wide, but are all shown in the set of *populata* in the British Museum." We would ask Dr. Hulst whether the "American *populata*" is "*populata*, L." European entomologists will scarcely understand the former term, the latter is intelligible. We should suppose that there are some other interesting items in the paper but, as our readers will observe, the American nomenclature (especially the generic) is so different from our own, that we must confess to an inability to understand many of Dr. Hulst's remarks. British entomologists interred Walker's British Museum entomology with his bones. Some American entomologists appear to delight in the gruesome business of resurrecting and re-interring it.

Mr. Auld gives (*E.M.M.*, March) a detailed account of how to get larvæ of *Phorodesma smaragdaria*. His directions are: Fenchurch Street for Southend line to Benfleet Station, then work right along the coast to St. Osyth; examine closely every patch of *Artemisia maritima*; caterpillar is a "fluffy-looking, spider-like creature" clinging to the twigs. Clothing itself as it does with little pieces of its food-plant, it is very difficult to detect.

A description of the larva of *Tephrosia extersaria*, of which there are two distinct types as regards coloration—pale pea-green and purplish-brown—is given by Mr. G. T. Porritt (*E.M.M.*, March, p. 67).

* The *comma-notata*, Haw., is a variety of *Cidaria truncata* (*russata*), a very different-looking species from *C. populata*.—Ed.

† We would refer Dr. Hulst to Staudinger's *Catalog der Lep.*, etc. (1871), p. 183. This book should be in the hands of every synonymist. A wild guess like this only makes confusion worse confounded.—Ed.

Mr. C. G. Barrett quotes (*E.M.M.*, March, p. 60) a letter written by the late Jenner Weir to Mr. McRae, which throws some interesting light on the method of pairing among the *Psychidae*. Mr. Weir found that, in the case of *Psyche villosella*, the female, as a rule, did not leave the case, but was fertilized by a male while still in the case. He further noticed "that no male paid any attention to those females which I had helped out of the cases." Mr. Weir thus describes the process of pairing, as he witnessed it: "The male always, when emerging, leaves the pupa-skin nearly two-thirds projecting from the larval case; the female, on the contrary, leaves the unbroken abdominal portion of the pupa-skin at the bottom of the case; she partly emerges and clears the emergent end, thus enabling the male to obtain access to the case; he inserts his extensile body as far into the case as the wings will permit, so that I have seen the wings become horizontal. Afterwards the female retreats to the bottom or proximal end of the case and deposits her eggs in a mass, apparently in the old skin."

Herr A. H. Fassl, Jun., of Teplitz, calls attention (*Insekten Börse*, Mar. 1st) to the fact that pupæ of *Vanessa urticae* which were found on stinging-nettle were invariably dead. Last summer, in a stone-quarry near Teplitz, he came across a large brood of larvæ, which he kept under observation until pupation had taken place. Most of the pupæ were attached to stinging-nettle, these were all adorned with beautiful gold spots, but all were dead. Close by, however, on the rocks, were found seven pupæ which were alive, and which yielded imagines later on. Herr Fassl suggests in explanation of this curious fact, that either the larvæ which are diseased do not quit the food-plant for pupation or else that the nettle has some adverse influence on the pupa. He inclines himself to the latter explanation, inasmuch as he has found living pupæ of *V. urticae* on the leaves and stems of hop. Dr. Standfuss, in commenting on the foregoing, admits that pupæ of this species found hanging on the nettle yield only a very small percentage of imagines; when the nettle is exposed to the sun for the greater part of the day the pupæ are golden all over, but when the plant grows in shadier places the pupæ found on it are of a more normal grey colour. A very large proportion are affected with parasites. Whereas healthy larvæ, reared under favourable conditions, have a tendency to energetic wandering, this tendency is wanting in diseased larvæ, and so the latter pupate close to or on the plant on which they have fed; they have energy enough to enter the pupal condition, but not sufficient for the development of the imago. Dr. Standfuss denies that the nettle exerts any lethal influence on the pupæ, inasmuch, as in the case of larvæ bred in captivity, a great many pupate on the nettle and yield imagines. We quite agree with Dr. Standfuss.

In June, 1854, the late Mr. Birchall took a fine series of *Erebia epiphron* var. *cassiope* about half-way up Croagh Patrick on the Westport side "in a grassy hollow, where a little hut is erected for the shelter of pilgrims." From that time no specimens had been captured in Ireland until the summer of last year (1894), when, we learn from the *Irish Naturalist* for March, the Rev. R. A. McClean took a single specimen on the edge of a wood at Rockwood near Sligo, at a height of about 1,000 feet. This locality is about fifty miles from Croagh Patrick, Co. Mayo, so that the species probably has a wide distribution among the mountains of Western Ireland.

In *The Naturalist* (March, 1895) the Rev. C. D. Ash, B.A., gives an account of "The Lepidoptera at Skipwith in 1894." The bad season hardly appears to have reached Skipwith. It must have been one of the few oases that cropped up here and there amid the general desert of failure. 219 species of Macros and 127 Micros are recorded as the result of the year's work. The most noticeable records, perhaps, were the great abundance of *Choerocampa porcellus* at rhododendron flowers, and of *Noctua umbrosa* at sugar in August; *Notodonta dictaeoides* and *Acronycta leporina* were taken in the larval stage. *Anarta myrtilli* was captured on April 21st and throughout May and June; a second brood commencing to emerge on July 14th.

In *The Entomologist* for March, Mr. W. F. de V. Kane, evidently guided by the remarks in *The British Noctuae*, &c., vol. i., p. 47, records the pale form of *Chortodes arcuosa* under the name of *morrisii*. The information obtained from Mr. Dale and quoted there was corrected in *The British Noctuae*, &c., vol. iv., pp. 99-101, where it is pointed out that *morrisii* is undoubtedly the prior name of *C. bondii*, and a full account of the occurrence of this species in the neighbourhood of Charmouth is given.

We are in receipt of a little booklet from Mons. Enzio Reuter, Helsingfors, on the destructiveness of certain insects during the last few years to various cultivated crops. The most interesting articles to lepidopterists are those on *Charaeas graminis*, *Hadena secalis*, *Apamea basilinea*, and *Tortrix paleana*, the last of which has recently increased sufficiently to make it a pest, injuring more especially *Phleum pratense*. Insects of other orders are also fully dealt with both as to ravages committed and remedies suggested.

Mr. G. T. Porritt notes (*The Naturalist*, March) *Fidonia pinetaria*, which was captured in Raincliff Wood, near Scarborough, by Mr. A. H. Barker last year, as a good and interesting addition to the list of Yorkshire Lepidoptera.

Mr. N. M. Richardson (*E.M.M.*, March, p. 61) adds *Tinea vinculella*, H.-S., an insect which in colour and size somewhat resembles *T. argentimaculella*, to the British fauna, from specimens bred from larvæ captured at Portland. It differs from *T. argentimaculella* as follows: "The wings are acutely pointed in *vinculella*, but bluntly in *argentimaculella*, this being most striking in the hind-wings, as it is rather hidden in the fore-wings by the dense cilia. The markings in *vinculella* are broader and not so silvery, and the minute apical silvery spots of *argentimaculella* are absent; the markings also differ in shape in the two species." The larva of *vinculella* makes a case out of lichen and particles of stone, which lies quite close to the lichen-covered rock. The larva of *argentimaculella* makes no case.

The veteran Mr. J. W. Douglas, F.E.S., differentiates (*E.M.M.*, March, p. 68) *Aleurodes proletella*, L., from *A. brassicae*, Walk., by means of the characters of their respective larvae, and establishes the fact that *A. proletella* is indigenous, having been taken at Coddenham in Suffolk. *A. proletella* feeds on celandine (*Chelidonium majus*), *A. brassicae* on plants of the cabbage tribe.

In view of the great increase in entomological literature, Mr. A. R. Grote proposes that the following points should alone be considered in the compilation of the bibliography for monographic papers and catalogues: 1. The original citation for the species. 2. All trivial synonyms (these latter to fall away entirely in course of time when ascertained beyond any cavil). 3. The reference for the combined term which is most necessary in all revisional work and which should only be missed where the combined term is original. 4. A reference in Catalogues to a figure and, where more than one is extant, the citation of a standard work for this purpose. All other references should fall away and no references should be made to the Government Reports of economic entomologists. New names should not be proposed in such Reports as not securing adequate publication.

Mons. J. Künckel d'Herculais describes (*Comptes Rendus*, cxix., pp. 244-247) the means by which the *Acridiidae* bury the abdomen in the ground for the purpose of oviposition. There is no perforation of the ground, the hinder part of the body is merely forced into it; as the Arabs say the female "plantent." On dissecting females whose abdomina had reached the maximum of distension, the author was surprised to find that the abdomen was filled with air: on the air being withdrawn the abdomen was reduced from 8 to 5 cm. in length. When the position is firmly taken up, the females of the migratory locust maintain the parts of their genital armour as widely separated as possible and secrete a viscous material which agglutinates the grains of sand or the particles of earth at the bottom of the cavity: they then begin to lay their eggs. These and the viscous material are emitted simultaneously, but the latter is peripheral and so consolidates the walls of the cavity, which has the curved form of the abdomen. When the eggs are laid the viscous material continues to be shed, and on drying forms a stopper which protects the cavity.

The *Siphonaptera* is a new order of insects, the embryology and history of which Dr. Packard, of Boston (U.S.A.), has just completed the investigation of in an elaborate memoir of forty-three pages. This new order he regards as standing nearer the *Diptera* or two-winged flies than any other, but with many points of relationship to the beetles. The species are, unfortunately, too well known. For the new order to which the industrious Boston zoologist has devoted so many studious hours is composed of the ancient fleas!—*Daily Chronicle*, March 6th, 1895.

PRACTICAL HINTS.

A HINT FOR BREEDERS OF HAWK MOTHS.—Having had several larvæ of *Acherontia atropos* and other Hawk moths brought to me during the past season in an advanced stage of growth, I successfully tried the following plan to enable them to accomplish their transformation to pupæ. I took a large flower-pot and put into it the usual crocks for drainage, and upon these not less than an inch of moist earth. On this I placed the larva, and then inverted a smaller pot (or the upper half of one) over it, so as to enclose it in a chamber at least as large as the original cocoon would be. I then filled up the large pot with moist earth, taking care that this should entirely cover what I may call the artificial cocoon, and left it so for at least three weeks. In every case in which I have tried this plan, I have succeeded not only in getting a perfect pupa but, so far as the *A. atropos* are concerned, a perfect imago as well. The imagines of the other species have of course not yet emerged. Similar larvæ covered with damp moss or earth failed completely. I may add that the same treatment was successful in the case of larvæ inadvertently disturbed in the breeding pots. Possibly this plan has already been adopted by some but, as it is new to me, it may also be new to others.—D. EDGELL, 5, Albert Road, Bognor. *Feb.* 17*th*, 1895.

ON BREEDING CHARICLEA UMBRA.—I have on several occasions taken by the roadside, in the course of a few hours, from eighty to three hundred larvæ of this species, off rest-harrow. Of eighty that I brought home one day, only forty were to be counted on the following day, and I found that I could not supply them with full rations of their favourite food—the young seeds of rest-harrow. Solitary confinement of the few survivors with foliage, blossom and seeds of rest-harrow, was successful. On another occasion I brought home about three hundred from Tuddenham, and supplied them with scarlet-runner beans in the green pods, which I suspended amongst rest-harrow from the tops of the jars. The larvæ fully appreciated the beans as well as the pods, and I was able to rear six to eight or more in each jar, without any instance of cannibalism, except in one or two jars that were too crowded. The moths emerged well the following season, and I do not remember a single cripple. Green pods of peas were also eaten, but scarlet-runners were preferred.—F. NORGATE, Bury St. Edmunds. *Feb.* 1895.

NOTES ON COLLECTING, Etc.

STRANGE BEHAVIOUR OF A LARVA OF DICRANURA VINULA.—I had a number of larvæ of this species in an ordinary breeding-cage. One of them, when almost full-fed, descended to the bottom of the cage, and began to walk slowly round and round in a small circle. This it continued to do for three weeks, and during the whole of that time I never observed it to cease from its restless crawl, nor to deviate from the small circle that it had selected. It refused to touch any food, although I continually placed fresh leaves in its path. Beyond the darkening in colour that habitually precedes pupation, it suffered no external change. At the end of the three weeks it again crawled on to its food, fed for a day or so and then spun up—the perfect insect emerging in due course. Is this long period of restless movement without food an unprecedented occurrence?—A. R. HAYWARD, Wellington College, Wokingham. *Feb.* 16*th*, 1895.

A HUNT FOR PHORODESMA SMARAGDARIA.—I have just read Mr. Auld's article under the above heading in the *E.M.M.* for March, and am simply amazed to think that, in these matter of fact times, a veritable Rip van Winkle should arise in our midst to tell us, as something new, this old story which we all knew so well. Do we live in such very fast times that the discovery of this particular larva about eight years ago, when its whole history was made known, has already become ancient history and the true facts lost in the dim though not distant past? How else can we explain the fact that we are treated to this mythical and not very elevating anecdote of the "beetle-catcher and his friend," which has been entirely evolved from the imagination of the narrator. The memory of my late friend Mr. Machin alone induces me to notice Mr. Auld's absurd statement, and to inform him that the correct account of the matter is to be found in *The Entomologist*, vol. xvii., p. 235, and in *Trans. Ent. Soc. Lond.*, October, 1886. If he reads these carefully, he will come to the conclusion that his disparaging "story" (as he calls it) of one of our best practical field-entomologists (only recently passed away from us) is at the present time particularly ill-chosen and shows, to say the least of it, very bad taste.—Geo. Elisha, 122, Shepherdess Walk, N. *March 1st*, 1895.

Notes from the Exchange Baskets.—*Does the male Cheimatobia brumata carry the female when in copulâ?*—Mr. Tutt writes on Jan. 28th:—"The note by Mr. Mason, *re Cheimatobia brumata* (*ante*, p. 92), is very interesting. I have repeatedly seen it asserted that female specimens of this species have been taken at lamps, but I have always doubted the assertions that the male carried the female there. There is no reason why the male should not do so, except that, so far as my experience goes, the female, if disturbed when *in copulâ*, either drags the male after her or they both fall to the ground."——Dr. Freer (Rugeley) writes on Jan. 30th:—"I can corroborate Mr. Mason's observations as to male *C. brumata* carrying females. On a tree-trunk the female will drag the male all over the place, but the male is able to carry a female quite ten yards, as I have found them both at my lamp which I place in an upper room."——Mr. Finlay (Morpeth) writes on Feb. 25th:—"As regards *C. brumata* flying *in cop.*, I should like to have the opinions of thoroughly practical collecting entomologists on the subject, as I have seen it repeatedly stated in horticultural journals, and newspapers, that the male *C. brumata* carries the female. In all my collecting experience I have *never* seen a pair of moths flying *in copulâ*, and I have taken hundreds of pairs in that condition; generally when a pair of moths *in cop.* are disturbed they fall to the ground and remain motionless for a time, or free themselves from each other."——Mr. Tutt writes on March 1st:—"The proof (?) that Dr. Freer advances *re* the male *C. brumata* carrying the female appears to me to be of much the same character as that on which the general assumption that this is really so has been based; that is, the male and female have been found on lamps, at lighted windows, &c., *in copulâ*, and it has at once been assumed that this distance from the ground has been reached by the male carrying the female there. The first notion is, of course, that they must have flown, but the assumption appears to me to be so directly contrary to our knowledge of the habits of the insect, that I want to hear some direct evidence—not mere statements as to the unlikely positions in which they have been found, but the evidence of entomologists who have observed the male in the act of flying to light whilst the female has been attached to him. We do not, of course, trouble ourselves about the habits of such common insects, with the result that when a simple question is asked which everyone thinks everyone else should know, no one knows anything whatever about it."

NOTICES AND REVIEWS.

Glimpses of American Entomology.—*The Twenty-fifth Annual Report of the Entomological Society of Ontario*, 1894. [Published by Warwick Bros. and Rutter, 68, and 70 Front Street West, Toronto]. Of all the entomological publications that come to us from America we must own that the modest little volumes published by this society interest us perhaps more than all others. Last year we gave a short review of one under the above title, and we feel as little inclined to pass this year's over with just a few words of praise. Captain Geddes, we see, gives an account of a remarkably late brood of *Vanessa antiopa* in the Bermudas. He found "the larvæ feeding on the yellow and partly faded leaves of a young elm tree, which they nearly stripped of its foliage; many of the larvæ fell to the ground with the falling leaves. The butterflies from this brood came out in the house on the the 6th and 7th of November." An account of *Pamphila metacomet* by Mr. Fletcher is exceedingly interesting. He describes it in all its stages, but I would specially call attention to the following extract:—"When ready to pupate the larva spins a close cocoon similar to that of *Acronicta oblinita*, the end of which is stopped up with a silvery-white, flakey powder which is emitted through the skin apparently, from two large white patches plainly visible just previous to pupation through the skin beneath segments 11 and 12 . . . The tongue case protrudes beyond the wing cases as in *Pamphila cernes*, &c." We have still much to learn about our Skipper butterflies; more, perhaps, than of any other group of butterflies. The presidential address by Mr. W. Hague Harrington, F.R.S.C., is an excellent resumé of the work of the Society for the last 25 years. We are reminded by the President that "the contributions dealing with lepidoptera probably equal in number and volume those relating to all the remaining groups. This, however, is not surprising, for to this Order belong the most beautiful examples of all terrestrial life; flowers of the air, their wings decked with all the hues that blossom or gem can show; as they wing their brilliant flight through the glad summer days, or hover radiantly over the fragrant blooms, they naturally appeal to every heart which is warmed by the least vestige of artistic or poetic grace." He has a word of warning, too, for the collector, against the amassing of large collections, since the latter so frequently engross the former's time that one "becomes merely an insect curator instead of an entomologist." In Mr. Lyman's paper, "Common names for Butterflies—shall we have them?" he states both sides of the question very fairly. In the course of his remarks he says, "It is all very well to say that it should be as easy to remember the scientific as the popular name, but it isn't:" and concludes as follows:—"If it be agreed that the adoption of popular names is on the whole desirable is it practicable? No doubt it is for a limited fauna like that of England or of New England, but is it for the whole of North America? Who will undertake to invent suitable popular names for the upwards of sixty species of *Argynnis*, the nearly forty species of *Melitaea*, the fifty species of *Thecla*, the equal number of species of *Lycaena*, or the upwards of ninety species now grouped under the generic name *Pamphila*?" A very practical question this; we quite agree with Mr. Lyman that the "idea appears to be utterly hopeless and impracticable;" we would also add—utterly unnecessary. An excellent paper by the Rev. C. J. S. Bethune on the "The Butterflies of the Eastern Provinces of Canada," with notes, localities, and woodcuts, is very interesting. *Coenonympha inornata*, of which we want to learn something in order to compare it with *C. typhon*, is dismissed as "a very rare butterfly taken at Massasanga Pt. (Macoun). Lake Winnipeg, Sault Ste. Marie, and in Newfoundland and Labrador." The Rev. T. W. Fyles gives us an interesting paper on

"Food, feeders and fed," but his knowledge of "English caterpillars" which are cannibals is rather mixed, for he states that "*Thyatyra derasa*, *Characlea delphinii* and *Cosmia trapezina* are well-known examples." *C. delphinii* is evidently better known as a British insect in America than it is in Britain. Mr. Stevenson gives an account of "An attack of *Ephestia interpunctella*" on some raisins imported from Smyrna by Liverpool and Montreal to London, Ontario. Of "Parasitism, the balance wheel of nature," Mr. F. M. Webster discourses this year. There is a very mild criticism of some very rash statements on the subject that we ourselves noticed last year in these pages, and we quite agree with Mr. Webster that no one, "be he ever so good an observer, can, within the space of one life-time, collect sufficient data upon which to base the statement that 'they (parasites) usually appear in force only after the damage is done.'" Mr. J. Alston Moffatt furnishes a paper on the re-appearance of *Pieris protodice* near London, Ontario, in October, 1894. This species, a close ally of *P. rapae*, has not been seen since 1872 (before then it had been abundant), the year when *P. rapae* was introduced into the district. Wherever the introduced *P. rapae* has spread, from there *P. protodice* has vanished. The explanations given have usually been rather far-fetched, but Mr. Moffatt's conclusions are worth repeating. He says:—"Now it is generally admitted that the life of Europe is of a more vigorous, tenacious and aggressive character than that indigenous to this continent; therefore I come to the conclusion that *protodice* and *rapae* are but different races of the one species, and that when they met and commingled, the stronger constitution and proclivities of *rapae* prevailed, and the outcome of the union were all stamped unmistakeably *rapae*, the characteristics of *protodice* being completely absorbed and obliterated . . . . Therefore, when these external influences (which produced the typical *protodice* and brought it into harmony with its environment at first and which still exist) have had sufficient time to work their utmost upon *rapae*, and no fresh importations take place, a reversion to the original type will take place as a matter of course."

Some of our readers may remember an article on "Wing Structure" by Mr. Moffatt that appeared in the second volume of the *Record* (p. 274). In the *Report* under consideration Mr. Moffatt publishes a further paper on the same subject, entitled "Remarks on the structure of the undeveloped wings of the *Saturniidae*." This paper is too long to quote *in extenso*, but it will be found by all biological lepidopterists to be one of extreme interest. Dealing with the suggestion that the nervures might be constructed spirally, and that the extension of the wing might be produced by, as it were, the relaxing of a compressed spring, Mr. Moffatt says:—"I could see nothing to confirm such a view. The prominent rings of each segment made a complete circle. The extension of the nervure is in a straight line, something after the manner of the drawing out of a telescope, only the one section not merely draws out of the other, but the small end of the one section draws out with it the inside of the large end, and keeps on extending until the nervure is all brought to a uniform thickness, with a slight reduction at the outer end." He is satisfied that extension is not brought about by the pressure of fluid within the nervures, and gives as his reason that he found the nervures of an expanded wing hollow in parts and quite empty; further, "the parts of the nervures where the segments unite seem to be solid, somewhat resembling the joints of a bamboo-cane, which would make the passing of the fluid through them almost, if not quite, impossible." Mr. Moffatt's impression is, that "the nervures do not in any measure contribute towards the extension of the wing, but depend for their own extension on the pressure derived from the fluid flowing between the membranes."

An examination of the wing of a specimen of *Anosia archippus*, which had matured up to the point of emerging but had died before accomplishing the change, enabled Mr. Moffatt to give the following interesting description of its structure. "I removed the costal nervure, and when examining the cut edge with a lens I perceived in one place that the edges of the membranes had parted. By many efforts and steady directing I succeeded in getting the point of a pin between them, when I found that the winglet was like an empty sac. The two membranes were not in the least attached; even at the edges there was no pressure required to separate them, and the only thing that showed any symptom of holding them together was the fringes; so I separated the two membranes clean from base to apex without an effort, when the whole structure of the winglet was exposed to view. The nervures are in the upper membrane, with a groove in the lower, opposite, into which they fit." The paper also contains some highly interesting and suggestive remarks on the physiological way in which the colouring matters enter the scales.

There is a long and somewhat exhaustive paper on "The Gipsy Moth (*Ocneria dispar*)" by J. Fletcher, of Ottawa, in which he goes over the ground of its probable introduction, its rapid spread in America, and the damage it has already done. Some fifty pages of economic entomological matter and two photographs—of Professor W. Saunders, F.R.S.C., an old Crediton boy, and of A. R. Grote, A.M., an old Lancashire lad we believe—complete a most interesting and readable little volume. As the *Report* is published by the government, a note to Mr. Moffatt, Librarian of Ent. Soc. Ontario, Victoria Hall, London, Ontario, with but little more than sufficient money to cover postage will, I doubt not, be sure to obtain it. It is also in the libraries of the Ent. Socy. of London and the City of London Ent. Society.

Entomologisk Tidskrift, 1894.—[Published by the Entomological Society of Stockholm].—This volume contains a number of very interesting contributions. Sven Lampa writes several papers on economic entomology, dealing, amongst others, with several well-known British species. A paper (written in English) on the remarkable *Hemimerus talpoides*, which Saussure brought to the knowledge of naturalists, is extremely interesting, and the writer, Dr. Hansen, after chapters entitled "Introductory Remarks," "Description," "Propagation," "Occurrence and Biology," "Literature on the subject," finishes with a short chapter on "The systematic position of Hemimerus," in which he concludes that "*Hemimerus* most decidedly belongs to the Orthoptera," and that it constitutes "a separate family very closely allied to the family *Forficulidae*." A paper on the geographical distribution of certain Lepidoptera in Sweden, by J. Meves, includes *Chrysophanus phloeas* var. *americana*, *Melitaea athalia* var. *parthenoides*. *Spilosoma urticae*, *Notodonta tritophus*, *Cymatophora flavicornis* ab. *unimaculata*, *Agrotis* *hyperborea*, *A. stigmatica*, *Hadena glauca* var. *lappo*, *Miana literosa*, *Tapinostola hellmanni*, *Plastenis retusa*, *Cabera pusaria* var. *rotundaria*, *Eugonia erosaria* ab. *tiliaria*, Hb., *Cidaria didymata* var. *ochroleucata*, and other species interesting to British lepidopterists. "A revision of the genus *Corisa*, Latr." and a "Revision of the Scandinavian Pseudo-neuroptera," appear to be the very last work of that excellent entomologist the late lamented Pastor Wallengren. Description of new Bombyces by Prof. Aurivillius, and some important notes on "The Insect Fauna of the Cameroons," by the same author, are of the greatest interest. In connection with the latter paper we notice that a variety of *Hypolimnas chapmani*, Hew., is figured, as well as two new species; whilst a number of hitherto unknown Nymphalid pupæ and larvæ are also figured, the hairs and spines of some of the latter being marvels in the way of structure. Scandinavia lost its share of well-known entomologists in 1894: Jacob Spänberg, Knut Frederik Thedenius, Oskar Theodor Sandahl, and H. D. J. Wallengren having died during the year. Portraits of the three first-named are given, that of Pastor Wallengren has yet to come.

SOCIETIES.

At the meeting of the Entomological Society of London on Feb. 20th, 1895, Mr. W. M. Christy exhibited specimens of *Lycaena astrarche*, caught in Sussex last summer, which had a white edging round the black discoidal spot. He said the specimens might, perhaps, be identical with the Northern form of the species known as var. *salmacis*. Mr. H. Goss exhibited a small collection of Lepidoptera from the South of France, made by Mr. Frank Bromilow. Amongst the species exhibited were the following:—*Heterogynis penella*, Hb.; *Zygaena stoechadis*, Bkh.; *Apamea testacea*, Hb.; *Apamea dumerilii*, Dup.; *Luperina matura*, Hufn.; *Grammesia trigrammica*, Hfn.; *Caradrina exigua*, Hb.; *Calophasia platyptera*, Esp.; *Eucrostis olympiaria*, H.S.; *Nemoria pulmentaria*, Gn.; *Acidalia subsericeata*, Hw. var. *mancuniata*, Knaggs; *A. filicata*, Hb.; *A. rubiginata*, Hufn.; *A. marginepunctata*, Göze; *A. imitaria*, Hb.; *Boarmia consortaria* var., F.; *Ematurga atomaria*, L.; *Aspilates ochrearia*, Rossi; *Cidaria fluviata*, Hb.; *C. riguata*, Hb.; *C. basochesiata*, Dup.; *C. rivata*, Hb.; *C. bilineata*, L.; *C. vitalbata*, Hb.; *Eupithecia oblongata*, Thnb.; *E. pumilata*, Hb. var. *tempestivata*, Z.; *Botys chermesinalis*, Gn.; *Pyrausta ostrinalis*, Hb.; *Botys cespitalis*, Schiff. and *Adela australis*, H.S. [Some of these species were evidently incorrectly named by Mr. Bromilow, *e.g.*, the insect called *consortaria* var. was not that species, nor were the specimens named *ostrinalis* that species. We believe there were other errors.—Ed.] Professor Meldola invited discussion upon the address delivered by Mr. Elwes on the Geographical Distribution of Butterflies at the last Annual Meeting. He remarked that he had not himself had time to consider the paper in an adequate manner, but he thought that the discussion might lead to a useful expression of opinion if the speakers would deal with the question as to how far the scheme of distribution advocated by Mr. Elwes was borne out by a comparison with other orders of insects. He was of opinion that in considering schemes of Geographical distribution, the results arrived at were likely to be of greater value the wider the basis on which they rested, and he therefore suggested that the question might also be taken into consideration as to how far it was justifiable to draw conclusions from the consideration of one Division or one Order only. He did not offer these observations in a spirit of adverse criticism, but simply with the object of setting the discussion going. Dr. Sharp remarked that Geographical distribution consisted of two divisions; firstly, the facts; secondly, the generalisations and deductions that may be drawn from them. He thought that as regards insects generally our knowledge of the facts was not yet sufficient to warrant many generalisations. Still the impressions of those who have paid attention to particular groups of insects are even now of some importance, though at present based on incomplete knowledge. He thought the Rhopalocera would prove to be a somewhat exceptional group in their distribution. Notwithstanding that Australia and New Zealand are so poor in them, this was by no means the case as regards Coleoptera, Australia being very rich in them and its fauna very distinct. He thought that if Lepidoptera generally were well collected in Australia and New Zealand, it would be found that there were more species than was supposed. He instanced the case of the Sandwich islands, where there were supposed to be very few species of Lepidoptera, and yet some 500, or perhaps more, had been recently found there by Mr. R. C. L. Perkins, who had been sent to investigate the islands by a committee appointed by the Royal Society and the British Association. Mr. McLachlan said he was of opinion that no definite demarcation of regions existed, but that all the regions overlapped; in any case the retention of the Palæarctic and the Nearctic regions as separate provinces was not warranted on entomological data. He thought that at the close of the Glacial period some insects instead of going north were dispersed southwards, and that the present Geographical distribution of some forms might thus be accounted for.

The February meetings of the North London Natural History Society were very interesting ones. On Feb. 14th, the President, Mr. L. B. Prout, who is making his way to a very high position in the ranks of scientific entomologists, read a paper on "Specialists and Specialism." Having stated that the tendency of the present day is towards a more and more restricted specialism, he said that this movement is one to be encouraged, and laid stress upon the fact that the whole sequence of the history of the rise and progress of the study of the Natural Sciences necessitates such a course. After a passing eulogistic reference to Gravenhorst's work in connection with the Ichenumons and to Dr. F. Buchanan White, who "was a specialist of the highest rank in certain branches of Natural Science," but "never allowed his specialism to interfere with his appreciation of Nature as a whole." Mr. Prout proceeded to express his own views on the subject. The collection of general facts must historically precede specialism. The age of collecting such general facts is practically past. Our store-houses of knowledge are now so vast, that it would be vain to attempt the acquisition of a sufficient acquaintance with their contents to make us really all-round naturalists. Specialism, even a very restricted specialism, is therefore to be highly commended. Nevertheless, an exclusive specialist is in a far worse plight than a naturalist who is not a specialist at all. Therefore, he is the ideal naturalist who has an open mind towards all natural objects, but who gives special attention to some circumscribed department of Nature. The inter-dependence of the different departments should be met by corresponding inter-dependence amongst students of Nature. Mr. Prout then went on to describe his own ideal with regard to the study of Natural History. Every naturalist should have a general knowledge, accurate if not profound, of Nature as a whole. Every naturalist should have a speciality in some direction. Specialists should be known as such to their fellow-naturalists. They should be the depositaries of knowledge in their special departments, by aid of their brethren, who should communicate to them any facts in those departments of which they might become cognisant. They should place their knowledge at the service of any true working naturalist who might require it. It was recognised that this was a high ideal, but Mr. Prout had great faith in the elevating power of a high ideal, and his own intercourse with Natural History workers led him to hope for excellent results if a larger number of them could be brought to realize the advantages of a defined specialism. Every naturalist should be a specialist, recognizing himself as such, and recognised also as such, at least by his own circle of acquaintances, if not more widely. In opposition to the views of the author it might be objected: (1) That many naturalists have little leisure for Natural History, and no inclination to take up any special group during such time as they have. Mr. Prout was of opinion that even such would find their interest in the subject increased if they confined themselves to some small province. (2) That those who have plenty of energy for actual field-work, object to be saddled with some special group and the concomitant responsibilities of attention thereto. Mr. Prout held that there is plenty of room for general work in Natural History conjointly with specialism in some one special group. (3) That many have no distinct leaning towards any particular department. Mr. Prout said he was no advocate of undue haste in the matter; all he desired at present was to arouse interest in the subject. (4) That the whole scheme was too quixotic. Mr. Prout believed that inability to do much was no reason for refusing to do the little we could. The able and interesting paper, which we have only been able to summarise, led at once to practical results. Mr. Rose announced his intention of taking up the genus *Eupithecia*; Mr. Battley, the "Thorns:" Mr. Robbins, Ferns; Mr. Wheeler, the *Ranunculaceae* and Snails; Mr. Prout, the genera *Melanthia, Melanippe, Coremia* and *Anticlea*.——On Feb. 28th, 1895, Mr. Battley opened a discussion on the genus *Taeniocampa*. He was dissatisfied with the arrangement of the species in the *Entomologist Synonymic List*, preferring the following: *T. gothica, T. munda, T. incerta, T. opima, T. gracilis, T. populeti, T. stabilis, T. pulverulenta, T. miniosa*. The eggs of *T. populeti* are laid in batches on twigs and soon hatch; the larvæ are met with on trees in spring and early summer: the pupæ are subterranean and frequently gregarious; the imago develops in the autumn underneath the pupa-skin. *T. pulverulenta* emerges in March, *T. gracilis* in May, and the others at times intermediate between these two, being usually on the wing at the time the sallows are in bloom. The moths come to sugar, and frequent blackthorn and other blossoms. Mr. Bacot recorded the emergence of *T. munda* on Feb. 24th, 1894. Mr. Nicholson thought sycamore was as attractive to insects as sallow. Mr. Harvey said that *T. gracilis* occurred among the Theydon birches during the last two weeks of the "sallowing" and the succeeding week. Mr. Prout did not like the idea of sandwiching *T. munda* between *T. gothica* and *T. incerta*, as he considered the two latter were closely allied. He also considered *T. miniosa* and *T. pulverulenta* to be closely allied; the larvæ of the former were not unlike some bright specimens of those of the latter. He believed *T. miniosa* still occurred at West Wickham. The scarcity of *T. munda* in the Broxbourne district might be accounted for by the absence of oak, as he thought this species was chiefly an oak-feeder.

City of London Entomological and Natural History Society, —*Feb. 5th*, 1895.—The Association of Students of Natural History, now known under the above name, though it can boast a career extending over a period of 36 years, has never till recently launched out into exhibitions, soirées, or similar public functions. However, on the 5th February last it emerged from its lengthy, but by no means inactive or unfruitful seclusion, and held a conversazione in the Library of the London Institution, Finsbury Circus, in a smaller room of which building the Society holds its ordinary meetings. Notwithstanding the fact that this was its first venture in this direction, the result was eminently satisfactory, and both visitors and members agreed that the efforts of the exhibition-committee met with signal success. The weather being favourable, a goodly number of members and friends gathered together to inspect the numerous exhibits, and to indulge in quiet chat. The hum of conversation was pleasantly interrupted at intervals by vocal and instrumental selections, the programme of which was kindly arranged by, and efficiently carried out under the superintendence of, Mr. W. J. Petty, organist of St. Andrew's, Plaistow. Although the Society is more particularly devoted to the study of Entomology, as its name implies, the exhibits were not by any means confined to insects, but embraced many other branches of Natural History, and the members received very able assistance in this respect from their friends and from members of other Societies. It is, of course, impossible to enumerate all the exhibits, but the following may be selected as worthy of special notice :—

Among the British Lepidoptera, Mr. G. Elisha very generously sent twenty drawers of "Micros," which were universally admired; Mr. B. A. Bower also exhibited in this group his two cabinet drawers of Tortrices, which were exquisitely set and arranged with much neatness. Mr. D. C. Bate's exhibit of *Arctia fuliginosa*, showing hybernating larvæ, cocoons, and perfect insects all belonging to the same brood, was very interesting. Mr. Tutt showed his long series of the various species of "Sallows," and Mr. C. A. Briggs very kindly sent his "Blues"; among the latter many beautiful and striking varieties were noticeable, as well as several examples of hermaphroditism. Mr. J. A. Clark's Geometrae and Mr. F. J. Hanbury's *Agrotidae* and Diurni also deserve mention, the latter included a fine series of *Chrysophanus dispar*. Mr. Quail contributed four drawers of "life-histories." One of the tables was occupied exclusively by a brilliant gathering of exotic Lepidoptera, the exhibitors being Messrs. A. Bacot, D. C. Bate, J. A. Clark, W. A. Pearce, Dr. J. S. Sequeira and Capt. B. B. Thompson. Mr. Clark's exhibit included a perfect pair of the largest

Lepidopteron known (except, perhaps, *Attacus atlas*), *Thysania agrippina*, a native of Brazil, which measures ten inches across the expanded wings. Representatives of most of the other sub-orders of INSECTA were provided by Messrs. J. S. Soul (Coleoptera, Hymenoptera, Neuroptera, &c.), O. E. Janson (Coleoptera), G. A. Lewcock (Coleoptera), G. B. Ashmead, H. A. Auld and J. A. Clark, the two latter gentlemen showing nests of several British species of *Vespa*. In the department of Botany, Commendatore Thomas Hanbury came over from Italy purposely to show and describe a collection of the fruits of the *Aurantiaceae*, and other interesting plants grown in his garden at La Mortola; Mr. F. J. Hanbury provided rare and extinct dried British plants, chiefly Orchids.

Among the exhibitors of cases of stuffed birds, nests, eggs, &c. were Messrs. J. A. Clark, F. J. Hanbury, J. T. Crockett and G. B. Ashmead. Mr. D. C. Bate exhibited a piece of telegraph pole, upon which was mounted a Green Woodpecker (*Gecinus viridis*). The specimen was from Norway, where the bird makes considerable trouble by piercing the poles to such an extent as to cause many of them to break off. The birds, it is supposed, are deluded into the idea that there are insects in the poles by the humming caused by the wires.

Geology, conchology, and other branches were not neglected. Mr. Alfred Sich exhibited two rare shells—*Helix aspersa monstrum* and *Clausila biplicata*; Mr. Gurney, a case of coral and the jaws of a shark; Messrs. J. A. Clark and C. Oldham, polished agates and madrepores.

One feature of the Conversazione, which, as usual, attracted much attention, was a fine display of microscopes. Nearly twenty instruments of various sizes and patterns were actively engaged during the whole evening in revealing some of the marvels, both living and dead, of the animal and vegetable worlds to the wondering observers. The exhibitors were Messrs. F. Coles, W. R. Dodd, J. D. Harding, P. S. King, A. J. Rose, J. S. Soul, C. Willmott, A. Bacot, J. A. Clark, F. J. Hanbury, W. H. Jackson, H. H. May, C. Nicholson, Dr. J. S. Sequeira, and others. A recent invention in connection with the production of Photo-micrographs was exhibited and explained by the inventor, Dr. W. A. Kibbler.

We must not omit to mention the collection of rare and otherwise interesting books on Natural History, which were very kindly lent from the Library of the London Institution, by the Secretary, Mr. R. W. Fraser.

Feb. 19*th*, 1895.—The following resolution was carried unanimously:—"That a hearty vote of thanks be accorded to all who assisted the members of the Society at the recent Conversazione in the matter of exhibits, and to those ladies and gentlemen who kindly gave their services in respect of the musical programme." Exhibits:—Mr. Clark: a sooty-black specimen of *Dicranura vinula*, which he had purchased at a recent sale at Stevens'. Mr. May: *Catocala nupta* from Tooting Bec Common, which had been relaxed slightly with damp sand, and then with wood naphtha; one of the specimens had an unusually pale central patch on each fore-wing, thus resembling its congeners *C. sponsa* and *C. promissa*. Mr. Bacot: a bred specimen of *Nyssia hispidaria*, having male head and thorax, and a female body. On behalf of Dr. Knaggs, Mr. Clark showed a sample of a preparation of linoleum, which is superior to cork for setting-boards, &c., on account of the closeness of its substance; also samples of the new "nickel" pins, by

Messrs. Deyrolle of Paris. Some of these having been exposed to the vapour of butyric acid, were covered with a green coating resembling, and akin to, verdigris; this being butyrate of copper, indicated that the so-called "nickel" pins contained a considerable amount of copper. Mr. Clark also distributed some of Dr. Knagg's "sulphuretted" pins. These were the ordinary white ones, which, after being dipped, first into a nitrate solution, and then into hydrosulphate of ammonia, came out much hardened, and practically proof against the action of organic acids. Mr. H. A. Sauzé read a paper on "Alligators and Crocodiles."

March 5th, 1895.—Exhibits:—Mr. Bell: a female specimen of *Argynnis adippe* from the New Forest, having a small portion of the right fore-wing slightly bleached, but otherwise perfect. Mr. Clark: a short series of *Cucullia gnaphalii* from the collection of the late Mr. Machin, who bred them from larvæ obtained at Sevenoaks. Mr. Southey: a series of *Smerinthus populi*, among which was a specimen having the right hind-wing of a nearly uniform cream colour. Messrs. May, Hamling and Riches also exhibited the same genus to help to illustrate a most instructive and comprehensive paper read by Mr. Bacot on "The genus *Smerinthus*." * The Secretary read a letter from Mr. Heasler to the effect that he had now completed the list of records of Coleoptera for the Society's *London Fauna List*, and forwarded the same in manuscript, so that it might be of use to members during the coming season. The list comprised records of more than half the total number of species of British beetles, and was really a handbook of those occurring in the London district, inasmuch as it included much information as to methods of capture, besides localities, dates and other statistical matter. Mr. Heasler is to be congratulated on his most masterly production, for which the Society owes him a deep debt of gratitude.

ON THE PROWL.

The western sky is all aflame:
  The sun's red steeds their stalls are nearing:
Or if they aren't, it's all the same:
  You know the sort of track I'm steering.
    It's time to get the treacle pot,
    And not to talk that kind of rot.

Now night unfolds her dusky wings:
  A few faint stars are coyly peeping:
I wonder why one hunts the things
  That haunt the woods, instead of sleeping!
    We're nearly there, with hope elated,
    Fetch out the spirits (methylated).

The moon her silvery orb aloft
  Through spaceless depths is slowly raising;
I rather fancy I'll be scoffed
  If that's the kind of night I'm praising.
    Those matches, please, this way, young man, turn;
    I think it's time to light the lantern.

Red glows the light on many a gold
  And pink and saffron tinted pinion.
I've got as much as I can hold,
  I've filled my pill-boxes and tin one.
    It's getting late by my chronometer:
    Just net that little last geometer.

You see yon glimmer in the East,
  That's where the day will soon be breaking.
I really think the man's a beast
  Who goes to bed when moths are waking.
    But I've got other work to do
    To-morrow morning—haven't you?

G. M. A. H.

* This we shall publish hereafter.—Ed.

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AND

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Above Lake Bourget.

By J. W. TUTT, F.E.S.

The heat of the late August sun is tempered in the early morning, although it shines brightly in a cloudless sky of deepest azure. Our nets are put into order as soon as we step from the train at the little wayside station of Grésy-sur-Aix. Grésy is five or six miles to the north of Aix-les-Bains, and the delightful-looking country has tempted us to explore its mysteries during the few hours that we have at our disposal.

When the train has steamed out of the station, we leave the little lane into which we first entered and, by a level crossing, pass over the rails, and make for some low hills that lie a little to the west of the railway. The mowers' scythes ring out blithely in the morning air, as we walk by the side of the clover fields where they are at work; a few fragile-looking white butterflies show us that *Leucophasia sinapis* is taking its morning flight. Have you ever held a specimen of the Wood White butterfly against the light and traced the nervures of its fore-wings? The discoidal cell at the base is restricted to an extent that is never seen in other British butterflies, whilst the nervure which runs from it to the apex of the wing is a most complex structure, for all the branches which are usually given off from the top of the discoidal cell itself, when it is of normal size, are here given off from the nervure which represents the extension of the upper boundary of the discoidal cell, and not from the cell itself. Compare, too, the simple structure of this same nervure in *Aporia* and *Pieris*, with the more complex one in *Euchloë*, and then with the still more complex one of *Leucophasia*. Dr. Chapman has formulated a theory that those butterflies whose pupæ have the greater number of movable abdominal segments are lower in the scale of development in their own particular group, than those whose pupæ have them fixed, and he traces up the *Pieridae* on these lines in the following ascending sequence:—*Aporia*, with three movable incisions (two free segments); *Pieris*, with two movable incisions (one free segment); *Euchloë* and *Leucophasia*, with no movable incisions, the pupa being solid. The complexity of the nervure forming the upper part of the discoidal cell and running towards the apex of the wing, increases as we ascend through the same genera, so that one cannot help considering the two sets of facts as pointing to the same conclusion. *Colias hyale*, too, is on the wing, and in a rather narrow lane we meet with *Epinephele tithonus* in some numbers, together with *E. ianira* and its usually twin-spotted relative *E. lycaon*, which abounds around the blackberry bushes. *Argynnis aglaia* is getting worn, as also is *A. niobe*. The lane opens out upon a rocky hillside, covered above with a deciduous growth about two years old. On the rough ground *Hipparchia arethusa* swarms. You do not know *arethusa*! Oh yes, you do. It is like *Hipparchia semele*, but rather smaller, rather lighter in tint, and with a yellower band across the wings. This yellow (almost orange) band, is sometimes much brighter than at others, and Staudinger describes a var. *dentata* as "supra fascia latiore: alis posterioribus subtus venis albis, linea dentata ante marginem," and certainly some of these specimens agree well with this description, whilst others, perhaps, are Rambur's var. *boabdil*, which is "supra obscurior, subtus dilutior, venis albis," although Staudinger gives only the Andalusian Mountains as a locality for this latter variety. The habits of *H. arethusa* are much the same as those of *H. semele*, and its underside resembles well the stones and rocks on which it rests, being exquisitely marbled and reticulated with slender lines. It varies, too, in spotting; most specimens have but one spot in the yellow band, and that placed somewhat towards the apex; others have an additional spot, the two then occupying the positions in which the spots of *H. semele* are found; whilst I have a specimen with three. Up through the undergrowth we force our way, and then the large black *Satyrus dryas*, with its purple gloss and two beautiful black ocelli with purple centres on the fore-wings, flies softly and gently about among the grass. Here is a lovely male, with a beautiful purplish-blue band on the underside of its hind-wings. Fine great insects the females are, larger than any of our British butterflies, excepting, perhaps, *Papilio machaon*, or female *Apatura iris*. It belongs to the "Browns" as we call them. What a misnomer this name "Browns" is! Have you ever seen an *E. ianira* or an *Erebia aethiops* fresh from the pupa? Have you ever seen the iridescent hues that flicker and fade, then grow brighter and brighter, until their brilliancy is marvellous; little ripples of purple, violet and rose, ever changing, never constant; charming greens and orange tints which fine off into purest gold? If you want to know the true colour of a Meadow-brown butterfly, you must watch it emerge from the pupa, and then place the new-born creature in the sun-light, and observe the beautiful rainbow tints that play over its wings with every movement; only then will you know what colour a Meadow brown really is, and you will be rather surprised that anyone ever thought it "brown." We describe from dead bodies and miss the life, we grasp at the shadow and miss the substance. The butterfly in the cabinet may teach us many wonderful lessons, but the beauties of living nature are only to be found in the woods and fields, and by the stream.

As we force our way through the bushes many strange moths fly out, and at last we reach a path, along which we turn. Here *Argynnis latona* greets us again; and here, too, we meet the magnificent *Hipparchia briseis*, its grand white transverse band making it very conspicuous. A beautiful creature is the large *semele*-like *H. briseis*, requiring, in the hot sun, a sure eye and steady hand to effect its capture. The large female reminds us of the females of *Apatura iris*, to which insect this species is, perhaps, somewhat nearly allied. It settles on the limestone path; its upper wings are drawn up, and the matchless waves of whites and greys of the underside are most effective for its protection. Beautiful and marvellously worked are the intricacies of these lines, which combine to form so strong a means of protection. Here is a male, with the pale transverse band much restricted, and with the ordinarily pallid portion very strongly suffused with a deep fuscous hue; Esper figures an aberration under the name of *pirata*, which is described by Staudinger as being "fasciis infuscatis," this author apparently supposing it to be only a feminine aberration, but our specimen, being a male, proves that this is not so. One female is of a paler ground tint, and there is some variation in the number of round black spots which are found in the sections into which the darker nervures divide the white transverse band. Six of these sections form the band, and a small black spot exists in the first and fourth sections. Some have a third spot developed in the third section, and this varies much in size. Other insects fly wildly in the hot sun, and presently we turn up again by a tangled path and cross a clearing on the outskirts of the wood. In a corner the charming *Lycaena argiades*, with its slender tails, is found. One is puzzled that this species should ever have been taken in England, for the haunts it loves here are brilliantly sunny, and scarcely know what winter means. *Colias edusa* is seen drying its wings, whilst *Colias hyale* careers madly by. *Gonepteryx rhamni*, like a big, live yellow leaf, flutters and hangs about most charmingly, and then we bear to the right a little and enter a sloping field, almost covered with heather and wild thyme, which leads into the upper part of the wood. *Aspilates gilvaria*, *Selidosema plumaria*, *Mimaeseoptilus plagiodactylus*, *Acidalia ornata*, *Nomophila noctuella* (*hybridalis*), *Botys ferrugalis*, *Plusia gamma*, *Euthemonia russula*, *Setina irrorella* (of quite a British type) and *Strenia clathrata* fly up at almost every step, whilst *Lycaena astrarche*, *L. bellargus* and *L. corydon* flit from flower to flower. *Plusia gamma* is pale in colour, and much like the immigrants which reach Britain so frequently in late spring or early summer, whilst *N. noctuella* and *B. ferrugalis*, also reported to have decided migratory tendencies and habits, differ in no wise from British specimens. We pass through the wood and soon emerge at its upper edge, on the border of a lucerne field alive with insects. *Pieris rapae* is the chief intruder perhaps, then *Lycaena corydon*, but *Colias edusa* is there too, with *Pieris napi*, and a few Fritillaries besides. But if the lucerne field is alive, what is to be said of the strip of flowery waste on which we suddenly come, and which, some ten to thirty feet in width, extends to the stubble of the next field? Here the flowers are literally alive, and one has only time to determine what the species are. Interesting beyond all, perhaps, are the comparatively inconspicuous *Nemeobius lucina*, specimens of the second brood flitting gaily with *Lycaena icarus*, *Argynnis latona*, and the *Coliadae*, which abound here, whilst *Acidalia ochrata* also gets up from the herbage. In a nook near by, is taken the only specimen we see of *Erebia aethiops*, a large richly-coloured male, just out of chrysalis, and displaying rainbow-tinted hues as the sunlight glints on the dark scales of its upper wings. But beautiful as are the butterflies here, they bear no comparison with the charming brilliancy of the *Melampyrum*. With its orange and purple bracts, it forms one vast vista of fairy loveliness in the woods, one heaped-up bank of exquisite beauty by the side of the path. No cold æsthetic loveliness has nature here, but full radiant beauty of the richest and most delightful hues. Nothing can be more charming than this glorious fulness of colour, no blending of hues more delightful than the orange and purple masses, with the deep emerald setting of the bushes behind. But my companion is out of sight, so I saunter on; soon a clover field attracts my attention. Here are most of the butterflies again, with *Pyrameis cardui*, *Pieris daplidice*, and the great *Hipparchia briseis* in addition, but we have to go on, and soon we reach another road. Here the blackberries are in such profusion, and the sun is so hot, that my heart goes out to the luscious fruit, and my hands follow my heart. Then we climb over the hedge, and, passing through a little coppice, find ourselves in a clover field. With the increase of heat comes increased insect life. Butterflies simply swarm here. *Melitaea cinxia*, *M. athalia* and *M. dia* are in considerable abundance as well as the larger beauties, *Argynnis niobe* and *A. aglaia*. The famous seven-leagued boots would be utterly inefficacious for the capture of *C. hyale* or *C. edusa* here, even were one so disposed. But one is hardly so disposed in the now broiling sun, and we slowly cross the field, and run our eye repeatedly over the surrounding country, then back to the butterfly population around us. Across the field we skirt the edge of a wood, with acres upon acres of undergrowth composed almost entirely of box, in which *Minoa euphorbiata* abounds; whilst presently from the ridge of the hill we look down upon a most charming picture.

Woodland and fields roll down to the shores of Lake Bourget, which, marvellous in colour, lies like a solid mirror of exquisite beauty far below. Vineyard after vineyard, with their fruit purpling in the sun; fields of maize with their heavy cobs, from which the purple-red stigmas hang pendent in rich beauty, run down to that charming sheet of smoothest blue which extends for miles without a break down the valley. On the other side, as on this, steep mountains form its background, the higher ones to the south here and there glistening with snow, or even with a miniature glacier névé. But the colour of that beautiful lake! Is it blue, is it green—that deep intense colour that makes the water so perfect a picture of embodied loveliness? It's blue! No, it's green! we exclaim in tones almost without a break, and the mind changes its opinion each time we gaze afresh on it; nay, it changes even while we gaze. Why is that charming colour rarely seen elsewhere than among the Swiss lakes? Is it due to the solid matter which the glacial streams bring down in millions of tons in their headlong rapid course? Maybe, for if from a glacier stream you take a glass of water and hold it up in the sunlight, the tiny particles of mica which fill it up and permeate it sparkle with resplendent beauty; but so tiny are they, so incomprehensibly light, that not a single atom seems to fall to the bottom as sediment, even after hours and hours of repose. Maybe there are millions of such particles here, and their action on the light may have something to do with it. Whether this be so I trow not, but I do know that the colour of these lakes is one of the most charming of Nature's many charming beauties with which she everywhere surrounds us.

Here, looking on the lovely lake, we will end our morning walk. We did, of course, find our way back to the station, and were in Aix soon after noon, but the charming picture lay uppermost in our minds, and even the enchanting *A. latona*, the attractive *H. briseis*, the large purple-black *S. dryas* and doughty *C. edusa* fail to remove, even for a moment, the delightful and entrancing picture which the lake has just revealed to us.

The Genus Smerinthus.*

By A. BACOT.

There are only five European representatives of the genus *Smerinthus*—*tiliae*, *ocellatus*, *populi*, *quercus* and *tremulae*—only the first three of which are found in the British Islands. *S. quercus* is a rare species, occurring in Southern Europe and Asia Minor. *S. tremulae* is very rare, and is confined to Central and Northern Europe; it seems doubtful whether it is specifically distinct from *S. populi*. Some papers by Mr. E. B. Poulton on the larvæ (*Trans. Ent. Soc. Lond.*, 1884–1888) led me to try and breed our three indigenous species from the egg, and this paper is based on the notes which I made in the course of my experiments.

The Eggs.—There is great similarity in colour between the eggs of the three species. Those of *S. ocellatus* and *S. populi* are bright emerald-green, and have a pearly lustre when fresh; those of *S. tiliae* are duller and more of an olive-green; those of all three have a semi-transparent appearance. The eggs of *S. tiliae* and *S. ocellatus* are almost exactly alike in size and shape—a longish oval, about $^1/_{12}$ in. in length; that of *S. populi*, though not much longer, is rounder, and in bulk is nearly half as large again as either of the others. The surface of the eggs is smooth and shiny, but under the microscope it is seen to be slightly granular in structure. Just before hatching, the eggs are slightly tinged with white. They are usually deposited on the underside of leaves, either singly or in pairs. Less frequently those of *S. ocellatus* and *S. populi* are found on the smaller twigs and leaf-stalks, but I have never heard of those of *S. tiliae* being found in a similar situation. Hatching usually takes place in from ten to fourteen days—according to temperature.

The Larvæ.—The newly-hatched larvæ have certain characteristics common to all three species. They are of a whitish-green colour, the white appearance being caused by a dense growth of short, bristly hairs, which entirely cover the larva, with the exception of the head, scutellum, juncture of the segments, and 13th segment; these hairs are forked at the tip, and look under the microscope as if there were a star on the top of each of them. On the head, scutellum and 13th segment there are a few scattered hairs, and a few longer hairs are scattered over the body, but these are not as a rule forked—or only slightly so. The horn is proportionately much longer in the first skin than in any of the later ones; its tip is bifid, each prong ending in a long bristle which is simple or slightly knobbed at the tip. It is covered, like the body, with short, forked hairs, which are black in *S. tiliae* and *S. ocellatus*, green in *S. populi*. The head, in *S. tiliae* and *S. ocellatus*, is round in the first skin; in *S. populi* it is roughly triangular.

After the first moult there is a very noticeable change in the appearance of the larvæ. Instead of the dense growth of short hairs which were such a conspicuous feature in the preceding skin, they are now covered with numerous tall, cone-shaped tubercles of a bright yellow colour, surmounted by insignificant hairs. Although the tubercles are thickly scattered over both body and horn, I do not think they are

* A paper read before the City of London Entomological and Natural History Society, on March 5th, 1895.

so many in number as were the hairs in the 1st skin. These tubercles are present in all the subsequent skins, and are sometimes very large and prominent, being so closely massed together on the oblique stripes as to give these the appearance of ridges [this is very noticeable in *S. populi* in its 3rd skin]; the hairs arising from them get gradually smaller, and finally lose their bifid character. I could not trace any forked hairs in the full-grown larvæ. Mr. Poulton does not lay any stress on the change in the appearance of the larvæ after the first moult; he says that tubercles are present at the base of each hair before as well as after the first moult. Possibly he used a higher power than I did; with a 1-in. objective I could not detect them, whilst they were most conspicuous after the moult.

I have been obliged, from want of space, to leave out the rather lengthy notes I took of the larvæ in each skin, but have embodied them in the tables which I pass round.*

S. tiliae.—The full-grown larvæ of *S. tiliae* vary a good deal in coloration. Some of mine had red blotches bordering the front of the stripes; one or two had red borders to all the stripes, others only to some of them. I particularly noticed that the weak stripe (the 6th) always came off worst, the blotch being either faint or altogether absent from this stripe, even when it was strongly marked on all the others. Another thing that struck me was, that the colour of the tubercles persisted more than that of the surrounding surface, the yellow colour showing up plainly in the midst of the red blotches. It is probable that these red blotches are remnants of an ancestral character similar to the bright borders of the stripes in *Sphinx ligustri*.

Just before pupation the colours of the larvæ get dull; in some the back darkens and becomes bronze-green or blue, the tubercles showing up as bright specks. In the brood I reared, this change was not general; most of the larvæ became dirty-white previous to going to earth, and I found, when changing their food, that the dark ones were much more easily passed over than the light ones. In their earlier stages the larvæ usually rest on one of the veins on the underside of a leaf, but in the later stages choose a twig or leaf-stalk for the purpose. They seem to dislike the light and, when their food is changed, get underneath the leaves as soon as possible. Lime, elm and hazel are usually given as the food-plants; Mr. Barrett mentions birch, and Mr. Symes once beat a larva from honeysuckle.

S. ocellatus.—The larva of *S. ocellatus*, when small, usually rests on the mid-rib or on one of the larger veins of the leaf: it has a most tenacious grip, and has also the power, like those of *S. tiliae* and *S. ligustri* in their younger stages, of dropping on a thread if by any chance it should lose its hold. I first noticed the larva assume the "Sphinx attitude" when in the 2nd skin.

While examining a young larva from Norfolk, I noticed that it was attached by the 4th pair of prolegs and the anal claspers only, and that the other three pair of prolegs were withdrawn until they were flush with the ventral surface of the body. I have since found that this habit of retracting the prolegs not in use is characteristic of the larva in all its stages. As the larva grows larger it rests, as a rule, on an upright twig, which it grasps with its anal claspers and with the last

* We regret that we have not room to insert these interesting tables.—Ed.

(or last two) pair of prolegs, assuming an upright attitude, with the fore part of the body raised and the head drawn back. In this position its resemblance to a leaf is very perfect, and the reason for the withdrawal of the unused prolegs is apparent, as, if not withdrawn, they would break the regular leaf-like outline. Occasionally I have found larvæ at rest on the mid-ribs of partially eaten leaves, and in that position they do not raise the fore part of the body, and they use all the prolegs.

The variation of the full-grown larvæ is almost parallel with that of *S. populi*: the oblique stripes are, however, usually broader and whiter, though sometimes, in the yellow form, they are as yellow and nearly as narrow as in *S. populi*. Larvæ are sometimes met with which have traces of an 8th oblique stripe, and Mr. Poulton mentions one which had a 9th as well. One that I bred this year showed a tendency to darken before pupation in the same way that those of *S. tiliae* and *S. ligustri* do. The food-plants given are blackthorn, apple, willow, sallow, poplar, aspen and wild plum.

S. populi.—The larva of this species makes only three moults, while those of the other two make four. Whether this is always the case I cannot say. Possibly some broods may have four moults, others only three. Dr. Chapman states that some larvæ of *Moma orion* have four moults, others five, and that this is not a sexual difference, as is the extra moult in the female larva of *Orgyia antiqua*.

The larvæ of *S. populi*, like those of *S. ocellatus*, vary considerably in their later stages, ranging from dull green or sage-green to quite a bright yellow. The spiracles are often surrounded by a red spot, and it is not uncommon to get larvæ with an entire or partial subdorsal row of similar spots. These spots are said to simulate the small red galls so often found on willow and poplar leaves. In one larva that I bred this year the spots of the lower row were absent from the thoracic segments, whilst those of the upper row were present on those segments. I used to have a notion that the different forms were from different broods, chiefly because I had usually found the dull-green forms on black poplar and the bright ones on Lombardy poplar, sallow or willow. It is true that I have occasionally found the latter on black poplar, but I do not remember ever taking the dull forms on Lombardy poplar. This year, however, I bred both forms from eggs laid by a single female, and Dr. Buckell has had the same experience.

The young larvæ have very similar habits to those of *S. ocellatus*, but, as they get older, the position in which they rest is very different: this is nearly always with the head downwards, and although the fore part of the body is raised, as in *S. ocellatus*, the head is curved inwards towards the leaf or twig; they will grasp the stalk of a leaf with their anal claspers only and hang down behind it, and it is quite remarkable how small a sallow leaf suffices to hide a full-fed larva. On poplars I have frequently noticed them, when they have eaten half the leaf, so resting as to represent the eaten portion themselves, and they are then so well protected that, with any wind, it would I think be impossible to detect them. I have noticed that the larvæ are much easier to find on misty mornings and before the sun is up. Probably the explanation of this is, that in bright sunshine the lights and shadows are much stronger, and consequently the slight difference in tint between the larva and the leaf is not so noticeable. The same fact holds good with *S. ocellatus*, and I think that, as a rule, the protective coloration of larvæ is most perfect in sunlight or in full daylight.

As regards food-plants, sallow, black poplar, Lombardy poplar and aspen, are mentioned by Rev. S. St. John; Stainton gives birch; Newman, the common laurel and laurestinus; Mr. Kirby, willow; Mr. Barrett, rose. I tried feeding some young larvæ on laurestinus and birch, but the attempt failed utterly, although I found, as Mr. Prout had told me, that they would eat apple freely.

The Pupæ.—The pupæ of *S. tilae* and *S. ocellatus* are enclosed in a frail cell or cocoon, composed of earth spun together with a few slight silk threads. In the case of *S. populi*, I could find no trace of silk, nor were the pupæ enclosed in a cell, although they were supplied with the same material as the others in which to pupate. As a rule, those of *S. populi* are only just beneath the surface, while the larvæ of *S. tiliae* and *S. ocellatus* burrow to a depth of several inches. The difference between the pupæ of *Smerinthus* and those of the rest of the *Sphingidae*, is very striking; the chief points are the shortness of the wing-cases and the complete absence of the sheath of the tongue, in addition to which, they are thicker and more rounded, the head is small and does not project so far, and the small size of the eye-cases is very noticeable. On the surface, the pupæ of *S. tiliae* and *S. populi* are much alike, the latter being rather the rougher of the two; the scar left by the anal claspers is very distinct in both species. In colour, the pupa of *S. tiliae* is of a deep red-brown, while that of *S. populi* is of a dead black with, when quite dry, a slight greyish tint on the antennæ-cases and other raised surfaces. In shape, that of *S. tiliae* is more like that of *S. ligustri* than that of *S. populi*, which is by far the shortest and dumpiest of the three. The pupa of *S. ocellatus* comes between the other two as regards shape, but is much more rounded at the anal end, the scar left by the anal claspers being, as a rule, hardly visible; it has a smooth polished surface, and is of a deep brown or black colour. The anal spike (which I used to think had some connection with the horn), is largest and thickest in *S. tiliae*; in *S. ocellatus* it is smooth and relatively smaller; while in *S. populi* it is much smaller, and generally sharp and slender.

The Imagines.—*S. tiliae* emerges in the afternoon, in which respect it is very constant. Mr. J. H. D. Beales states (*Ent. Rec.*, vol. xiv., p. 165) that his specimens, whether forced or not, almost invariably emerged between twelve and two. The other two species usually emerge about midnight, although I have had some out as early as 9.30 p.m., and others as late as 8 a.m. Mr. Prout tells me that when forced they usually emerge between 5 and 7 p.m.

S. tiliae is out during May and June. Mr. Barrett says there is no second brood, but Mr. Bellamy stated at one of the meetings of this Society, that he had seen a specimen on Nov. 22nd. The other two are also out during the same months. *S. ocellatus* is partially double-brooded, and occurs again in August or September. *S. populi* is said to be regularly double-brooded, the second brood coming out at the end of July and in August; and the rearing of three broods in one year has been recorded. The second brood of *S. populi* is, however, I fancy, only a partial one, the greater portion of the early pupæ going over the winter before emerging. Out of about forty larvæ that went down at the end of June 1892, only five or six yielded imagines the same year; one of these was crippled, and the others rather under-sized. I have frequently raised broods, no members of which emerged before the winter. The emergence of the first brood would seem to be spread over a considerable space of time; in 1894, I "assembled" a perfectly fresh male on June 22nd, and a specimen is recorded (*Ent. Rec.*, vol. i., p. 180), as having been taken in a moth-trap on July 8th.

The well-known position assumed by the moths when at rest, is undoubtedly protective so far as our British species are concerned. *S. tiliae* is said to rest on the young shoots that spring directly from the trunk of the lime, and to simulate a group of small leaves. I have seen one hanging from the top of a split oak fence, and it so exactly resembled a withered leaf, that none but a practised eye could detect the difference. *S. ocellatus* rests on bushes or hedges, and is said to exactly resemble a withered leaf or spray of leaves. I have never found one at large, but even in a breeding-cage, notwithstanding its large size and rich coloration, it is by no means a conspicuous object. What special purpose the ocelli subserve, it is rather a puzzle to determine; they are completely hidden by the fore-wings when the insect is at rest, and cannot, therefore, be protective under those circumstances; is it possible that they have the effect of startling bats or birds that are about to make a meal of the flying moth? That they are of some special benefit to the moth I feel sure, because they are such a constant character, and moreover, are well developed in the many allied species that are distributed over nearly the whole of the N. Temperate Zone. *S. populi* is said to rest during the day on the trunks of poplars or on hedge-banks. I have only once found the moth at rest, and then it was on the trunk of a poplar, where it was not at all well protected.

All three species are said to fly slowly and heavily at dusk, and again later in the night. I have never seen any of them on the wing spontaneously, but have thrown up *S. populi* and *S. ocellatus* during the day; they had a feeble and fluttering flight, something like that of a bat—but slower. Bred specimens of both species are usually lively and active about dusk, and the males again from about 10.30 p.m. to midnight.

Distribution.—*S. tiliae* is much less common than either of the other two. It is fairly plentiful and widely distributed in the south and south-east of England, scarce in the Midlands, and very scarce, if not altogether absent, in the north of England, Scotland, Ireland and Wales. On the Continent, according to Mr. Kirby, it is common except in the extreme north and south; it also occurs in Siberia, and there is a specimen in the Brit. Mus. collection, from Sierra Leone.

S. ocellatus is commonly distributed in the south and east of England, less commonly in the north of England and south of Scotland; in Ireland it is scarce but widely distributed. It occurs throughout Europe and northern Asia, and closely allied forms are found over nearly the whole of the N. Temperate Zone.

S. populi is found throughout Europe, except in the extreme north and south, and also in northern and western Asia. Mr. Barrett says, "It appears to occur in all parts of the United Kingdom excepting the west of Scotland. It is scarce in the west of England and Wales, and in Ireland it is found wherever poplar is common. Formerly it was abundant in the south of England, and even in London . . . . . now, however, it is rarely seen in the suburbs of London, and seems to be generally less common throughout the country." My own experience is quite the reverse of that of Mr. Barrett's. I have always found it common in the suburbs of London, in fact, much more plentiful in and around London than in any part of England that I have visited. In the City of London Society's "ten-mile list," Dr. Buckell tells me that it is recorded as occurring over the whole area, so that it seems to have as much right to a place among the special London fauna as *Biston hirtaria,* sparrows, pigeons or cats.

STRUCTURE OF THE IMAGO.—In this the genus differs widely from the rest of the *Sphingidae,* the following being some of the more noticeable points of difference. The fore-wings are ampler, the hind margin generally irregular and sometimes dentated; the head and eyes are very small; the antennae are soft and flexible, are more or less pectinated, especially in the males, and taper slightly towards the tip. The tongue is very short, and is even said to be entirely wanting in *S. quercus.* In place of the firm and elegant bodies which are usual among the Sphinx moths, the bodies of this genus are soft and blunt, and, in the females, very bulky, and remind one forcibly of the larger Bombycids. To this group they also present affinities, though probably only superficial ones, in nearly all the above-mentioned characters, as well as in their great egg-laying capacity and in their tendency to "assemble." Perhaps the similarity of their habits would largely account for these points of resemblance, though both Mr. Poulton and Professor J. B. Smith (of Washington) seem to be of opinion that there is a true relation between *Sphingidae* and *Bombycidae,* and I believe Dr. Chapman considers that *Smerinthus* is related to *Notodonta.*

THE RELATION OF THE GENUS TO ALLIED GENERA.—As to the position which *Smerinthus* occupies in relation to the other genera of the family, opinions differ. Stainton, Barrett and Newman place it just before *Acherontia,* while it is placed just after *Choerocampa* by Kirby. Mr. Poulton says that in their younger stages *Smerinthus* and *Sphinx ligustri* are very near together; they certainly have many characters in common. *S. ligustri,* in its first skin, has forked hairs, though these are black, and are thinly scattered compared with the "door-mat" appearance which is characteristic of *Smerinthus.* The shape of the head is similar to that of *S. tiliae* in its earlier stages, and the pupæ are also somewhat alike. In the imagines, however, the only points of resemblance that I can see are that the head and eyes of *S. ligustri* are small, and that the antennæ are somewhat similar in structure. On the other hand, the resting-position is quite different; *S. ligustri,* like *A. atropos, S. convolvuli,* &c., resting with the fore-wings sloped over the back and the hind-wings folded underneath them. The resting-position of *Choerocampa* is similar to that of *Smerinthus,* but the pupæ are very different. Whatever may be the right place for *Smerinthus,* I can see no reason for putting *A. atropos* next to it; for I think that without question *S. ligustri* is a nearer relation, and it is probably a link between the two. Turning to individual differences, the hind tibiæ of *S. tiliae* have four spurs, while those of the other species have only two. I find that *A. atropos, S. ligustri, C. elpenor* and *M. fuciformis* also have four spurs to their tibiæ. The males of *S. tiliae* have a frenulum, but in the females this is only rudimentary, the loop being entirely absent and the bristle being replaced by a number of short slender ones which are of no apparent use. The males of *S. ocellatus* possess a small bristle, the females a group of small ones, but there is no trace of the loop in either sex. I examined a number of specimens of *S. populi,* but could find no trace of loop or bristle in either sex, except in one female, which had a group of small bristles on one hind-wing only. No doubt this was simply an instance of reversion, the frenulum being as a rule altogether wanting in this species.

A consideration of all the different characters present in the several stages leads me to think that *S. tiliae* is the oldest form, and that *S. ocellatus*, though its habit and food are very different, as is also the coloration of the imago, is not really so widely removed from *S. tiliae* as a superficial knowledge of the two species might lead us to suppose. *S. populi*, on the other hand, is, I believe, much farther removed from *S. ocellatus* than is usually thought to be the case; it seems to have developed right away from the others, and to have lost many of the ancestral features that they retain. The similarity of the eggs and of certain characters in the young larvæ of *S. tiliae* and *S. ocellatus*, and the wide divergence of *S. populi* in these stages, will be apparent from a study of the tables that I have passed round. I am well aware that the adult larvæ of *S. ocellatus* and *S. populi* are often difficult to distinguish; but the likeness is really only a general one, and probably arises as much from the similarity of their food-plants and of the dangers to which they are exposed as from actual relationship. When we compare the imagines, the resemblance between *S. tiliae* and *S. ocellatus*, as regards the shape and markings of the wings, is very close, while *S. populi* is entirely different in both respects. One very stable and, perhaps, important marking that *S. ocellatus* and *S. populi* have in common is the white lunule on the margin of the discoidal cell of the fore-wings; but though no trace of this is present in any of the specimens of *S. tiliae* that I have seen, a very similar mark may be noticed in *S. ligustri*, albeit in this species it is black instead of white. Mr. F. N. Pierce, of Liverpool, has been good enough to make preparations of the genitalia for me, and writes thereupon as follows:—"I found them very difficult to manage, as they were so large, thick and strong, and I have only succeeded fairly well. As regards size, those of *S. populi* and *S. tiliae* seem much nearer; but in structure there is no doubt that those of *S. ocellatus* and *S. populi* are nearer to each other than either of them are to those of *S. tiliae*. I am much struck with their strength in *S. ocellatus* compared with what obtains in *S. populi*." From Mr. Pierce's remarks it will be seen that the evidence of relationship afforded by the genitalia is not in accord with that furnished by other characters. I am not altogether surprised at this, as the genital organs would probably be among the first to undergo modification in a new species, and they are probably not so valuable a guide to the relationship between well-established species as to the distinction between species that have all their superficial characters in common.

Hybrids.—The occurrence of hybrids between *S. ocellatus* and *S. populi* is a fact that has always had a certain amount of fascination for me. Up to the present my attempts to cross the two species have only yielded me a very poor series of the former, but I shall try again. The literature of the subject is not extensive. The earliest note I have been able to find is one by Mr. House in *Trans. Ent. Soc. Lond.* for 1842. Mr. House obtained five batches of eggs from *S. populi* impregnated by *S. ocellatus*, and one batch from *S. ocellatus* impregnated by *S. populi*, but only 30 eggs from one of the former batches proved fertile. From these he reared 19 larvae, which pupated in July. Twelve moths emerged in August, the other seven pupæ going over the winter. Of the imagines, he says:—"The power of reproduction is completely lost, as they appear to be as near intermediate between the sexes as between the species; they evidently partake of the nature of both sexes: as a proof, every insect of the genus *Smerinthus*, on touching, discharges copiously a fluid, which in the ♂ is pure white, in the ♀ of a yellow or ochre colour. This insect discharged, at the same motion, first the white and then the ochre fluid quite distinct, and this compound discharge was quite uniform in every specimen, which is never the case in any true species or sex." Of the larvæ he notes that, in the first stage, no difference was observable between them and those of *S. populi*, very little in the second, more in the third, whilst finally they were more like larvæ of *S. ocellatus* than of *S. populi*. The pupæ seemed to be exactly intermediate. Professor Westwood says that Mr. House's is the first recorded statement of any satisfactory result, and that his specimens incline much more to the ♂ parent than to the ♀. Mr. Galliers (*Weekly Intelligencer*, vol. x.) bred a hybrid from eggs of *S. populi*, fertilized by *S. ocellatus*, the fore-wings of which resembled those of the mother, except that they were much darker, whilst the hind-wings resembled those of the father, the ocelli being finely developed. In the *Report of the British Association* for 1870 is the following note by Mr. Edwin Birchall:—"The hybrid moths were produced by the union of *S. ocellatus* ♂ with *S. populi* ♀. The larvæ were barely distinguishable from those of *S. populi*, and appeared healthy: but there must have been constitutional weakness, for of sixteen which assumed the pupa state, only six produced moths; of these, three were males, two females, and one hermaphrodite. In form and colouring the influence of the female parent predominates in all the specimens, one only having the margin of the wings strongly denticulated as in *S. ocellatus*. In the hermaphrodite specimen the right antenna is pectinated, and the whole of the right side of the insect presents the characters of *S. ocellatus*, the male parent, whilst the left or female side differs from an ordinary ♀ *S. populi* only by a little more brilliancy of colour. The generative organs were much distorted, and there were no ova in the abdomen." There is an evident blunder in the foregoing, probably a printer's error, for Mr. Birchall would surely not speak of the wings of *S. ocellatus* as strongly denticulated. Probably the sentence beginning "In form and colouring" should be amended by the substitution of "male" for "female," and of "*S. populi*" for "*S. ocellatus*." In the *Entomologist*, vol. xiv., is a figure of a hermaphrodite purchased by Mr. Briggs from Mr. Birchall's collection, which is very possibly the identical specimen alluded to in the foregoing extract. It would be difficult to imagine a greater jumble of the two species than the figure represents. Mr. Kirby, in the November number of the same volume, says: "I was under the impression that hermaphroditism was the usual character of these hybrids; and it has suggested itself to my mind as a possibility, which I have not at present sufficient data either to prove or disprove, that the sterility of hybrids in general may perhaps be partly due to hybridism having a tendency to produce hermaphroditism." In *Ent. Record*, vol. i., pp. 95 and 202 is an account by Mr. P. Kirk of a successful rearing of hybrids from ♂ *S. ocellatus* and ♀ *S. populi*.

There are one or two points to which I should like to call attention. First, for the eggs to be fertile it seems necessary that the female parent should be *S. populi*. This may be due to the difference in size of the eggs of the two species: the young larvae of the hybrid, being probably larger than those of *S. ocellatus*, would not have sufficient room to develop in the egg of that species. Then the small percentage of hybrids that arrive at maturity is noteworthy. Weismann's theory of the "germ-plasm" furnishes us with a comparatively simple explanation of the small number of larvæ that hatch from the eggs; only those ova which had a large number or a majority of unaltered or ancestral determinants in their germ-plasm would be able successfully to complete their development. Thus the unmodified determinants from both parents would be able to combine and work in unison; and if, when combined, they formed a majority, they would be able to control the development of the embryo and the earlier larval stages. If, on the other hand, the ancestral determinants were few in number, the modified determinants would assume control, but these would differ in accordance with the parent they were derived from, and as it is probable that the routine of development differs to some extent in each species, the growth of the embryo would be checked in its early stages.* Probably the embryonic stage is the most critical one, for it is then that the internal organs necessary to larval existence are developed. The pupal would also be a critical stage, but the larval stages after hatching would not be of nearly so much importance in this respect inasmuch as the size, shape, coloration, &c. (especially of the adult larvæ), as well as the food, are so similar. The tendency to be double-brooded is much stronger in the hybrids than in either of the parent species; this may be due to reversion; inasmuch, however, as *S. tiliae*, which I believe to be the oldest form, has very rarely been known to emerge before the winter, it is more likely to be due to physiological causes. Hybrid specimens also seem to have a greater tendency to "grease" than those of either of the parent species.

So far as I know *S. tiliae* has never been observed to cross with either of the other two. This may be due to no one having experimented in this direction, or perhaps the difference in the genitalia prevents the union. Such a cross, however, does not seem impossible; though, if fertile eggs were obtained, it would probably be difficult to know what food the larvæ would eat.

It occurred to me, when reading the account of the supposed copulation between two males of *Bombyx quercus* (*Ent. Rec.*, vol. v., p. 198) that the best way to get crosses between different species would be to place the two individuals that you wish to cross in one cage, and to place a ♀ of the same species as the ♂ in an adjoining cage; I have since discovered that this was the method employed by Mr. House in his successful experiments.

Variation considered biologically.†

(*Being some Notes sujgested by the* ROMANES LECTURE *of* 1894.)

By J. W. TUTT, F.E.S.

1.—THE ACTION OF INTRA-SELECTION ON THE DEVELOPMENT OF ABERRATIONS AND VARIETIES.—One of the most interesting features of *The Romanes Lecture* of 1894, was Professor Weismann's definition and

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* Roughly speaking there are three factors present in the fertilized ova. (1) modified determinants of *S. populi*; (2) modified determinants of *S. ocellatus*; (3) ancestral or unmodified determinants from both species. It is the latter which can combine and work together to produce the hybrid.

† Part of a Paper read before the Lancashire and Cheshire Entomological Society, Jan. 13th, 1895.

expansion of the theory of intra-selection. The wonderful adaptations which are found in the constituent tissues or parts of an organism were explained by William Roux as due to the application of the principle of selection to the component parts of the organism; he assumed that, just as we find a struggle for survival among the individuals of a species, so in every organ or tissue the smallest living particles contend with each other, and those that succeed best in obtaining nutriment, being thereby enabled to multiply most rapidly, are victorious over those that are less suitably equipped. Weismann summarises the three factors in the process of selection as "variability, heredity, and struggle for existence." The process of selection may, therefore, go on, not only among individual organisms, but among the different units that go to make up the organism, down even to the smallest conceivable living particles, which Weismann calls "biophors." This process of selection which is carried on in the living parts of organs and tissues is called "intra-selection."

In accounting for the process of intra-selection, Weismann is inclined to assume that it is not the "particular adaptive structures which are transmitted, but only the quality of the material from which intra-selection forms these structures anew in every individual life. Peculiarities of biophors and cells are transmitted, and these pecularities may become more and more favourable and adaptive in the course of generations if they are subject to natural selection." From an entomological point of view, the statement that "Intra-selection effects the special adaptation of the tissues to special conditions of development in each individual" is interesting, for it is by this means that the occurrence of aberrations, which are so exceedingly abundant among insects, is to be explained. There can be no doubt that intra-selection, like its greater and older namesake natural selection, has, in the course of generations, brought about the greatest possible degree of adaptation and harmony among the different parts of organisms, which parts have hence become relatively perfect under the given conditions to which they are normally subjected. Hence a definite form and character are given to the whole and to each of its constituent parts, whilst, at the same time, the mingling of the parental germ-plasms must always secure a certain amount of variation in the primary constituents.

2. The dark coloration of Chrysophanus phloeas in southern latitudes.—It becomes interesting at this stage to consider how far an organism can be affected by external influences to which it is not (according to Weismann) adapted in advance. As an illustration of this, Weismann (p. 22) writes:—"There are numerous examples known in which unusual climatic conditions have produced changes in animals and plants. . . . . . . A small ruddy-gold butterfly, *Polyommatus* (*Chrysophanus*) *phloeas*, acquires a black tinge when it comes to live in warmer climates, such as that of Southern Italy. This, again, is not to be regarded as an adaptation, but must be looked upon as a direct effect of warmth. This has been shown by Merrifield's experiments, the results of which agree with my own observations. In this and several similar cases there is no ground for supposing that the reaction of the scales of the butterfly is, so to speak, an intentional one—or more correctly, that the determinants of the scales were so arranged in advance by natural selection that they should produce black under the influence of a high temperature."

Here I join issue with the learned Professor; for I believe that the determinants of the scales *are* so "arranged in advance by natural selection" that they *must* produce black under the influence of a high temperature.

It is well known that within the area of distribution of a species, there is a certain part in which the environment is more perfectly fitted than in the remainder, by food-supply, climatic conditions, &c. for the development of the species in its most vigorous form. Outside this limited area the species exists under less completely favourable conditions; the food-supply, climatic conditions, or other external factors of environment may partially fail, and as a result the insect produced may be less vigorous, less highly developed either as regards size or colour (for it must be remembered that in insects the scales and the colour are as much structural as the wing membrane itself), and may altogether show considerable difference from individuals developed under the most favourable conditions.

The darkness or otherwise of *Chrysophanus phloeas* seems to be due to climatic (temperature) conditions. It is well known that, as regards acclimatisation, some species succeed better in cold and others in hot, some in wet and others in dry seasons. Whether this be due to the fact that some insects have spread to us from more northern, others from more southern latitudes, or to other causes, it renders it highly probable that the same amount of heat may act prejudicially on one insect and advantageously on another. In the latter case increased heat may be expected to produce effects that show an increase of vitality, whilst in the former cold will produce the same result. A great excess of either heat or cold would, of course, be injurious to any species. To an insect that exists in Britain, say, in a mean temperature of 54° but prefers 60°, any decrease of temperature will be injurious, whilst increased temperature will affect it beneficially until it reaches 60°, and will not affect it prejudicially probably until it exceeds 66°.

It is a fact that the largest, most vigorous, and brightest coloured specimens of *Chrysophanus phloeas* are obtained in the temperate parts of the Palæarctic area, and that, as we pass south, the insect becomes less brilliant, darker, and often smaller. This tends to show that it is one of those species which prefer an environment more like that of our temperate climes, and that a higher temperature affects it more or less prejudicially. The most easily marked evidence of this prejudicial action appears to be seen in the scaling, for, even in Britain, a very hot summer like 1893 always produces a fair proportion of dark specimens, even in those localities where, in cooler seasons, the colour is most brilliant. This is sufficient to prove that the range of variation in the determinants of the scales is such as may enable the insect to be either black, or of a bright ruddy golden colour, and the external stimulus which brings one or other of these extreme conditions to the fore, appears to be that of temperature. This conclusion, I need hardly point out, is diametrically opposite to that of Professor Weismann.

But it is interesting to pursue this matter farther, and to enquire what particular physiological processes are concerned in the production of this colour phenomenon in *Chrysophanus phloeas*. The colours of insects are, I consider, largely dependent on three factors:—(1) The pigment in the scales themselves. (2) The shape, &c., of the scales, giving rise, either by diffraction or interference, to the non-pigmentary colours.

(3) The colour of the membrane of the wing. The inter-relationship of these three factors must be considered, if we are to get any true idea of the changes which the colours of insects undergo when exposed to abnormal temperatures. In Mr. Merrifield's experiments, referred to by Prof. Weismann, and in the natural variation which occurs in Southern Europe, there can be no doubt that all three are affected.

If we apply the simplest elementary laws of vital force to the pupa, we shall (as I have previously pointed out in the pages of this magazine), find that the following facts hold good:—(1) The pupa when first formed has a certain amount of inherent vital force, by means of which both the process of "histolysis" and that of "rehabilitation" are carried on in it. (2) That pupa which has the nearest approach to the normal amount of vital force will undergo the most perfect "histolysis" and "rehabilitation," and will produce an imago most nearly conforming to the natural type, that is, to the form produced under the most healthy and satisfactory conditions. Conversely, the pupa whose amount of vital force is farthest removed from the normal (whether by excess or defect) is the one in which "histolysis" and "rehabilitation" will be least perfect, and the imago produced therefrom will be farthest removed from the normal type. (3) That individual which has been best fed and which has enjoyed the most perfect health in the larval stage, will enter pupal life under the most satisfactory conditions, and will (the pupal conditions being equally satisfactory), emerge therefrom as the best specialised product, whilst the converse of this must also be true.

Another important point appears also to depend on an elementary principle. The vital force of the pupa is converted into energy; the energy at the disposal of the pupa is most probably directed, first to the building up of the vital and reproductive organs, afterwards to the secondary organs or tissues, or such as are not necessary to life. Therefore, any excess of energy in a pupa will be expended, as a rule, on secondary structures rather than on vital ones, and so we find that a weak or diseased pupa fails first in regard to non-vital tissues, such as pigment, scales, wing membrane, etc.

It would appear, therefore, that, as a general rule, pigment, scales, etc., are well or ill developed in proportion to the amount of material and energy available for the purpose. As a result, such insects as pass through their change at the normal temperature produce the form which is normal for the district; that is, they undergo the normal processes of histolysis and rehabilitation, and, in a state of health, have at their disposal the energy requisite to give them the normal wing-expanse, scaling and colour. If an increase or decrease of temperature lowers the vitality of the pupa, it lessens the available energy. The insect, therefore, does not develop under such favourable conditions; it needs what energy it possesses to build up its vital organs, and so fails in perfectly building up the secondary tissues. This failure is in direct proportion to the degree in which the vitality is lessened. If the temperature during the period of active development be below a certain degree, the vital force ceases to act at all and death results. Heat greater than that to which the insect is normally subjected, instead of lowering the vitality to the lowest ebb at which life can be sustained, affects the histolysis and rehabilitation in a directly opposite manner. Under its influence the vital processes are carried on at express speed. Energy is expended at the fastest rate possible, and the tissues are formed without having sufficient time to mature, as they would under normal conditions (we may here suppose these to be those which are most beneficial to the species); the surplus material is rapidily utilised, with the result that as marked an abnormality is produced under the one condition as under the other, although in an opposite direction. It is conceivable, that to insects which normally mature at a low temperature, a moderately high temperature might be fatal, and that the pupal tissues would not form at all. It is clear, however, that all changes in the environment of the pupa must necessarily produce some effect on its development. If the change be sufficiently extreme, then the effect is death; anything short of such an extreme will produce an effect proportioned to its magnitude. If a pupa be thoroughly acclimatised to a given range of temperature, then excessive heat or cold must be injurious.

The fact, that an increased temperature produces dark specimens of *Chrysophanus phloeas*, must be looked upon as simply a fortuitous circumstance, inasmuch as it appears to be largely due to the dark ground coloration of the scales, for *Vanessa polychloros* becomes darker by the subjection of its pupa to a low temperature. Probably the physiological result is much the same in both cases; heat in the case of *C. phloeas*, cold in the case of *V. polychloros*, being detrimental to the development of the most highly specialised individuals of these species.

I take it, therefore, that, within the limits of existence, the possibilities of the germ are such, that the determinants of the scales, owing to the action of natural selection, present a range of variation within the extreme limits possible to the species, and that external influences determine, through their physiological action, which of the three factors shall come to the fore in the final production of the scales.

It is difficult, therefore, to say that Weismann's selection of *C. phloeas*, as a case in which an organism can be affected by external influences for which it is not adapted in advance, is pertinent to the question. It appears to me that the insect must be more or less adapted to its climatic environment in all the countries in which it exists. It may be better adapted to some localities than to others, but still it is adapted to all. If it shows some definite external character on the confines of its range wherein it differs conspicuously from the more highly developed forms produced in the most favourable areas of its geographical distribution and if this difference be a difference of scale-coloration, then the scale-determinants must be considered as ranging between those exhibited under the most favourable and under the least favourable environment, and to this extent it must be conceded that *C. phloeas* is adapted in advance, and that the illustration fails so far as it positively states that it is not so adapted. It is clear that the species is adapted to hot countries because it is widely spread over them. It may not be so well adapted, but yet at the same time we cannot say that it is *not* adapted, and it is clear that the limit of variation in the determinants of the scales must lie between the dark coloration produced under one condition of environment and the bright coloration produced under the other. That this is the result of natural selection acting on the development of the insect is obvious. We may "not look upon the reaction of the scales of the butterfly as an intentional one," but this does not necessarily exclude the possibility that the determinants of the scales are so arranged in advance by natural selection that they should produce black under the influence of high temperature.

3.—A BIOLOGICAL EXPLANATION OF THE SEASONAL DIMORPHISM EXHIBITED BY VANESSA LEVANA AND ITS SUMMER FORM PRORSA.—The explanation of the learned Professor with regard to the seasonal dimorphism of the well-known *Vanessa levana* and its form *prorsa* is probably the most unsatisfactory of all the explanations in the paper. Having determined that *C. phloeas* is affected by external influences for which it is not fitted in advance, and that the increased darkening is the outward sign of this difference, he goes on to say:—"But in other and to all appearance similar instances the relations may be of a different nature, though at a glance it may be impossible to definitely decide that this is the case. We must at any rate be careful not to regard as necessarily accidental all the variations that appear under the influence of temperature. Many years ago I made experiments with the seasonally dimorphic butterfly *Vanessa levana-prorsa*, and was able to prove that the two forms of one and the same species, while very different in colour and pattern, owe their difference to the effect of different degrees of warmth during the pupal stage: it is at least possible to convert the summer generation into the spring form, by lowering the temperature. Even at that time it appeared to me doubtful whether such a total change in colour and pattern in the summer form of *V. prorsa* could actually depend only on the chance influence of a higher temperature, and the idea of mimicry at first crossed my mind. But now, by the united labours of many excellent observers, we know that mimicry is of a much commoner and more wide-spread occurrence than could formerly have been supposed, and I should now consider it possible that the summer form—*V. prorsa*—might have resulted from imitation of *Limenitis sibylla*, which flies with it in clear spaces in the woods, and to which in fact it is strikingly similar. I cannot, however, at present give a proof in support of this supposition, and am not even able to say whether *Limenitis* is to be included among protected species. The reasons which lead me to this conclusion cannot be given here in detail, and I mention the idea only as an illustration—whether real or imaginary—of how the impression might arise that a metamorphosis was due to external influences, while the influence—in this case warmth—had only to play the part of the stimulus, the real cause being a variation of the primary constituents of the germ, produced by processes of selection—in this instance by adaptation of the summer generation so as to render it similar to a protected species which flies about along with it." So far as Professor Weismann commits himself to an opinion here, it would lead one to suppose that variation in the germ, followed by the external stimulus of a high temperature in the pupal stage, leads the red-brown *Vanessa levana* (coloured somewhat like a Tortoise-shell butterfly) to assume the dark coloration of *Vanessa prorsa* (coloured of a deep black-brown, and resembling somewhat, to a superficial observer, *Limenitis sibylla*) in order that it may mimic *Limenitis sibylla*. If one asks on what grounds Professor Weismann is led to such conclusions, it would appear that they are practically nil—for he expressly states that he is not in a position to "give a proof in support of this supposition." Now Mr. Merrifield has proved to a certain extent that these forms are interchangeable upon the application of the right temperature, hat is, that the spring form *levana* is obtained with a low, *prorsa* with a high temperature, applied *at the time of pupal development.* It must be evident at the same time, that whatever variations there may be in any one germ, tending to produce either of these forms, must be in every germ, and that, given a fit environment, *levana* may become *prorsa*, and *prorsa* may become *levana.* This being so, it follows that such germ probabilities as may exist, are transmitted until the pupal stage, for it is not until the pupal tissues have undergone histolysis and are undergoing rehabilitation that the external factor—temperature—comes into play. The possibility of either form being evolved, then, exists in the pupa, and we find that given an environment including a low temperature the red-coloured *levana* is produced, given one including a high temperature the dark-coloured *prorsa.* Natural selection has given this species a distinct tendency to produce special forms at special seasons under differences of pupal environment, but experiment has proved that the possibilities of becoming either are in each pupa, with a strong tendency, however, in favour of producing its own form. I would now ask—What has the appearance of the dark *Vanessa prorsa*, at the same time as a somewhat similarly coloured *Limenitis*, to do with the biological principles involved in this change of colour, which, as we have seen, appears to be largely governed by an external stimulus—temperature? Is it that *Vanessa* and *Limenitis* are so closely allied (and they are very closely allied) that they both still show traces in their summer forms of their common origin? This I can understand. Is it that this real relationship is accentuated by the fact of *Limenitis sibylla* and *Vanessa prorsa* being naturally subjected to similar conditions of environment (temperature, etc.), in their pupal stages, which different experimenters have proved to be the particular stage in which *V. prorsa* is affected? This would appear to be so, for Weismann says, "they fly together in open spaces in woods." If so, are the mere facts connected with their similarity sufficient data to justify us in assuming that this similarity is the cause of the summer appearance of *V. prorsa*? Is this not, just a little, putting the cart before the horse? It appears to me, that there is a very simple biological explanation of the phenomenon, and that it is not after all so far removed from the phenomenon presented in the coloration of *Chrysophanus phloeas*, which we have just considered.

It is very evident—without going into the argument as to whether *levana* or *prorsa* is the older form—from the experiments on this species, that every egg laid by the species, may, under certain conditions of environment and external stimuli, develop either *prorsa* or *levana.* The scale colour-determinants or possibilities then, from the very first, range between the red of *levana* and the almost black of *prorsa*, and it seems to me that, since these same possibilities exist until the very time that the scales and their contained pigment are finally formed in the pupa just before emergence, the explanation lies in the intensity or completeness with which the colour is developed and produced at this stage. In other words, it is due to the ability with which the environment allows the vital forces to make the most of the material at disposal. If pigment be an expression of energy, it is clear that under the influence of a cool temperature the vital force of the pupa is not sufficient to cause the pigment material to undergo sufficiently rapid metabolism to produce, in this species, the probably higher colour-development representing *prorsa* and so *levana* only is produced, whilst, on the other hand, under a sufficiently high temperature, the more rapid metabolism perfects the pigment and produces the higher coloration characteristic of *prorsa*. Here, at any rate, is a simple biological explanation in accordance with the facts at our disposal and not requiring any assumption. In fact, I claim to have given some proof in support of my view, and this, at any rate, has some advantage over the idea of Professor Weismann, who can give no "proof in support of his supposition."

It is, of course, conceivable, as we have seen in the case of *C. phloeas*, that the most perfect development may sometimes take place with a low temperature, and that a high temperature (and rapid metabolism) in such cases acts adversely.

SCIENTIFIC NOTES & OBSERVATIONS.

On wing structure.—After reading Mr. Moffat's interesting paper on this subject, of which some account is given *ante*, pp. 161-162, I wrote to him pointing out that, inasmuch as the energy used up by the muscles in flight would need renewal, especially in those instances where the insect remained on the wing for some time, it followed that there must be circulation of blood through those muscles. I received the following reply from Mr. Moffat which is, I think, of sufficient interest to be submitted to the readers of the *Record*.—F. J. Buckell.

There are many interesting questions yet to be settled in connection with the structure of insects. The need of circulation at the base of the wing is one of these. A mature butterfly's wing is a very unlikely thing to have circulation in it. But there are degrees of dryness; a wing a week or two old is much drier than one only a day or two old. The joint of the wing seems to be pretty deeply set in the body of the insect; but there must be muscular attachment at the base, and to keep the wing movable, the muscles must have nourishment and moisture. How far up the wing this may extend is the query. I cannot comprehend circulation without a going and coming; if blood entered without returning I should expect it to clot and dry up solid, why not to the very base? I cannot say. The under wings of some Coleoptera (the *Staphilinidae* for instance) are jointed in the nervures, so that they can be folded up; there must, I think, be circulation there. Also in the hind-wings of Orthoptera, as the insects fold them up like a fan, nothing but a flow of moisture would keep them flexible; and yet it may be quite imperceptible. That the fluid is of a life-giving nature, and corresponds to the blood of the higher animals, I believe but cannot demonstrate. Mr. Fletcher, of Ottawa, contends that the fluid does enter the nervures. Experimenting with the nervures of a *Cecropia*, he found that he could draw water through them, and called my attention to the fact. I examined a number of different kinds, and found that my statement that the nervures presented a structure somewhat like that of bamboo is incorrect. The nervures are, as stated by Kirby and Spence, hollow tubes and, for all practical purposes, empty. What I took for separations are the dried remains of what may have been moisture and are of a frothy consistence; they offer no resistance to the touch and do not adhere to the walls of the nervure: they are also irregular distances apart. I found one space, about $1\frac{1}{2}$-in. long, quite empty; the walls of the tube were clean, as if no moisture had ever touched it. If anything can be said to fill the nervures, it must be air. I must have jumped to a conclusion, without investigating that particular point, when I gave expression to what I thought I had seen. Still, I think the evidence is against the idea of the fluid entering the nervures, though not against the possibility of its doing so. A great deal of investigation is still needed; and that, too, by different persons, so that the observations of one may be tested by others and so finally the truth may be arrived at.—J. ALSTON MOFFAT, London, Ontario. *March 4th*, 1895.

PRE-OCCUPIED GENERIC NAMES IN THE LEPIDOPTERA.—Under this title Mr. Meyrick publishes a note in the *E. M. M.* for March (p. 72), wherein the statement is made that "generic names are now, for the sake of accuracy (?) and clearness, treated as combinations of letters without meanings and accordingly exempted from orthographical emendation; hence a difference of a single letter must be held to constitute a distinct name." I have not heard that such treatment has been authorised by any rules of nomenclature adopted by any competent body, and Mr. Meyrick's statement would seem to be contradicted by himself in the conclusion of his note, where he says, in regard to a corrected spelling of certain original names, that he sees "no reason why those who prefer the correct form should not continue to use it." Therefore corrections of an original name are allowable, and if corrections, then it follows that the original form is not inviolable and is not to be held as a mere senseless combination of letters. The entire object of the rule against duplication would seem to have its origin in the necessity for avoiding confusion. But this is equally liable to happen if there is only an unimportant letter to separate the names, a letter liable to be lost in pronunciation or confounded in writing or printing. *Eupselia* and *Eupsilia* are distinguishable only by such an unimportant letter. An important letter would be a consonant affecting the root of the word or the prefix, not an interchangeable vowel nor a suffix. We might, for example, use *Tepida* and *Lepida*, but could we use *Lepeda* and *Lepida*? What is most certainly the same name or word, sometimes receives in the original printing a wrong letter by printer's error. It is not therefore a different name. It would appear that "single letters" are of varying value, and that the singularity which is sufficient in one case may fail in another to validate the generic title as a distinct name. The names cited by Mr. Meyrick, viz.: *Gracillaria* and *Gracilaria*, etc., if "mere combinations of letters," might equally well be used for distinct genera with *Pandemos* and *Pandemis*, if a single letter without reference to its quality or position were really sufficient to establish names as distinct. As I understand the matter, the date has been once for all fixed, beyond which literary research is not needed in nomenclature; but all names proposed since that date are liable to have their title investigated, no matter how "thoroughly established" they may be held to have become. It is a matter of regret that there are so many mere combinations of letters, nonsense words, in existence, such as Mr. Walker's alliterative *Nadata, Datana, Tadana,* though these sound well enough and besides are sufficient for the purpose intended. But many names, in fact most, possess a meaning and a derivation, and if the spelling of such names may be subjected to correction, why may not any name be entirely changed or dropped, when too near another, to obviate confusion? If the view were formulated and adopted by a competent body, that generic names are to be treated as a fortuitous combination of letters then, under the law of priority, it would seem imperative that we revert to the original spelling (or rather misspelling) of *Gracilaria, Cosmopterix* and *Micropterix.* I believe that, on the whole, adherence to the present custom of regarding generic titles as liable to change when too near and evidently the same word with a previous title, to be a wise one and less productive of error than a retention of badly differentiated names. It would seem that the whole subject might be brought up for discussion and authoritative ruling, but until this is done (and I am not able to find it made the matter of any "Rule"), there would appear to be reason for the action of those who take the ground that names for genera insufficiently distinguishable for practical use should be abated. And if, in principle, generic names are to be regarded as mere combinations of letters, must not the same be held of specific titles also? By what authority does Mr. Meyrick qualify the attempt to deprive the Latin names of insects of all relevancy by the use of the adverb "now"? Does not such a principle contradict the fundamental notion of the Linnean system of nomenclature as displayed in the *Systema Naturae,* in which the generic and specific titles form the commencement of the diagnosis?—A. Radcliffe Grote, A.M.

CURRENT NOTES.

Mr. H. G. Dyar expresses the opinion (*Ent. News,* March), founded on the larval characters, that *Orneodes* (*Alucita*) *hexadactyla* belongs to the most typical section of the Micro-lepidoptera. He finds that some of the larvæ of the *Pterophoridae* also possess the characters of "Micros." He believes, therefore, that "the *Orneodidae* and *Pterophoridae* are not so very distantly related."

We are informed by Mr. J. Hartley Durrant, F.E.S., in response to our remark on the subject (*ante.,* p. 142) that the reason why Lord Walsingham gives "Stgr. *Cat,*" and not Linné, as the sponsor for *Alucita,* is that he regards the name as wrongly used by Staudinger, and that *Alucita,* L. ought really to be applied to the genus *Leioptilus.*

Mons. l'Abbé Bégin, Prof. of Nat. Hist. at the Seminary of Sherbrooke, in the Province of Quebec, recounts (*Le Naturaliste Canadien.,* Feb.) the capture on Oct. 30th, 1894, of a male and female *Colias philodice,* which were much darker than the specimens he had taken earlier in the summer. In place of the normal light-yellow ground colour, these two specimens were of a tolerably deep greenish-yellow, and the black patch at the base of the wings was more pronounced and more extended. Mons. Bégin asks whether possibly the autumn cold may have acted in some way on the pupæ, and thus given rise to this melanism, but confesses that at present observations are too few to justify any dogmatic expression of opinion on the subject.

Mr. Hulst says (*Ent. News*, March, pp. 70–73) that *Camptogramma fluviata*, Hbn., has, as synonyms, *C. lapillata*, Gn., II., 430, from Abyssinia; *C. baccata*, Gn., II., 430, from Ceylon; as well as the following from North America; *Cidaria peracuata*, Wlk., 1421; *Coremia abruptata*, Wlk. sup., 1681; *C. pigrata*, Wlk. sup., 1681; *Camptogramma exagitata*, Wlk., 1331, *Camptogramma* (?) *signataria*, Wlk., 1718. There is also a specimen of the same called *plemyrata*, Feld., but I do not know whether it is correct." He further notes that "*Cidaria inclinata*, Wlk., 1727, is a synonym of *C. ferrugata*, L.," and that "*Tephrosia scitularia*, Wlk., 406, is *Epirrita cambrica*, Curtis;" we assume this to be our *Venusia cambrica*. There is also a note to the effect that "*Boarmia divisaria*, Wlk., 489, of the D'Urban collection, is the same as *B. crepuscularia* var. *abraxaria*, Wlk., 403;" whilst *Melanippe furcifascia*, Wlk., 1294, "is a synonym of *Cidaria hastata* var. *gothicata*, Gn., as is also the *hecate*, Btl., from Japan. It is the form with unicolorous black hind wings." We are pleased to see that Mr. Battley is making himself authoritatively responsible (*vide* SOCIETIES, p. 165) for the *Ennomidae*, and Mr. Prout for a section of the *Larentiidae*. We want someone to become a specialist in the *Boarmiidae*. That these gentlemen have plenty to do, if their specialisation is to be real, is evident from the above.

It is with the greatest regret that we have to announce the death of Mr. Berthold Neumoegen, of New York, whose magnificent collection is world-renowned. He was born on November 19th, 1845, and died on January 21st, of consumption, hastened by an attack of grip (influenza). His extreme wealth allowed him to send collectors into, and to obtain collections from, far distant countries, and he was not only an ardent collector but also a thoroughly well-informed scientific entomologist. An excellent photograph of him appears in the *Ent. News* for March.

The German newspapers contain the very singular statement that Prof. Neumann of Vienna exhibited before a meeting of the Medical Society the daughter (aged three years) of a gardener residing near Brunn, Austria, who had on various parts of the body curling reddish marks under the skin. Prof. Neumann stated that these were the mines of a Microlepidopteron, and their presence in such an astounding situation he ascribed to the fact that the eggs of the moth had come in contact with the skin, and that the newly-hatched larvæ had burrowed into the skin in the same way as into a leaf. His assistant, Dr. Rille, had the little patient under observation in order to observe the further action of the larvae, and to remove them where their presence could be perceived. The story sounds incredible, but as it is now being repeated in various journals we give it for what it is worth. A proper substantiation of the fact and the determination of the species exhibiting such carnivorous propensities will be awaited with interest. In America a small Phycid, *Laetilia coccidivora*, Comstock, feeds normally on the cottony maple scale, *Pulvinaria innumerabilis*, Rathvon; and both in India and North America the predaceous habit of certain butterfly larvæ has been announced, but the present case would seem to involve a change of habit, a leaf miner becoming a parasite on a living body, a flesh miner. To our knowledge such an incident has not been reported before.

The occurrence of *Zabous gibbus* in large quantities in the environs of the city of Bremen last summer has excited considerable comment and enquiry. The beetles seemed to come from the new embankment fringing the river Weser. They crawled up the bank and over the adjoining thoroughfares, being often trampled under feet by passers-by. They were observed to be employed in burrowing into the clay in certain places, apparently to oviposit. It has been suggested that the material employed in the new dyke may have contained the larvæ or pupæ of this species, but, since this material was not brought from a great distance, and the beetle is quite rare throughout the entire district, this explanation, while possibly the correct one, is not free from difficulty, and may not be the true explanation.

The "Butterfly Tablet," manufactured by Denton Bros., Wellesley, Massachusetts, U.S.A., is now being used in America for specimens it is desired to preserve from "the vicissitudes of the voyage," or which, as "types," it may be worth while to keep separately intact. Each specimen is placed, unpinned, with the wings expanded, in a thin card-board box made for the purpose. The body fits in a shallow groove in the white substance which forms the lid of the box, and is covered by a glass plate, which keeps the specimen in position, and allows the upper surface to be examined. The whole is fastened by white paper, gummed round the edges, and the box is thus excluded from depredators.

"The University of California, at Berkeley, is far ahead of Europe in one respect. For the Entomological Society—better known as the "bug hunters"—have begun the issue of an "Entomologists' Daily Post-card." A post-card of the usual size is printed on both sides, leaving a meagre space for the address. The information supplied to subscribers is a note of captures, hints of various sorts, and entomological lore generally. Weekly scientific magazines are generally perilous ventures in America—and even in England—but a daily one, devoted to a single speciality of the most unpractical sort is, for money-making California, a departure which quite keeps up its credit for always taking the lead in unconventionality."—*Daily Chronicle.* March 6th, 1895.

Mr. C. Fenn remarks (*E.M.M.*, April) that there are many varieties of the larvæ of *Tephrosia extersaria* intermediate between the two extreme forms mentioned by Mr. Porritt. He also notes that, "like many of the GEOMETRÆ, this species is liable to vary in the structure of the larvæ, some individuals being almost without the dorsal protuberance." Mr. Fenn fed his larvæ on birch, but has generally beaten the larvæ from hazel in September.

Mr. Newstead, the energetic Curator of the Grosvenor Museum at Chester, reports (*E.M.M.*, April) that birds are very efficient enemies of the *Coccidae*, or scale-insects, which work such havoc on many of our trees.

Mr. Ed. Saunders has been able to determine (*E.M.M.*, April) from material sent him from the Isle of Arran by Mr. K. J. Morton, that *Andrena albicans*, Kirb. is the host of *Nomada bifida*, Thoms.

The Entomologist's Record

AND

JOURNAL OF VARIATION.

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On the development of Sex in Social Insects.

By J. W. TUTT, F.E.S.

There is an article by Dr. St. George Mivart in the March number of *Harper's Monthly Magazine* on "Heredity," in which, among other things, the author criticises that part of Prof. Weismann's *Romanes Lecture*, 1894, which deals with the development of sex in "social insects."

It is, of course, well known, that Lamarck, the French naturalist, antedated Darwin in the publication of the opinion that the development of species was essentially due to modifications which were brought about in existing species by the influence of changes in their environment, and that such modifications were transmitted to their progeny, and after a time became permanent. Darwin in part followed out this idea in his *Origin of Species*, but, in addition, he worked out the conception that these modifications, due to changed environment, were intensified and made perfect by "natural selection"; that, instead of comparatively fixed characters, as it were, becoming modified, every living organism or part of an organism was subject to indefinite variations, and that the destructive agencies at work in nature weeded out individuals possessing characters that were disadvantageous, so that only individuals possessing such characters as were of advantage were preserved. These characters were transmitted by them to their offspring and, as the useful characters would vary indefinitely in diverse organisms, the most different characters might be selected and transmitted. The main point of Darwin's conception, then, was not so much the acquisition of new characters to be handed down, as the modification of existing characters in a direction useful to the particular individual — the handing down of such modified structures by "heredity" being assumed as a matter of course.

Every entomologist who has studied his insects knows how much there is to be said for the existence of these congenital variations; among Lepidoptera it may be truly said that no two insects have exactly the same facies. Now we know that the broad lines of congenital variation can be transmitted to offspring (as witness the racial breeding of *Amphidasys betularia* var. *doubledayaria*, &c.) and therefore we can hardly deny that the smaller congenital variations are also transmissible. This was Darwin's main plank in his theory of "natural selection"; and even when he brought forward examples based more directly on Lamarckian principles, and assumed that the environment had developed modifications which were transmissible, we find him always going somewhat farther and attempting to prove the influence of "natural selection" in such cases.

We can see how great a step this is in advance of Lamarckism pure and simple. The latter assumed a direct modification due to varying external conditions; the former explained how it was possible for the external conditions to become the stimuli which set in motion tendencies to variation already existing in the organism itself. It did not pretend to prove the development of new organs (or of acquired characters as recent writers choose to term it), but it showed how modifications of existing organs were slowly brought about and became transmissible. The organ, being a part of the animal, was clearly transmissible, the form it assumed has already indicated its tendency to develop on given lines, and hence there appears no difficulty in understanding why it took the direction. To talk of the transmission of a slowly-changing but existing organ as the transmission of an acquired character, or to put such a development on a par with the mutilation of a given structure to test whether the mutilation will be transmitted as an acquired character appear equally absurd.

But we are not now particularly concerned with the question whether acquired characters can or cannot be transmitted, although Dr. Mivart appears to consider that this question has some bearing on the transmission of modified existing structures. We believe the latter to be quite possible, whether it be explained by "natural selection" weeding out the useless in the particular line of development in the animal in which such modification be found, or whether it be explained by Weismann's theory that, although structures themselves are not transmissible, the peculiar characteristics of each structure are.

As is well known, "social" insects—bees, ants and termites—are peculiar in the matter of sex. In all there are (1) drones (males); (2) queens (fertile females); (3) workers (more or less infertile females); whilst, in addition, the termites have (4) a form of the workers, modified specially for fighting purposes and termed soldiers.

It has been known, probably since the time of Virgil, that the drones are developed parthenogenetically, *i.e.*, from eggs not fertilised by the sperm cells. The absence of sperm, then, seems to be the only condition necessary for the development of the male form. An unfertilised egg produces a larva, and no matter what nutritious or innutritious food the larva may get in the course of its existence, it changes to a pupa and produces a male in due course. It is not so with the fertilised eggs. The stimulus of the sperm is all-sufficient for the production of females; a fertilised egg *must* produce a female insect: but when the larva hatches, it is in the power of bees, ants or termites to cause it to produce either a fully fertile female or a sterile female by feeding it differently. For three days all the young female larvæ (*i.e.* all larvæ from fertilised eggs) are fed alike. If, after that time, a more nutritious and more plentiful diet be given, the bee, ant or termite emerges a fully fertile female or queen. If, on the other hand, the larvæ are fed with a less plentiful supply of comparatively innutritious food, they still produce females, but with smaller bodies and wings, and with the generative organs in a very imperfect condition, so that they are incapable of copulation and are usually incapable of laying eggs; they are, however, provided with certain structures not possessed by the queen, which enable them to carry on the labour of collecting pollen and doing the necessary work of the hive.

In termites and ants much the same general principles with regard to the production of males, queens and workers appear to hold good; but Grassi has shown that, in the case of the latter, the community determine, still using food as the stimulus, whether the insect shall be an ordinary worker or a modified worker, *i.e.* a soldier.

The out-and-out Lamarckian attributes this difference in development to the difference in the character of the environment (the determining factor of which in this case is food). The Darwinian explanation is much more complex. Darwin leaves out all consideration of food, and states that occasionally animals in a state of nature are sterile, that if insects were occasionally sterile and sterile forms were found to be useful to the community, natural selection would preserve such. He points out also that the neuter insect differs greatly from its fertile parents. It is also absolutely sterile, so that it could never have transmitted specially acquired modifications of structure or instinct to its progeny. The special structural characters of the neuter insect appear, however, always to be correlated with its sterility. The process of natural selection may be applied to the community as well as to the individual; hence, selection has in this case been applied to the family and not to the individual for the purpose of gaining a serviceable end. Further, slight modifications of structure and of instinct correlated with the sterile condition of certain members of the community have proved advantageous, consequently the fertile males and females have flourished and transmitted to their fertile progeny a tendency to produce sterile members with the same modifications, and this process has been repeated an immense number of times until the differences between fertile and sterile females have been arrived at. Darwin further states, that the neuters having been formed, variation in the neuters would lead to natural selection bringing about such forms of variation as are of the greatest use to the community, that where two forms of neuters—workers and soldiers—have been developed, these are the extremes of a series of variations, the extremes having been preserved because both are of use to the community, whilst the intermediates have been weeded out by continual selection.

For myself I am unable to see how food as a factor can be left out. Allowing the influence of food as the primary cause of determining the direction which the female larva shall take, one can understand that modification may not be due so much to the direct quantity (or quality) of the food tending to produce actual structures in excess or defect, as to the indirect influence that it exerts (as a stimulus acting on the organism as a whole) in causing the organism to produce certain structures in the case of the queen, others in the case of the worker. It is not simply the quantity of the food-supply which determines the final result, but rather the influence of the food-supply on the system, because it appears evident that the larvæ, whether they finally produce queens or workers, get as much food as they need, once the point is determined as to which form of the female they shall produce;

but the queen, having a plentiful supply of food, develops large oviducts (some 200 tubes in the bee), whilst the worker, with a smaller supply of food, is not stimulated in this direction, the oviducts being reduced (to about 6 in the bee) whilst the secondary structures connected therewith are more or less atrophied. The special characters of the worker, such as the pollen bags, &c., are structures that require but little food or material for their development, hence the smaller size, ill-developed ovaries, &c., all point to the fact that the smaller supply of food has affected the final development of the worker, especially as we know that it might have been—had it been fed on more nutritious food from the third day onward—a queen instead of a worker.

No one denies that the difference of food does end in producing the results described; it is the way in which this acts that is in question, although Darwin in the *Origin of Species* attempts to explain the origin of neuters among social insects without reference thereto. The Lamarckian considers that the action of the food is direct; the Darwinian, that chance tendencies in the direction of the present workers proving to be advantageous in the advancement of the community, the tendency was seized upon, and as it was found to be more or less in the power of the community to govern it in the required direction, it was developed accordingly.

Professor Weismann says that food is not the cause of the development but merely the stimulus to which the organism reacts in the given direction; that the cause itself is the variation in the germ, that the germ-plasm of each egg has in it in fact three different parts or "ids," a male-id, a queen-id, and a worker-id; that absence of fertilization is the factor that determines the development of the male-id, whilst fertilization determines the development of the female-id; and that when the latter has been determined the queen-id or worker-id is developed under the stimulus of good or poor feeding respectively, and that all modifications are due to the latent primary constituents of which these "ids" are assumed to be composed.

According to the Professor's explanation, then, the germ-plasm of every bee's egg has in it all the constituents necessary to form a male, a queen or a worker, and either of these "ids" may be developed by means of a proper stimulus. He further asserts that each of these "ids" is in turn composed of the primary constituents of which the different parts of the body are built up. These primary constituents he calls "determinants," and as each different part of the body is subject to variation, he supposes the determinants to have been developed by minute variation of the germ-plasm by the process of selection. Criticising this part of Professor Weismann's paper Dr. Mivart says:—"He (the Professor) appears to feel no difficulty in believing that in the germ-plasm of a bee's egg, there are not only all the necessary constituents or determinants of a queen, a worker and a drone, all three ready to be called forth into predominance by an appropriate stimulus, but also that all these have been exclusively developed by fortuitous minute variation in the structure of the germ-plasm of an insects (the hypothetical root-ancestor of the bee) in the idants, ids, and biophors of the ancestors of which there was never anything whatever of the kind! And not only the diverse conditions of the ovary and all the positive characters of which males, queens and workers differ, but also all the wonderful and appropriate instincts which lead the nursing bees to feed and treat the different larvæ in the manner appropriate to each, have all alike been produced by minute accidental variation in the microscopic structure of the particle of protoplasm within an egg-tube of the ovary of a bee! The faith which can accept such a dogma seems to us a faith which can move mountains of intellectual perception and cast them into the sea—*in mare ignorantiae*—of incoherent imagination."

Now we feel inclined for a little way through this paragraph to go with Dr. Mivart, and as the destructive criticism goes on we feel satisfied that he must have another explanation to offer us which is based less on theory and more on fact. Our expectations, however, are doomed to disappointment, for although the habits of bees are tolerably well known, Dr. Mivart stops suddenly at the end of the above quotation and passes to frogs. We have more than once stated that destructive criticism of a theory is very easy, but we have always added that it is more difficult to find something better to put in place of what you attempt to destroy; this Dr. Mivart evidently finds, for he holds up Professor Weismann's theory to ridicule, without showing a single detail in which the theory fails, or attempting to give a single word of explanation as to how the facts dealt with are to be explained. No one can know better than Dr. Mivart that a theory is not a statement of facts, but is simply put forward as a means by which facts can be explained. Where, we would ask Dr. Mivart, would the science of physics be now if the various theories in physical science—which all served their turn and helped to advance the study—had not been put forward?

The rest of Dr. Mivart's paper does not bear directly on our special branch of the subject, so, as it is not our intention to go into the general subject of heredity, we will conclude by pointing out that, according to this writer, all the explanations of our great philosophical naturalists have so far been futile, that when we seek to "explain the entire activities of a living organism by the functions of its 'cells' each 'cell' so considered becomes but an entire organism 'writ small'; so every 'biophor,' 'idiosome,' 'gemmule,' &c., of a 'cell' becomes the 'cell' again 'writ small.' Biophors, &c., are terms for mental images of material particles which only differ from bodies perceptible to the senses because they are supposed to be exceedingly minute. They are, therefore, necessarily incapable of making us understand the vital, immaterial activities of entire organisms, and the use of them amounts to an attempt to make imaginary representations of things perceptible to the senses, serve as representative of things imperceptible to the senses, and therefore essentially incapable of any such representation." That is, we take it, that we are deceiving ourselves with the infinitesimal nature of the atoms which form the ground-work of our speculations, and therefore these are foredoomed to failure. Instead of this Dr. Mivart sees in living things "a materia organism and an immaterial energy," and this energy is sufficient to explain all the body's activities. "Such an individual and individuating material energy cannot, of course, be pictured by the imagination, but that is no bar to its intellectual apprehension." Which we would ask is the more tangible? To understand gemmules, biophors, &c., in which we have to imagine such an "immense number of minute parts and their motions" which tend "so to fatigue the fancy as to make persons think that by having had their imagination thus overwhelmed by a complication of mental images exceeding its grasp, they have arrived at something of a really different nature, and capable of explaining realities which the reason indeed apprehends, but of which the senses can take no cognizance," or, on the other hand, the delightfully clear "individuating immaterial energy," which "cannot of course be pictured on the imagination," the formation of the imaginative picture being, however, "no bar to its intellectual apprehension."

The British Representatives of the genus Caradrina.*

By LOUIS B. PROUT, F.E.S.

The genus *Caradrina* was constituted by Ochsenheimer in 1816, and was employed, with a similar though more restricted signification, by Hübner in his *Verzeichniss*. Treitschke, however, was the first, in 1825 (*Die Schmett. von Europa*, vol. v., part 2, p. 246), fully to describe it, and consequently he is cited by Lederer and others as the authority for the name. Treitschke says that "the moths have notched or weakly pectinated antennæ, a small dorsal tuft, and glossy fore-wings on which, in addition to the transverse lines, a shade stripe is mostly present in the neighbourhood of the reniform. The orbicular is small or wanting, as is also the claviform entirely. The larvæ agree in form and habits; with longitudinal lines, interrupted, oblique dashes and spots or tubercles, which are furnished with fine hairs; rounded off towards the anus. All live on low plants, particularly species of plaintain (*Plantago*)."

This is not one of those genera which have undergone the remarkable vicissitudes in regard to classification to which our attention has recently been called by Mr. Grote and other eminent bibliographers. A few of Ochsenheimer's and Treitschke's species have been removed from it and located elsewhere; but the whole of the six species which will occupy our attention this evening were originally included in the genus, and have there remained. The six British species, as I hope to show in detail presently, are *morpheus*, Hufn.; *alsines*, Hb.; *taraxaci*, Hb.; *ambigua*, Fb.; *superstes*, Tr.; and *quadripunctata*, Fb. I have placed them in the order in which they occur in our lists, which follow their customary method in separating two possible allies (*morpheus* and *quadripunctata*) by placing them at either end of the genus.

Treitschke divides the genus into four groups; (A) with narrower fore-wings and whitish hind-wings; (B) with slender bodies, broad bronze-coloured fore-wings and brown-grey hind-wings; (C)with earth-coloured, darker-mixed fore-wings and yellow-grey hind-wings; (D) with fore-wings without stigmata, only with transverse lines, or unicolorous. His group (A) consisted of *glareosa* (now removed from the genus), *morpheus*, *cubicularis* (*quadripunctata*) and *exigua*; (B) of *palustris* and two others; (C) of *superstes*, *ambigua*, *alsines*, *blanda* (*taraxaci*) and two others: (D) of *trilinea* (*trigrammica*) and others. In our present restricted generic sense, only groups (A) and (C) now concern us; group C (the *taraxaci* group) best represents Hübner's *Caradrina*.

* A paper read before the City of Lond. Ent. and Nat. Hist. Soc. on March 19th, 1895.

Guenée (*Noctuélites*, &c., vol. v., 1852) arranges the species somewhat differently, *morpheus* being transferred to the *taraxaci* group; *quadripunctata* is thus the only one of our British species that is left separate from the rest, though, of course, in company with a number of its continental allies, such as *selini*, Boisd.; *kadenii*, Frr., &c., &c. His unreasonable separation of *Laphygma exigua* from the region of *quadripunctata* has not been followed by Staudinger; and, though it is found in South's *Entomologist Synonymic List*, it is worthy of notice that Guenée himself rectified his mistake in a letter to Millière (published by the latter in his *Iconographie*, vol. iii., p. 293) in which he says that since 1867 he has made acquaintance with the larva of *quadripunctata*, and that it belongs rather to *Laphygma* than to *Caradrina*.

My first impression, when I began to study this genus, was that it contained two sub-genera—one containing *morpheus* and *quadripunctata*; the other, the *taraxaci* group—and I still think, from the structure of the genitalia, antennæ, &c., that the two first-named species are nearer to one another than either of them is to the other group, and that Treitschke was therefore not far out in his classification. But *morpheus* has really no very close allies, and I think the best course to adopt would be to sub-divide twice thus:—1 (A) *quadripunctata* and its allies; 1 (B) *morpheus*; 2 *superstes, taraxaci, alsines, ambigua*. I may say here that Mr. F. N. Pierce, who is specially studying the genitalia of the Noctuæ, and who has again most kindly given me his help in this direction, considers that the genitalic differences are here of full generic value. Should *quadripunctata* prove to be, as Guenée suggests, congeneric with *exigua*, that group may ultimately have to be removed to *Laphygma*.

Concerning the early stages, I am not really competent to speak; I have reared *taraxaci* from egg to imago, *quadripunctata* from larvæ, and am also acquainted with the larva of *morpheus*; all the species of the *taraxaci* group are very closely allied as regards the appearance of the larvæ, food-plants, habits, &c., and all hybernate when but partially grown; *morpheus* and *quadripunctata* differ widely from them in superficial view (and also, I must admit, from one another) but both hybernate full-fed in the cocoon in which they pupate in early spring. From the differences in the early stages and also in the position in which the wings are held when at rest, Werneburg in 1854 (*Berichte des Lepidopterologischen Tauschvereines*, p. 145) suggested that *quadripunctata* did not belong in the same genus with *alsines, ambigua*, &c.; but no serious attempt has yet been made to separate it; nor shall I venture to do more than I have already proposed—*i.e.*, to follow Treitschke in placing it and *morpheus* in a different section of the genus from the others—until much more accurate observations and studies of the early stages have been undertaken.

The differentiation of the species in the *taraxaci* group is no easy matter, and I think it will be better in the first place to consider these species together, and, in doing so, to take the opportunity to establish the claim of *superstes* to a place in the British list; after which, the variation of each species may be separately dealt with.

It is not surprising to find that there was continual confusion and obscurity with regard to these species in the early days of the history of nomenclature and classification. We can hardly rely upon any determinations as to the meaning of the older authors, and are compelled practically to take Hübner as our starting point. *Alsines* is generally quoted, on Treitschke's authority, as *alsines*, Brahm; but Brahm probably had both species, or possibly *taraxaci* only, before him; Illiger and Laspeyres agree in uniting his *alsines* with *blanda*, W.V., and his description * indicates that *alsines* is very variable, the typical form being obscure brownish-grey, *without* the dark central shade; further, he expresses a suspicion that he may be dealing with two closely-allied species. It seems almost equally unsafe to ascribe the species to Borkhausen, who must also have united the two —his *blanda* being quite a different species, apparently *Taeniocampa populeti*. I have therefore called it *alsines*, Hb. Hübner considered that there were three species in this group, which appear in his *Verzeichniss* as:—2,310, *C. blanda*, Schiff. *Verz.*, L. 8: *plantaginis*, Hb. 576, and *blanda*, 162. 2,311, *C. alsines*, Bork., 254 : Hb. 577. 2,312, *C. taraxaci*, Hb. 575. His *blanda*=*plantaginis*, therefore, represents a probable union of all the white hind-winged specimens (*ambigua*, Fb., and *superstes*, Tr.); as recently as 1857 Lederer doubted the specific distinctness of these two.

Treitschke was the first to recognise that there were four species in the group, and his very careful working of them out was based largely on material supplied to him by Herr Georg Dahl, a celebrated collector of the period, who had bred immense numbers, and had learned to differentiate them in the larval state. Treitschke calls the four species: *superstes* (first named by Ochsenheimer, described by Treitschke); *ambigua*; *blanda*; *alsines*. The name *blanda* has not been allowed to stand, because, though the actual name dates back to the *Vienna Catalogue*, yet neither Schiffermüller's indications nor Fabricius' diagnosis is considered adequate for purposes of identification, and Hübner's name *taraxaci* is prior to Treitschke's description.

Several attempts have subsequently been made to upset the specific right of one or other of the group. In addition to Lederer's impossible union of *ambigua* and *superstes*, I may mention Guenée's treatment of *superstes*, as a probable var. of *taraxaci*, and the opinion of Snellen and Van Leeuwen (*Tijd. v. Ent.*, serie ii., vol. xvii., p. 133; vol. xviii., p. 135), that *taraxaci* was not specifically distinct from *alsines*. On grounds which I will now proceed to give, I consider that the specific right of all four is well established. I wish here gratefully to acknowledge the willing and patient help given me by Messrs. J. A. Clark and C. Nicholson, in connection with those investigations for which the microscope has had to be called into requisition.

(1). Dr. Speyer pointed out (*Stett. ent. Zeit.*, xxviii., p. 73. *et. seq.*), "that the four older species of the *alsines* group, whose specific difference besides is under no doubt, also, in addition to the difference which the colouring, &c., presents, admit of the recognition of one such, even if slight and only appearing distinctly on comparison, in the ♂ antennæ." He then describes each in detail, and as I have personally verified his

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* Mr. Tutt probably looked up Brahm from Staudinger's incomplete reference (Brahm., II., p. 114) and was consequently led into writing (*Brit. Noct.*, I., p. 147) "Brahm only described the early stages," and into treating Borkhausen's as the type description. As a matter of fact, Brahm's *Insekten Kalender* is arranged in months, and the description (a most careful one) of the imago is to be found at a later page (298) than that of the larva.—L.B.P. [Quite correct. Ed.]

results, I bring them before you with confidence. *Superstes.*—Antennæ the shortest ciliated; length of cilia in middle of shaft, scarcely half the diameter of the shaft. *Taraxaci.*—Cilia somewhat longer; length, about two-thirds of the width of the shaft; the segments slightly swollen laterally. *Alsines.*—Cilia somewhat longer still, beginning to crowd together in the middle of the segments to form short tufts; the shaft with deeper segment-incisions. *Ambigua.*—Cilia longest, almost equal in length to diameter of shaft, and distinctly massed together in tufts; shaft also with lateral protuberances and strong segment-incisions. Thus *superstes* and *ambigua* are seen to be so remote structurally, that, if Lederer had given half the care to these two which he gave to some other genera (*e.g. Agrotis*), he could not have united them. It is interesting to note that even Treitschke considered them "far removed" in form, &c. The occasion that gave rise to this article of Speyer's, was the erection of a fifth species in the group, *sericea*, of which I shall have more to say presently, but which, unfortunately, agreed in the antennæ with *alsines*.

(2). Mr. F. N. Pierce, with his usual courtesy, has examined the genitalia of specimens of each of the four in my possession; he finds *alsines, taraxaci* and *superstes* so close, that he does not venture to pronounce positively as to their specific right, though it is possibly more than a coincidence, that the very slight differences in shape which do seem to be observable follow a gradation which places the species in the same order as that arrived at from the antennal structure—viz., *superstes taraxaci, alsines, ambigua*; but *ambigua* is again abundantly distinct from the other three, in the fact that in it the "lower lip" has a bulbed termination, while in the other three it ends in a mere point.

(3). The larvæ of all four have been known for nearly a century, and yet I have not come across any authenticated instance of the species breeding otherwise than perfectly true; and the differences between the forms are too constant to allow of a possible explanation of them as "aberrations," while on the other hand, they too often occur together in the same localities, to admit of their being regarded as "local races." Considering the structure of the genital organs, hybridism between some of the species would perhaps be possible. Herr van Leeuwen announced (*loc. cit.*) that he had taken an *alsines* and a *taraxaci* in cop., and exhibited a brood resulting, which he said contained both forms; but, as Snellen and de Graaf considered that all the offspring were *taraxaci* and that there was "no single *alsines* among them," there is no need to suppose that the parents were anything more than two different forms of that species. We in England may, at any rate, claim to have had some experience with these two species, and have never found serious cause to doubt their distinctness—"the caterpillars being so different" (Newman). As to *superstes*, the male antennæ appear to be quite sufficiently different from those of its nearest ally, *taraxaci*, and it has been bred and closely studied by Fuchs and others on the Continent.

The differentiation by scale markings is a very delicate business, and I am afraid I cannot offer very much that is tangible; but it would be a serious omission if I were to ignore it altogether. Treitschke makes a special point of the very strong black dusting in *superstes*, and this is very noticeable in all the specimens I have seen; the basal area is dusted with minute black specks; the elbowed line is always accompanied by very prominent black dots, giving it a double appearance;

the subterminal is nearly always dark shaded internally, the border deeply black dotted—sometimes, also, part of the border of the hind-wings; the stigmata filled up with darker colour than the ground; and the central shade is frequently well expressed. The orbicular stigma is not generally so large as in *ambigua*, and is usually placed obliquely, being elongate, not round; the pale borders of the stigmata are also less narrow, and less clean cut. The insect is generally larger and more strongly built than *ambigua*. Compared with *taraxaci*, the hind-wings are cleaner white, and such darker dusting as they do possess is yellowish rather than greyish; besides, the lighter, more straw-coloured tone of the fore-wings, with the coarse black dusting already mentioned, give it a totally different aspect from that species. Herr A. Fuchs, who appears to have been one of the first entomologists since Treitschke's time to give close attention to the breeding of *superstes*, and to its undoubted specific right, says (*Stett. ent. Zeit.*, xlv., p. 261, etc.):—"In distinguishing the moths of the group *ambigua*, *superstes*, *taraxaci*, the hind-wings must before all things be taken into consideration. (1). Decidedly the whitest hind-wing is borne by both sexes of *ambigua*. When von Heinemann (i., p. 431), recording the same observation, adds thereto that the (white) hind-wings of the male *ambigua* are very little, of the ♀ somewhat more strongly, dusted with brown-grey *on the nervures*, towards the border, the state of the case is very well indicated in these words, and especially the remark at the same place that this brown-grey dusting appears the most distinctly at *the apex* of the ♀ hind-wings. (2). Very different from the hind-wings of *ambigua*, are those of *superstes*, which bear on a white ground *a yellowish silky gloss*. Towards the border, appears on the nervures and at the apex, a much more copious yellowish-grey dusting—not brown-grey as in *taraxaci*—which is at least as strong in the ♂ as in *ambigua* ♀, in the ♀ decidedly stronger. Then, while *ambigua* ♀ only appears a little brown-grey about the tip, the ♀ *superstes* has, at the border of the hind-wings a dull yellowish-brown band, reaching from the tip as far as the hinder angle, merged in the ground colour towards the base, and with indistinct traces of the two arched stripes. Through this dirty tone-colour, the hind-wings of *superstes* ♀, remind one of darker ♂ *taraxaci*. (3). As *ambigua* has the lightest, so *taraxaci* has decidedly the dullest, hind-wings of the group. These are in the ♂ *dirty whitish-grey*, at the border about the tip grey-brownish, in the ♀ brown-grey almost throughout, with lighter base. *Superstes* is the largest species, with the broadest wings. . . . . *Taraxaci* has the darkest unicolorous brown-grey fore-wings, with only fine markings."

In the Rheingau also, where Fuchs collected, the times of appearance of *superstes* and *ambigua* differ, but I find that there is so much irregularity in the appearance of some of these species in different places and in different seasons, that we must not over-estimate the importance of this; it is, however, noteworthy that *superstes* seems everywhere to be single-brooded, and to appear pretty regularly in July; while *ambigua* is generally double-brooded, its second brood not appearing until the latter part of August, being fresh when, according to Fuchs, only a few damaged stragglers of *superstes* still remain. I think the double-broodedness of *ambigua* will turn out to be precisely parallel to that of *Leucania pallens* and other well-known species, the first emergence extending over a considerable period, and the second brood feeding up very rapidly, so that there would hardly be any period of summer when some specimens might not be found; see the notes by Mr. A. J. Hodges (*Ent. Rec.*, vol. vi., p. 42, etc.) on the appearance of the species in Guernsey.

The sole claim, at present, of *superstes* to a place in the British list rests on the capture of two specimens by Mr. Tutt at Deal in July, 1886. In working up the material for his valuable *British Noctuae and their Varieties*, Mr. Tutt detected the agreement of these two specimens with continental examples received as *superstes*, as well as with Herrich-Schaeffer's figures. On the strength of this, he introduced the species as British (*op. cit.*, vol. i., p. 145). It is carefully and accurately diagnosed and described on pp. 148–9; but the Sligo specimens, reported as a probable var., seem to me to be certainly a local form of *taraxaci*, and, if so, *superstes* var. *suffusa*, Tutt, must unquestionably sink; the Isle of Wight specimens in question all belong to *ambigua*. The confusion which subsequently resulted from the unfortunate transposition of the names has been cleared up by Mr. Tutt (*Ent. Rec.*, vol. vi., p. 53); and I take this occasion to apologise for some further difficulty which has arisen from my somewhat hastily-formed opinions expressed at a meeting of this Society last October (*Ent. Rec.*, vol. vi., p. 22), that probably *superstes* was not truly British at all; that opinion was based on such knowledge as I then possessed, but I had not at that time seen Mr. Tutt's Deal specimens; and it was, I hope, excusable, since the Deal specimen figured (*Ent. Rec.*, vol. iv., pl. C, fig. 4) happens to be, as I then assumed, an ochreous var. of *ambigua*. The history of five large specimens from Deal, which are in Mr. Tutt's collection, is so curious, that it will be worth while to go into it in detail. Mr. Tutt, whose quick eye for determining NOCTUÆ is pretty well known, had sorted out these five from his *ambigua* simply by eye, and had set them down as probable *superstes*; and when I quoted Fuchs' notes on the different time of appearance of the two allies, he obtained what appeared to be a striking confirmation of his determination; all these five were captured (in fine condition) in July, while all his numerous *ambigua* were dated June or August! Mr. Tutt then kindly permitted me to study the specimens, which resulted in my considerable bewilderment; I had thought I could separate the two species pretty readily, but I made one of them "certainly *superstes*," another "pretty certainly the same," two "pretty certainly *ambigua*," and the fifth "a puzzle, probably an ochreous var. of *ambigua*." They were all larger than normal *ambigua*, and the fact that they formed a kind of transition to his largest and most *superstes*-like Deal *ambigua*, combined with the simultaneous discovery that *ambigua* on the Continent did possess also a large form, led me, on reflection, again to doubt whether any of them were really *superstes*. You may judge, therefore, of my satisfaction when I discovered, from Speyer's notes, already quoted, how widely different were the ♂ antennæ of the two species. Fortunately, Mr. Tutt's five specimens were all males, though the "puzzle" (which I take to be the specimen figured in the *Record*, *loc. cit.*) was a puzzle in another way, for its abdomen looked quite different from those of the other males, and almost as nearly like that of a ♀. Messrs. Clark and Nicholson will support my testimony that it is impossible to confound the antennæ of the two species, and that we may confidently claim *superstes* as British, though only two of Mr.

Tutt's five belong thereto. The resemblance in size and form may perhaps be in some degree seasonal—the specimens of *ambigua* which appear in the height of summer being possibly inclined to favour their contemporary *superstes*. One of the three large *ambigua* was taken in the same year as the two true *superstes*, the other two in July, 1887, and July, 1888, respectively. I may add that Mr. Tutt's two *superstes* are not so strongly marked as some specimens I have seen, hence the contrast with *ambigua* is less striking.

SCIENTIFIC NOTES & OBSERVATIONS.

Discussion on the Nature of certain Insect Colours.

(*Continued from page* 140).

As far as the *Pieridae* are concerned, we have apparently got a definite pigment. I have written to Dr. Hopkins, and he tells me that the uric acid derivations will dissolve in hot water, that they are enclosed in a scale as in an envelope and not intimately combined with the chitin, as is the case in most other Lepidoptera. With regard to the excretion seen at the time of emergence of most Lepidoptera (Macros at all events), it is, I believe, in every instance a nitrogenous waste product, belonging to the urea, ammonia and cyanogen groups—either or any of them. In some moths, *e.g. Cerura vinula*, the excretion is at first pinkish, changed by exposure to white; quadurate of soda changed by oxidation to uric acid. The same change is to be observed in the excreta of snakes.. Dr. Riding objects to the term black pigment. To my mind, everything has colour—be it black, white, red, blue, etc.—unless it is transparent and transmits all rays. It is only a matter of degree after all. We begin with white which reflects everything, and pass on to pale colours which absorb a few rays and reflect many, and so on up to black which absorbs everything. We are not talking of light (of course white light will split up into a rainbow of colours), but of white paint, black paint, etc., and I have never heard any scientific man that I have come across object to melanin being termed black pigment. On the matter of *Thecla rubi*, I have nothing to say at present, but will wait until I have had time to put it under the microscope by daylight. With regard to refraction [? diffraction.—Ed.] and brightly coloured insects, it must not be forgotten that a very great number, I may say most, of the gorgeously coloured Papilios, Ornithopteras, etc., come from the gloomy forests of South America and the Malay Archipelago. Now, of one thing I am convinced, you cannot have pigment without sunshine, *e.g.* deep sea molluscs, worms and cave reptiles, which are colourless and transparent, blood pigment being always present, however, in the reptiles; therefore, I think, it is in these insects that some of the best examples of colouring by refraction will be obtained. No one, I opine, will deny that the purple of *Thecla quercus* and *Apatura iris* is refractive. The green of *Miselia oxyacanthae*, which gives a reddish tinge when the direction of the light is changed, appears to me to be of the same character as that of *Thecla rubi*, and I think that in this insect the var. *capucina* is probably the ancestral form. Can Mr. Tutt, or any one acquainted with Continental insects, tell me if var. *capucina* is commoner in the north than the form usually considered typical? I get var. *capucina* here in the proportion of about 1 : 4.—R. Freer, M.B. *Jan. 30th*, 1895.

Thinking over the change of colour of *Thecla rubi* by wetting, may not the following be an explanation? There seems to be green and red pigment in the scales, the green being superficial. When white light strikes these green granules, a great part is reflected from their external surface as white light, which, however, carries with it some green that has been reflected from the posterior surface after penetration. The white light penetrating deeper meets with the red granules, but owing to the dark back-ground most of it is absorbed. What little red is returned mixes with its complementary green and forms white light, which slightly diminishes the intensity of the reflected green. When light is transmitted there is much more red light, part of which forms white light by uniting with the green, and the remainder meets our eyes as red. When water is added, the amount of superficial reflected light is very much diminished, because the light passes through water instead of air (a dense medium instead of a rare one), consequently more red light, proportionately, is reflected, part of which combines with the weaker green to form white light, and the rest appears to us as red. Were it connected with the interference of light from the striæ of the scales, as Mr. Tutt suggests, should not the colour vary with position, as in *Thecla quercus*? I tried to verify this explanation by experiment. I painted some carmine on one glass slide, and a smaller patch of bluish green on another, and then placed the latter on the former. By reflected light the colour was green, by transmitted reddish-brown. Looking at them by light passing through water, where the green covered the red it was no longer visible as such, but looked reddish-brown. The difficulty is in getting right shades of colour, but carmine and yellowish-green, to which I added some Italian blue, when superimposed, produced a brown not unlike that of *T. rubi*.

Dr. Freer does not quite seem to see that I merely laid stress on correct definitions of the terms—pigment, white, black, etc.—to show that there is a material something in the scales of moths which is acted upon by light and is a factor in the production of colour, and that it is reasonable to suppose that this material something may be altered by chemical agents, etc., so that light may affect it differently. I am not quarrelling with the terms we daily use. We must and always shall speak of black pigment, red pigment, isolation of pigment, &c.; but I wished to suggest that we should not forget the limitations of their exact meanings, as it appears to me, that only so can we realise how chemical agents, heredity, etc., may act in bringing about and perpetuating changes of colour. I agree with Mr. Burrows in thinking pigment the usual cause of colour in Lepidoptera; on the other hand, Dr. Freer seems to think their colours mostly those of light—and among others, brings forward in proof our *T. quercus*. All the dark brown of this insect seems certainly due to pigment granules in the scales, but I also notice that the more superficial scales which give the purple colour (undoubtedly by dispersion of light, as Dr. Freer says), are also coloured pale yellow or yellowish-brown. Is it not probable that this yellow pigment explains the purple colour? When white light is dispersed by the striæ of the scales, may not the yellow light combine with the dispersed blue—its complementary colour—and form white light, whilst the remaining waves of red and violet mix to form the purple we see. How else can we explain the purple? If this be the case, does not pigment, even in *T. quercus*, play by far the largest part in the production of the colour? I ought to have added that the brown scales and yellow scales are different, the brown have teeth and are more finely striated (in the proportion of 3 to 2) than the yellow; the latter have *no* teeth, and therefore would not scatter the light but reflect it more in mass, the striæ are also more raised, and the white scale has the appearance of being more distended with air.

I would ask readers to add after the words "black pigment" (*ante*, p. 85, 17 lines from the bottom)—"in the sense of the other pigments, inasmuch as black is not a distinct colour."—W. S. Riding, M.D. *Feb. 13th*, 1895.

The "pigment" question touches ground at last, and curiously enough, just where it was expected not to do so. The fact of a white "pigment" or "white pigment-factor" appears to be proved by the quotation made by Mr. Tutt. I wish I were younger, had better eye-sight and were more leisured, that I might take up the matter in its chemical aspects. Granted that a "pigment" or "pigment-factor" has been detected and isolated in some whites, analogy would seem to suggest that other pigments should be modifications of the same form of matter. It may be so or it may not. Could I attack the subject practically, I should look along that line. But whilst we must admit that some whites are produced by pigment, we cannot deny that other whites are caused by structure, so that we may all be right. I remember many years since reading in the *Chemical News*, vol. xv. (1867), p. 299, a note upon the colouring matter or pigment (*turacine*) which beautifies the wing and tail feathers of the South African lory (*Turacas albocristatus*). Analysts prove that this colour contains copper. I have shot and eaten many a lory, and always found the whole body—flesh and bone—stained through with the colour, and the crop full of the purple berries of a sort of wild grape. Whether the colour of turacine is due to copper or not I do not know, but—What is the nature of the colour of birds? Prof. Church isolated 1·6 grain of pigment from each bird at a cost of 10s. 6d.!! Turacine dissolved in slightly alkaline solutions, and was precipitated (*i.e.* isolated) by hydrochloric acid. Is not the lovely "gloss" of freshly caught insects a proof that form has a share in the decoration? I take it that the dull disappointing appearance of a set and dry insect, is caused by some slight change brought about by drying, the latter being sufficient to destroy some of the diffractive effects of the scales. The "black" question requires more thought. Of course, one can imagine that in some cases the chitin is not so colourless as in others. May be some is stained almost black itself—and also backed by pigment granules, also black. A pure black is, I believe, the most difficult effect to obtain, because it requires the complete absorption of all light rays; and there must be different degrees of absorption, *i.e.* more or less complete. I believe there are various qualities of lamp-black, as I know there are of black cloth. The most beautifully coloured Papilio that I met with in South Africa—a lovely mother-of-pearl with, I believe, oblique lines of red-brown—has a curious habit of haunting the insides of thorny bushes, where its charms are not only "lost to sight" but are also "to memory dear" if one goes for it with a net. My impression is that it did not seek the light of day where best it could be admired. Why are so many nocturnal insects brightly coloured? Can they admire one another in the dark? Does not "natural selection" require that such decoration should be seen and appreciated?—C. R. N. Burrows. *March 1st*, 1895.

With regard to the points raised by Dr. Freer, I would point out that there is a great deal of difference in the colours of the fluid material voided by different newly-emerged insects, and that they vary widely in different specimens of the same species. Sometimes this variation appears to be sexual, in other instances the fluid appears to vary in the intensity of its colour among different individuals, irrespective of sex. Now that its connection with the pigment material in the wing has been to a large extent demonstrated, and we know that unsatisfactory conditions of health produce in some instances a partial failure in pigment, it is forced upon one that this difference in the colour of the voided material, is, in the same sex, to a large extent dependent upon the healthy condition, or the reverse of the individual. I am satisfied that the colour of the waste matter voided has but little direct connection with the colour of the wings, because the fluid voided is of a bright red in *Aporia crataegi*, and we all know that there is no red in the colour of this species. I do not know that the gorgeous butterflies, mentioned by Dr. Freer, inhabit, in the way assumed, the "gloomy forests" of the Tropics. So far as my reading has led me, I have always pictured those brilliant fellows as flying bird-like on the outskirts of the forests and above the tallest trees, but rarely descending into the dim vistas beneath the arched canopy formed by the interlacing foliage of the lofty crowns of the forest monarchs. In these dim shades a new insect world of duller-coloured butterflies and moths exists, quite different from those of the outside world which haunt the tree-tops above, or the open spaces of the forests. The purple of *Thecla quercus* and of *Apatura iris* is, I believe, largely due to the diffractive action of the scales on light; I do not understand in what way they can be refractive. I am sorry to say that I know but little of the distribution of *Miselia oxyacanthae* var. *capucina*, even in the British Isles. Strangely enough, I have never been able to get the variety from my friends with sufficient freedom to give even a guess at its British distribution. Staudinger, in his *Catalog* (1871), gives "England" as its sole habitat. This I much doubt. I believe the metallic appearance of certain parts of the wing of this species to be purely superficial. I have a specimen which was in Coverdale's collection when I bought it, among his "albinos" as he called them, in which the colour is almost entirely gone, and yet, which shows the metallic portions of the wing with something of a smooth glossy appearance, and I have a specimen of *Plusia chrysitis* in which the pigment beneath the glossy patches is practically *nil*, although the superficial gloss remains. In all these species there is no doubt whatever that the glossy surface of the wing, which gives certain parts their metallic lustre, is entirely superficial, and *has no direct connection whatever* with the colours which the lustrous areas directly overlay. I could only give a speculative reason for my opinion, but I have frequently advanced the supposition that *capucina* was probably the ancestral form of this species.

I have read Dr. Riding's theory as to change of colour in *T. rubi* under the influence of wetting, and must confess that it is by far the most scientific explanation of the phenomenon yet brought forward. It is, I suppose, reasonable to assume that if two coloured lights which are complementary be reflected, one of which is in excess, that equal quantities of the complementary colours would combine to form white light whilst the excess would pass on to the eye and ultimately produce the colour impression of the object.

I have already largely discussed (in a work now in the press) the question of the glossy colour seen on many insects' wings, particularly those of Erebias, Hipparchias, &c. There can be little doubt that they are almost entirely due to diffraction and interference phenomena. I have also (*British Noctuæ*, &c., vol. ii., pp. 3–4) entered somewhat fully into the actual structure of scales, the walls of which may themselves be black in colour. There is no need to repeat the facts, and I would only suggest that this is the point I wanted to make (*ante*, p. 110) in my remarks on black coloration, which may be found there.—J. W. Tutt. *March 3rd*, 1895.

CURRENT NOTES.

Mr. John Hartley Durrant, F.E.S., shows the hand of a master (*E.M.M.*, April) in his article on the true sponsor of the name *ocellatella* (*Gelechia*). It has generally been attributed to Stainton, but Mr. Durrant shows that while it is in the highest degree probable that Stainton did give the name, yet the earliest *published* description of the species under this name is by Boyd in the *Weekly Intelligencer*, of August 31st, 1858, and that, therefore, according to rule, the species must in future be known as *Lita ocellatella*, Boyd.

Mr. Sidney Crompton writes (*E.M.M.*, April):—"Those specimens of *Colias edusa* caught in Teneriffe are similar to the English, but much brighter in colouring and larger in size." They differ greatly "in point of size, colouring, and width of the black hind-marginal border, and in the size and colouring of the orange discoidal spots." In the ♀s there is considerable difference from the type; especially noticeable is "the great size and conspicuous dentation of the yellow markings on the black border of the hind-wings." Both var. *helice* and *C. hyale* are very rare in Teneriffe.

Mr. Samuel Stevens records (*E.M.M.*, April) an experience with *Psyche villosella* in 1848! Dealing with the question of the method of copulation he says:—"One afternoon I found a ♂ and ♀ *in cop.*, and on examination I observed that the latter had *turned itself round in the case* to admit the organs of the ♂ when pairing took place, and the wings of the ♂ then became horizontal. In *no case* did I find the ♀s leave their cases."

Mr. Henry Schneider, in an interesting "Life-history of *Ornithoptera richmondii*" (*Entom.*, April), states that the pair of fleshy horns (*i.e.*, the osmateria) that can be extended behind the head, are proportionately very much longer in the young caterpillar.

Mr. C. W. Dale has compiled a summary of insects known to be symbiotic with ants (*Entom.*, April). He states that the known species (British we presume) which inhabit ants' nests are:—Coleoptera, 54; Lepidoptera, 1; Neuroptera, 1; Hemiptera, 1; Homoptera, 12: Diptera, 1; Thysanura, 1; Acari, 3; Onisci, 1. Total 75 species. The editor of our contemporary would do well, however, to submit Mr. Dale's contributions to some literary revision. What can we make of the following? "They were accredited by the ancients with carrying on harvesting operations, which have since been discredited but have been proved to be fully correct, etc." We should like to know on what grounds the harvesting operations carried on by the ants were discredited. Was it because they did not use reaping machines? It is refreshing, however, to know that their agricultural methods have since been proved to be fully correct. We suppose Mr. Dale means to say, that *the fact* of their carrying on these operations was discredited but has been proved to be correct. But why could not Mr. Dale say what he meant?

Mr. Nash, of Standish Vicarage, Stonehouse, Gloucestershire, has re-discovered the fact that the larva of *Cossus ligniperda* pupates during winter underground in an earthen cocoon. The full-fed larva of *C. ligniperda* always winters in a cocoon, frequently an earthen cocoon, and changes to a pupa in the following spring, the moth emerging in July.

The Rev. W. F. Johnson, M.A., F.E.S., reports (*Irish Naturalist*, April) that, on the N.W. coast of Ireland, in the neighbourhood of Donegal, sugar in 1894 "was not a success, and melanic forms were entirely absent." In 1893, "matters were quite the reverse, sugar was most productive, and dark forms abounded;" 87 specimens of Lepidoptera were met with, of which 60 were new to the district.

Hr. F. Schille, not finding in any of the books to which he had access, save in Speyer's *Deutsche Schmetterlingskunde*, any mention of the double-broodedness of *Stauropus fagi*, recounts (*Societ. Entom.*, April 1st) his own experience of the species in the valley of the Poprad river in the neighbourhood of the Carpathians. On April 29th, 1893, he beat a freshly-emerged ♂ from a birch, and in the following year, on May 1st, secured an impregnated ♀ which laid 16 eggs, 15 of which yielded larvæ, although only five of these went on to pupation. The eggs were laid between the 1st and 4th of May; the larvæ hatched May 21–23, and were fed throughout on beech. The changes of skin occurred as follows:—I. June 4–6; II. June 12–15; III. June 19–21; IV. July 1–3. The first larva pupated on July 18th, and an imago (♀) emerged August 4th. The writer supplements his own experience by that of Werchratski, who found at Ober-Uhrynow on Sept. 3rd, 1884, a full-grown and also a very young larva; the latter was reared on oak, on which the larvæ were found, and pupated at the end of October, the imago appearing in the following spring.

Mr. Eugen Mory, of Basel, records (*Societ. Entom.*, April 1st) an instance of parthenogenesis in *Bombyx quercus* that occurred last summer. He was breeding moths from pupæ and killing them as soon as their wings were expanded; he is quite certain that a ♂ and ♀ were never in the box at the same time; nevertheless, a week or two later, the box was swarming with larvæ of the species; these "fed with excellent appetite on the willow leaves I presented to them and, with a dozen more gathered from willows in our neighbourhood, are now hibernating in my garden." We shall look with interest for information as to the further career of this brood.

In a short note (*Insekten Börse*, April 1st) on "Winter Breeding," Herr Rauwald, of Halle, states that he found a small larva of *Triphaena pronuba* in September. It fed well on "Braunkohl" and "Weisskohl." When the cold began, the room in which it was being reared was warmed and was kept warm throughout the winter. The larva buried itself in November and the imago, a thoroughly well-developed specimen, appeared in March. The writer found that the larva of *Uropteryx sambucaria*, did not feed at all during the winter although kept in a warm room. In March, the larva began to crawl restlessly about in the cage and, as the ordinary food was not then available, Herr Rauwald was obliged to buy a rose-bush, on the leaves of which it fed until elder, &c., were once more available. He remarks that the resulting imago was a good one, "although somewhat costly."

We understand that the fine collection of Micro-Lepidoptera made by the late Mr. Machin is to be brought to the hammer on May 28th

PRACTICAL HINTS.

On rearing the larvæ of Tæniocampa miniosa.—Some of your correspondents appear to have experienced difficulty in rearing larvæ of *T. miniosa.* I have successfully bred a large number, and my plan was as follows:—Almost fill an eight or ten-inch flowerpot with cocoanut-fibre; in this plunge a jar containing the food-plant—in my case, bramble—and carefully pad the mouth with cotton wool. Insert a light bamboo cane to support a gauze sleeve, fastened round the rim of the flowerpot with elastic. The pot is then placed in the open air, where it will receive plenty of morning sun. This is an arrangement which most nearly approached the natural conditions in which I have found the larvæ. They are day-feeders, and seem to love the sunlight. I never lost any in the way your correspondents describe.—H. Tunaley, 30, Fairmount Road, Brixton Hill, S.W.

NOTES ON COLLECTING, Etc.

Early Appearances.—The past winter has been so severe and long, that the following notes may be interesting. March 8th, hardly any thaw, *Phigalia pedaria* seen; 9th, *Hybernia rupicapraria* and *Anisopteryx aescularia*, frequent; 17th, *Tortricodes hyemana*, swarming; *Lobophora carpinata*, seen.—T. A. Chapman, M.D., Firbank, Hereford.

Notes from the Exchange Baskets.—Mr. W. F. de V. Kane (Monaghan) writes on Feb. 13th:—"To the various notes and suggestions put forward to account for the lack of insects last year, I would add my mite. Firstly, the lack was just as phenomenal here as in England. Yet our winters are normally much more equable and wet, and in the south frosts are but slight and evanescent; and so, if an open mild winter with sudden snaps of cold is unfavourable to hibernating larvæ and pupæ, species with those habits should be very rare in Ireland, and especially in the south. Yet Kerry is our New Forest, and the south is far more prolific than the north. Ulster, which has a climate very similar to that of Mid-Yorkshire, is very unprofitable to the entomologist, except as regards sea-coast species and, perhaps, moor insects. One fact, I noticed last spring, *viz.*, the numbers of Tæniocamps with crumpled and deformed wings. I attribute it to the pupæ having been parched up by the dry summer of 1893. The drought was common to Ireland and Great Britain, the heather in parts of Kerry being dead and brown in July. Now, extraordinary conditions often produce a change of habits in animals. In a harsh dry spring, years ago, I noticed that the rooks took to killing young rabbits, being unable to get their ordinary supply of succulent food. I watched them from the window congregating every day about the rabbit burrows, and they made great execution among the innocents. Similarly, birds in general in 1893, failing to get their usual supply of worms, molluscs, etc., from the arid pastures, were ravenous for larvæ and insects of all sorts. I noticed chaffinches clearing a crop in my garden—of aphides. O si sic semper! In Kerry, in June and July, though moths were plentiful, not a single arboreal larva was to be beaten, or if so, about one each half-hour—and I persevered long enough to test this thoroughly. On the Continent, however, wherever dry hot summers are normal, there is no lack of Lepidoptera of all sorts. But in France and Switzerland birds are very scarce—especially our common small insectivorous species. No doubt, too, as Mr. Tutt suggests, larvæ that bury themselves often failed to get down into the hardened earth where stiff soil exists, but sandhill Agrotids, etc., would not be so effected. Were such genera and species distinctly rarer in 1894? I had no opportunity of observing, but suggest the matter as one worthy of enquiry. The *Dianthoeciae* were notably scarce, but this was by reason of the great dearth of *Silene* capsules, which I noticed in 1893. For the above reasons I demur to the suggestion of the open mild winter having been the predominating factor in producing in 1894 the scarcity of imagines generally. Mr. Tutt's notes as to hybernating larvæ and second broods seem to me very probable explanations so far as they go. We should invite testimony from all parts as to the scarcity or abundance in 1894 of sandhill, bog, or moor species, internal feeders—such as the *Sesiidae* and *Eupithecia togata*, etc.; such, also, as hybernate as ova and emerge (1) early in the spring; (2) late. The cold spring of 1894 no doubt killed off numbers of delicate early broods of larvæ. I think bog-haunting species were in normal abundance as well as Tæniocamps, though the latter, perhaps, not quite up to the mark." ———Mr. J. C. Moberly (Southampton) writes on Feb. 19th:—"My experience of the *Agrotidae* this year is, that some were more abundant and some less abundant than usual. *A. nigricans* and *A. exclamationis* were certainly as abundant as ever. *A. aquilina* and *A. obscura* were not scarcer than usual at Wicken, and *A. simulans* seems to have been more frequently met with both in Scotland and at Portland, according to my correspondents. The same remark would seem to apply to *A. cursoria* and *A. tritici*, but *A. segetum*, which is usually a pest at sugar and at flower-heads, in every variety and at every season, I hardly met with at all. It was strangely conspicuous by its absence. *A. saucia* I did not see, and *A. ypsilon* only sparingly. In our neighbourhood also, larvæ of such common species as *Noctua festiva* and *Triphaena orbona* were very scarce. The abundance of Tæniocamps at sallows last spring and the scarcity of spring larvæ after hybernation go a good deal in the direction of Mr. Tutt's theory, but will that also account for the comparative scarcity of the *Xanthidae*—*Scopelosoma satellitia*, *Agriopis aprilina*, etc., in the autumn of 1894. *Sesia formicaeformis* occurred very freely last year among the osiers in North Hants, and, though the same cannot be said of *S. sphegiformis*, as many were observed this year as last in that locality. On the other hand, *Trochilium apiformis* seems to have disappeared this year at Wicken, where it was also scarce last year. This may, perhaps, be accounted for by the hard work of some of the collectors there."———Mr. J. J. F. X. King (Glasgow) writes on Feb. 23rd:—"The reason why certain insects have varying times of appearance is, I think, little understood. Among the Neuroptera I have myself noted some strange anomalies as to their times of appearance. I think that Mr. Tutt gives a very reasonable theory as to the scarcity of some insects during certain periods."——— Mr. E. Bowles (Waltham Cross) writes on Feb. 27th:—"About the bad season of last year we have many theories to choose from, and most of them have helped. I feel sure the heat of '93 upset many species; for instance, I have bred *Selenia tetralunaria* for five or six seasons, and never had any difficulty with either spring or summer brood. In 1893, when I went to gather in my harvest of pupæ towards the end of September, I was surprised to find they had *all* emerged and the sleeves were swarming with newly hatched larvæ, from which I only saved about six, to carry on the breed, out of thousands; as, of course, the frost and the fall of the ash leaves on which they were feeding came when most were but half grown. The early part of last season was not bad in the New Forest. Geometer larvæ swarmed. *Catocala promissa* and *C. sponsa* occasionally fell with a musical thump into the beating-tray—they are never beaten freely. I believe they feed on the top-most oak boughs, out of reach. Should you be lucky enough to meet with one blown down after a storm of wind, it is always galloping up the trunk. The imagines were plentiful. *Thecla quercus* was abundant, but *Asphalia ridens*, which swarmed the previous year, was almost absent—are they still in pupa? Many of the woods looked in May like they do in winter, they were so stripped of leaves. In July it was quite the reverse, it was hard to find an oak-leaf with a bite out of it. Thus, it is clear, species whose larvæ were well-fed before the excessive heat of 1893 commenced were not scarce in 1894; whereas species whose larval period corresponded with the spell of hot weather failed to appear in many cases in 1894. I have somewhere come across a theory that in wet years, the eggs of lepidoptera are laid in more sheltered places, instead of in the open, and thus the young larvæ gain protection. It seems to me very likely to be true."——— Mr. Maddison (South Bailey, Durham), writes on March 4th:—"Speaking of this district, I should say the scarcity of insects in 1894, arose from several causes. (1). The extreme hot weather prevailing in 1893, must have thoroughly baked many pupæ, especially those of Noctuæ, whose larvæ do not go deeply into the ground. Many larvæ, from the same cause, must have perished in trying to find a suitable place in which to pupate, and there must have been others of the later-feeding species which were too far forward and not able to hybernate, and so died. (2). The very bad frosts here at the end of May and early in June (1894), killed all the young leaves on the oaks, birches, &c., and young larvæ must have perished in thousands. I had several hundreds of young larvæ sleeved out on various trees and shrubs in my garden, and lost nearly all of them in two nights. A lot of ova did not hatch out. (3). With the exception of a few days, July and August and most of September were cold, wet and sunless here, and larvæ grew very slowly, and many died. I had a brood of *Psilura monacha*, which (sleeved out on whitethorn almost from the egg), did not pupate till October, and the imagines (the pupæ having been removed to a warm room) emerged in November, all of them undersized, and nearly all cripples. In the same way a brood of *Polia flavicincta* sleeved out from the egg on lilac, did not pupate till October, and the imagines appeared in November, and one as late as December 2nd. These were of fair size, and there were no cripples. Although I searched well I did not see a single wild specimen of *P. flavicincta* in its usual locality, so that probably the wild pupæ are lying over. On the other hand, *P. chi* was unusually abundant, with a larger proportion of var *olivacea* than usual. *Dichonia aprilina*, generally abundant, with many dark specimens, was scarce, and there were no abnormally dark forms. There were also numbers of common Noctuæ larvæ in the gardens in October, but several afternoons' beating in the woods produced nothing at all."———Mr. A. Robinson (Chislehurst), writes on March 7th :—"I have some remarks to make with regard to Mr. Tutt's second proposition that "hybernating larvæ must hybernate at a certain age; if they get beyond that age, they must go on to maturity or die." I don't agree. When is a larva said to hybernate? I take it the word "hybernate" simply means "pass the winter in the larval state." A hybernating larva is hybernating all through the winter; there is not a definite point at which hybernation begins. Take *Callimorpha hera*. Those I keep in the house are rather more forward than those I keep outside, but both hybernate. The warmth enables those inside to do a little more feeding than the outside ones. Both nibble at odd times all through the winter, except in the case of the outside ones when it is very cold. Of course some larvæ that hybernate will, with the aid of careful feeding and warmth, feed up in the autumn, but have we any evidence to show the effect of again exposing these to their natural conditions at different periods. Mr. Tutt may have authorities on this point, but if so, we want chapter and verse. The larvæ that I am acquainted with that will feed up in the autumn are Noctuæ (*e.g. Aplecta prasina*), but I am very vague as to what proportion of the Noctuæ it extends to. Can it be done with the Bombyces? Further, and most important of all, does it ever occur under perfectly natural conditions? Certainly I have met with odd insects at extraordinary times. I remember Mr. Bowles catching a worn *Nonagria cannae* at Horning, about the 1st of August, when all the rest were larvæ, but I don't remember ever catching a species (of which the larvæ hybernate) in the winter or early spring. With regard to Mr. Bowles' question whether the *A. ridens* of 1893 are still in pupa, I took a lot of larvæ in 1893, and they all emerged in 1894. I do not think I have any pupæ lying over. *A. ridens* will spin up anywhere, so the hard ground would not affect them. I have an impression that Tate prophesied there would be none next year from past experience."———Mr. S. Webb (Dover), writes on March 22nd :—"Heavy rain in May swept away ground larvæ from the Downs. Heavy rains in woods, although not so destructive, prevent these larvæ swept off from recovering their lost places. The hot sun later baked the ground thoroughly, and there were no showers in July to soften the surface and allow *Lycaena corydon*, etc., to emerge."———"Mr. Tutt writes on March 25th :—"The most interesting part of Mr. Maddison's note, appears to me to be that part which refers to the different effect of the wet and cold summer of 1894, on *Polia chi* and *P. flavicincta*. His remarks suggest that *Polia chi* is more suited to a wet and cold climate, a suggestion strengthened by the fact that it flourishes at fair altitudes on our hills and moorlands. Again, that the wet season produces var. *olivacea* more freely under such humid conditions, makes it highly probable that the variety, if the species really spreads to us from a colder region, is the older form. The comparatively ill effects (so far as delay is concerned) on its ally *P. flavicincta*, is not at all unexpected, as the latter is a comparatively southern species, and hence in its more northern habitats probably carries on a more precarious existence in abnormally wet and cold seasons, than in more southern localities. The baking of the ground in 1894, mentioned by Mr. Webb, must have been very partial. From June to September was one continuous down-pour in most districts—rain, nothing but rain."——" Mr. Tutt writes again on April 3rd :—"I am much interested in the notes which attempt to explain the bad season for lepidoptera of 1894. Since probably no two species have identical habits, it is clear that no explanation relating to one species will exactly suit another, and it is only when there is a general failure that some general cause or causes can be attributed. But our discussion has brought out the fact that it was rather a partial than a general failure, and hence it is still more difficult to fix the peculiar conditions which united to bring about the result. Mr. Bowles' experience substantiates to the hilt my statement *re* double broods, and the effect on the resultant larvæ. The young larvæ which hatched from the eggs of this second brood of *S. tetralunaria*, could not possibly reach that stage at which they hybernate = rest (*i.e.*, the pupal stage), and hence, as he shows, the whole mass of young larvæ which he describes were, with the exception of six, absolutely wasted. His sleeves, too, being exposed to natural conditions, are sufficient proof of the absolute destruction which took place in nature. Mr. Robinson seems somehow to have misunderstood my statement. His argument all round proves my contention. Certainly " hybernate as larvæ " means " pass the winter in the larval state," but not " simply " this. We use the term " hybernation " and " aestivation " in a much more restricted sense, *viz.*, for the absolute resting periods of insects in summer and winter. For this absolute resting period, natural selection has fitted some insects at some particular point of their existence—egg, larva, pupa or imago. They must reach this point or die. Mr. Bowles' *S. tetralunaria*, instead of spending their resting period as pupæ, emerged. The imagines did not take on the resting period, but paired, laid eggs, and died. The eggs did not take on the resting period, but hatched. The young larvæ did not take on the resting period, but went on feeding to reach their proper resting period, and died in the attempt; only six, Mr. Bowles tells us, reached the pupal condition where the resting period was natural. These I presume he treated artificially to obtain the result. I saw Mr. Porritt's larvæ (some dozens at least), of *Callimorpha hera*, hybernating last Christmas, all absolutely in the same skin (I don't know which) ; natural selection has bred, in the course of ages, the reaction of hybernation into these larvæ at that age (*i.e.*, in that skin) ; if one of these larvæ nibbled just enough during the winter to cast that skin, Mr. Robinson would find that he would have to feed it up or it would die ; that it nibbles but does not cast that skin is nothing to the point. The resting period of *C. hera* may include nibbling. But the nibbling must not be sufficient to make the larva moult, for having moulted that skin and passed the hybernating stage, it would be beyond Mr. Robinson's power to compel that larva to hybernate in the next skin. I carried out some most interesting experiments on two species whose larvæ have a complete resting period—*Boarmia repandata* and *B. roboraria*. At other times I have experimented on *Hemerophila abruptaria*, which hybernates as a pupa, and they were parallel with the experiments that nature performed on *S. tetralunaria* for Mr. Bowles. Scudder has written about it, I believe; see also Dr. Chapman's notes on *Arctia caia* in *Ent. Record*, vols. iv. and v. There are, of course, larvæ that pass through the winter without any very distinct resting period, but I am satisfied that in nature, when an insect, which has a distinct resting period, passes, in the autumn, that stage at which it normally rests—whether it be as egg, some particular skin in larva, pupa, or imago—and has gone on to the next stage, that no resting is possible for that particular insect until a whole cycle has been completed, and it has reached that stage at which it naturally rests. The rarity of such occurrence or attempts to do this in nature, the fixity of the resting habit at a certain point, shows how ruthlessly nature has weeded out these independent movements, and how completely the race that natural selection has evolved in a given district responds to the normal environment—climatic and otherwise—of the district. I still consider that my explanation suffices for the insects affected in the direction indicated."

SOCIETIES.

At the meeting of the Entomological Society of London on March 6th, 1895, Mr. B. G. Nevinson exhibited a long series of *Heliothis peltigera*. He stated that the specimens were bred from larvæ found on the Dorsetshire coast during July, 1894, feeding on the flowers of *Ononis arvensis*, which were extremely luxuriant. A few were taken on *Hyoscyamus niger*. He added, that all the larvæ went down by the end of July. The first emergence took place on August 20th, and they continued coming out, at the rate of about five a day, through the rest of that month and September; only five emerged in October, and the last one appeared on November 11th. Mr. Nevinson said that not one larva was ichneumoned, and only three or four imagines were crippled. Mr. Bower exhibited a variable series of *Scoparia basistrigalis*, showing light, intermediate and dark forms, taken at Bexley, Kent, from June 12th to July 7th, 1891–94. He said that the species appeared to be poorly represented in collections, and when present was almost invariably mis-named. Mr. Eustace Bankes commented on the rarity of the species, and said the specimens exhibited formed the most interesting collection of it and its varieties which he had ever seen. Lord Walsingham exhibited larvæ of *Pronuba yuccasella*, which he received more than four years ago from Colorado, and which were still living. One specimen of the moth had emerged two years ago. Mr. Goss exhibited (for Mr. G. C. Bignell) a pupa of a Tortrix, with the larval legs, and also a specimen of a Sawfly (*Emphytus cinctus*), with eight legs. Professor Meldola exhibited a wooden bowl from W. Africa, from which, after arrival in this country, a number of beetles (*Dermestes vulpinus*) had emerged. Specimens of the latter were also exhibited. It was not clear to the exhibitor whether the larvæ had fed upon the wood, or had simply excavated the cavities which were apparent in the interior of the bowl for the purpose of pupating. It was generally considered that the larva of *D. vulpinus* excavated the wood for the purposes of pupation, and not for food.——On March 20th, Mr. H. St. John Donisthorpe exhibited a living female of *Dytiscus marginalis* with elytra resembling those of the male insect. Dr. Sharp said he had seen this form before, but that it was very rare in this country, though abundant in some other parts of the Palæarctic region. Professor Stewart asked if the genitalia had been examined. Mr. Champion stated that Mr. J. J. Walker had collected several females of an allied species (*Dytiscus circumflexus*) at Gibraltar with elytra resembling those of the male. Dr. Sharp exhibited specimens of *Brenthus anchorago* from Mexico showing extreme variation in size. He remarked that the males varied in length from $10\frac{1}{8}$ mm. to 51 mm.; the female from $9\frac{1}{2}$ mm. to 27 mm. In the male the width varied from $1\frac{1}{3}$ mm. to 4 mm. Mr. Blandford commented on the difficulty of mounting minute Lepidoptera, Diptera, Neuroptera, etc., and exhibited samples of strips of material which he had found most suitable for the purpose of staging minute insects. He said his attention had been called to this method of mounting by the receipt of specimens from Dr. Fric of Prague. On examination of the material he found it to be a fungus, *Polyporus betulinus*. He stated that Lord Walsingham had expressed his satisfaction with this material, and had sent him specimens, similarly mounted, from Zeller's collection. Mr. McLachlan remarked that he thought the material exhibited preferable to artichoke pith, which had been used for a similar purpose. Mr. Goss exhibited a species of Mantid, *Pseudocreobotra wahlbergi*, received from Captain Montgomery, J.P., of Mid-Ilovu, Natal. He said he was indebted to Mr. Champion for determining the species. Mr. Merrifield read a paper entitled "The results of Experiments made last Season on *Vanessa c-album* and *Limenitis sibylla*." This was illustrated by an exhibition of specimens of *L. sibylla*, and a long series of *V. c-album*, to show the effects of temperature in producing variation. Dr. Dixey said that many of the forms of *V. c-album* exhibited reminded him of *V. c-aureum*, a Chinese species, which he believed to be the oldest form of the genus. He thought that much of the variation shown in this series of specimens was due to atavism, and was not altogether attributable to the effect of temperature. Mr. Barrett said he was interested to find that one of the forced forms of *L. sibylla* was similar to a specimen he had seen which had emerged from the pupa during a thunderstorm. In connection with Mr. Merrifield's paper Mr. F. W. Frohawk exhibited a series of 200 specimens of *V. c-album* bred from one female taken in Herefordshire, in April, 1894. The series consisted of 105 males and 95 females, and included 41 specimens of the light form, and 159 of the dark form. Professor Meldola said that he was glad to think that the subject of Seasonal Dimorphism, which had been first investigated sytematically by Weismann, was receiving so much attention in this country. He was of opinion that the results hitherto arrived at were quite in harmony with Weismann's theory of reversion to the glacial form, and all the evidence recently accumulated by the excellent observations of Mr. Merrifield and others went to confirm this view as opposed to that of the direct action of temperature as a modifying influence.

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Notes on the Habits and Variation of Lithosia lutarella and its variety pygmaeola.*

By J. W. TUTT, F.E.S.

The Deal Sandhills! A name to conjure with among entomologists a dozen years ago; now, thanks (?) to the golfers, utterly ruined for many of the rare insects which formerly abounded there. In the afternoon sunshine of early July, *Acidalia ochrata* flew in hundreds among the *Ononis*, in its restricted haunts just beyond the "second battery;" *Nola centonalis* could be obtained by searching with a lantern in the hollows where the *Hippophaes rhamnoides* grew; and on the marram culms at night, *Lithosia pygmaeola*, the English form of *L. lutarella*, was sometimes to be seen in thousands. Miles of undulating sandhills, left by the sea and protected by an immense bank of shingle, stretch from Deal into Sandwich. No shifting masses of sand, liable to be blown hither and thither by each passing wind, are these, for they are, as a rule, bound solidly together by grass and wildflowers; here, with the tough coarse marram growing luxuriantly on the sloping banks; there, extending for a considerable distance level and flat and covered with turf that would do credit to many a park or lawn. *Galium* and *Ononis*, dwarf and spare, make nevertheless a beautiful carpet of yellow and pink. Now, we come across a damp hollow filled with thistles and dock, in which *Chrysophanus phloeas* sometimes abounds, then, meet with a dry patch covered with stinging-nettles, which are often skeletonised by the larvæ of *Pyrameis atalanta* and *Vanessa urticae*, whilst yonder, a knoll is festooned with a healthy patch of dwarf sallow. Occasionally a ditch may be seen running across the mounds, stretching from the sea far inland, its banks clothed with a luxuriant growth of delicately scented *Spiraea* and brilliantly tinted *Epilobium*, with a dank undergrowth of ditch-side vegetation, on which the caterpillar of *Choerocampa elpenor* may frequently be seen. In the slimy depths of the ditches, reeds, irises, bulrushes and *Sparganium* revel, whilst the *Potamogeton* and water-lily float their leaves and blossoms on the surface of the water. Along these ditches, rare Wainscot moths occur; *Leucania straminea* and *Nonagria sparganii*, roam among the reeds and irises,

* Read before the South London Entomological and Natural History Society, Feb. 20th, 1895.

whilst the fen-loving Muslin moth (*Nudaria senex*) and its companion Footman (*Lithosia muscerda*), with *Acidalia emutaria*, are to be seen fluttering lightly along the edges. Threading its way, with buzzing flight, in and out among the ditch plants is *Coenobia rufa*, whilst over the surface of the water *Hydrocampa nymphaeata*, *H. stagnata*, *Paraponyx stratiotata* and *Cataclysta lemnata*, sometimes abound. Nothing stranger than the larvæ of these water moths comes within the ken of the lepidopterist, nothing more interesting than their habits will he discover among his insect studies. Then, when evening closes and the weird stillness comes over the hills whilst the darker mantle of night enwraps us within its mysterious folds, the rare *Schoenobius mucronellus* with its mahogany-tinted wings and long-pointed snout, plays hide and seek with *Doryphora palustrella*, among the plants by the ditch-side. Then, too, the Agrotids get on the wing (I use the term Agrotids in its widest sense), and their flight is as the onward rush of an invading army. Hundreds, thousands, millions I have seen there; to their number in some seasons there seems no limit.

Such were the sand-hills as I knew them until a few years ago; such, in part, I do not doubt they are still. But about ten years ago, a philanthropist found out our Eden, and built tents in the hollows that the delicate little *Nola centonalis* loved. Thither, in the summer-time, he brought lads from the Great City, who, perhaps, would not otherwise, have seen God's sea, nor felt His pure air blow upon their faces, and His bright sun tingle and tan their cheeks. As an entomologist, I have often been inclined to curse the philanthropist who discovered the Deal sand-hills. But I know something of the boys who come from the black slums of the Great City; I have seen the inside of their homes (!); I have talked with the women who bore them, and have, ere now, like the prophet who was brought to curse the king's enemies, found myself blessing the philanthropist altogether. Then the golfers came. For them I have the utmost contempt. They are men of like passions with ourselves, and I hate them most bitterly, and this is why. The first piece of ground they levelled was the little corner in which *Acidalia ochrata* loved to lay her eggs, where the banks sheltered her from the rude blast. I spoke to two individuals I met there, when they were apparently discussing the spot. They smiled—a heathenish, besotted, ignorant, sardonic grin, which was meant to convey withering contempt. I was informed that I had no business there at all (which was true, I suppose, as such things go). My appeal, I am sure, settled the fate of *Acidalia ochrata*, so far as it had not been hitherto settled.

A clear, dark night; a sky into which one peered, and learned, in a way never known before, that it was unfathomable; a glorious scintillation of the heavenly jewels which thickly stud the firmament; a veritable canopy of points of light where the angels' path—the milky way—stretches its arch through the deep blue-black dome of Heaven! The night is warm, with the slightest suspicion of a breeze crawling over the sand-hills from the south-west; it is a night in which all the delights of Nature are concentrated for the enjoyment of her creatures. I wonder if my companions remember those occasional nights, when we sat on the little seat and looked out over the sea, watching the waves roll in upon the shingle, their path marked by the reflections of the stars, which tossed up and down in the depths of the water, whilst the steady pull of oars told of the toiler at his work. Companions in the Great City, companions in the broad-acred northern county, were not those nights the perfection of enjoyment, as the spot where we sat was the ideal of reposeful peace?

Such a night as this was the night for the Pigmy Footman. Then the pale-coated *Lithosia pygmaeola* crept up from the moss-forests, where he slept by day, which stretched miles and miles upon the surface of the ground beneath the ordinary verdure and around the roots of the marram grass. With his round head, and his narrow wings closely folded round his slender body, he crawled up and sat, silent and immovable, on the grass culm. Then he would be followed by another, and another, until every culm around had an occupant. There they sat quite still, until, presently, a slow unfolding of the wings displayed these organs and rather surprised you as to their extent, considering how small they previously looked. With outspread wings, each moth slowly crawls to the top of the culm, and then slowly waves its wings to and fro. It is the lantern that has startled them you think. Yes—No! they do not appear to be attracted by the lantern to-night, but, as they fly off, they are seen to be fluttering here and there in little crowds. They are love-making, "assembling" the learned call it, and for half-an-hour or more they are very busy. That small fat-bodied specimen there is a female. Her wings are much less ample than those of the male. After a time the love-making ceases, the unpaired males console one another on their want of success, while the paired moths enjoy their brief nuptials. This, then, is the time to see *L. pygmaeola*. I have seen the sand-hills on some occasions literally swarming with them. Like the Agrotids, thousands, millions have been there. Where are they now?

We thought just now, when the males began to fly, that the light perhaps disturbed them, that they were attracted by it and would probably fly to it, but we found that it was not to be so that night. Yet on some nights they are attracted in large numbers by a small lantern put upon the ground in their haunts. No one can tell when they are likely to be attracted by light; on one night you may put your lantern quite close to them, peer at them, or pick them off the grass culms, without disturbing one of the crowd around you. On another evening, apparently precisely similar, the approach of the light is sufficient to scare every moth, and they will then flutter around you, and even crawl on your body if you continue to hold the lantern in your hand.

The Footmen are highly developed moths, probably among the most highly specialised of all our moths. They have well-developed tongues, and, like most insects with well-developed tongues, they love honey, and come occasionally to the entomologist's sugar. They are not regular sugar-visitors though, but when sugar is "on," *Lithosia pygmaeola* is generally "on" also. In the daytime, too, it is often to be seen, dreaming in the afternoon on a grass culm, fast asleep apparently, but with one eye wide open, for it drops among the grass as soon as disturbed. I believe Harding took the moth for the first time in England, when sunning itself one afternoon after a rain shower. When I presently tell you of its day-flying habits in the warm valleys of Piedmont, I think you will agree with me that this afternoon's airing, which it occasionally takes at Deal, is the remnant of a very old habit which was acquired by it ages ago—perhaps before it had spread so far north and west as England.

An uninteresting, invariable, dowdy sort of moth, you mentally ejaculate, as you look over your series of "four" or "six," or even "half-a-row." Don't believe it! It's one of the most interesting little follows in existence—"in existence," mind, not in your cabinet. Why, your six specimens are all absolutely alike, all males too, no wonder you do not see much to interest you in them. They are in fine condition and well set, you say. Two very good and necessary things, I must own, but still in spite of that you yourself think them "dowdy, invariable and uninteresting."

At any rate, if you consider beauty to be idealised in a Tiger moth, you are quite correct in saying that this moth is dowdy; but invariable and uninteresting it is not. Why, I have already proved that it is interesting—if not to your satisfaction, at least to my own—but I will prove it more fully yet. Let us consider its variability now. You have heard that the specimens captured on the Continent differ from our British form; but the latter varies too. From bright golden to black—well, not quite black—is a very fair range of colour, but there is an incredulous smile on your lips which suggests that you think I am joking. I am not, though. Bright golden-yellow to almost black is the extent to which the variation in the colour of *L. pygmaeola* extends in the specimens exhibited to you, which were all captured on the Deal sandhills, so that the species can in no way be considered an invariable insect.

Most of us believe in evolution now—there are lots of things evolutionists tell us that I don't quite believe, but I do believe in evolution. Probably all the younger men who have been brought up in this age of books believe in evolution sufficiently to agree with me that all the Footmen have sprung, more or less remotely, from one ancestral type. A lady friend of mine hated Darwin (or rather his name)—she said she hated *him*; his works were immoral and inimical to all religious belief, she used to say. What work of Darwin's gave you that impression? I once ventured to ask. "What work—no work!" she exclaimed, "fancy me reading one of his books." I could not fancy it, but if the lady had read it, and if she could have understood only a little of it here and there, she might have been a broader-minded woman. Well, where was I? Oh yes, I remember, I suggested that you would agree with me that the Footmen all sprang originally from one ancestral form, although they are now so very different. Yet, as you know, they are in some respects very similar. There are the unicolorous *sororcula*, *deplana* and var. *stramineola*; then there are the species with a yellow costa—*lurideola*, *complana* and, rather less strongly marked, *griseola*. Then in colour we have the bright golden *sororcula*, var. *stramineola* and *quadra* ♀; the browner-yellow *deplana*; the leaden-grey *lurideola*, *griseola*, *complana* and *quadra* ♂; the spotted *muscerda*; the black *rubricollis*. You observe that the difference in colour in *G. quadra* is sexual—the male is dove-grey, the female orange; in *L. griseola* the same colorations occur but are in no wise sexual, and so on. Now these characters, both of colour and markings, which recur in these allied species under different conditions, show certain relationships, often termed by the learned phylogenetic relationships, because they tell us in unmistakable characters, more or less of the developmental history of their race. It is of the phylogenetic significance of the colour and markings of *pygmaeola* I would speak.

I will not theorise to-night, but just point out a few facts. You can then deduce your own theories. Staudinger says of Doubleday's *pygmaeola*: "Anterior wings pale greyish-yellow," and that you see applies to many of my specimens. Now look carefully at my series of specimens from Deal. I have divided them up in a general way into batches, and you will see that a moderate proportion are somewhat unicolorous, pale yellowish-grey specimens in both sexes—undoubtedly the true variety *pygmaeola*. But coming very near to these is another group, with the head, thorax and wings distinctly bright yellow. Then we find that a few specimens are not satisfied with this but reach a bright golden *sororcula*-like colour; so that we have pale yellowish-grey, brighter yellow, and golden forms in ascending sequence. Now let us go down. We find specimens of a much duller greyish-yellow than the first, the costa, however, remaining quite pale yellow compared with this ground colour (a small, ill-defined *lurideola* in fact). Then an unicolorous leaden form (nearly all taken in the year 1888, and referred to in my *Melanism and Melanochroism in British Lepidoptera*), whilst this leads on to the darkest specimen of all, not quite black, and unfortunately not in excellent condition. Then I remember one of our collectors telling me some years ago that he had taken one spotted somewhat like *muscerda*. That the characteristic coloration and markings of almost all our species of *Lithosia* should occur in this one species is surely striking enough to make you wish to know more about this insect, and to seek for the meaning of this variation. What is the phylogenetic significance of these facts? I told you I would not theorise, I think there is no need to do so, because it would be insulting to your intelligence, to suppose that you cannot read the lesson as well, at least, as I can.

Pygmaeola is variable then, and its variability probably makes it a little more interesting; but we have not done with the insect yet. *Pygmaeola* is only a local race, it is, in the true sense of the term, only a variety itself. The lesser variations then cannot be varieties, and they are of course not aberrations; yet, if they are to convey a definite impression to us they must be given some more or less definite value, and hence scientific men call them sub-varieties of the local race we know so well under the name of *pygmaeola*. Some of you may have smiled at the thought of a sub-variety; I trust I have made clear to you that sub-varieties are existing facts and that the term "sub-variety" is therefore a necessary one if the real scientific meanings of the variation of some of our species is to be worked out.

Well, if *pygmaeola* is only the name of a local race of the species and not the name of the species itself, what is the name of the latter? you ask. The trivial name of the species is *lutarella*. In the Val de Money, a branch of the Val de Cogne, between Cogne and Valnontey, in full view of the great and grand glacier of the Rossa Viva which faces towards Cogne, and three or four miles only from its termination, Dr. Chapman found *L. lutarella* in some abundance, although I had previously taken two or three specimens in the Cogne valley itself, between Silvenotre and

Epinel, flying about three o'clock in the afternoon. It was on a rough morainic piece of ground covered with coarse grass, except where huge bare stones rose high above the general level, that it occurred, near Valnontey; and we found it flying in the morning sun, between 8 and 9 a.m. There is no doubt about the insect. It's *pygmaeola*, was my first remark. Dr. Chapman soon discovered a means of getting the males in considerable abundance. Finding a female on the grass, he sat down and boxed the males as they slowly came up. We soon had enough of the males, and a somewhat tedious search on the herbage gave us a few females. Brilliant yellow, are they not? no "pale yellowish-grey" specimens there; *L. sororcula* has to look to its laurels to compete with this, and yet it is very different to the golden sub-varieties of *pygmaeola* from Deal, which I have pointed out to you. This would appear to be the true *lutarella* of Linné, the *luteola* of the *Vienna Catalogue*, and the *lutosa* of Esper. It appears to have a wide range—"Central and Eastern Europe, Southern Scandinavia, Finland, Steppes of South-Eastern Russia (Sarepta), Alps, Pyrenees, Hungary, Armenia and Siberia" is the rather comprehensive range given in Staudinger's Catalogue (1871). We do not appear to get the form among our British *pygmaeola* even as an aberration. The golden sub-varieties show the thinner scaling of *pygmaeola*, although they approach the type in colour.

But our brighter yellow (not the golden) *pygmaeola* is the connecting link with the type. It is the best scaled of all the British sub-varieties, and is Zeller's variety *pallifrons*. Staudinger diagnoses it as "fronte flavo, alis anterioribus flavis," and very truly adds, "forma conjugens *pygmaeola* et *lutarella*." He gives as the range of this variety (of which Boisduval's name *vitellina* is much the older)—"Germany (north and east-central), Gothland, France (north and central) Corsica, Dalmatia, Greece." Near Aosta, just across the bridge which spans the Dora, we explored a little valley among the vineyards; just a tiny gully, made by the winter storms and torrents, but an insect Paradise. It was literally full of insects, and among them was *L. lutarella* var. *pallifrons*. I have brought it for you to see. It is almost identical with our yellower *pygmaeola*, but very different from the Cogne Valley specimens. Only that one, I have no more; I am very sorry, but I caught no others, or I would have brought them for you to see. I am sorry, too, that I have not a specimen of Speyer's ab. *nigrocincta*, which Staudinger diagnoses as:—"Alis anterioribus linea nigra cinctis," and says that it comes from "East-central Germany." "Anterior wings surrounded by a black line"—makes your mouth water almost, does it not? and that is only the description.

There appears to be only one more item to add, and that is that var. *pygmaeola* occurs, so far as Staudinger's Catalogue is correct, only in "England and Holland." Snellen, in his *Vlinders*, &c., calls it *lutarella* var. In Holland and in England the conditions are presumably very similar, and have produced a similar result.

I promised not to theorise and not to be scientific; I trust you will consider that I have kept my promise; I suggested that I would attempt to convince you that our charming little *Lithosia* was both variable and interesting; I trust I have succeeded.

The British Representatives of the genus Caradrina.*

By LOUIS B. PROUT, F.E.S.

(*Concluded from page* 198).

Concerning the differentiation of *alsines* and *taraxaci* by scale-markings, I do not think I can add anything to what is contained in *Brit. Noct. &c., viz.*: that *alsines* is generally more ochreous in tone, rougher-looking, with more black markings, the central shade (and also the inner line) nearly always well pronounced. Continental writers generally make a point of its larger size, broader wings, and generally stronger build; but, though we do get one form of *alsines* larger than any *taraxaci* which I have seen. yet this will not hold in the majority of cases; neither is there very much importance in the differences of the hind-wings, which are often quoted on the Continent; the hind-wings of *alsines* are *generally* darker and, perhaps, more yellowish-tinted than those of *taraxaci*; but our *taraxaci* do not, as a rule, have such whitish hind-wings as appears to be normal on the Continent.

The times of appearance of these two species seems to vary very much in different places. Rössler says, that there are at least two broods of *alsines* at Wiesbaden, but I do not think his experience is general. Most authorities, however, agree that it appears somewhat earlier in the summer than *taraxaci*, which latter belongs rather to the end of July and August. I am not aware whether there is ever an attempt at a second brood of *taraxaci* in a state of nature, but a few larvæ in a batch that I reared in 1893-4 fed up much more rapidly than the rest, and produced imagines in the autumn of 1893. This behaviour, as I have remarked earlier, is quite normal in *quadripunctata*.

The geographical distribution of the *taraxaci* group is decidedly irregular. In most places on the Continent, from which I have seen records, *alsines* is by far the commonest; but in some others—*e.g.*, parts of France (according to Guenée), Dresden (according to Steinert, *Iris*, vol. vi., p. 261)—our rarity, *ambigua*, is even commoner; again, in the Rheingau, Fuchs reports the generally rare *superstes* as commoner than *ambigua*; while *taraxaci*, so common in many parts of Britain, is generally comparatively rare on the Continent.

I have occupied so much time with these general notes on the genus, that I must content myself with cataloguing the species with their varieties in almost as concise manner as Mr. Tutt has done in *Brit. Noct.* My excuse for going over that ground at all is that a good deal has come to light since Mr. Tutt wrote, so that this very intricate group seems to require a thorough overhauling; and also that I have been able to devote much more time to the genus than he could possibly have spared, with the gigantic work of the whole of the Noctuae before him.

Group I.

Caradrina (? Laphygma) quadripunctata.—*Claripalpis* [? Scop., *Ent. Carn.*, p. 213 (1763)]: Snellen, *Vlind.*, i., p. 444 (1867): *grisea*, [Hufn., *Berl. Mag.*, iii., p. 412, No. 91 (1766)]: Rott., *Naturf.*, St.,

* A paper read before the City of Lond. Ent. and Nat. Hist. Soc. on March 19th, 1895.

ix., p. 138 (1776): *quadripunctata*, Fb., *Syst. Ent.*, p. 594 (1775): *cubicularis* [W.V. (1776)], Bork., *Naturgeschichte*, vol. iv., p. 212 (1792): *segetum*, Esp., 150, 4, 5 (? 1791).

Two older names for the species which we now call *quadripunctata*, Fb., have been rejected by Staudinger as insufficiently described. Fabricius' diagnosis is readily accessible in Mr. Tutt's book; I will therefore only say that the type form is not very accurately defined as to colour, no qualification being given to the very general term, "griseis." The transverse waved stripes are said to be "obsoletis," and it presumably agrees with our most frequent British forms. Treitschke's diagnosis of his *cubicularis* is identical with this, and it must be by an oversight that Mr. Tutt has connected it (doubtfully) with his var. *cubicularis*, Haw.

Staudinger's supposed varieties—*grisea*, Ev., *congesta*, Ld., *menetriesii*, Kretschm.—have all turned out to belong elsewhere, and we have only the following varietal names left here:—

α. var. *cubicularis* (Haw.) Tutt, *Brit. Noct.*, vol. i., p. 153, for the pale whitish-grey specimens.

β. var. *blanda*, Haw., *Lep. Brit.*, p. 208 = *superstes*, Steph., Wd., for the large forms not necessarily also "dark," as Bentley says.

There are, however, two important colour variations which require naming—the ochreous form and the unicolorous fuscous form; in order not to ignore Mr. Tutt's valuable work, these may perhaps be quoted as:—

γ. var. *albina*. Tutt (*nec*. Eversm.); yellow grey.

δ. var. *ménétriésii*, Tutt (*nec*. Kretschm.); almost unicolorous greyish fuscous.

Or if this latter name should not hold, as Mr. Tutt gives *superstes*, Steph., as a still darker form, we may re-name this form var. *obscura*.

Other variations, such as in the clouded or unclouded outer margin, the precise size of the stigmata, distinctness of transverse lines, &c., are too slight and inconstant for naming; Mr. Tutt's remarks under this head (p. 152) deserve consideration. If we single out any well-marked variation for mention it should be:—

ε. var. *bilineata*, n. var.—The striking form in which there are no transverse markings except the *very distinct* inner and elbowed lines. There is a very pronounced example in the Doubleday Collection, and I have seen several others.

One curious point in the variation of this species is the occasional suppression, more or less, of the elbowed line, and the bringing into prominence of the more regularly curved dark line behind it; I have a specimen which illustrates this to perfection. I have also one var. *ménétriésii* (*obscura*) in which both these lines are plainly visible, and the space between them is of the typical colour, while all the rest of the wing is considerably darkened.

[*Grisea*, Eversm. (*nec*. Hufn.): *montana*, Brem.: *petraea*, Tgstr.—All the best authorities are now agreed that this Russian species is distinct from *quadripunctata*, and Aurivillius finds that the ♂ genitalia are quite different. It is generally smaller, has very distinct dark red-brown wedge-shaped marks in place of the reddish line bordering the subterminal; and grey, not white, hind-wings, with a distinct dark central spot. As for the rest, it is tolerably unicolorous grey, entirely free from ochreous tinge, weakly marked. It occurs as far westward as Scandinavia, and, it is just possible, may ultimately be detected here.]

[? *Leucoptera*, Thnbg.: *ménétriésii*, Kretschm.: *cineracens*, Tgstr.—This also cannot be a var. of *quadripunctata*, on account of the conformation of the ♂ genitalia. Aurivillius treats it as a separate species, but Staudinger now opines (Rom., *Mem. sur Lep.*, vi., p. 485) that it is a northern form of *selini*, Boisd.; this is likely enough, as I do not suppose Aurivillius had compared it with the non-Swedish *selini*. Like *grisea*, *ménétriésii* is chiefly Russian, but extends to Scandinavia; while *selini* occurs, though sparingly, over a good part of Europe. Hence, I do not see why we should not discover *ménétriésii* in Britain, and I should recommend entomologists who possess nearly unicolorous, cinerascent specimens, with snow-white hind-wings, to submit them to minute anatomical investigation.]

[*Albina*, Eversm.: *cubicularis* var. H.-S., 425: and var. *congesta*, L. This seems to be entirely a Russian and Asiatic species.]

There are also some other very close allies (or possibly varieties) of *quadripunctata* or *selini*: such as *infusca*, Const., from the Landes; *laciniosa*, Donz.; *anceps*, H.-S.; *milleri*, Schulz. I must not, however, linger any longer at this group, except to say that I think it is worthy of very close and careful study.

Caradrina morpheus.—*Morpheus*, Hufn., *Berl. Mag.*, iii., p. 302, No. 52 (1766); *sepii*, Hb., 161.—Hufnagel describes the type of this species as "dirty yellow," Rottemburg, as "dirty yellow-brown;" so that, as Mr. Tutt says (though only quoting Vieweg's later diagnosis of 1790), "the yellow or ochreous specimens constitute the type." The only varieties that I know have been worked out by Mr. Tutt (*op. cit.*, p. 147), and are:—

α. var. *sepii*, Hb.—Rusty reddish-brown, much the colour of dark *alsines*; dark markings distinct. I have seen no British examples quite agreeing with this, though, perhaps, all our distinctly marked brown specimens are best referred to here.

β. var. *obscura*, Tutt.—Deep greyish-fuscous, inclining to blackish; markings indistinct.

γ. var. *minor*, Tutt.—Very small ($\frac{7}{8}$-in.).

Group II.

Systematists do not seem to agree at all in the order in which they place the species of this group; I therefore venture to follow my own order, based on characters of the ♂ antennæ and possibly also supported by the genitalia.

Caradrina superstes.—*Superstes* [Ochs. (1816)]; Tr., v. ii., p. 260 (1825); H.-S., 382: ? *blanda*, Hb., 162: ? *plantaginis*, Hb., 576.

Lederer rejects the name *blanda*, Hb., for this species to avoid collision with the *blanda* of the *Vienna Catalogue* (= *taraxaci*, Hb.). For my part, I am glad that he has done so, for Hübner's fig. 162 looks to me more like one of my *taraxaci* from Sandown than like any *superstes* I have ever seen, and I only add *blanda*, Hb., as a synonym here in deference to unanimous testimony of entomological authorities. *Plantaginis*, Hb., is generally referred to *ambigua* as a very strongly marked var., but to me it appears like *superstes*, and I am pleased to find one authority, Guenée, on my side.

Treitschke diagnoses this species thus: "alis anticis flavo-cinereis, nigro adspersis strigisque punctatis." Hübner's figure, if representing a known form of the species, must constitute:—

a. var. *blanda*, Hb.—More flesh-coloured in tone, transverse lines less distinctly double.

CARADRINA TARAXACI.—[*Blanda*, W. V., *pro parte* (1776)]: ? *blanda*, Fb., *Mant.*, ii., p. 147 (1787): *alsines*, Brahm., *pro parte* (1791): *taraxaci*, Hb., 575.

As Hübner was the first to make separate species of this and the next, we accept his names *taraxaci* and *alsines* for them, and regard his figures as the types. The type of *taraxaci* is of a rich darkish brown (not at all ochreous), with the stigmata *and the transverse lines* bordered with whitish; I have one specimen from the Isle of Wight that agrees fairly well with it, though very small.

The variation of this species is, as Mr. Tutt says, extremely difficult to deal with, being really very considerable, yet not producing any very strongly-defined varieties. The work of our early British authors is almost useless, as they even start from a different form as type; yet it would hardly be right to ignore it entirely. When they depended on such an unstable character as the form of the subterminal line, one is compelled to disregard them; but some of their names can be used, after Tutt, as varietal appellations. Most of the extreme forms seem to have been unknown to them, and they described only those which were taken in gardens, woods, etc., round London. I will make such remarks as I can towards the elucidation of this matter, under the head of the different varieties as catalogued by Mr. Tutt.

α. var. *sordida*, Tutt.—The ochreous form of *taraxaci*, near *alsines* in colour, though smoother in appearance, and without a distinct central shade. *Sordida*, Haw., seems to me too likely to be a synonym of *alsines* (as in Doubleday's and South's lists), to be safely cited here.

β. var. *xanthographa*, Haw., = *ambigua*, Steph.: *plantaginis*, Humph. and Westwd.—Regarded by our older authorities as the type form of this species. "Fuscescent" (Haw.), "greyish fuscescent" (Steph.); otherwise Stephens copies Haworth's diagnosis verbatim, and I think the name *ambigua* should fall before *xanthographa*, Haw. The stigmata should be distinct; the transverse lines not so. Many of the ordinary London specimens belong here.

γ. var. *redacta*, Haw.—Authors are hopelessly at variance as to the points in which this differs from the last, except that it is a trifle smaller. I think, therefore, in order to avoid hair-splitting distinctions, this name should (after Curtis), be united with the preceding. "A simple sub-variety of the preceding" (Tutt).

δ. var. *blanda*, Gn., = *taraxaci*, H.-S.—This is darker and more rosy than Hübner's type, and is without the whitish boundaries of the transverse lines; hind-wings frequently whiter than in the type. Mr. Tutt points out that with us it is a coast form, and describes it carefully, while Herrich-Schaeffer's figure (380), will also help in its determination.

ε var. *egens*, Haw., = *alsines*, Steph.—I have united vars. *ε* and *ξ* of Tutt, to denote the fuscescent form with distinct markings, including a quite visible central shade. Wood's figure, 198, does not fit well to Stephens' description, and seems rather to unite with the other London variety, *xanthographa* = *ambigua*. There is a misprint in *Brit. Noct.*, i., p. 150, 6A; "fuscous, with *indistinct stigmata*, &c.," should read "with *distinct* stigmata, &c."

ξ. var. *laevis*, Steph.; Wd., 200.—Markings indistinct; sometimes quite obsolete. I have bred two or three of this variety from Sandown.

η. var. *suffusa*, n. var.—No name has, I think, been proposed for the darkest form of this species, obscure deep fuscous; I have, therefore, transferred Tutt's *suffusa* from *superstes*, here.

[*Caradrina alsines* var. *amurensis*, Stgr., *Rom. Mem. sur Lep.* vi., p. 486, from Amurland, appears either to belong to *taraxaci* (according to the ♂ antennæ), as a local race, or (according to the genitalia) to be as distinct from both as they are from one another. Oberthür (*Études d' Ent.*, v.), records it as *blanda* (*i.e.*, *taraxaci*). It is smaller than *alsines*, with the hind-wings, and especially the under-surface, somewhat darker].

Caradrina alsines.—[? *Blanda*, W. V., *pro parte* (1776)]: *alsines*, Brahm, *pro parte* (1791); Bork., *pro parte* (1792): Hb., 577: [? *glabra*, Mus. Schiff., *teste* Ochs.]: ? *sordida*, Haw.: *implexa*, Steph. (*nec.* Hb.).

The type of this species, as I have remarked already, is Hübner's *alsines*; this is the brightest-coloured form of the species—in fact, exaggerated into a very bright orange-brown. It is, perhaps, not worth while to separate from this the brighter normal specimens of the species, in which case we have only, so far as I am aware, the following named forms:—

α. var. *suffusa*, Tutt, *Brit. Noct.*, i., p. 147 = var. **A**, Gn.—Darker than the type, through stronger dusting with black scales. I have seen some good examples from Hull.

β. var. *levis*, Stgr., *Stett. ent. Zeit.*, xlix., p. 29.—A local form, received by Staudinger from Central Asia. "Far lighter brownish or yellowish-grey (hard to denote), which contrasts strongly with the dark brown-grey of the typical German *alsines*." Markings sharply defined; hind-wings, whitish. I must add that I suspect "typical German *alsines*" are darker than our normal English form, and it is quite possible that var. *levis* (which I have not seen), is not far from my only two Sandown specimens, which are too light and yellowish for the type. On the other hand, it is by no means certain as yet that this var. belongs here at all, and that it may not ultimately be erected into a separate species.

Implexa, Steph., belongs certainly, as Mr. Tutt points out, to typical *alsines*, and was so determined by Curtis long ago; it is therefore surprising that Doubleday gives it as a var. of *taraxaci*, and that South follows him in this.

[*Caradrina sericea*, Speyer, *Stett. ent. Zeit.*, xxviii., p. 73, described after a ♂ from Amsterdam, and a ♀ from Cassel, is near *alsines* in structure, and Staudinger is not exactly satisfied that it is distinct; the fore-wings are narrower, broadening much less towards the outer edge, therefore, more uniform in width; the tone of colour much nearer *superstes* than *alsines*, with a strong silky gloss, and almost without markings; the palpi are not externally darkened with grey, as in all the allies. Herr Snellen of Rotterdam, the discoverer of the first specimen, still considers it a good species, and kindly writes me that he is willing to compare with the original any doubtful examples which I may submit to him, as he thinks it by no means improbable that it might be detected in England].

Caradrina ambigua.—[? *ambigua*, W. V. (1776]: *ambigua*, Fb., *Mant.*, ii., p. 148 (1787): *plantaginis*, Dup., vi., p. 59; ? Hb., 576.—In this species there is a good deal more variation than I was aware of until quite recently. The differences in size are apparently partly seasonal, the second broods appearing to be generally small. Mr. Tutt (*Brit. Noct.*, i., p. 148), has shown that the type is cinereous, with a central shade visible.

α. var. *plantaginis*, Dup.—Weaker marked, without central shade (*vide Ent. Rec.*, vol. iv., pl. C, fig. 5).

β. var. *obscurior*, n. var.—I took this name, which explains itself, from a note by Meves (*Ent. Tidsk.*, v., p. 72), in which it was used apparently entirely as an adjective. Mr. Hodges has taken specimens which are much darker than the type.

γ. var. *ochracea*, n. var.—Strongly tinged with yellow. I have seen three examples—Mr. Tutt's extreme one from Deal (*Ent. Rec.*, vol. iv., pl. C., fig. 4, which has come out too brown); and two less extreme from Guernsey, in Mr. Hodges' collection.

δ. var. *dilucida*, Stgr.—I have not yet traced this name to its source; It is the form from Central Asia, of which Alphéraky says (Rom., *Mem. sur Lep.*, v., p. 84), " a little paler, and more yellowish than European specimens; hind-wings entirely white." This is so decidedly paler than var. *ochracea*, and of not quite so decided an ochreous tint, that it seems undesirable to unite it with that var.; especially as that seems to be a mere aberration, this a well-marked local race.

On the Gradual Disappearance of Lepidoptera from South-Eastern London and its Neighbourhood

(LEE, LEWISHAM, ELTHAM, BEXLEY, CHISLEHURST, ETC.)

By C. FENN, F.E.S.

My experiences of collecting in this district date back to 1860, and in comparing my records made about that time with those of the present, some very remarkable gaps become manifest in the latter. Concerning the causes which have conduced to this result, it is difficult to speak with absolute certainty. Of course, the extension of building has destroyed many of the old hunting-grounds, but this is not sufficient to explain the disappearance over wide areas of very many insects which were common thirty-five years ago. Butterflies are most conspicuous by their disappearance; next to them come the true BOMBYCES, and so on to the end of the PYRALIDES; the remaining " Micros " do not seem to have been much affected. I am well aware that smoke is generally set down as the chief cause, but I fail to see that it is an adequate one, some of the species having habits of life exempting them to a large extent from its effects.

I will now enumerate the species that have been particularly affected. *Euchloë cardamines*, used to be very abundant, but, although not extinct, it is decidedly scarce now. *Gonepteryx rhamni*, formerly common, but now only occasionally seen. *Colias edusa*, common on railway banks and in clover fields; for many years I have only seen an occasional specimen. *Argynnis paphia*, formerly abundant at Darenth, &c.; the last specimen I saw was on the outskirts of Joyden's Wood, about twelve years ago. *A. euphrosyne*, formerly abundant in all the woods in the district (Shooter's Hill, Bexley, and Joyden's Woods, West Wickham, etc.) has now disappeared from most of these, and though it still lingers at Darenth, is not abundant there. *Vanessa polychloros*, used to be fairly common, especially in the spring, and the larvæ were always to be taken freely at Darenth; I have seen no signs of it for a very long time. In 1857–9, this was an abundant insect near Finsbury Park; whether it exists there now, I cannot say. *V. io*, was formerly common, especially on the marshes, where the larvæ were abundant; now we rarely see the imago, and I can only recollect the capture of one or two broods of larvæ for a long while past. *Pararge egeria* and *P. megaera*, seem to have quite disappeared from the Lee, Eltham and Bexley district, and the same may be said of *Epinephele hyperanthus*. *E. tithonus* was formerly one of the most abundant of our butterflies, swarming along our hedges, and occurring commonly in gardens and many other places; it began to disappear about 1878, and is now quite extinct. The last individual I noticed was at Paul's Cray Common, in 1887. *Thecla rubi* used to occur at Shooter's Hill and Bexley Woods, and was very common at Darenth; it may linger yet at the last place, but has long since gone from the rest. *T. quercus* was very common at Shooter's Hill and the neighbouring woods, but is now extinct there; solitary specimens only have been noticed at Bexley and Chislehurst, within the last five years. *Lycaena astrarche* used to be abundant round Dartford, but is now rarely seen. *L. bellargus*, formerly known as the Dartford Blue, is the Dartford Blue no longer; I doubt if it has been captured there for twenty years. *L. corydon* used not to be a scarce insect in the Dartford district, but I have heard of no captures for very many years. *L. argiolus* was fairly common in our lanes and gardens in the spring, and was very common in some of our woods, being sometimes almost abundant at Darenth. We never see it now close home, and I should say that Chislehurst is the nearest spot to London in this direction where it is to be found. It was abundant at Hornsey, and even a mile nearer London, in 1859. *Nemeobius lucina* is another extinct species. Harding, a well-known collector in the sixties, used to pay a yearly visit to Joyden's Wood, Bexley, where it was then abundant. *Pyrgus malvae* and *Nisoniades tages* still linger, but they are very scarce, and the same may be said of *Pamphila sylvanus*, but of *P. linea*, I have not seen a specimen for many years. It will thus be seen that, in the course of thirty-four years, no less than eleven species of butterflies have become extinct within a radius of ten miles from Lewisham, four have become rare, and seven that were formerly common, are now scarce; this practically reduces our butterflies to ten species, all very common ones.

Among the *Heterocera* the disappearances are not proportionally so numerous, and in some instances, I am strongly of opinion that human agency has had something to do with the result, so many of the conspicuous species being much rarer now than formerly. *Sphinx ligustri*, formerly very common in the larval state, is now very rarely seen. *Macroglossa fuciformis* was common at Darenth, where I used to take it. I have heard of no recent captures. *Zeuzera pyrina*, formerly abundant, is now rarely seen, and the same is the case with *Zygaena filipendulae*. *Nudaria mundana*, formerly abundant, is now extinct. *Lithosia complana* used to be fairly common, now it is only occasionally met with. *Gnophria rubricollis* which was formerly not scarce, is now extinct. *Nemeophila plantaginis* was formerly not rare; I have heard of no recent captures. *Arctia caia* used to swarm in the larval state on every weedy bank, but this is no longer the case. I have seen the imagines flying in dozens round our street lamps, now it is only an occasional visitor. *A. villica* and *Spilosoma mendica*, formerly very common, are now very scarce. *Psilura monacha* was formerly common at Darenth, in the larval state, but I do not think it occurs there now. *Eriogaster lanestris* is quite extinct. *Bombyx neustria*, formerly one of our greatest pests, is now comparatively scarce. *Porthesia similis* is very greatly reduced in numbers, and seems likely to follow the example of *B. neustria*. *Bombyx rubi* is never seen now. *Bombyx quercus* and *Odonestis potatoria* were formerly abundant as larvæ; now a day's work within a radius of ten miles from Lewisham, would hardly yield a dozen.

Of Geometers the list is a fairly long one. Of course, in the case of a few very local species the destruction of their habitat is the cause of the disappearance. *Angerona prunaria* and *Eurymene dolobraria*, once locally common, are now never seen. *Eugonia quercinaria* and *Boarmia repandata* seem to be getting scarcer. *Tephrosia luridata* is less common than it was. *Ephyra porata*, *E. punctaria* and *E. annulata*, all formerly abundant, are now nearly extinct. *Acidalia subsericeata* not scarce in the past, is now never seen. *Bapta temerata* and *B. bimaculata*, which were locally common, are now almost extinct. *Aleucis pictaria* does not occur now in the old Dartford locality. *Numeria pulveraria* is gradually getting scarce. *Minoa murinata*, once locally abundant, is now extinct. *Abraxas sylvata* formerly occurred sparingly over the district, especially at Abbey Wood. I have heard of no captures for many years. *Ligdia adustata* used to be very abundant everywhere, but is now much less common. *Eupithecia pulchellata*, once locally common, is now extinct. *E. castigata* and *E. vulgata*, formerly pests, are now, the former scarce, the latter far from abundant. *E. dodoneata* and *E. exiguata*, formerly very abundant everywhere, are now scarce and local. *E. sobrinata* used to abound on all the palings round gardens, it is now only noticed on street lamps. *Melanippe hastata* was never common, but is now extinct. *Anticlea rubidata*, formerly abundant along every hedgerow, is now decidedly scarce and local. *A. nigrofasciaria*, once not uncommon, is now rarely seen. *Camptogramma fluviata* was fairly common at street lamps between 1863 and 1870. I have not heard of any captures in the last ten years. *Philbalapteryx tersata* used to be common where clematis grew, it is now scarce. *Scotosia vetulata* was formerly excessively abundant in several localities, but I only know of one spot where it occurs now, and that sparingly. *Cidaria suffumata* was locally common, it is now extinct. *C. fulvata* and *C. pyraliata* were abundant everywhere, now they are far from common.

Among the Pseudo-Bombyces the only noteworthy absentee is *Diloba caeruleocephala*; save for an occasional specimen on the street lamps, it is rarely seen now. It used to swarm in the larval state.

The causes which affect the Noctuæ are, I think, different from those which influence the other groups. So many of their larvæ are concealed by day, either under the lower leaves of low plants or in the ground, that atmospheric conditions concern them little. The reasons for their disappearance must be sought elsewhere. I append the list for what it is worth. *Cymatophora fluctuosa* used to be occasionally taken in our home woods, and the larvæ were not rare at Darenth and West Wickham (*vide*, *Intell.*, vol. i.). I have heard of no captures lately. *Asphalia diluta*, formerly a swarming species, seems to have become scarcer the last few years. *Acronycta* (*Cuspidia*) *tridens*, once common in the larval state, has not been so noticed for years, and the same remark applies to *Acronycta* (*Viminia*) *rumicis*. *Tapinostola fulva*, once swarming locally, is now extinct. *Chortodes arenosa*, which used to swarm locally, is now only represented by an occasional specimen. *Coenobia rufa* is extinct, though it also used to swarm locally. *Apamea unanimis* was formerly common on the marshes; I have only seen two in the last ten years. *Agrotis tritici*, common at heather blossom, I have not seen for years. *A. agathina*, formerly excessively abundant in the larval state on heaths in spring, is now scarce. *Noctua c-nigrum*, formerly an abundant insect, is now scarce. *N. umbrosa*, once locally abundant, is now extinct. *Pachnobia rubricosa*, which was one of the commonest visitors to the sallows, is now one of the rarest. *Dyschorista fissipuncta* (*upsilon*), excessively abundant at sugar and among willows at dusk, is no longer common. *Xanthia fulvago* abundant at honey-dew on sallows in the autumn, is now scarce. *X. aurago*, locally not uncommon, is now extinct. *Cirrhoedia xerampelina* used to be captured in small numbers at the street lamps, but none have been seen during the last ten years. *Plastenis retusa*, formerly not at all scarce in the larval state, has quite disappeared. *Aplecta advena* (occasionally common) is never observed now. *Calocampa vetusta* and *C. exoleta*, never very common, are apparently gone. *Cucullia verbasci*, formerly common in the larval state, is now conspicuously absent. *Erastria fasciana*, once locally common, is now extinct. *Habrostola tripartita*, formerly common, is now apparently extinct. *Mania maura*, once very abundant, is now uncommon. *Prothymia viridaria* (*aenea*) has quite disappeared, though it used to be common.

I have only selected a few of the most conspicuous examples among the Pyralides and Crambi. *Rivula sericealis*, once a swarming insect in every lane, is now far from common. *Pyralis costalis* (*fimbrialis*) abundant at light, &c., is now scarce. *Ennychia octomaculalis*, once locally common, is now extinct. *Scopula ferrugalis* very common at light, is now rarely seen. *Botys pandalis*, common in all our home woods, is now seldom seen. *Ebulea sambucalis* used to be abundant in every garden, it is now scarce. *Perinephele lancealis*, once locally common, is now extinct. *Paraponyx stratiotalis*, once a pest at light, is now rare. *Crambus falsellus* was common in gardens and on palings in their vicinity, but I have not seen one for many years. *Chilo phragmitellus* from being locally common has become rare. *Aphomia sociella*, formerly common in every lane, is now much less common.

It will be seen that, roughly speaking, of 100 species affected, about 40 have actually become extinct, 20 rare, and 40 that were formerly abundant are now not common. Curiously enough the Tortrices seem to have been quite unaffected. Whether this arises from the fact that less attention was paid to them in past times than at present, I cannot say. The district is singularly rich in Tortrices, and although I know of very many more species occurring in our home district than I did thirty or thirty-five years ago, I can only call to mind a single species (*Catoptria albersana*) that seems to have become rarer, and perhaps it may have been overlooked.

The subject is too large to be settled in a single article. I am not an entire believer in the smoke theory; its action seems too partial. We can see how smoke affects lichen-feeders, which are among the first to disappear: but the causes which have led to the abandonment of vast tracts of country by such species as *E. tithonus*, *E. hyperanthus*, *P. megaera*, *V. io*, *E. lanestris*, *A. caia* and many others, must have been widely different, although I can make no satisfactory suggestion as to their nature.

CURRENT NOTES.

Mr. H. C. A. Vine expresses the opinion (*International Journal of Microscopy*, April), that it may be said with some certainty that the larvæ of the following species of Diptera prey upon aphides:—*Syrphus laniger*, *S. topiarius*, *S. balteatus*, *S. ribesii*, *Catatomba pyrastri*, and, in all probability, *Platychirus albimanus*. In the course of his dissections of the imagines of the *Syrphidae*, Mr. Vine's attention was "frequently arrested by the pollen-grains which are invariably present in all parts of the alimentary system, from the œsophagus to the rectum, and even in the excreta." His "observations on the stomachs of several species of *Syrphus*, *Eristalis* and *Rhingia*, leave no doubt that in all these, pollen constitutes the bulk of the food ingested, and it is found in the œsophagus, in the sucking stomach, in the digestive stomach, and in the alimentary canal in varying conditions, which indicate plainly the progress of digestion." Only three kinds of pollen were found; one of these is, without much doubt, that of some species of *Doronicum*, or leopard's bane; another, that of some near allies of *Lathyrus*; while the third could not be identified. The paper should be read by students of Diptera.

According to Grote, who described the external structural features of *Megathymus yuccae* in 1875, this species shows more moth than butterfly characters in the imago. No butterfly has such a tibial armature. Grote proposes for the group the family name *Paleohesperidae*, and regards it as an especial American link, in a line of development which would run: *Hesperiidae*, *Paleohesperidae*, *Castniidae*, *Cossidae*. Riley's later studies of the insect in all stages, lead him to the conclusion that *Megathymus* is rather to be considered a butterfly, and with this conclusion Scudder agrees. As compared with the *Hesperiidae*, however, Grote insists that the moth characters are everywhere more apparent, and obtain so largely that the balance seems turned in that direction, so that it should be excluded from the butterflies. The *Paleohesperidae*, like the *Citheroniidae* and the *Arzamini*, are instances, according to Grote, of the survival in the American fauna, of intermediary structural types in the Lepidoptera.

Dr. Pabst, of Chemnitz, draws attention to the fact, that the question of the origin of the squeaking tone produced by *Acherontia atropos*, has not been finally solved. He recapitulates the observations of Réaumur, Swinton and Landois; the theory of the latter, that the sound is produced by air, forced from a sucking chamber (situated at the anterior end of the abdomen) through the proboscis, is contradicted by the observation of Taschenberg, who found that the sound was emitted by an individual in a bee hive, whose proboscis and abdominal pouch were filled with honey, to the exclusion of air, Steinert (*Iris*, ii., 277) reports the sound to have been heard from a pupa, before exclusion, though in a fainter measure. Similar, but less audible sounds, have been reported in other *Sphingidae*. The sound produced by *A. atropos*, has been commonly likened to the squeaking of a mouse. Dr. Pabst compares it in quality of tone to that creaking sound produced by the beetles *Aromia moschata*, L., and *Lema asparagi*, L., while far greater in volume.

The *Acherontinae* are peculiar to the Old World, and though the genus has been reported from Mexico, it would seem to be an error produced by the resemblance in ornamentation to the Sphingid genus *Phlegethontius*, in which latter, however, the antennæ are about twice, and the tongue very many times as long. According to Grote, neither genus nor group occurs in either North or South America. It is to be regarded as a probable development of the *Sphinginae*, after these had left the central more generalized Smerinthoid type of the family. The *Acherontinae* have inferentially, from all their characters, reached a stage of evolution precluding the idea of further advance or development in their direction. The short antennæ, the great development of the muscles of the thorax, the comparatively broad and short wings, the adaptation of the tongue to feeding upon honey gathered by other insects, these, and other features, seem to have attained a certain completeness of expression which, while pointing to an extended antecedent history, appear to warrant the view that the *Acherontinae* are the last of a long line. While it is not possible to give in a linear series the probable development of a family, the arrangement first proposed by Mr. Grote, to give the *Smerinthinae* a central position, makes this view presentable in a collection. This is attained by arranging the family in the series: *Macroglossinae*, *Choerocampinae*, *Smerinthinae*, *Sphinginae*, *Acherontinae*. The arrangement of the English genera would be:—*Hemaris*, *Macroglossa*, *Deilephila*, *Choerocampa*, *Smerinthus*, *Sphinx*, *Acherontia*.

Mr. J. Hartley Durrant, F.E.S. relates (*E.M.M.*, May) the way in which he succeeded in capturing *S. pygmaeana* in some abundance at Merton, in Norfolk, last year. The insect was met with from March 25th to April 15th ; at the latter date the specimens were getting worn, so that the hunt was given up. This year the species had not put in an appearance by April 3rd. At first the captures were made from isolated high spruce firs, but, as the moths have a tendency to fly round the tops of the trees, progress was slow. By a happy inspiration Mr. Durrant was led to work the spruce hedges which border the grass drives in the Merton kitchen garden. Here his success was immediate and striking ; for whereas he had only succeeded in capturing 32 specimens in 13 days from the trees, a couple of hours' work at the hedges yielded 33. The ♂ appeared to fly freely for about half-an-hour at mid-day, and after this time could be beaten out from the sunny side of the hedges, but was only to be met with from about 12.30 to 4.30. For some time males only were captured (with one or two exceptions) but at last Mr. Durrant discovered that whilst the males, when disturbed by the beating-stick, fly out, the females drop to the ground like a stone. After this discovery he caught as many females as males. April 15th is suggested as probably about the date when under normal conditions the species will be well out.

Mr. Durrant also (*ibid.*) gives a description of the hitherto unknown imago of *Fumea ? limulus*, Rghfr. This is a case-bearer whose habitat is Ceylon. Rogenhofer, who was only acquainted with the case and the larva, supposed that it was a Psychid; but Mr. Durrant, who describes the imago from four specimens in Lord Walsingham's collection which were bred by Mr. Green at Pundaloya, points out that it is not a Psychid but belongs to the *Depressariidae*, and constitutes the type of the new genus, *Pseudodoxia*. Mr. Durrant says:—"The occurrence of a case-bearing larva in this family (*Depressariidae*) is interesting, and apparently unrecorded, but I have reason to believe that coleophorous larvæ occur in more families of the super-family *Tineidae* than is generally supposed."

Mr. J. J. F. X. King, F.E.S. of Glasgow, adds (*E.M.M.*, May) two species of *Hydroptilidae* to the British list:—*Hydroptila tigurina*, Ris, which is not uncommon in the Ambleside district, and *Oxyethira frici*, Klap., of which he has a single specimen taken in the Rothiemurchus district a few years ago.

L'Ami des Sciences Naturelles, a popular monthly illustrated magazine, began its career on July 1, 1894. It is edited by Mons. Eug. Benderitter fils, is published at Rouen (Rue des Champs-Maillets, 11), and the subscription is 5 francs per annum. Coleopterists will welcome an illustrated analytical table of the coleopterous genera of France by Mons. Houlbert, which is appearing from month to month. Another interesting series of articles, of a popular kind, on the dung-beetles, by Mons. Coupin, should be of general interest.

We learn from *Science Gossip* for May that Mr. W. M. Christy has bred *Nyssia lapponaria*, "which has apparently only been found once previously in the seislands," from larvæ which he found last year in Scotland. We hope Mr. Christy will be able, without so indicating the locality as to set the entomological "bag-men" on the track, to tell us something of the circumstances under which he made the discovery.

NOTES ON COLLECTING, Etc.

NOTES FROM THE EXCHANGE BASKETS.—Mr. Fenn (Lee) writes on Jan. 16th:—"Mr. Horne's *Scoparia* is, although a peculiar variety, undoubtedly *atomalis*, and if it were not for the fact that in a long series it graduates into *S. ambigualis*, I should say it was distinct. *Ambigualis* is very variable, both in markings, size and habit, and in the present state of our knowledge it is impossible to say certainly that there are not at least three or four species mixed up under this name. Mr. Finlay's *ambigualis* are of a very interesting form; another very distinct form occurs at Darlington."——Mr. E. A. Atmore (King's Lynn) writes on February 18th:—"Dr. Corbett's *Lithocolletis* is very interesting. As Mr. Richardson has observed, it is a curious variety, but one side of the body is not very unlike *L. klemannella*, but darker and more brilliant than in my specimens of the latter. I breed an occasional specimen of *L. klemannella* from the under surface of leaves of the alder (*Alnus glutinosa*), growing here. I am sending round in the exhibition box for Dr. Corbett and others interested to see, three specimens of a *Lithocolletis* sent me as *L. dunningiella*. The first, or top specimen, and the next, are from Mr. G. Elisha, in 1886, and named by him *L. dun-*

ningiella; No. 3 is from Mr. J. B. Hodgkinson, in 1889 (one of lower wings broken, and also named by him *dunningiella*). These specimens are very much like *L. nicellii*, but darker, though not so dark in ground colour, or so brilliant in markings as Dr. Corbett's insect. If *L. dunningiella* is like those sent me, and which I now exhibit, there is little difference between it and *L. nicellii*—insufficient I think for it to rank in our lists as a distinct species from the latter (*L. nicellii*). I have never heard of *L. dunningiella* being bred. Mr. Horne's *Scoparia* is a curious var. of *atomalis* I think, but I never saw such a var. before." ———Mr. N. M. Richardson (Weymouth) writes on Feb. 22nd.:— "There is evidently a little uncertainty about the number of costal spots in the *nicellii* section of *Lithocolletis*, as, on examination of my series of *klemannella* which has normally only four costal markings, I find a specimen with five on one side, and a trace of the fifth on the other. This specimen, with two others were bred by Mr. J. H. Threlfall. I should certainly hesitate, as I see Mr. Atmore has done, in saying that his specimens of *dunningiella* were not *nicellii*. I do not know on what ground their captors called them *dunningiella*, and if *dunningiella* are like them, I should think the name might sink as a synonym. But I write as I said before, in ignorance of its appearance. Mr. Finlay's *Scopariae* are no doubt all *ambigualis*, the dark ones approach *atomalis*. ———Mr. Arthur Horne (Aberdeen) writes on March 4th:—"*S. ambigualis* is an abundant and likewise an exceedingly variable insect in the north of Scotland. From the experience that I have had with it, I do not think for one moment that *atomalis* is a distinct species. I can always get both forms together, in fact, they run insensibly into each other. In the exhibition box I send eight *S. ambigualis*; two of them were named var. *atomalis* by Mr. Barrett, and I have purposely removed the labels, and shall be glad if any of the members will point out the vars. from the type.———Dr. Corbett (Doncaster) writes on March 8th:—"The discussion now going on with regard to *Scoparia* and *Lithocolletis* is very interesting, and will, I hope, be instructive. Both these genera seem not to be thoroughly known, and any combined experiences such as this note-book furnishes, may serve to clear up the fog. (1). With regard to the genus *Scoparia*. The differential diagnosis between *atomalis* and *ambigualis*, in the *Manual*, is not satisfactory, as I think that we shall all agree that in a long series of *ambigualis* from one locality (one might almost go so far as to say from one tree trunk) specimens might be found answering equally well to the description of either species. In all probability all such specimens would be *ambigualis*. But when in one locality we find, besides the usual varied forms of *ambigualis*, another form or species with different markings, and generally of a much smaller size and distinct habit, I think that the probability is great that we have another species. The *Scoparias* that I took at Eskdale during the summer of 1887, and which I suppose to be *atomalis*, were not to be found on tree-trunks, indeed, I never saw them during the day, but at the dusk of evening they flew in abundance among the bushes of *Myrica gale* on the bog. Close to the bog were typical *ambigualis*, on tree-trunks by day. Now, if the two forms were only varieties of one species, is it not highly probable that being so close together they would have interbred and produced intermediate forms? None such were to be seen. As to Mr. Horne's specimens in the exhibition box, I take them to be all *ambigualis*, and I should call No. 3 and 4 in the first row, var. *atomalis*, but No. 3 not such a well-marked example as No. 4. But I am much inclined to think that we have the same confusion about *ambigualis* var. *atomalis*, and the species *atomalis*, as we had about *Noctua festiva* var. *conflua* and *Noctua conflua*. With regard to *S. basistrigalis*; although some specimens come very near to large well-marked specimens of *S. ambigualis*, they may be distinguished generally by the following points:—*S. ambigualis*—(1) Imago abundant from May to August. (2) Distribution very general. (3) The 8-mark variable, but seldom dark. The first line (profile-line), not beginning as a black dash on the costa. (4) Expanse 9‴—10‴. *S. basistrigalis*—(1) Imago during latter end of July and beginning of August. (2) Very local. (3) The 8-mark very distinct and dark. The first line commences as a black dash on the costa. (4) Expanse 10‴—1″. 1‴.—The *Lithocolletidae* are possibly even more puzzling than the *Scoparias*. In the *frolichella*-group, I have always supposed that we had five species which might be distinguished as follows:—(1) *Nicellii*—feeding on nut (underside of leaf); three fasciæ and two costal streaks; apical spot long and oval. (2) *Frolichella*—feeding on alder (underside of leaf); two fasciæ and three costal streaks; apical spot, irregular. (3) *Klemannella*—feeding on alder (underside of leaf); two fasciæ and two costal streaks; apical spot, round. (4) *Dunningiella*—food-plant, doubtful; two fasciæ and three costal streaks; apical spot, oval. [The four species, *nicellii*, *frolichella*, *klemannella*, *dunningiella*, have no basal streak]. (5) *Stettinella*—feeding on alder (upperside of leaf); two fasciæ and three costal streaks; with a basal streak. It is very evident that the number of fasciæ and streaks are somewhat liable to vary, and at any time fasciæ may be divided, or streaks united, so that these terms may be convertible the one into the other. This being the case, normally-marked specimens of *nicellii*, *frolichella* and *dunningiella*, are hardly to be distinguished by transverse markings of the costa; they all possess five such marks. *Frolichella* and *nicellii* are easily distinguished when bred, by the pabulum, and may also generally be distinguished by size, the former being much the larger species. From *dunningiella*, which, according to the *Manual* is intermediate in size, they are only distinguished by the duller colour and oval black spot of this latter species. In the absence of knowledge of larval habits, I think that *dunningiella* must at present be considered a very doubtful species, perhaps the specimens considered as such, are generally to be referred to *nicellii*. *Stettinella*, apart from its larval habits, is sufficiently distinguished by the basal streak. This leaves *klemannella*, with four costal streaks, which nearly fits my exhibit in the last round of the basket. But in the description in *The Manual*, and in the specimens of *klemannella* which are exhibited by Mr. Richardson, there is not the brilliant basal blotch reaching from costa to inner margin, that my specimen possesses. However, such a small difference as this would not do to form a species, and I must wait until I have the fortune to breed more, and learn more of the insect, before settling whether to call it a *klemannella* or to consider it a new species."

Spring Notes.—The spring opened this year in North Germany with much promise to the entomologist of a successful season. The bees held their Easter feast in unwonted numbers, and rare species were often captured. On sallows the cuckoo bees, *Nomada*, were in great plenty, while the catkins were alive with *Bombus* and *Anthrena*. The spring flowers, cowslips and anemone, *Gagea spathacea, Ranunculus ficaria*, all have their hymenopterous visitors, eagerly drinking the health of the season. The busy honey bee, appearing to our eyes less careless than the rest, teaching its proverbial lesson of eternal industry, seems this year particularly obtrusive. By the rows of silver birches, feathering in tender green, numberless pairs of *Vanessa urticae* are flirting; while flying low, up the middle of the road through the wood, *Gonepteryx rhamni* passes on in solitary search. The summer of 1895 may offer some compensation for an unusually long winter and a lagging spring.—A. R. Grote, Hildersheim, Germany.

A hunt for Phorodesma smaragdaria.—In reference to the remarks made (*ante*, p. 158) on this subject, I should like to be allowed to say that it was in the month of July, 1845, that Mr. Douglas captured *Phorodesma smaragdaria* at St. Osyth; and perfect as was the description of its larva given by him to the Entomological Society of London in the year 1852, it left something to be desired with regard to its food-plant. True that Mr. Ingall gathered up a pupa with a mass of *Artemisia maritima* at Queenboro', in the Isle of Sheppey, four years later, but his notes having only just come to light (*Entom.*, vol. xxviii., p. 40), it was left until until Mr. Machin's great success in taking the larvæ off sea wormwood before the food, as far as this country is concerned, was placed on record in the somewhat inaccessible *Transactions of the Entomological Society of London*. So far, then, the general body of collectors had not received much assistance, and it only remained for them to gather such information as was afforded by our entomological periodicals. For that purpose we have been referred to the *Entomologist* for 1884, and there we find that Mr. Elisha, after a description of the larva (which we had from Stainton's *Manual*, and Shield's *Practical Hints*, some thirty years before), says "*The exact locality, and the food-plant, I must for obvious reasons at present decline to state.*" Let us thank the men then who gave us the first information respecting the food of the larva. They carefully worked Fobbing Marsh, and soon learned the secret of the food-plant. This happened, not "eight years ago," as Mr. Elisha seems to think, for nearly twice that time has elapsed since these seekers after truth fulfilled the object with which they set out. It may seem somewhat strange that the fact of Mr. Elisha having read a paper on *P. smaragdaria*, should, in his opinion, preclude anyone in future from alluding to the subject, or from giving a short account of the method of taking it, for the benefit of our younger readers; but how anyone could so far distort my remarks into an attack on our late respected fellow-worker, Mr. Machin, is beyond my comprehension.—Henry A. Auld, 31, Belmont Hill, Lee, S.E. *April 20th*, 1895.

Lasiocampa ilicifolia at Cannock Chase.—In his remarks on the sale of the late Mr. Machin's Lepidoptera "A Looker-on" seems rather to doubt the fact that *Lasiocampa ilicifolia* used to be taken on Cannock Chase. In this part of the world the name of Bonney is more than a guarantee of genuineness. That Mr. Bonney used to send considerable numbers of this insect away to collectors, I have been told by his brothers, who used to assist him to search for the larvæ. That *L. ilicifolia* is no longer to be found here, is, I fear, a fact. Dr. Freer has worked the Chase for many years; and for seven years, during the last four of which I have been collecting assiduously, I have lived within a few hundred yards of the ground where Mr. Bonney used to find the larvæ. Yet, though over the ground very frequently, I have never seen a single specimen of either larva or imago. This piece of ground has changed considerably since those days; a part of it is now a field, the rest a thick covert; and the bilberry, which was the food supply, has had to give way to larch and pine. Perhaps a Chase fire was the cause of its extermination. I can assure you that if the data with Mr. Machin's eight specimens were right, there can be no doubt about these eight at any rate being genuinely British.—Basil Burnett, Park House, near Rugeley. *March 25th*, 1895.

"A Looker-on" seems exercised in his mind as to the authenticity of the *Lasiocampa ilicifolia* in Mr. Machin's collection. Several members of the Bonney (not Bonny) family took this insect in some quantities about the years 1858–62, or thereabouts. And it was from them that E. Weaver (perchance one of "Looker-on's" names of authority) obtained his knowledge of the insect. The Bonney's are well known and highly respected in this town, and one of them has a cosmopolitan reputation as a geologist. I myself took the larvæ in 1879 and 1882 (*vide, Entomologist*, vol. xvi., p. 260). It was always a very local insect and restricted to a small area; probably owing to the fact that the Chase is constantly being fired, and this particular patch apparently escaped, judging from the appearance of the bilberry and heather before it was enclosed. This patch is now partly ploughed up and partly turned into a fir plantation, and the probability is that the insect is extinct. I can assure all entomologists who have *L. ilicifolia* labelled "Bonney," that they may rely on their being genuinely British. The Bonney's seemed to do comparatively little exchanging; facilities for doing so were not great in those days. When looking over the family collection some years ago, I discovered, in the deal, uncorked, unvarnished and warped cabinet containing it, a drawer, in which were quite 200 specimens of *ilicifolia* in various stages of destruction by grease, verdigris and mites. *Eheu fugaces!*—Richard Freer, M.B., Rugeley, Staffs.

Hepialus humuli, &c., in Ireland.—I read with some surprise in the *Record* of April 1st that this species is considered rare in Ireland, and that the Rev. W. F. Johnson only knows of two localities where it has been obtained. I have always found it one of the commonest moths in this county (Waterford), where it frequents meadows in the early summer; last summer, had I been so disposed, I could have taken it in hundreds. I may also mention that it is by no means uncommon to see specimens of *Pararge megaera* and *P. egeria* late in October. Last year I saw a specimen of the latter on October 27th, and in 1893 one of the former on October 24th. Does not this point to the probability that these butterflies are sometimes triple-brooded?—L. H. Bonaparte-Wyse, Manor of St. John's, Waterford. *March 26th*, 1895.

In the *Record* for April 1st, is a short note about the scarcity of this species in Ireland. I was collecting all last summer in Co. Fermanagh, and found *H. humuli* swarming everywhere, on several evenings at the end of June. I took one ♂ with brown markings on the fore-wings.—Endymion Porter, St. Paul's Vicarage, Stratford, E. *April 4th*, 1895. [The notice as to the rarity of *H. humuli* was quite an error, it should have been *H. lupulinus*.—Ed.]

Lepidoptera in the Cheltenham district.—I am afraid this will be a very poor list of insects that occur in this neighbourhood, but my experience of the past season has been most disheartening; sugar and larva-beating have been absolutely useless; light was very little better, though I lit my moth-trap every favourable night; ivy and sallow produced about a couple of dozen insects all told; the majority of those I did take were captured within a mile or two of my house, which is about 2½ miles from Cheltenham along the London road. *Phigalia pedaria* was the first to turn up, this came to my study window on Feb. 9th. I then started my moth-trap, but took nothing till the 28th, when *Hybernia rupicapraria*, *H. marginaria* and *Anticlea badiata* put in an appearance, a very early date for the last-named. On the 15th of the same month I took *H. leucophearia* at rest, and *Anisopteryx aescularia*; on the following day, while searching for pupæ on a large poplar near the house, I came across empty cocoons of *Dicranura vinula*, *D. bifida* and *Poecilocampa populi*. During March I took, besides those already mentioned, *Taeniocampa munda* and *Scopelosoma satellitia* on the 7th; *Orrhodia vaccinii* and *O. ligula* on the 9th; *T. gothica*, *T. stabilis* and *T. pulverulenta* on the 13th; *T. instabilis* and *Xylina rhizolitha* on the 19th, all at sallow. On the 30th, I captured a ♀ *Grapta c-album* in the garden, and placed her in a glass filter with a gauze covering, and with some nettle inside to try and induce her to lay; during the first week of April she deposited some thirty eggs on the upper surface of the leaves and on the gauze; these hatched in due course, the young larvæ were sleeved on a red currant tree, and produced imagines in July; some of these had undersides of dark brown, whilst others were beautifully mottled with lighter brown and metallic green. In April, I worked the sallows every favourable night and took, besides the common frequenters, a single specimen each of *Pachnobia leucographa*, *T. gracilis* and *P. rubricosa*. My moth-trap produced a few *Larentia multistrigaria*, *A. badiata*, *A. nigrofasciaria*, *Eucosmia certata*, *Selenia bilunaria*, *Triphosa dubitata* and *Cidaria suffumata*. Hunting by day, I took *Gonepteryx rhamni*, *Pieris rapae*, *Vanessa urticae* and *G. c-album*; also larvæ of *Mellinia circellaris*, *Xanthia fulvago*, *X. flavago* and *Eupithecia tenuiata* in catkins. During May I bred *Amphidasys betularia*, *Odontopera bidentata* and *Smerinthus tiliae* from dug pupæ, and captured *Eupithecia subnotata*, *Melanippe fluctuata*, *M. sociata*, *Coremia designata*, *C. ferrugata*, *C. unidentata*, *Cabera pusaria*, *Hemerophila abruptaria*, *Eupithecia vulgata*, *Ellopia fasciaria* and *Spilosoma menthastri* by means of the moth-trap; sugar only produced *Gonoptera libatrix* and *Brotolomia meticulosa*, while *Pieris napi*, *Argynnis euphrosyne*, *Pyrgus malvae*, *Nisoniades tages*, *Coenonympha pamphilus*, *Ematurga atomaria*, *Acidalia remutata*, *Abraxas sylvata*, *Lomaspilis marginata*, *Eupithecia abbreviata*, *Epione advenaria*, *Venilia maculata*, *Euclidia mi*, *Herbula cespitalis*, *Pyrausta purpuralis* and *Ennychia anguinalis* were obtained during the day, as also larvæ of *Diloba caeruleocephala* and *Porthesia similis*, and a colony of thousands of *Nudaria mundana* feeding on lichen on beech trees and stone walls. These larvæ were identified by Dr. Chapman. I was away the whole of June and best part of July at Milford Haven, where I had very little time for entomology, but saw *Colias edusa* and var. *helice* there on the cliffs. During the latter part of July I was at home and took or bred *Cabera exanthemaria*, *Phalera bucephala*, *G. c-album*, *Miana strigilis*, *Hepialus humuli*, *Larentia didymata*, *Hypsipetes sordidata*, *Boarmia repan-*

data, *Acidalia bisetata*, *Chortodes arcuosa*, *N. mundana*, *Cidaria fulvata*, *Noctua festiva*, *Eupithecia minutata*, *Cucullia umbratica*, *E. rectangulata*, *E. sobrinata*, *Triphaena orbona*, *P. similis*, *Bombyx neustria*, *Acidalia aversata*, *A. dimidiata*, *A. virgularia*, *Cleora lichenaria*, *Cidaria pyraliata*, *Leucania impura*, *Larentia viridaria*, *C. pusaria*, *Agrotis corticea*, *Caradrina alsines*, *Uropteryx sambucata*, *E. isogrammata*, *Bryophila perla*, *L. marginata*, *Abraxas grossulariata*, *Hepialus sylvinus*, *Boarmia gemmaria*, *Eubolia limitata*, *Nola cucullatella*, *Xylophasia lithoxylea*, *Crocallis elinguaria*, *S. bilunaria*, *Geometra vernaria* and *Spilosoma menthastri*. On Aug. 1st, I went down to Tenby for four weeks, returning on 29th; I set my moth-trap on the next night, when I took *Neuronia popularis* and *Luperina testacea* commonly, also a few each of *L. cespitis*, *Plusia gamma*, *C. ferrugata*, *C. designata* and *M. fluctuata*; on the same day I found at rest at the foot of an ash tree a very fine ♀ *Cirrhoedia xerampelina*, but although I hunted dozens of trees every evening afterwards for a week or more I failed to find another. September produced *Noctua umbrosa*, *L. cespitis*, *L. testacea*, *Polia chi*, *N. popularis*, *C. truncata*, *A. pyramidea*, *P. flavicincta*, *Rumia luteolata* and *A. tragopogonis* at light, *Chrysophanus phloeas*, *Lycaena agestis*, *L. icarus*, *L. bellargus*, *G. c-album* and *P. atalanta* during the day, and *Orthosia lota*, *Orrhodia vaccinii*, *O. ligula* and *Hadena protea* bred from eggs and pupæ. During October, I took *Oporabia dilutata*, *Himera pennaria* and *Anchocelis litura* at light, *O. vaccinii*, *O. ligula*, *Mellinia circellaris* and *A. pistacina* at ivy, and *X. ornithopus* at rest. On Nov. 1st, I took a fine ♀ *A. sphinx* at rest on an apple tree in my garden, from which I obtained about a dozen eggs, and hope to rear some imagines in Nov. next, but the larvæ being cannibals I am not looking forward with pleasure to the difficulty of keeping them in separate sleeves, which I suppose I shall have to do, unless someone will kindly give me a hint as how else to prevent their eating each other. On the 7th, I found *Hybernia aurantiaria* at rest, and on the 18th, I took a beautiful specimen of *Xylina semibrunnea* at ivy, which is a good deal darker than those I took in Hampshire a few years ago, the other moths taken in November were, *Cheimatobia brumata*, *B. meticulosa*, *Caradrina quadripunctata* and *Orthosia macilenta*. The only insect which turned up during December was a solitary specimen of *Poecilocampa populi*, which came to my moth-trap.—R. B. Robertson. *March*, 1895.

Errata.—Page 157, 14 lines from bottom for "growth" read "transition towards pupæ"; in the next line for "accomplish" read "complete."

SOCIETIES.

At the meeting of the Entomological Society of London on April 3rd, 1895, Mr. C. J. Gahan exhibited two examples (♂ and ♀) of a rare beetle, *Chariea cyanea*, Serville, which had been kindly sent to him for examination by Mons. René Oberthür; he stated that Lacordaire was mistaken with regard to the sex of the specimen which he described in the *Genera des Coléoptères*. He pointed out that the elytra of the ♂ were relatively much shorter than those of the ♀, and that the joints of the antennæ from the third to the tenth were bi-ramose. Mr. Gahan also exhibited two species of the genus *Decarthria*, Hope, and said he believed these were the two smallest specimens of Longicorns known.

Dr. Sharp exhibited the soldiers and workers of a species of Termite found by Dr. Haviland in South Africa. He stated that these insects possessed eyes and worked in daylight like Hymenopterous ants, and that in habits they resembled harvesting ants by cutting grass and carrying it into holes in the ground. Dr. Sharp said that, although these holes were probably the entrance to the nests, Dr. Haviland was unable to find the actual nest, even by prolonged digging, so that the winged forms were still unknown. He thought this species was probably allied to *Termes viarum* of Smeathman, in which the soldiers and workers possessed eyes and had been observed by Smeathman to issue from holes in the ground, whose nests could not be discovered. Mr. McLachlan observed that it was possible there might be species of Termites without any winged form whatever. Mr. Rye called attention to the action of the Conservators of Wimbledon Common, who had been destroying all the aspens on the common. He enquired whether it was possible for the society to protest against the destruction of the trees. Mr. Goss said he would mention the matter to the Commons' Preservation Society. Mr. Francis Galton, F.R.S., read a paper entitled, "Entomological Queries bearing on the question of Specific Stability." The author said that the information desired referred to (1) instances of such strongly marked peculiarities, whether in form, in colour or in habit, as had occasionally appeared in a single individual in a brood; but no record was wanted of monstrosities, or of such other characteristics as were clearly inconsistent with health and vigour; (2) instances in which any one of the above peculiarities had appeared in the broods of different parents. In replying to this question, he said it would be hardly worth while to record the sudden appearance of either albinism or melanism, as both were well known to be of frequent occurrence;* and (3) instances in which any of these peculiarly characterised individuals had transmitted their peculiarities, hereditarily, to one or more generations. Mr. Merrifield stated that he received some years ago, from Sheffield, ova of *Selenia tetralunaria*, the brood from which produced, in addition to typical specimens, four of a dark bronze colour, and from these he bred a number of specimens of a similar colour. Dr. F. A. Dixey referred to a variety of the larva of *Saturnia carpini* with pink tubercles. He said the imago bred from this larva produced larvæ of which ten per cent. had pink tubercles. Professor Poulton said he had found larvæ of *Smerinthus ocellatus* with red spots, and that this peculiarity had been perpetuated in their descendants. Mr. G. F. Hampson read a paper by Mr. C. W. Barker, entitled, "Notes on Seasonal Dimorphism in certain species of Rhopalocera in Natal." Mr. Merrifield said he was of opinion that a record of the temperature at different seasons would be a very desirable addition to observations of seasonal dimorphism. Mr. Hampson said he believed that temperature had very little to do with the alternation of forms. At any rate, according to his experience, in India the wet season form succeeded the dry season form without any apparent difference in the temperature. Professor Poulton remarked that the apparent tempera-

* We doubt very much whether it be even remotely true that "the sudden appearance of either albinism or melanism" is known "to be of frequent occurrence." We take it that neither albinism nor melanism has anything but the slowest process of development, but it is to be expected that species, originally much darker or paler than now, would, under suitable conditions, show reversion.—Ed.

ture as felt must not be relied upon without observations taken by the thermometer.

The South London Entomological and Natural History Society met on February 28th, 1895, when the following among other exhibits were made:—Mr. Edwards: larvæ of the Dipteron, *Eristalis tenax*, found in some water in the stump of an old apple tree. Mr. Adkin: a series of *Crambus ericellus* from Sutherland; it was stated that this species differed from *C. pascuellus* in always having the silvery stripe narrow and even. Mr. Tutt: continental specimens of *Xanthia ocellaris*; he pointed out the features that differentiated it from *X. gilvago*, *viz.*, (1) the lower part of the reniform was white; (2) the nervures were well dotted with white scales; (3) the apex of the wing was more pointed.——On March 14th, Mr. F. A. Hall exhibited a Pierid butterfly (*Ithomia patilla*) and its Danaid mimic (*Dismorphia fortunata*). from Nicaragua. Mr. Sauzé: a specimen of *Aedipoda tartarica* taken among imported garden produce at Brixton. Mr. Adkin: a series of *Melanippe hastata* from Sutherland, which were intermediate in colour between the usual southern and northern forms. Mr. Frohawk: a long series of *Grapta c-album*, showing both the light and dark forms of the male and female, which had been bred from a single batch of eggs. As the progeny of one brood these were most interesting. It has generally been supposed that there was considerable seasonable dimorphism exhibited between the specimens bred in July from May ova, and those bred in October from July ova. This large brood of over 200 specimens bred from 275 eggs laid in May and June, 1894, however, exhibited in both sexes the brightly-coloured form with pale marbled undersides usually supposed to characterise the July specimens, and also the darker-tinted form with more uniform undersides, usually supposed to characterise the October specimens. It was stated that only those with light-marbled undersides were seen on the wing during the summer months. Mr. Tutt suggested that, since the light ones appeared more generally on the wing in summer, and he was under the impression that only the specimens with the more uniform coloured undersides were captured after hybernation, it was probable that the dark ones even of the early brood went into hybernation at once, whilst the lighter specimens were those that produced the October brood. It was well known that some specimens of each brood of *V. urticae*, even if there were three broods in a season, went into hybernation, and he suggested that in *G. c-album* the coloration might be an outward sign of the hybernating individuals. From Mr. Frohawk's remarks it appeared that they were generally the last to emerge, and hence took a longer period for their development. If it should be found later on that the October brood produced what has hitherto been considered the two seasons' forms, it would be interesting to find what percentage of these were of the bright form and whether such as were of this form would attempt to perpetuate a third brood and only the dark ones go into hybernation. That so large a percentage of Mr. Frohawk's summer brood were of the dark (autumn) form was highly suggestive that a large percentage were produced by natural selection with the tendency to hybernate strongly developed, and explained how in cold seasons when only a single brood occurred the insect was not exterminated. In a year like 1888, for example, a second brood was impossible, and had the whole of the early brood paired and tried to produce a second brood utter extermination would have followed.——On April 11th, Mr. Winkley exhibited a bred series of *Nyssia hispidaria*; one specimen was whitish and lacked the central band, the transverse lines and apical streak alone being dark grey; another specimen was uniformly smoky black.——On April 25th, Mr. Frohawk exhibited a specimen of *Papilio machaon*, bred from a Wicken larva, which had ochreous-yellow blotches at the anal angle, and in which the blue markings were almost white. Mr. Mansbridge: three melanic specimens of *Phigalia pedaria* taken by him this year near Barnsley; he remarked on the gradual extension of this form: Mr. Adkin said that Mr. South had taken one example at Macclesfield. Mr. Moore: a specimen of *Pterostichus madidus*, F., which had been attacked by a *Gordius*. Mr. Turner: a specimen of *Plusia moneta*, which was taken at Wickham in July, 1894, by Mr. Slade of Hatcham: also a series of *Spilosoma menthastri*, two London specimens having only a few small dots on the fore-wings, whilst three Scotch forms had a darker ground colour and the second (or elbowed) line more or less complete, especially in one specimen.

The North London Natural History Society had another interesting meeting on March 14th. Mr. Hanbury announced that he had been successful in rearing *Noctua conflua* from some Shetland ova. Dr. Gerard Smith delivered a lecture on "The Organs of Insects," illustrated by photo-micrographs. Dwelling for a few moments on the specially-interesting geological history of insects, he said that the class Insecta was represented as far back as the latest Silurian strata; and that this, like other instances of the early and apparently sudden introduction of highly specialised animals, suggested the possibility of our having overlooked a law of rapid expansion of species under conditions as yet unknown to science; since the postulate of very gradual variation through immense periods of time, even admitting the imperfection of the geological record, is difficult to maintain in the face of such evidence. In the case of Insecta it was especially so, since the theory of sudden introductions being due to reversion to a far back type, which itself reached specialization by long and gradual steps, is inadmissable, owing to the period before the appearance of insects being one of aquatic life. Some photographs of insect eggs were then shewn. Dr. Smith said that the stages of metamorphosis in insects were not new phenomena, but were analagous to the stages in the ovarian life of other animal forms. The eggs being very numerous, the supply of nutriment for each embryo is necessarily insufficient for the future foundation of the imago. The elementary stage has therefore to be gone through after leaving the egg. Mouth parts of the wasp, bee, mosquito and flea, and tongues of several insects, were then shewn; and the great variety and special modification of these for different needs noticed. Dr. Smith then turned to the antennæ, dwelling on the differences of opinion as to their function, but said they seem formed to feel aërial vibrations, whether coarse or fine. He also gave reasons for considering them to be auditory organs. Some specially fine photo-micrographs of insects' eyes were next placed upon the screen, and Dr. Smith explained the functions of simple and compound eyes respectively, afterwards turning to various forms of feet of insects, and scales of Lepidoptera, and other peculiarities of wings of insects. Dr. Smith then explained the tracheal respiratory system, and dealt with the questions arising as to the origin of wings from the gills of aquatic larvæ. A photograph of a rare deep-sea insect, *Aepophilus bonnairii*, was next placed upon the screen. This is a deep-sea perfect insect; the method of its respiration is still uncertain. Dr. Smith pointed out its rudimentary wings, and suggested that perhaps they ought to be called nascent. Other special organs of insects shown were stings, saws, musical sound producers, gastric teeth, &c., and Dr. Smith noticed the difficulties in tracing the evolution of these instruments of extreme perfection, and of accounting for their existence upon the supposition that every such organ was evolved entirely through the putting into practical use of its first rudimentary forms, which were not such as could be of any use.——At the meeting of the Society on April 11th, Mr. Nicholson exhibited the cocoon of *Brotolomia meticulosa*, and called attention to the very small aperture through which the moth had escaped: also a batch of eggs of *Endromis versicolor* laid by a ♀ recently bred by Mr. Battley: these had changed from straw colour to a dingy chocolate. Mr. Smith announced that he had bred seven specimens of *Selenia tetralunaria*. Miss M. E. Robinson [We are glad to see ladies coming to the front in this society.—Ed.] read a paper on Ockley, and stated that both Coleoptera and Lepidoptera are very numerous in that district.———On April 25th, Mr. Battley recounted his experience in the New Forest at Easter. *Taeniocampa miniosa* was taken in some numbers, and single specimens of *Xylina ornithopus*, *X. socia* and *Panolis piniperda*, as well as *Lobophora carpinata* and *Eupithecia abbreviata*. The sallows, in spite of the cold nights and persistent N.E. wind, proved fairly productive. Mr. Battley also mentioned that *T. gracilis* seemed to be turning up more abundantly than usual at Theydon this year.

At the meeting of the Birmingham Entomological Society on Feb. 18th, 1895, a letter was read from Mr. G. H. Kenrick, requesting to be relieved of the office of President. Mr. G. T. Bethune-Baker was appointed to succeed him, and Mr. P. W. Abbott was elected Vice-President. Mr. R. Freer exhibited the following varieties from Cannock Chase: *Rumia luteolata*, of a lovely pale or yellow orange colour, deeper along the costa; *Notodonta dictaea* of a delicate pale brown, without any white; a specimen of *Noctua festiva*, of the form called *conflua* by Newman. Mr. E. C. Rossiter: a specimen of *Lycaena astrarche* from Arley, which closely approximated to *L. corydon* in colour, and had a white spot in the centre of each wing; also a dark *Cleora glabraria* from the New Forest. Mr. R. G. B. Chase: *Dianthoecia conspersa* from Lundy Isle. Mr. P. W. Abbott: *Sesia culiciformis* from Market Drayton, and a bred series of *Hadena dissimilis* from Hull. Mr. R. C. Bradley: a rose bush from his garden at Sutton, that was covered with the empty cases of *Coleophora gryphipennella*.

REVIEW.—We have to acknowledge the receipt of *Wayside and Woodland Blossoms*, by E. Step (published by Frederick Warne & Son. Price 7/6). This excellent little pocket book of Botany, written in a popular style, and containing a large number of plain and coloured illustrations, will be found very useful by entomologists whose botanical knowledge is small.—Ed.

The Entomologist's Record

AND

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A Hunt for the April Spangle Gall.

By T. A. CHAPMAN, M.D., F.E.S.

A few weeks ago, Mr. Bignell asked me to get him some of the galls of *Neuroterus aprilinus*; so, of course, I did so. I persuaded myself that I did so for sundry reasons—such as my regard for Mr. Bignell and his work; the certainty of his detecting me if I made any lazy excuses, such as want of time or ignorance of the game. But I have a sad suspicion that the real reason for my getting them was, that I could not resist the excuse for a hunt. Latterly I have treated entomology more from the student's than from the hunter's point of view, chiefly because my opportunities for such hunting as I understood were extremely limited. *Naturam furca expelles*—the old Adam was still there, and the chance of a hunt could not be resisted. *Neuroterus aprilinus*, though one of the spangle gall flies, does not make a spangle gall. I may confess that, except for a little information obtained from Mr. Bignell, my knowledge of galls of all kinds is of the slenderest. I was to look for a gall appearing from the 25th of April to the beginning of May, and a description of it was to be found in Cameron, vol. iv., p. 139. It appears with the opening buds, presenting itself instead of the proper catkins or leafy shoot. My hunting ground, without going far afield, consists of the lower boughs, just above the browsing line, of a score or two of oak trees that may fairly be described as fine park timber. This year the oaks were a week or ten days late, and my first few searches were quite blank. At length, I met with a couple of galls that looked hopeful and were pronounced by Mr. Bignell to be the genuine *aprilinus*. With this encouragement, and with the advancing expansion of the oak buds, I made some more successful searches. By this time, the days were very warm, and the progress made by the oaks, as by other vegetation, was extremely rapid. This was about the 1st and 2nd of May. I now knew what to search for, but my knowledge was gained at the expense of letting the season go by. I met with a tree that was very freely covered with the galls, but already they were nearly all empty; afterwards, however, I found two other trees well tenanted, and succeeded in finding some full galls. Cameron says that they yield up the perfect fly within three days of the appearance of the galls; my own impression is, that 24 hours is nearer the truth in a season like this, when the budding of the oak is delayed till late, and then takes place in weather more like July than early May. Up to a certain point the gall-bearing bud expands like a normal healthy one; then it assumes a rather rounder form, but, as a similar form is largely affected by buds containing catkins, this is not a very helpful indication. In the next stage, the top of the gall is just visible among the scales at the apex of the bud, and I could probably have detected these had I been as learned when I began the search, as I was when I ended it. Still, they differ very little from many catkin buds; the chief difference being, that the green surface of the exposed gall is smooth, whilst the catkin where exposed is nodulated and of a yellow-green. In a very few hours the gall is more exposed, and is then tolerably easily spotted after a little practice; it is fairly firm and solid, and one has little fear of injuring it when breaking it off with the bud containing it. In a very short time it expands to the size of a small pea, and the fly escapes. The gall still further enlarges after the escape of the fly, but now readily gives way under the finger in breaking it off. The cavity within is very large—almost big enough for the fly to buzz freely in it—but the enlargement is so recent, that, up till the last few days, the *Neuroterus* must have been as closely confined by his lodgings as any other gall tenant. The flies that so emerge are ♂ and ♀, so that this stage of the insect corresponds to the summer gall stage of those species of the genus that are more strictly entitled to be called spangle gall makers.

There is no difficulty in collecting a reasonable supply if one happens to hit upon the right tree at the right time, but to ensure doing this, much time must be spent in looking daily over a number of trees and watching their progress. I was very lucky, therefore, to secure even such a measure of success as I did, not having given much time to the chase, and starting in great ignorance of how the hunt should be conducted. In a couple of days more the gall shrivels up, and the bud returns very much to its normal appearance but with a ragged dishevelled aspect. This at least is the case with a very dry atmosphere and hot sun, and with the thermometer at 70°, the oak leaves being nearly an inch long, and the galls of *Andricus quadrilineatus* and *Neuroterus baccarum* quite obvious. What may occur in a cold damp season I do not know; probably the gall remains fully expanded till it withers, rots, and falls off.

I have said that the shrivelling of the gall restores the bud to a nearly normal aspect, a result one would not expect on examining the gall when at its greatest expansion; a comparison of several galls in both conditions, however, explains how this occurs. The gall is really formed in, and consists of, the little cone of succulent stem that forms the base of the bud, and carries on its surface the inner series of brown scales forming the bud; when at its largest, the green succulent wall of the gall is more freely developed between the bases of the scales at some places than at others, so that one thinks, on casual inspection, that the gall is placed on the growing point of the bud, and has forced the scales aside, and occupies their centre; but this is not so; the gall is under the scales, and the small central chaffy scales may usually be found on some part of the gall, tolerably close together, and other scales on different parts of its surface, and these, though now very irregularly dislocated, go back nearly to their proper places, when the soft tissues of the gall shrivel up.

In a few cases, the gall occupies one side only of the bud, and a few leaves or catkins develop on the other. The great majority of the galls are one-celled, but a very large number are double, and a very occasional one contains three or more cells; I incline to think that the latter, at any rate, are due to more than one oviposition taking place in the same bud.

The next step is to obtain the summer gall, but here Cameron is not so clear a guide as one might wish, and there appears to be still room for some doubt as to what the summer (agamic) gall may be. This would correspond to the spangle or winter gall of the more typical species of *Neuroterus*, from which *aprilinus* clearly differs considerably in habit.

On May 12th, a search on *aprilinus* trees showed some male catkins with certain anthers looking a trifle larger and a trifle greener than normal, and an examination showed the upper part of the filament, or perhaps rather the dissepiment between the anthers, to be thickened and swollen, slightly separating the bases of the anthers; these anthers were also less easily broken off than those supposed to be normal and healthy, some of which had already dehisced; still the difference was so slight that I did not feel sure that I was not deceiving myself with some ordinary variation in the anthers. On May 14th, the swollen stamens presented many examples in which the bases of the anther cells were widely separated, and the whole stamen of about twice the normal bulk: the normal stamens were dehisced, shrivelled and withered; whilst, on the trees examined, a large proportion of the galled anthers were also dead, but in a different way from the healthy stamen, being brown and fleshy looking, rather as if they were rotting instead of shrinking into a dry husk.

On the 16th, these galls of *schlechtendali* were fully developed as regards size, and were beginning to fall. Notwithstanding that the thermometer stood at the remarkable figure, for May, of 75° in the shade, I was surprised by this remarkably rapid development. I visited my two most accessible trees on which *aprilinus* had been freely present, in order to see how the galls were progressing, and was surprised to find them well developed and dropping off without more than a slight touch. They were, however, rather scarce; it would have been difficult to get a few score of them, as a great many of them appeared not to have properly developed and the catkins had dropped off except where kept on by *baccarum* and *quadrilineatus*. I therefore visited *the aprilinus* tree at once and found *schlechtendali* abundant; that is, the catkins freely remained on the tree and all had several galls—many of them a dozen or two. They were already but lightly attached and easily broke off in gathering. Though I describe them as abundant, of course only a few low branches were accessible and from these I made a fair bag for Mr. Bignell; if the tree was as well-tenanted throughout, there were no doubt a good many hundred thousand galls upon it. Why this tree was so well tenanted, whilst my trees were largely failures, I don't know. It is strong evidence in favour of this being the summer gall of *aprilinus*, that only these two trees exhibited any *schlechtendali*, and that this one was the most fully supplied with both forms, whilst trees that had shown no *aprilinus* were free from *schlechtendali*.

A good account of these galls may be found in *The Entomologist*, vols. IX. and XI.

My botany has got so rusty, that my knowledge of the oak anthers is practically merely what I have observed whilst looking for these galls. They appear to consist of two cells, like most other stamens, the filament passing between them close to the base: but each cell is again so subdivided into two portions, that, perhaps, the anther is properly four-celled: if so the cells are arranged two and two. The gall of *schlechtendali* begins in the filament or between the anthers. The two cells of the anther continue to adhere together at their apices, but the growing gall separates their bases, and in doing so leaves them attached as described, two and two: and whilst the gall proper is whitish, the anthers remain greenish, and so are conspicuously mapped out on the upper surface of the gall—perhaps I ought to say the surface skin of the anthers, for their substance soon forms a portion of the gall. The little gall, which is hardly as large as a millet seed, is therefore flattened back and front when the gall appears between the anthers, is rounded below, and has two sloping surfaces to each side on top, each of these sloping surfaces, formed by an anther cell, has a groove down its centre marking the subdivision of each cell into two, and these grooves, meeting at the top, form, with the grooves between the two anther cells, a cruciform arrangement of furrows at the apex.

The ripest have already a very firm texture. One I opened contained a small larva. Another contained two larvæ, one rather bigger than the other. Whether the second was a proper tenant or an inquiline, I know not.

About May 21, galls kept in the house were fully ripe; that is, the gall proper was rounded, and of firm, almost woody, texture; the remains of the anthers forming projections on the surface were easily rubbed off, as well as some loose tissue at the base, whilst the small larva already nearly filled the whole interior, leaving the woody shell only.

Schlechtendali is said to remain 15 months in this condition, and the woody character of the galls favours this supposition. Lying on the ground they no doubt escape the dangers of desiccation, but how so small a particle can escape the many other dangers that must surround it, is difficult to understand; doubtless only a small proportion do escape, the enormous numbers that occur on a favorable tree, being no doubt necessary to meet the great destruction that occurs at this period.

The dates of *aprilinus* this year (1895), in which things were late, but went forward most rapidly under a high temperature when they did begin, are:—April 29th. Early oak trees show buds well open, one or two *aprilinus* discoverable with difficulty. May 2nd: Buds generally bursting, with shoots an inch long, but hardly anything like leaves on *aprilinus* trees. *Aprilinus* fully developed, a majority empty. May 6th: Leaves an inch long, *aprilinus* shrivelled and collapsed. May 12th: Anthers shewing greener and larger than normal for galls of *schlechtendali*. May 14th: Galls of *schlechtendali* distinct. May 16th: Galls of *schlechtendali* falling. May 21st: Galls of *schlechtendali* fully developed.

Some few precocious oaks were quite a week earlier than these dates, but these, probably from want of search, yielded no galls of *aprilinus*.

Eudryas Stae-Johannis.

By A. RADCLIFFE GROTE, A.M.

A little entomological mystery, not entirely unconnected with a British Museum label, has at length passed into a stage where we may hope that it may be entirely cleared up. In 1867, I examined the late Mr. Walker's type of *Eudryas Stae-Johannis*, and recognised in the specimen a representative of a distinct species allied to our common North American, *E. grata*, publishing my conclusion, with other observations on the National Collection, in 1868.* In my subsequent lists I recorded the species as distinct, surmising, from the name, that the specimen had been taken on the St. John's River, Florida, by Doubleday, whose American material was generally described, and often redescribed, by Mr. Walker. The species remained undiscovered by American collectors, and I may say unnoticed, until Mr. John B. Smith visited the collection in 1891. The following year this author published a statement in the *Canadian Entomologist*, vol. xxiv., p. 133, to the effect that Walker's type bore the label, "Taken on the Church door at Horsley Downs;" and that: "It is probable that in some way the pupa of the insect was transported to England, and through the vicissitudes of the voyage, an aberration was produced." Mr. Smith, further, has "no hesitation in referring the species (?), as a suffused aberrant *grata*." From this, it is plain that a label, especially one in the British Museum, is a sacred object in Mr. Smith's eyes, and, rather than enquire as to its authenticity, he prefers to invent a theory to cover up its improbability. Aside from this circumstance, Mr. Smith's judgment, perhaps from unfamiliarity with this group of Lepidoptera, is sadly at fault, since a letter from my kind correspondent, Mr. William Schaus of Ormonde Lodge, Twickenham, announces the discovery of the mysterious species in Mexico! Mr. Schaus, well known from his collections made in Mexico and South America, has seen a number of specimens sent by a Mexican collector, so that the species is "beyond doubt." With this discovery, my observations in '67 and '82 are vindicated, and Mr. Smith's want of "hesitation" in 1891, is finally rebuked; but there still remains the mystery of the label. The "vicissitudes of the voyage" theory, is also consigned to that very extensive lumber-room, from which it is in future only to be dragged to be laughed at: for if the insect made the voyage all by its little self, it stood it out bravely, and remained true to its type until it reached the hands of Mr. Walker—perhaps the most perilous incident in its travels. But did it make the voyage at all in a live condition—as moth, as pupa, or as larva? My kind friend, Mr. J. W. Tutt, has been at some pains to set me right, and the label as well, in regard to the church door at "Horsley Downs," and the result is noted by me in the *Canadian Entomologist* for 1893, p. 319. It is a dreadful thing to suggest, but perhaps the label is wrong or wrongly placed, and was intended for another insect. I have been bold enough to offer proof that this has elsewhere occurred in the collection of Lepidoptera in the British Museum; in particular, that the specimen shown as the type of Mr. Walker's *Acronycta cristifera*, is really his American type of *Mamestra brassicae*, erroneously identified by this

* Also in 1882, see my *Ill. Ess.*, p. 42: my statement in this latter work is the one apparently intended to be contradicted by Mr. Smith.

savant of the past. Perhaps an enquiry of this kind with regard to the label on the type of *Stae-Johannis* might be productive of result, but it is clear that the interest will now be mainly of an antiquarian nature, while the probability is, that the voyage invented by Mr. Smith, in order to legitimize the label, should be treated as having a similar foundation to any one of those of Sindbad the Sailor. Mr. Smith, it is pretty clear by this time, conceived a wrong estimate of the insect, and invented a wrong theory, aided by a wrong label, to justify his original error. None of his usual excuses will avail him here. He cannot say, for instance, that he "knew" it was a good species, but recorded it as an aberration—because, there is the theory! Nor can he say that the "thin balsam" made the error easy; there is no balsam for Mr. Smith I am afraid in this sad case, thin or thick. At the most he might say my correction is merely "verbal," as indeed most corrections are, unless administered with a stick. Or he might say, that he "cannot account" for his mistake, neither can I. But, I anticipate, in selecting from the large stock of excuses which Mr. Smith has on various occasions offered to the public. *Qui s'excuse s'accuse*, and Mr. Smith himself is probably more affected than anybody else, when he is caught "napping" or "blundering." The whole statement, in fact, of Mr. Smith, his positive style, his faith in the label, his wild theory to establish its genuineness, his profound and solemn determination of the varietal character of the moth, remind us not a little of the occurrence noted in *Pickwick*, Chap. xi.—"there is an inscription here, said Mr. Pickwick, ... I can discern a cross." Seriously speaking, I must now correct the Philadelphia List, and give a full one of all the *Eudriinae* known.

EUDRYAS, Boisd. (1836). Grt., restr. (1895).
(Type): *E. assimilis*).
1. *grata*, Fabr., North America.
   assimilis, Bdv.
2. *stae-johannis*, Walk., Mexico; Fla.?
3. *cypris*, Grt., Paraguay.

EUTHISANOTIA, Hbn. (1825).
(Type: *E. unio*).
4. *unio*, Hbn., Atlantic District.
5. *brevipennis*, Stretch. California.

COPIDRYAS, Grt. (1876).
6. *gloveri*, G. & R., Texas.
7. *platensis*, Berg., Buenos Aires.

EUSCIRRHOPTERUS, Grt.
8. *poeyi*, Grt., Cuba.
   disparilis, H.-S.

CIRIS, Grt. (1863).
9. *wilsoni*, Grt., Texas.

Some varieties of Noctuæ from Doncaster.*

By H. H. CORBETT, M.R.C.S.

In submitting for your inspection and discussion this evening some varieties of NOCTUÆ from Doncaster, I do not intend to startle you by an exhibit of any very extraordinary forms, but rather to show, by a few picked specimens from my series of the various species, the ordinary range of variability in my locality, hoping that such of you as are interested in this group, may find something worthy of your attention and study. The comparison of local forms of common insects is to me

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much more interesting than is the collection of extraordinary aberrations (in many cases the result of artificial selection), which are of no use in determining the amount of variability, nor the local range of varieties, in any species. I do not mean that such inbred artificial varieties are of no scientific value. They are of use in showing how much more rapid is the variation of species under artificial than under natural selection; and that by artificial means, races may be developed, that in nature would probably never exist. But I maintain that as an aid to the *natural* history of a country, they are out of place. The Rotherham and Barnsley Ermines are of interest as showing what may be made out of *Spilosoma lubricipeda*, just as fantails, pouters, &c., are interesting as showing what may be made out of the rock dove. True, *S. zatima* or *S. radiata* may exist as a foreign variety in a state of nature, but this does not make Yorkshire *radiata* a natural part of the lepidopterous fauna of Yorkshire. Before describing my varieties, I should like to say a few words concerning varietal names. Until very lately I had a great objection to the introduction of an alarming number of new names; such I looked upon as an unnecessary excrescence on our already too confusing nomenclature. Since, however, I have studied Tutt's *British Noctuæ and their Varieties*, my opinion has undergone a complete change, and I am now one of those who prefer to use a short varietal name, rather than an unwieldly verbal description. For example, it is much simpler to write and much easier to understand *Orrhodia vaccinii* var. *mixta*, than "the variety of *O. vaccinii* characterised by a dark ground colour, and pale margins to the stigmata, pale nervures, dark transverse lines, and with an ochreous band near the hind margin." Against this it may be urged that among polymorphic species there will be no end to varietal names, and that instead of simplification, we only get confusion more confounded. But this is not the case, because, if we have distinctive names for several well-marked varieties, intermediate forms may be distinguished by means of hyphened varietal names of such forms as the intermediates most nearly approach.

The varieties occurring at Doncaster confirm the opinion expressed by me in an essay, read before your society some time ago, that in that locality, while we are in some measure under the influence of the West Riding melanic area, yet there is a decidedly southern tendency in our insect fauna as regards species; but as regards varieties, the general tendency is towards boreal forms.

The first species that I would draw your attention to is *Asphalia flavicornis*. I have six specimens in my box. The 1st, 2nd and 5th, are the ordinary North of England form, and represent the Linnæan type:—"Upper wings grey, with three black strigæ." In the 5th specimen the stigmata are very curiously formed. The 4th is almost the southern form (*galbanus*, Tutt), the indistinct stigmata and pale transverse lines belonging to that form, but the ground colour not being quite light nor green enough. The 6th is intermediate between the 4th and the type; while the 3rd is a very beautiful and, I believe, uncommon form, with the ground-colour paler than in the type, and the transverse lines very strongly marked. This is the only specimen of this variety that I have seen. The type is by far the most common form at Doncaster, the *galbanus*-like specimens being very scarce.

Asphalia diluta.—This species is very abundant at sugar, and, for a generally constant species, varies considerably, but I have not met with what is known as the Yorkshire form (*nubilata*, Robson and Gardner). My 5th specimen approaches *nubilata* in the distinct dark transverse bands, but only two of the bands are well-defined, the basal and hind-marginal being very faint. The 3rd specimen had a very remarkable appearance as it rested on a sugared tree, the two bands and the enclosed space appearing to form one broad central space. This effect may be got by looking at the insect in certain lights now. The 1st specimen is the palest that I have met with here.

Cuspidia (Acronycta) psi.—Mr. Tutt speaks of this as a very variable species. The three specimens exhibited show all the range of variation that I have found here.

Viminia (Acronycta) rumicis.—The common form with us appears to be the Linnæan type, and is represented by the 1st of the four specimens in my box, but specimens are occasionally to be found such as the 2nd and 3rd in my series. These do not appear to be the true var. *salicis*, for, according to Stainton, *salicis* "closely resembles *rumicis*, but is smaller and darker," while the melanic form that I take is rather larger than the type. Again, in *salicis*, the reniform is obsolete, while in all the dark specimens that I have taken, it is quite obvious. The 4th specimen is only interesting from its general uniformity of colour.

Leucania lithargyria.—The red form exhibited was bred by Mr. Young of Rotherham; I suppose it may be referred to var. *ferrago*, Fb.

Hydroecia nictitans.—In the case of this usually very variable species, I have been struck with the very small amount of variation observable in such specimens as I have met with here. In 1893, I took a considerable number on flowers at Edlington, and every one was of the form shown in the first four in the box. I did not see one with either yellow or red stigmata, and those I exhibit show the extreme range of variation in ground-colour. The only specimen with orange reniform that I have seen, was taken at sugar last autumn, and is the 5th specimen in the box.

Xylophasia polyodon.—This polymorphic species varies much here, but I have not yet met with such completely melanic forms as I used to take near Manchester. Very pale specimens, such as the 1st in my box, are not infrequent. The type, such as my second specimen, together with intermediate forms between it and the pallid form, are by far the commonest with us, while vars. *obscura*, Tutt, and *infuscata*, White, are not infrequent. It is worthy of note that during the dry season of 1893, I did not see one melanic form among many hundreds that came to sugar.

Charaeas graminis is abundant with us on flowers of *Senecio jacobaeae*, and, as will be seen from my specimens, it varies considerably. The development of the pale branched longitudinal streak—sometimes only forming a conspicuous pale spot below the reniform, and at others spreading so as to include all three stigmata in a pale area—is striking. The ground colour also varies much.

Apamea didyma (*oculea*).—Of this protean species we have a great range of varieties, and I confess that I am unable to classify them in a manner satisfactory to myself. So far as I can determine the varieties they are:—1. var. *lugens*, Haw.; 2—3. var. *rava-flava*, Tutt; 4. var. *albistigma*, Tutt; 5. var. *didyma*, Esp.; 6. a form intermediate between *furca*, Haw., and *didyma*, Esp.; 7. var. *furca-flava*, Tutt. The commonest forms with us are dark brownish-grey, almost unicolorous, with whitish reniform, = var. *rufa-albo*, Tutt. Various black forms are very common, but those with a well-developed H-mark, are rather scarce. The *ophiogramma*-like forms are common, but typical *didyma*, such as specimen 5, are very scarce. I have only met with two, and both these were taken on the same night in 1893.

Noctua festiva.—The four specimens exhibited show all the range of colour variation that I have found at Doncaster, and you will say that they are wonderfully uniform for such a variable species. No. 2 looked very curious on the sugar, on account of the strong development of the two transverse lines.

Noctua xanthographa.—You will notice a vacant space in the series. This was occupied by what I thought to be a good form of *xanthographa*: more careful study, however, showed it to be *Agrotis nigricans*; so I took it out to avoid the jeers of those who should discover my error for me: but I will dare to confess my mistake now. Of the specimens in my box, No. 2 appears to be var. *cohaesa*, H.-S., while the others may all be referred to the type—No. 3 approaching var. *rufa*, and No. 6 verging towards the northern form var. *nigra*, Tutt. The light grey form *cohaesa* is very scarce here, about 99 per cent. being the type.

Pachnobia rubricosa.—None of the forms exhibited seem quite to agree with the varieties named in *The British Noctuæ*, &c. No. 1 is the palest form that I have found, but is, perhaps, hardly light enough for var. *pallida*, Tutt. The beautifully-marked specimen No. 2, seems to be intermediate between *rufa*, Haw. (agreeing with that form in having "all the lines well marked in clear ashy-grey") and *mixta*, Hb., having the slate-grey ground colour of the latter variety somewhat developed. Nos. 3 and 4 may be referred to the type, the latter being a peculiarly dark specimen.

Of the very interesting genus *Taeniocampa*, I only show two specimens; but before enlarging upon them, I may briefly summarise the whole genus so far as Doncaster is concerned, as follows:—*T. munda* fairly common, type prevalent, red forms occasionally met with. *T. instabilis*, very abundant; melanic forms prevail. *T. opima*, very rare. *T. gracilis*, very rare. *T. populeti*, common; type prevalent; occasionally intermediate forms occur between type and var. *donasa*, Esp. *T. pulverulenta*, excessively abundant; very little prone to vary. *T. miniosa*, not known in the locality.

T. gothica.—This species ranks next to *T. pulverulenta* in abundance, and varies considerably, but I have seen nothing like var. *gothicina*, that is, forms with the black mark surrounding the orbicular obsolete. The ground colour varies from greyish-ochreous, as in the 3rd specimen, to purplish, as in the 2nd. The range of development of the black mark is shown in the series exhibited—No. 1 having it least, and No. 2, perhaps, most developed. The brownish tint of the mark in No. 6, is the nearest approach to var. *gothicina* that I have found.

Taeniocampa stabilis varies much with us in size, in colour, and in markings. The first two specimens are var. *rufa*, Tutt, and are the only specimens of this form that I have seen in my locality. Nos. 3 and 4 agree pretty well with Vieweg's description of the type "ferruginous-grey, with spots and subterminal line yellow," but have not "the margin spotted with black." 5 and 6 are referable to var. *obliqua*, Vill., and are remarkable for the conspicuous dark ground colour of the stigmata. No. 7 is a curiously unicolorous form, to which I cannot put a name.

Orthosia macilenta.—The most abundant form with us is of a pale ochreous colour, with or without the black spot in the lower half of the reniform, and with very little trace of a central shade. Nos. 1, 2 and 3 represent this form. Similar specimens, but with the central shade well developed as in No. 4, are fairly frequent. The darker reddish variety, such as No. 5, is far from common.

Anchocelis litura.—Only two named varieties of this species are found at Doncaster, and of these, var. *rufa* is the more abundant. Nos. 3 and 4 are of this form. No. 3 is remarkable for the strong development of the row of black spots near the hind margin. Of var. *rufa-pallida*, Tutt, which has the basal portion of the fore-wing pale grey, strongly marked specimens are occasionally met with, but more frequent by far are intermediates between this and var. *rufa*.

Orrhodia (*Cerastis, Glaea*) *vaccinii.*—This interesting species is extremely abundant, and varies so greatly, that many specimens are difficult to refer to any of the varieties named in *The British Noctuae, etc.*, but good types of the following varieties are obtainable. No. 1 = var. *ochrea*, Tutt, very common. Many intermediate merge into *variegata*, *rufa* and *spadicea*. No. 2 = var. *variegata*, Tutt, abundant, merging into *spadicea* and *mixta*. No. 3 = var. *rufa*, Tutt; good, well marked specimens of this form are not common. Many specimens are more or less marbled, and the lines are visible, approaching *variegata* and *spadicea*. No. 4 = var. *mixta*, Stdgr.; it is far from common. No. 5 = *vaccinii*, Linn. This dark red unicolorous form is very common, and merges into *unicolor*, Tutt. Many of these dark forms are very difficult to distinguish from the next species, *O. ligula*.

Orrhodia ligula, Esp. (*spadicea*, Gn.).—This species, though common, is not nearly so abundant as *vaccinii*, nor does it vary so much. The commonest form is the unicolorous black-red var. *spadicea*, Haw.; var. *subnigra*, with the subterminal band more or less ochreous, is also common, but var. *polita*, Hb., is very rare. I have only seen two, one of which I have in my box. The other escaped, and may still be living.

Scopelosoma satellitia.—This species equals, if it does not exceed, *O. vaccinii* in its abundance at sugar in the late autumn. It varies much in depth of ground-colour, from dull purplish-grey to ochreous. The very dark forms are not common, and are perhaps referable to the Linnæan type. Mr. Tutt says of the type:—"The type is described by Linnæus as having a white reniform" [a careless blunder, which has before been pointed out.—Ed.]: but in the Linnæan description quoted (*British Noctuae*, vol. iii., p. 7) are the words, "punctum flavum inter puncta duo nivea minutissima," and this would seem, so far as my Latin which is much out of repair would tell me, to mean "a yellow spot between two minute spots." If this translation be correct, the dark form with yellow reniform is the type. Such a form I have never found near Doncaster, all my dark varieties having white reniforms. The red forms are sometimes very beautifully marked and have a lovely purple sheen upon them.

Mellinia circellaris (*Xanthia ferruginea*).—Of this species I took a long series during the autumn of 1893, and an examination of them led me to the conclusion that more varietal names are required for this insect. Nos. 1 and 2 are var. *ferruginea*, Hb., reddish ochreous with dark transverse lines and central shade. Nos. 3 and 4 are something like the var. *macilenta*, Hb., but differ from that form in having the reniform entirely dark instead of light, and in not having a pronounced dark central shade. No. 5 is probably the type of Hufnägel, but whether he described such a very unicolorous and yellow form as this I do not know. No. 6 is of a grey colour, with hardly a trace of red or ochreous, and does not seem to fit in with any described forms.

Miselia oxyacanthae.—This species varies much with us, and the dark forms are nearly as common as the type; var. *pallida* is not rare, and all intermediates between this and the darkest *capucina* are to be found, some of the latter being almost black.

Calocampa exoleta.—Of this usually constant species, I took a long series at sugar last November. Most of these were very uniform in colour and markings, but I have picked out four specimens which differ somewhat from the type. No. 1 is remarkable for the division of the wing into two distinct areas—a dark basal, and a pale hind marginal—bounded by a line from the outer side of the reniform. Nos. 2 and 3 are the darkest specimens which I have met with. In No. 3 the subterminal line is bounded inwardly by an almost complete zig-zag black line, instead of the usual two or three wedge-shaped streaks. No. 4 is the most pallid form that I have seen, nearly the whole of the wings being of a pale reddish ochreous colour, only slightly darker on the costa above the stigmata and on the inner margin towards the base.

SCIENTIFIC NOTES & OBSERVATIONS.

Discussion on the Nature of certain Insect Colours.

(*Continued from page* 208).

I agree with Mr. Burrows that the gloss of freshly-emerged insects is due to moisture; but is not the explanation to be found in the scales being flatter, the teeth not so prominent, and the whole surface smoother than when dried—the consequence being that the superficially reflected light is less scattered, and is reflected more in mass, thus giving a glossy appearance? The absence of teeth from the scales (or their slight prominence) in those metallic blotches I have examined, and in the iridescent glossy areas of *Thecla quercus*, would point in the same direction.

The striæ of the scales seem to act like scratches on glass, and to cause iridescence in a strong light by interference, some of the rays reflected from opposite sides of the scratches interfering with and quenching each other, whilst others are not extinguished. (Mr. Tutt notices what seemed to me, too, a lapsus, in calling this refraction). Any one can see this for himself by examining a moth with a lens or microscope under brilliant sunshine, and varying the angle at which the rays strike the scales. In ordinary daylight we do not see any iridescence, and the appearance of the insect as we recognise and describe it, seems due in most cases to pigment-factors, except in those insects which we call iridescent, or where the colour or shades of colour vary with position (often inadequately described in text-books as a "rich gloss"). In the latter, probably both causes are at work. I have never examined the scales of tropical Lepidoptera, but I can understand that the brilliant sunshine of the Tropics would render the interference phenomena due to striæ much more marked, and that they very likely play a more important part in the general appearance of such insects than they do in our duller climate; still, I should expect it would be a part only (in the Lepidoptera) and that we should find abundant pigment-factor granules too. The test as to whether interference is the cause of colour is the variability of the colour at varying angles of the incident light; but as I endeavoured to show in the case of *T. quercus*, interference alone does not explain the purple gloss, but, plus pigment, it helps to do so.

"Why are many nocturnal insects highly coloured? Can they admire one another in the dark?" Mr. Burrows asks. Is not colour, in the large majority of insects, for protective and not attractive purposes? Does it not rather correspond with the seasons and with the environment? Then again, we may remember that many insects have two flights—one, in the very early morning when light abounds.

As to the fading of colours on exposure. Is not this comparatively easy to understand, if we consider that it is the absorbing and reflecting pigment-factor that is really affected? Some of the sun's rays split into two the carbonic acid (CO_2) absorbed by the chlorophyll cells of the green leaf, fixing the one constituent, and liberating the other. Some of the sun's rays split up the nitrate of silver of our photographic films. Is it not reasonable therefore to suppose that some of its rays may so gradually alter a pigment-factor, that it may lose in varying degrees its previous relative power of reflection and absorption? This would apply equally to the absorption-factor of black, though, as I have remarked before, I think even the purest blacks (in Lepidoptera) are only relative, and are, in reality, coloured.—W. S. Riding, M.D., Buckerell, E. Devon. *April 2nd*, 1895.

I quite agree with Dr. Riding that the colours of insects are for protective purposes. I have never been able to understand Darwin's position with regard to the supposition that insects selected their mates, or that sexual selection to this extent was possible, even in day-flying insects. In *Secondary Sexual Characters*, p. xviii., I have discussed this at length, and pointed out the advantage of Wallace's argument over that of Darwin in explanation of sexual dimorphism, illustrating my remarks by reference to the genus *Lycaena*. The observations I have made lead me distinctly to believe that there is practically no reason for considering that insects have developed any colours for attractive purposes. There can be no doubt that moisture covers thinly, as it were, the scales of some insects when they first emerge from pupæ. The whole surface of the insect is distinctly moist on its emergence, and there is no doubt that this film of moisture would produce interference results. The fact that these interference colours persist in some butterflies, such as the Meadow-browns, for two or three days, would suggest that the moisture is coagulable, and that it retains its power until a considerable period of flight has worn it off. I only suggest this as an additional reason for the presence of these colours in special cases; the explanations already given by Dr. Riding, are reasonable enough.—J. W. Tutt. *May 7th*, 1895.

The frenulum of the British species of Smerinthus.—Mr. Bacot, in his interesting paper on the genus *Smerinthus* (*ante*, p. 178), refers to that singular Heterocerous structure, the frenulum, as developed in the three British species of that genus. As I have studied this organ for several years past, and in the course of my study have examined many hundreds of species of British and Exotic moths, perhaps I may be allowed to say a few words on the subject. Speaking generally, we find in those species which possess the organ, that the males have a strong single bristle, springing from a prominence on the costal nervure of the hind-wing, and passing through a loop situated on the costal nervure of the fore-wing: that the females possess a number (varying in different species from two to upwards of twenty) of slender and weak bristles arising from the same point as the single bristle of the male, and that these bristles, instead of passing into a loop, are thrust into, and entangled among, a group of large raised scales or hairs, situated between the costal and median nervures of the fore-wings: in no case with which I am acquainted, has the female insect the single bristle, or the loop. This appliance probably reaches its highest development among the typical *Sphingidae*, but the case is far different with the Smerinthine group, many of which, including the giant *Caequosa triangularis* from Australia, possess it either weakly developed or quite abortive. In this, as in several other respects, they approximate to the broad-winged Bombyeids—*Lasiocampa*, *Attacus*, *Saturnia*, and their allies—to which they are probably nearly related. Considering now our three Smerinthine moths, we find that *S. tiliae* possesses the loop and bristle fairly well developed, and certainly quite effective, as the male has a well-defined loop, and the bristles of the female are sufficiently long to interlock with the scales of the fore-wing. In *S. ocellatus*, the male has a very short bristle, and the female a cluster of very small ones; the loop of the male is absent, as stated by Mr. Bacot, and the whole appliance is probably useless, or nearly so. The male of *S. populi* possesses the prominence on the hind-wing from which, in other species, the bristle proceeds; this is rounded in outline, and in some few examples terminates in a minute point which can hardly be called a bristle; all the female specimens which I have examined microscopically, have a very small but perfectly formed bunch of bristles lying close to the edge of the wing: but clearly in both sexes the appliance is quite useless, and is merely a survival. Although for the sake of simplicity it may seem well to follow the usual course of uniting our three *Smerinthi* in one genus, yet, taking into account the allied European and Exotic species, there is probably good ground for considering *tiliae* at least to be generically distinct from the other two, even if they are not all three representatives of different genera, not in respect of diversities of the frenulum alone, but in view of many other points.—Geo. C. Griffiths, Clifton. *May 7th*, 1895.

On the development of pigment in Nemeobius lucina.—Most pupa-cases are too opaque to permit the processes going on within the pupa to be observed through them. Such observations are, however, possible in the case of butterfly pupæ, especially where the imago is dark coloured. Last year, from a few eggs of *N. lucina* sent me by Mr. Tutt, I succeeded in obtaining two pupæ. These were of a pale wainscot-brown colour, with a number of black spots. Of this colour they remained through the winter, and, in fact, till within a short period of the emergence of the imagines. The first imago emerged on May 1st; its pupa passed through the same changes as those to be immediately mentioned in connection with the second, but no exact record was kept of them. The second pupa remained of the original colour until May 8th. At 9.30 a.m. on that day the thorax had become of a dark smoky black; at 11 a.m., the dark tint had invaded the central dorsal area of the 1st and 2nd abdominal segments; by 2 p.m. the whole abdomen had become dark, but not so dark as the thorax; at 9 a.m. on May 9th, the pupa was of a uniform blue-black tint all over. The imago emerged on the following morning (May 10th), and the pupa-case then resumed its pale tint. The dark tint was thus shown to be due, not to any change in the pupa-case, but to the pigment of the contained imago being seen through it. The development of the pigment evidently took place from before backwards; its entire production occupied less than 24 hours, and only commenced about 48 hours before the imago emerged. Although both larvæ pupated on the same day (July 23rd, 1894) and in immediate juxtaposition on the same leaf, so that the two pupæ had throughout been exposed to absolutely identical conditions, one imago (♀), emerged on May 1st, the other (♂), on May 10th.—F. J. Buckell, M.B., 32, Canonbury Square. *May 12th*, 1895.

On a uniform terminal for Super-family names.—Originating, I believe, in America, the practice has spread to this country, of applying the term "Super-family" to those large groups (Noctuæ, Geometræ, etc.), which roughly correspond with the sub-divisions which Linnæus established of his genus *Phalaena*. The term seems one worthy of perpetuation, indicating as it does the assemblage of families; but it would be very advantageous to adopt a uniform terminal to designate the Super-family. The names at present in ordinary use are simply the plurals of some genus in the group, so that it may sometimes be difficult to determine when, for example, one comes upon the name "Noctuæ," whether the reference is to the larger group, or only to the genus. By some authors, the terminal *ina*, has been used; this resembles the long-established Sub-family terminal *inae*, too closely to be desirable and, moreover, it offends against the canon that all names of groups larger than the genus should be in the plural number. Others, both in this country and America, seem disposed to transfer to the Super-family, the Family terminal *idae*. To do this would be to make a wholly unnecessary disturbance of nomenclature, and seeing that the terminal *idae* has marked the family at least from the time of Swainson (1827), it seems a pity to dislocate it. I would venture to suggest that the terminal *ides* should be adopted for the Super-family names and that we should write Sphingides, Noctuides, Geometrides, etc.—F. J. Buckell, M.B., 32, Canonbury Square. *May 16th*, 1895.

CURRENT NOTES.

We have received from Messrs. Watkins and Doncaster a sample of the Polyporous tablets now being used by many well-known lepidopterists, hymenopterists and dipterists, for mounting minute species. It takes readily the very finest pins, and will be of the greatest use to those who collect the very small species and have to move them somewhat frequently. It is preferable to pith, which has been used for some time by both British and Continental entomologists. It is sold at 2s. 6d. per ounce.

Mr. G. C. Bignell gives (*E.M.M.*, June) an interesting illustration of the way in which foreign importations may be supposed to be British. In walking through Cannwood he picked a handful of dried leaves, and thrust them into his pocket to keep other things steady. On his arrival home very wet, the contents of his pockets were emptied on to a table in his study and next day he found two ants, which he could not recognise, running about over the leaves. Supposing these to have been brought home with the leaves from Cannwood, they were sent as such to Mr. E. Saunders, who at once identified them as *Prenolepis vividula*, Nylander, a native of Egypt, Palestine, Texas, Australia, &c. Mr. Bignell then remembered that on the same night on which he had brought home the leaves, his daughter had returned home from London with a growing palm in a pot which had been placed on the same table as the leaves, he therefore concludes now that the ants came with the palms.

Mr. G. C. Champion (*E.M.M.*, June) adds *Otiorrhyncus auropunctatus* to the British list on the strength of specimens captured by Mr. Halbert in Ireland. Mr. Halbert states that it is locally common near Dublin, principally on the coast in the counties of Dublin, Meath and Louth, and that he had found it in moss, and by beating hedges and trees, and also by sweeping.

Mr. C. G. Barrett points out (*E.M.M.*, June) that the larvæ of the April brood of *Elachista cerussella* cannot feed, as do those of the August brood, in the leaves of the common reed (*Arundo phragmites*), inasmuch as those leaves die down in the winter and have not grown up in April. Mr. Barrett had received from Mr. W. C. Boyd some broad leaves of the reed grass or reed canary grass (*Phalaris arundinacea*) in which the larvæ of this species were feeding, and is inclined to think that this may be the customary food-plant of the early brood.

Mr. F. Enock records (*Science Gossip*, June) the capture, after many years' unavailing search, of the very rare aquatic hymenopterous insect, *Polynema natans*, Lubbock. This insect swims about in the water, using its wings for that purpose. It is one of the *Myrmaridae* or Fairy-flies, and lays its eggs in the eggs of dragon-flies.

Mons. E. André gives (*Bull. Soc. D'Hist. Nat. de Macon*, June) the following interesting account of the habits of the "Processionary Caterpillar of the Pine" (*Cnethocampa pityocampa*). The caterpillars are to be found in the spring in communities numbering 100 to 150, inhabiting white silken balls which are placed at the bifurcation of two branches of a pine tree, and which vary in size from that of the fist to that of the head. "They are rarely met with far from the nest during the day, especially if the weather be fine; but when evening comes, one of them determines to sally forth, followed by all the others, which form an uninterrupted chain, each one touching the one in front with its head. From time to time the leader stops in order to give time for the column to be formed, and does not resume its progress until it finds itself followed. As they go along each one spins a silk thread, which will serve as a guide on the return march. These threads together form a silk ribbon from one to two millimetres broad. If one proceeds to separate the column into two parts by throwing away some of the caterpillars, those in front stop directly and wait till the others have rejoined them. Once arrived at a branch well provided with verdure, each applies itself to the task of eating as much as possible, without troubling itself to keep the order of march: but when the time to return has come, the procession is formed again and takes the route to the nest by following the thread which was left on the outward march."

We have received from Mr. W. A. Luff, of Guernsey, a very instructive paper, reprinted from the *Transactions of the Guernsey Society of Natural Science* for 1894, on "The Aculeate-Hymenoptera of Guernsey." Mr. Luff gives an interesting epitome of the composition of the group, and appends a list of 95 species taken in Guernsey and of 45 taken in Jersey.

That keen observer, "A Son of the Marshes," says in one of his recent works (*From Spring to Fall*)—"The Queen of Spain Fritillary, the High Brown Fritillary, and also the Silver-washed Fritillary, when on flight, click with their strong wings. This I have heard distinctly as the grand creatures have flown within a yard of me."

Herr J. Speyer contributes to *Societas Entomologica* for May 1st, a very interesting paper on *Agrotis ripae* var. *obotritica*, Hering. This moth was discovered by F. Schmidt, at Wismar, and there are some notes on it by him in *Stett. ent. Zeit.* for 1858. In 1893 Speyer found the larvæ at Nieudorf on the Baltic; the first were obtained on August 20th, by night searching with a lantern on *Salsola kali, Cakile maritima*, and *Atriplex maritimum*, but others were afterwards secured by scraping away the sand immediately around the food-plants. It was only around plants actually growing in the sand, that they were to be met with; where there was a good deal of humus mixed with the sand, not a specimen was to be found, although the food-plants were growing there luxuriantly. The larvæ resemble those of *A. exclamationis* in structure, habits and markings, but are decidedly lighter in colour; the young larvæ are sometimes of an earthy coloration, sometimes of a dirty or greenish-yellow; when about to pupate their colour is a whitish-yellow, sometimes darker, sometimes lighter, and the author is of opinion that the two forms are correlated with the forms of the resulting imagines, some of which are entirely white, others of a darker colour. Speyer reared his larvæ, of which he obtained 50 in all, in three boxes. The first box he filled to a depth of 24 inches with sand from the place where he got the larvæ, the second with 9 inches of the same sand, and the third with 21 inches of the sand mixed with humus alluded to above. The 10 larvæ placed in this last box seemed uncomfortable, did not feed, remained under the food-plant, never went into the earth, and finally perished with the exception of one individual, which was experimentally transferred to Box No. 1. "Two or three minutes after the transfer," says Speyer, "the creature found itself so comfortable, that, as if it would take a bath, it rolled itself hither and thither in the sand, and soon disappeared into it." It was not noticed that the larvæ showed any predilection for the drier plants growing on the sand over the more juicy ones that grew on the humus-mixed soil, nor vice versa; both kinds were eaten with an equal appetite; it was, therefore, the humus-mixed soil that the larvæ did not like. By Sept. 28th, the last specimen had disappeared. During the winter, the sand in the boxes was moistened once a fortnight with a flower-syringe. On May 10th, 1894, the sand in Box No. 2 was turned over to see what had become of the 20 larvæ therein, and, to his astonishment, Speyer found that they had all bored into the wooden bottom of the box, 1½-in. thick, and had pupated in it. The pupæ were transferred to another box, in which some earth had been placed, and were covered over with moss. The first imago appeared on June 5th, five more (crippled) on June 10th, and the rest (in perfect condition) on June 11th and 12th. In Box No. 1 the imagines were later in emerging, the first not making its appearance till July 2nd, and the emergence continuing till July 14th. The sand in this box had not been wetted to the same extent as that in No. 2. The imago has a good deal of likeness to *ripae*, Hb. and *deserticola*, H-S., but varies very much, from a clear white ground-colour, with hardly perceptible markings, to darker with very distinct markings; it is also larger than the above-mentioned insects.

In the course of a very philosophical paper on "The Senses of Insects" (*Insect Life*, vol. vii., No. 1), Prof. C. V. Riley mentions an experiment that he made, with a view of ascertaining how far off, in the case of "sembling" moths, the ♀ could be detected by the ♂. He says:—"In 1863 I obtained from the then Commissioner of Agriculture, Col. Capron, eggs of *Samia cynthia*, the Ailanthus silk-worm of Japan, which had recently been introduced by him. I was living on East Madison Street, in Chicago, at the time, a part of the city subsequently swept by the great fire and since entirely transformed. In the front yard, which (so commonly the case in the old Chicago days) was below the side-walk, there grew two Ailanthus trees which were the cause of my sending for the aforesaid eggs. I had every reason to believe that there were no other eggs of this species received in any part of the country within hundreds of miles around. It seemed a good opportunity to test the power of this sembling, and after rearing a number of larvæ I carefully watched for the appearance of the first moths from the cocoons. I kept the first moths separate and confined a virgin female in an improvised wicker cage out of doors on one of the Ailanthus trees. On the same evening I took a male to the old Catholic cemetery on the north side and let him loose, having previously tied a silk thread around the base of the abdomen to insure identification. The distance between the captive female and the released male was at least a mile and a half, and yet the next morning these two individuals were together."

The entomophytous fungus, *Botrytis bassiana*, which is the cause of that fell disease among silk-worms, known as Muscardine, has been turned to economic account by Dr. F. Hein. He tells us (*Bull. Soc. Ent. France*, vol. lxii., p. cviii) that his advice was sought about the devastation of some forest trees in a rural part of France. He found that the ravages were due to the larvæ of *Cossus ligniperda*. In one tree he found the larvæ all dead in their burrows, the bodies being mummified and covered over with a whitish efflorescence. This was at once recognized as due to the fructification of an entomophytous fungus, which was later on determined to be the species mentioned above. He determined to see whether the disease could be induced in the living larvæ, which, he says, can be reared easily enough on hard green apples. The apples and the larvæ were dusted over with the white powder formed on the surface of the dead larvæ by the fructification of the fungus. Of several hundred larvæ of various ages experimented on, every one was infected within five or six days, and all died. The next step was to try whether the same result could be obtained in the haunts of the insect. A mixture of the spores and some talc powder was blown into the burrows of the larvæ. "The burrows hollowed by each larva cross, more or less, those formed by other larvæ, contamination seemed therefore, *a priori*, to be easy, first by the diffusion of the infected spores and then by the contact of healthy with diseased larvæ. In fact, in one week, of the larvæ contained in the tree experimented on, 15 in number, 12 were found infected and dead or dying." The results of this experiment might make it worth while for the Americans to give the plan a trial, in the case of *Zeuzera pyrina*, which is giving some trouble over there.

One of the best known collections of Fen Lepidoptera, that of Dr. F. Wheeler, is to be disposed of at Stevens' Sale Rooms on July 10th. We understand that that of Mr. Farren is to come into the market in September.

PRACTICAL HINTS.

On the management of the newly-hatched larva.—So far as I am aware, no instructions are given upon this important subject in any of the entomological handbooks. The plan which has succeeded best in my hands is the following:—I transfer the newly-hatched larvæ, by means of a camel's hair brush, to a small pill-box or glass-bottomed box, place some bits of the food-plant into this, shut up the box, and then put it into a corked or stoppered glass bottle. I tried transferring the larvæ to a small bottle with a cork or metal cover, but found that moisture collected on the sides of the glass to such an extent that many of the larvæ were drowned. By the method described above this is avoided, while, on the other hand, the drying up of the food, which occurs if the box is exposed to the air, is prevented.—Francis John Buckell, M.B., 32, Canonbury Square. *May 12th*, 1895. [We shall be glad to hear from others of our readers what methods they find most successful.—Ed.]

NOTES ON COLLECTING, Etc.

Colias edusa at Wimbledon.—Whilst crossing Wimbledon Common on June 3rd, my brother and I saw a specimen of *C. edusa*. I think the fact worth recording, as I have never seen the species in this locality before.—A. E. Dewey, 35, Moore Park Road, Fulham, S.W. *June 6th*, 1895.

Notes from the Isle of Man.—Since the 31st ult., sugar has been used by me every evening at Sulby, and with good results. Several exceedingly fine varieties and striking forms have turned up. The following are some of the insects taken during the last two nights:—3 *Choerocampa elpenor* (new to my list of Manx Heterocera); *Acronycta* (*Viminia*) *rumicis*; *Helotropha leucostigma*; *Xylophasia rurea*; *Apamea basilinea*; *A. gemina*; *A. didyma*; *Miana strigilis* (very dark); *Grammesia trigrammica*; *Rusina tenebrosa*; *Agrotis segetum* (light and dark); *Noctua festiva*; *Hecatera serena*; *Brotolomia meticulosa*; *Euplexia lucipara*; *Hadena oleracea*, *H. pisi* var. *splendens*; *Scoliopteryx libatrix*. Flowers of the white pink are yielding *Choerocampa porcellus*, *Cucullia umbratica*, *Plusia pulchrina* and *P. gamma* (hybernated and fresh specimens.—H. Shortridge Clarke, Sulby Parsonage, Lezayre, Isle of Man. *June 7th*, 1895.

NOTES FROM THE EXCHANGE BASKETS.—Mr. J. Mason (Clevedon) writes on March 18th:—"I think insects will be late this spring. Sallows are only just on the move; the only insects seen on the gas-lamps last night were a few *Hybernia rupicapraria*. My experience as to the flight of *Cheimatobia brumata* (*ante*, p. 159) agrees with that of Mr. Finlay, *viz.*: that the insects when *in cop.* if disturbed, always flutter to the ground. Of course the female may readily crawl up a lamp or into any other prominent position, and when there attract the males."—Dr. R. Freer (Rugeley) writes on March 24th:—"I took a few *Hybernia leucophaearia* and *Phigalia pedaria* on March 3rd. The former were somewhat abundant, but the percentage of cripples large."—Mr. Maddison (South Bailey) writes on March 29th:—"I have taken a few *H. leucophaearia*, *P. pedaria* and one *Anisopteryx aescularia*, during the last few days, but the weather is cold and wet and against out-door work."—Mr. A. W. Mera (Forest Gate) writes on April 6th:—"My experience quite agrees with that of Mr. Finlay as regards moths flying *in cop.*, and I have done a fair amount of mothing. But perhaps *C. brumata* may prove an exception to the general rule. The habits of some of the butterflies seem to differ in this respect; for instance, I have never yet seen *Limenitis sibylla*, *in cop.*, although I have taken a considerable number; in the same wood I have seen *Epinephele hyperanthus* flying about in abundance *in copulâ*, but in this case I believe it is the female that carries the male.

SOCIETIES.

At the meeting of the ENTOMOLOGICAL SOCIETY OF LONDON, on May 1st, 1895, Mr. Horace St. J. Donisthorpe exhibited a variety of *Rhagium bifasciatum*, a Longicorn Beetle, taken in the New Forest, in which the elytra were of a light testaceous colour. Mr. Waterhouse exhibited a living larva of a Longicorn Beetle, found in a boot-tree, which had been in constant use by the owner for fourteen years, the last seven of which were spent in India. The specimen was brought to the British Museum on May 6th, 1890, and was put into a block of beech wood in which it had lived ever since; it did not appear to have altered in any way during these five years. It had burrowed about eight inches, and probably made its exit accidentally. Mr. Blandford referred to a similar case which had come under his notice. Mr. Dale exhibited a specimen of a *Sesia*—supposed to be a new species—from the New Forest. It was the opinion of some lepidopterists present that the specimen was a pathological aberration of *S. tipuliformis*, which, owing to some failure of scale development had almost bare tibiæ, the chitinous skeleton of the leg being of a pale brownish tint. Mr. O. E. Janson exhibited a remarkable species of *Curculionidae* from the island of Gilolo, having exceedingly long and slender rostrum, antennæ, and legs: it was apparently an undescribed species of the genus *Talanthia*, Pascoe.

At the SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY on May 23rd, Mr. Barrett (on behalf of Mr. Horne of Aberdeen), exhibited very long series of *Agrotis cursoria* and *A. tritici*, from the N.E. Coast of Scotland, showing such a range of variation that it was difficult to determine where one species ended and the other began;

also a gynandrous specimen of *Saturnia carpini*, L., belonging to Dr. Mason, one side being male, the other, female. Mr. Hall: two specimens of the rare var. *unicolor*, Staud., of *Mamestra persicariae*, bred by a northern collector from a dark specimen derived from suburban larvæ; also several specimens of an *Eupithecia* from Mr. Machin's collection, which members thought were *E. minutata* var. *knautiata*, Greg. Of several members who had larvæ of *Callimorpha hera*, most had been only partly successful in getting them through the severe frost. A long discussion took place as to the felling of trees in Epping Forest. The general consensus of opinion was that no harm had been done, and that none was intended to be done. Mr. Carrington and others thought that a periodical cutting of the undergrowth would be of great advantage to entomologists, and instanced the method of cutting woods in Surrey and Kent.

The North London Natural History Society made its first excursion of the season on May 18th, to Epping Forest. The weather was cold and dull, and rain threatened. Theydon Bois was reached soon after 3 p.m., and the members at once proceeded into the Forest, but it soon became evident that there was very little to be done. Solitary specimens of *Nola confusalis* was found on tree trunks, and *Acidalia remutaria* and *Bapta temerata* were netted. Larvæ of *Nyssia hispidaria*, *Phigalia pedaria*, *Oporabia dilutata*, *Hypsipetes sordidata*, *Miselia oxyacanthae*, *Hybernia aurantiaria* and *Himera pennaria* were obtained by beating, but not in any large numbers.——At the meeting of the Society on May 28th, Mr. Robbins exhibited a freshly-bred specimen of *Dianthoecia capsincola* from Cromer. Mr. Woodward: bred *Choerocampa elpenor* from Ponders End. Mr. Prout said he thought the season was an average one, larvæ being fairly forward, and imagines not far behind them. Mr. Woodward reported the occurrence of *Drepana binaria* and *D. lacertinaria* in the Forest, three weeks ago.

The Birmingham Entomological Society met on April 22nd, when Mr. R. C. Bradley exhibited *Crabro varius* and *C. anxius* from Wyre Forest, and a specimen of *C. pubescens* from Sutton; he said that only four other specimens of the latter species were known to Mr. Saunders. Mr. Martineau: two specimens of *Andrena angustior*, a rare species, allied to *A. fucata*, from Solihull. Mr. Runge: eggs of *Asphalia flavicornis* as found; they were laid singly, in the forks of thin twigs. Mr. Martineau read a paper on a collection made in his house at Solihull. He made the collection in consequence of the statement, that 100 species enter a house in a year, being questioned. He had taken 136 species during the past year, and believed that if he had been able to do more work in the day time, the number might have been increased to 200. The most unexpected species were *Acidalia virgularia* and *Tinea semifulvella*, neither of which had previously been taken locally. He noticed that *Culex annulatus* and *C. pipiens*, which were common in the cellar, only settled on the brickwork, never on the plastered lathes which covered part of the ceiling.

The meeting of the Lancashire and Cheshire Entomological Society on March 11th, 1895, was chiefly notable on account of the very interesting paper entitled "Observations on insects found in birds' stomachs," read by Mr. R. Newstead, F.E.S., the Curator of the Grosvenor Museum, Chester. The author has, with great kindness, furnished us with the following epitome of the paper:—"The lecturer gave a resumé of some 450 *post mortem* examinations of birds which he had obtained from various parts of Cheshire, during a number of years. Of the many records the Coleoptera were by far the most numerous. Many species of *Geodephaga* were found in the rook, jay, wagtails, &c. *Dytiscus punctulatus* and *Helophorus aquaticus* were the only species of the *Hydradephaga* observed. Of the latter species, about 150 specimens were found in a golden-eye duck (*Clangula glaucion*). The same insect also occurred in several other birds. The *Brachelytra* were only represented by two or three species, found only during *hard* weather. The *Aphodii* were well represented. *A. punctato-sulcatus* was frequently observed in various birds. Also *A. fimetarius* in the starling. A night jar (*Caprimulgus europaeus*) had regaled itself with six specimens of *Geotrupes stercorarius*, five of which were found almost perfect. Although the hard coverings of the *Curculionidae* (*Rhyncophora*) are said to save them from attack ("Darwinism," p. 260), these insects far outnumbered the other Coleoptera. The names of many species were given, including *Sitones*, *Phyllobius*, *Apion*, &c. The records of the *Coccinellidae* were most important. These insects were found in the woodpecker, tree-creeper, swift, house-martin and cuckoo. The finding of *Phyllotreta undulata* and *P. nemorum*, is of economic importance. Three records were given, all from the tree-creeper (*Certhia familiaris*). During severe weather, two specimens of *Forficula* were found. From this fact it was suggested that these insects are nauseous. Of the Hymenoptera, the discovery of the larvæ of two species of *Tenthredo* in the cuckoo, was of the most importance. Several species of the *Ichneumonidae*, numerous specimens of a species of *Cynips*, and two species of *Formica* were also recorded. Larvæ and imagines of Lepidoptera occurred frequently, but could hardly be identified. Larvæ of *Abraxas grossulariata* in the cuckoo, was the most important find in this order. *Psyllidae*, *Aphididae* and *Coccidae*, were found in several species of the *Paridae*. Three species of *Coccidae* were determined. The Diptera were largely represented but, like the Lepidoptera, were most difficult to determine."

We have received with much pleasure the "Reports for 1894" of The Scarborough Field Naturalists' Society. The society, although not large in numbers, manages to cover a very large part of the Natural History field. There are reports on Botany, Conchology, Geology, Microscopy, Ornithology and Zoology, as well as on Entomology. The latter, we give in full; but have changed the obsolete nomenclature, which we regret to find still in force at Scarborough, for that which we uniformly adopt in our "Reports of Societies":—"1894 has been a most unfavourable year from an entomological point of view; the long continuance of wet weather during June, July and August almost put a stop to all entomological out-door work, and insects were remarkably scarce. However, notwithstanding the unfavourableness of the season, many rare and comparatively new species to this district have turned up, and some species have been in great abundance, while others almost if not quite absent. The early moths such as *Phigalia pedaria*, *Hybernia leucophaearia*, &c., were well out by the end of January. Early in March hybernated specimens of *Cidaria miata* put in an appearance, and by the middle of the month *Asphalia flavicornis*, *Anisopteryx aescularia* and *Larentia multistrigaria*, including some fine dark varieties, were common, and were followed in another week by *Lobophora carpinata*, *Panolis piniperda*, *Taeniocampa munda*, *T. cruda*, *Xylocampa areola*, and other common species. April began with *Pachnobia rubricosa* and other Tæniocamps common at sallow bloom. On April 10th one specimen of *P. leucographa* was taken, and on the 19th, a fine freshly-emerged specimen of *Asphalia ridens* was found on the bark of an oak tree, while *Eupithecia abbreviata* and *L. carpinata* were common. Heather-feeding larvæ were also very common: but, strange to say, many of the common Noctuid larvæ that feed on low plants were remarkably scarce. During May *Eupithecia lariciata* and *Hadena glauca* put in an appearance, but were scarce; but most other species were as common as usual; in June, however, there was a great change, the weather was bad and insects were very scarce. Sugar was a complete failure, the only species that visited it at all were *Hylophila prasinana*, *Rusina tenebrosa*, common; *Hadena adusta*, *H. glauca*, *H. dentina* and *H. thalassina*, all scarce. Heather-feeding larvæ were still plentiful and mostly well-fed; the best specimens taken being *Plusia interrogationis*, *Noctua castanea* and *Agrotis agathina*, the latter very plentiful; while larvæ of *Zygaena lonicerae*, which are usually in great abundance, were exceedingly rare. A single larva of *Hylophila bicolorana* was beaten from an oak tree, this species being new to the district. July continued much the same as June, sugar being of little use. The best species taken were *Nemeophila russula*, *Macaria liturata* and *Mamestra furca*, scarce; *Venusia cambrica*, *Acidalia dimidiata*, *Eupithecia minutata*, *E. nanata*, *Cidaria populata* and *Chortodes arcuosa*, all common. Ova of the following species were more or less common throughout the month: *Notodonta dictaeoides*, *N. dromedarius*, *N. camelina*, on birch; *Smerinthus populi*, *N. dictaea* and *N. ziczac*, on poplars and sallows. August was but little better than July until the end of the month, when *Hydroecia nictitans*, *Agrotis agathina* and *Noctua dahlii* were common, flying over heather bloom and at sugar *Dyschorista suspecta* was common, and *Noctua castanea*, scarce. *Hepialus hectus* was taken on August 10th, which is very late for this species. Larvæ of *Saturnia carpini*, *Eugonia tiliaria*, *E. erosaria*, *Dicranura bifida*, *D. furcula*, *Notodonta trimacula* and *Thyatyra batis* could now be found, and some of them were common. September was a much more favourable month, and larvæ of many species were in great abundance. *N. dahlii*, in company with *N glareosa*, were still to be taken on the moors; and the best larvæ taken during the month were *E. dolobraria*, *S. lunaria*, *E. erosaria*, *E. obliterata*, *E. trisignata*, *N. chaonia*, *N. dictaeoides*, *N. dromedarius*, *C. duplaris*, *A. flavicornis* and *A. alni*. October brought the usual autumn species, such as *Anchocelis helvola*, *D. aprilina*, &c., commonly to sugar; but nothing rare turned up. Larvæ of *B. rubi*. *S. fuliginosa*, *Bupalus piniaria*, *E. nanata*, *E. minutata*, *A. strigula* and *A. myrtilli* were all very common, but *E. trisignata* and *E. absinthiata* were very scarce, and *E. albipunctata* was not to be found at all. Nothing worthy of note turned up during November and December. The most noteworthy records of the year are:—*Asphalia ridens* and *Hylophila bicolorana*, both new to the district; *Dicranura bifida*, *Pachnobia leucographa* and *Hadena glauca*, which have not been recorded for Scarborough for the last twenty years or more; *Eupithecia albipunctata* var. *angelicata*; the dark varieties of *L. multistrigaria*; the scarcity of *Z. lonicerae*, total absence of *E. albipunctata*, and the great abundance of *A. agathina* larvæ; the late appearance (August 10th) of *H. hectus*; and the second appearance of *S. lubricipeda*, two specimens having emerged in September from larvæ collected in August. The following are also worthy of note:—*Orgyia pudibunda*, *Halia brunneata*, *Helotropha leucostigma* (Throxenby Bog)."

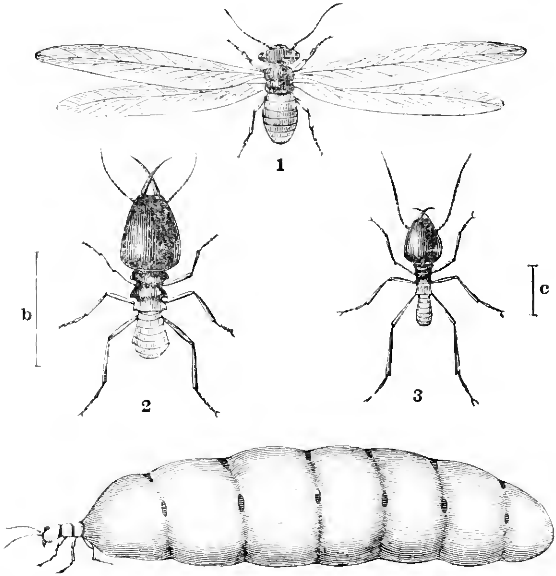
NOTICES AND REVIEWS.

Abstract of Proceedings of the South London Entomological and Natural History Society for the year 1894. (Published at the Society's rooms, Hibernia Chambers, London Bridge. Price 2s. 6d.).—The Society is to be congratulated on the very interesting volume of *Proceedings* which it has just issued, as well as upon the satisfactory condition, both as regards numbers and finances, in which it finds itself. The address of the retiring President, Mr. Edward Step, first demands notice. After an appreciative reference to the members who had died during the year, Messrs. Weir, Wellman and J. T. Williams, attention is directed to the important service which the magic-lantern may render to the illustration of scientific papers. Next follows an earnest protest against the use of technical and uncouth language where the simpler Saxon would be equally exact. Mr. Step then puts in a plea for the old folk-names which, however, he wrongly calls trivial names, the trivial name being the Latin word added to the generic name to indicate the species. The address concludes with some remarks upon the efficient carrying out of the Wild Birds' Protection Act. At the end of the volume are reports of the several Field-meetings of the Society, from the pens of Mr. Lewcock, Mr. H. J. Turner, and Mr. E. Step. Then follow papers on *Zygaena exulans* by Messrs. Tugwell and Tutt; a series of papers on species of *Zygaena* by Mr. Tutt; one on "A morning's sport near Rockhampton, Queensland," by Mr. W. F. Warne; another on "The Rhopalocera of the Indian Territory in 1893–4," by Mr. W. Mansbridge, F.E.S.; whilst Mr. Robt. Adkin contributes some interesting "Reflections upon odd Rambles on the Sussex Downs." The reports of the meetings are much more amplified than those which appear in the magazines, and contain numerous notes on specimens exhibited, together with an epitome of the discussions which took place. Non-members will do well to add the work to their library.—F. J. B.

To Nature-lovers we can recommend Nature in Acadie, by H. K. Swann. [Swann & Co., 2, Bouverie Street, Fleet Street, E.C. Price 3s. 6d.] It is a little booklet of 74 pages dealing with the rambles of a naturalist in Nova Scotia, and contains many interesting notes relating to the scenery and to the birds of the district travelled over. Here and there other natural objects are noted, but the birds occupy by far the greater portion of the book.

It is scarcely necessary to call the attention of our readers to The London Catalogue of British Plants, by F. J. Hanbury, F.E.S. We can hardly suppose that any entomologist is without it. A *ninth* edition has just been published by George Bell & Sons. Price 1s. cloth and interleaved; 6d. in paper cover and not interleaved. It brings many of the more difficult genera quite up to date and is an absolute necessity even to those who have the previous editions.

African Loan Exhibition at the Crystal Palace.



The White Ant (*Termes bellicosus*). 1, Male. 2, Soldier. 3, Worker Female (half natural size. A., &c., natural size).

There is at present being exhibited at the Crystal Palace, a collection of objects from, and relating to, Africa. Specially interesting to entomologists is a model of a village of White ants; this has been prepared by Mr. Bool, under the superintendence of Mr. Burns, F.E.S.

The so-called White ants do not belong to the order of true ants, although they approach them in their habits, and in the formation of their societies. Each community consists of a single queen, and of males, workers and soldiers. The queen of the species, *Termes bellicosus*, is often six inches long, four ounces in weight, and has been known to produce 80,000 eggs per day. She is always built into a special cell, which only contains a small aperture for the projection of the head, and a number of minute openings, to enable her attendants to enter the chamber for the purpose of removing the eggs to the necessary hatching depositories.

The nests of this species are rarely less than twelve feet high. They are composed externally of clay mixed with matter secreted by the ants. Contact with the air causes this compound to become as hard as cement. The natives use this material for paving the floor of their huts, and often utilise the nest as a furnace for cooking food or for melting auriferous quartz. The queen's chamber is in the centre of the nest, level with the ground.

If the nest be broken it is speedily repaired, a nest split from top to bottom being often made good in a single night. Immediately a fracture occurs, a number of workers emerge from the aperture; these summon the soldiers, who hurry around, snapping their large jaws, and biting at everything within their reach. When all is quiet, the soldiers stand by the workers until the fracture has been repaired.

Nests are also shown of *Termes atrox* and *T. mordox*, which are of a mushroom shape, and of the Tree termites (*Entermes moris*). Altogether the exhibit is one of profound interest to entomologists.

The Entomologist's Record

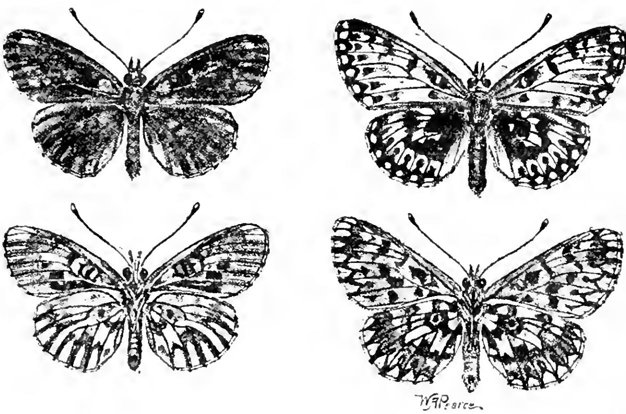
AND

JOURNAL OF VARIATION.

No. 12. Vol. VI. August 15th, 1895.

Varieties of Argynnis selene.

By S. G. C. RUSSELL, F.E.S.



1. 2.

(1) Upper- and under-side of a specimen captured June 4th, 1892.
(2) ,, ,, ,, ,, June 6th, 1892.

The two varieties of *Argynnis selene* here figured were both captured by myself in Abbott's Wood, Polegate, on June 4th, and June 6th, 1892. The species was in great abundance that year and Messrs. Tugwell and Porritt, whom I met in the wood, had also obtained some interesting varieties.

The earlier caught specimen is by far the more suffused, the dark markings having coalesced and become extended to such a degree, that the bright tawny colour, which usually occupies the greater part of the upper surface in *A. selene*, is only faintly indicated by a broken series of ill-developed spots towards the outer margin of both fore and hind wings. Otherwise, the wings are of a deep fuliginous-brown, in which the character of the normal black spotting is indistinctly traceable. The specimen, consequently, has a very unicolorous appearance, the wings being largely concolorous with the thorax and abdomen.

It is on the underside, however, that the great interest of this specimen lies. The fore-wings are more normal in ground colour than on their upper side, whilst the extended black marks towards the centre of the wing may easily be referred to the normal markings, but are extended in range. The underside of the hind-wings shows the outer series of arched pearly spots, that characterise *A. selene*, extended towards the centre of the wing and forming blotches at least from twice to three times the usual size, whilst the central pearly spot, so conspicuous in normal *A. selene*, is extended until it joins one of the outer blotches and so reaches the outer margin of the wing. The dark markings towards the base are absent, whilst the paler yellowish tint is in excess.

One cannot help being struck with the resemblance that the underside of this specimen bears to those of many species inhabiting Alpine regions; and the severer conditions under which the Alpine species maintain their existence, suggest that the variation here is entirely pathological, whilst the direction which the variation has taken, has been guided by atavic influences.

It may be interesting to note that this specimen was captured in one of the dark lanes, overgrown with long dank vegetation, which intersect Abbott's Wood, and that I saw no other butterfly near. It was only by chance that I noticed it fluttering in some brushwood, as I was hurrying along wondering when I should succeed in getting into the open again. Possibly this insect was bred amidst this herbage, but it would appear certain that, whatever the environment to which the caterpillar or pupa was subject during its development, it had an effect on the resulting imago, which is as remarkable as it is interesting.

I think I am correct in stating that Mr. F. W. Frohawk considers this insect to be *A. euphrosyne*, but Messrs. Tutt, Tugwell and Hawes think it to be *A. selene*, a conclusion with which the above notes show that I agree. At the time of its capture, *A. euphrosyne* was worn but still plentiful, *A. selene* was quite fresh and equally plentiful.

The second variety is, in a measure, the exact opposite of the first; for whilst the outer row of arched markings on the fore-wings, and the row of dots within them are almost normal, the centres and bases of these wings lack the normal black transverse markings, and the black costal streaks on the upper part of the wings are much restricted. The consequence is that the bright tawny portion of the wing is more extended than usual. On the hind-wings two abnormalities present themselves:—(1). An increased darkening towards the base and centre of the wing. (2). A union of the series of black dots by means of dark shades, to the apices of the arches which fringe the outer margin of the wing.

The underside of this specimen is less abnormal, for the dark markings, absent in the centre of the upper side of the fore-wings are here present, although in nothing like the usual depth of colour. The hind wings are richly coloured, the only sign of abnormality being the union of the small black dots with the outline of the arched markings on the outer margin of the wing, exactly as was described on the upper side.

The interest that these varieties had for me, suggested that they might have a general interest, and I therefore conceived that their reproduction would give pleasure to the readers of *The Entomologist's Record*.

Notes on Zygaena minos.

By J. W. TUTT, F.E.S.

Zygaena minos or, as it is sometimes called, *Z. pilosellae*, occurs in so few localities in the British Isles, that very few entomologists, who collect only within the limits of our sea-girdled country, have had the pleasure of seeing it alive. Far different is the case with the lepidopterist who visits the continent, for there, in any suitable part of Central or Southern Europe, this species is almost sure to be met with during July and August. Staudinger gives as the area of its distribution, "Central and Southern Europe (except Iberia and doubtfully Southern Italy); England; Scandinavia (Central and South); Livonia; Asia Minor; Armenia and Siberia"—a rather large tract it will be observed, of the Palæarctic area. Probably England in the exact sense of the word, is the part of the British Isles in which the species has been the least frequently observed, Cornwall being the only English county from which its capture has been recorded. Records exist both for Scotland and Wales, but Ireland is, so far as the British Isles are concerned, its chosen and favourite home.

Great was my delight when, for the first time, I saw this beautiful Burnet moth, buzzing over a flowery bank on the roadside near Bourg St. Maurice. Some few hundred yards nearer the foot of the zigzag path that leads up to the pass of the Little St. Bernard, we found a steep slope where the insect was abundant, careering about with its relative, *Z. carniolica*. Later in the day we found it on the ascent to the pass of the Little St. Bernard; whilst at Courmayeur, a few days afterwards, it hustled *Z. achilleae, Z. carniolica, Z. ochsenheimeri, Z. transalpina*, and other Burnet moths with which it lived, on the flowery slopes, although there its beauty was fast fading and the varieties were becoming very distinctly "diaphanous." Later on we met with a few specimens in the Cogne district, but there, Burnets of all kinds (with the solitary exception of *Zygaena exulans*) were decidedly scarce. Probably it was getting too late in the season; still more probably the altitude (5,000 to 8,000 feet) was getting too great for the species, although it must be admitted that a large colony was met with at an altitude of some 6,000 feet on the steep and dangerous slopes of Mont de la Saxe. However, *Z. minos* was an always welcome sight, and my comparatively small series does not present at all a fair sample of the specimens we came across.

The first thing that strikes one about this species, especially when one has been accustomed to five- or six-spotted Burnet moths, is its streaks. A long streak runs for some distance along the costal edge of the wing, starting from the base and extending for half the length of the wing between the costa and the sub-costal nervure. Then, what normally form the two outer spots in a six-spotted species like *Z. filipendulae*, are united into a somewhat irregular blotch, which in its turn is united by a streak with the upper of the central pair of spots. Lastly the lower of the basal pair of spots joins with the lower one of the middle pair, and forms another blotch running along the centre of the wing. There are thus three red blotches on the fore-wings in which the origin of the spots of the spotted species may be easily traced, or, if one prefers to take the opposite view, in which one may trace very distinctly the spots from which the blotches have been formed. These three red blotches limit the area occupied by the green or deep purple-blue ground-colour, and restrict this almost entirely to the outer edge of the wing. In most specimens, however, the nervures retain the green or blue ground-colour, and thus mark off very distinctly and decidedly the boundaries of the blotches. It sometimes happens on the other hand that the nervures fail to keep their very distinct character, and then the blotches are united more or less into a large crimson patch in the centre of the wing. Every possible intermediate condition is to be found between those specimens which have the three blotches completely united and those which have them completely separated, the various intermediate forms occurring as aberrations in almost every district. There is a considerable range of variation, too, as regards size, some of the females being very large. This variation in size is sometimes local; at Bourg St. Maurice, the specimens were uniformly rather small, whilst the smallest and largest specimens I have yet seen have come from County Galway; at Courmayeur, too, they varied from the largest size to the smallest.

Esper, in 1781, makes the following remarks about this species (*Die Schmett. in Abbild.*, Th. ii., p. 186, pl. 24, fig. 2 a ♂ b ♀). :—"It is now sufficiently proved that this is a distinct species. It is abundant in our neighbourhood, and has often been found *in copulâ*. It appears in company with *Sphinx filipendulae* and other species in similar localities. In some places, however, it is very rare, in others, does not occur at all. The sexes are of a different ground-colour, although the green of the female shows no such great differences from the ground colour of the male as occurs in *Sphinx lonicerae*. In both it inclines to be darker. The whole surface of the wing is so thinly scaled that it is almost transparent. In a few days there is scarcely any of the red colour remaining. This moth has the broadest wings of any of the group, with a narrow, somewhat shiny dark blue border round the margin of all the wings, and three bright red spots on the fore-wings. The basal pair are long, and almost of uniform breadth; they are separated by the blackish nervures. The third spot is largest near the apex, and fades into the surrounding area; it passes between the other two somewhat wedge-fashion, and often almost coalesces with them. The thorax, abdomen and antennæ are dark black, with a hardly perceptible bluish tinge." Esper then tells us that he has "often obtained large numbers of eggs which were laid one upon the other in heaps. In shape and colour, they are not different from those of *S. filipendulae*. After 14 days the larvæ hatched, and after feeding for a few weeks, hybernated." He then states that he named the species after a common plant *Hieracium pilosella*, on whose flowers, and those of other *Compositae*, it frequently rests. Fuessly, he states, considered this as the female of *S. pythia*, Fab., a totally different species.

It is well to quote thus fully what Esper says, because Staudinger takes Esper's name *pilosellae*, as the correct trivial name for this species. We will now examine the claims of two older names by which the species has been known, and try to understand why Staudinger rejected them.

We will first consider Fuessly's name *pythia*. In his *Ent. Mag.*, Stuck i. (1778), he figures the species (Pl. i., figs. 5–6) very accurately under the name of *Sphinx pythia*, and under this name the figures are referred to at pp. 139–140, where we find the description of the Plate. At p. 113, Fuessly gives a description of the insect under the same name. He writes :—"Atra; alis anticis viridibus maculis tribus oblongis approximatis sanguineis, posticis rubris." He then adds that "the species comes near *filipendulae*, the fore-wings are green, with three long blood-red spots. The under-wings blood-red, with bluish border. This species is rare in Switzerland, and is much like *Sphinx* *minos* of the *Vienna Catalogue*." This is the only reference that Fuessly makes to *minos*, although in Illiger's *New Edition of the Vienna Catalogue*, p. 35 (not 45), the description is referred to as if it were written under the name of *minos*, an evident error. Fuessly describes and figures the species under the name of *S. pythia*, nowhere does he call it *S. minos*. Now Staudinger, in his *Catalog der Lep.*, etc., refers to Fuessly's description of *pythia*, as follows:—"? Fuessly, *Mag.*, i., p. 140; T. 1, 6 (1778)." What the query is for I do not understand, for Fuessly's description is valid, the species certain, and the figures perfect. The *S. pythia* of Fabricius is another species, and his name has long been sunk as synonymous with *scabiosae*. Of the identity of the *S. pythia* of Fuessly there is no doubt. No species is known by this name, and it has three years priority over *pilosellae*, Esper. But it is inadvisable to change a well-known name if it can be helped, and one hardly likes to change *pilosellae* for *pythia*, in spite of the law of priority. There is still another name, however, to be considered—*minos*. This is a *Vienna Catalogue* name, and is referred to by Fuessly as a species near his *pythia*. It is the name by which the species was generally known, until Staudinger replaced it by *pilosellae* in (1861?) 1871. There appears to be no doubt of the identity of the insect which Schiffermüller and Denis called *Sphinx minos*. Its place in the *Vienna Catalogue*, among the Zygaenids, fixes it as a Burnet; the three-worded description "Schwarzlicher, dreiflekkiger Schwärmer, *S. minos*," determines the species almost certainly. The diagnosis in the *New Edition of the Vienna Catalogue*, is very unsatisfactory: "Alis anticis maculatis," but the references therein to various authors appear to be correct. It seems then to be pushing matters rather far to discard the name of *minos*; but if it is to go, then *pythia*, Fuessly, must undoubtedly take its place. So much for the synonymy.

There is no difference whatever between the Irish specimens and those from some of the Piedmont and Savoy localities, either in intensity of colour, size or variation of the markings. Occasional large and small specimens occur, as I have said, in all localities, the result of good or bad nutrition of the larvæ; the smallest specimens occur on those dry and hot mountain slopes on which the herbage is comparatively sparse and stunted, and one can but suppose that the occasional small specimens in other localities come from larvæ not particularly well placed as to food. I have already stated that there is considerable variation as regards the separation of the blotches. Those specimens in the British Museum collection in which the red blotches are comparatively thin streaks, and in which, therefore, there is a greater preponderance of the ground colour, are named var. *interrupta*. Another Staudingerian variety, *graeca*, is, according to the specimens in the British Museum, almost typical: like the Bourg St. Maurice specimens, they are inclined to be small, but appear to present no distinct characters whatever. One of the specimens in the Museum series, labelled *graeca*, is distinctly of the *interrupta* form.

Birchall was the first to refer the Irish insect to Lederer's *nubigena*, but Lederer's one specimen from the Pasterz glacier does not appear to have had anything sufficiently in common with our Irish specimens to unite them. Whether Birchall was acquainted with Lederer's original description is doubtful. Staudinger pulls out the gist of Birchall's description in the following diagnosis: "abdomine hirsuto, alis anterioribus subdiaphanis." When one comes to consider that there is no difference between specimens from Ireland and hundreds of European specimens, one can only be amused at the acumen with which Staudinger picked out the two characters which vary according to the condition of the specimens, and are of no structural value whatever. The Bourg St. Maurice specimens are quite indistinguishable from the smaller Irish ones, as also from the smaller of those from Courmayeur and other localities. All of these vary somewhat *inter se*, but they evidently belong to the lowland type. The specimens from the "Highest Alps" (which Staudinger gives as the home of var. *nubigena*), which we obtained in the Cogne Valley and on the Mont de la Saxe, at a height in both places from 5,000—7,000 feet, were large, rather thinly scaled, and varied somewhat in colour (the scaling and variation in tint being evidently largely due to exposure), and were not at all like the general run of Irish specimens. It follows, as might almost have been expected, that the lumping of the specimens from "Ireland and the Highest Alps," as *nubigena*, was done on altogether insufficient data. It must be confessed that Lederer's poor description, based on a single specimen, to some extent excuses the blunder.

Lederer calls this Alpine form *nubigena*, Mann, and describes it from a single male specimen which came from the Pasterz glacier. Probably the name owes its origin to Mann, but was never published by him. The specimen had "very thin scaling (like *exulans*), the red is pale carmine, the border of the hind-wings, more bellied." He then adds:—"If these characters remain constant in both sexes, then *nubigena* must be considered as a separate species. It should, however, be ascertained whether *minos* occurs in the intermediate regions, and what forms of it are to be found there." Guenée's remark that var. *nubigena* frequents open fields among mountains is vague, for such a statement may mean anything in altitude from sea-level, to 6,000 feet perhaps. So far, however, Guenée is probably right that the form which is found in the valleys at a low elevation is more nearly identical with the Irish specimens than are those from the higher altitudes, but *nubigena* proper does not inhabit "open fields," but the higher pasture slopes of the Alps.

The main point of interest to British lepidopterists is, that Staudinger is wrong in connecting the form of the species from the "Highest Alps," with the Irish form. The latter is essentially the typical insect of the lower elevations, which is found on almost all the open mountains, from sea-level up to an altitude of 5,000 feet, in Piedmont and Savoy. Zeller considers as the type the specimens from shady places in birch and larch woods. As a matter of fact, the specimens from the flowery openings in the larch woods behind Courmayeur in no way differed from any others in colour or in the extent or variation of the markings, but there was, perhaps, a very slight tendency to produce somewhat larger females than in some of the other localities in which the species occurred; this I assume to be due almost entirely to the more luxuriant vegetation, for within a few hundred yards, the species occurred on the open grounds, without any difference observable except this occasional one of size.

Generally speaking, then, we may look upon our Irish insects as differing in no way from the ordinary Continental type, but as varying from specimens with the blotches well-defined, to others in which the blotches become united. This latter extreme aberration, taken apparently almost everywhere with the type, where the species is abundant, is the ab. *polygalae* of Esper, which Staudinger diagnoses as "maculis confluentibus," and considers to be distributed co-extensively with the type. This, however, judging from Esper's own account, would not appear to be the case; for, after describing it as "alis rubicundis concoloribus, limbo sinuato superiorum atro caerulescente," he adds that "it was first discovered in the summer of 1780, in the neighbourhood of Brauenheim, the specimen figured, having come from Herr Gerning." He considers it to be closely related to his *Sphinx pilosellae*, of which it had been suggested that it was a variety; but plentiful as was *S. pilosellae* in Esper's locality (Franconia), no similar specimen had been found there. He further notes that in *Sphinx pilosellae* "the scaling is very thin, while in *S. polygalae* it is very thick, and that on both sides, all the wings of the latter are of unicolorous red." Esper's figure of *polygalae* (*l.c.*, pl. 34, fig. 3) differs from Hübner's figure of *rubicundus* (to which we shall refer presently), in that the colour is crimson, not coppery, and that there is a broader border to the outer margin, and a border on the inner margin, which is absent in *rubicundus*.

I do not appear to have come across any really well-marked specimens of Staudinger's ab. *interrupta*, which has the "macula media latius interrupta," nor of Ochsenheimer's var. *pluto*, which Staudinger diagnoses as "minor, macula media exterius non dilatata, alae posteriores margine nigro (in apice) latiore." Perhaps if the small specimens from various localities were carefully examined, a few might be found to present these characters. Staudinger, however, gives it as a "South-east Europe" form, and his "etc.," added to this locality, may suggest that he holds this opinion, as he marks it both as an aberration and as a local race, for it is possible that what exists as a local race in south-east Europe, may exist as an aberration in other localities. Ochsenheimer thus diagnoses it (*Die Schmett. v. Europ.*, Bd. ii., p. 26):—"*Zygaena pluto.* Alis anticis cyaneis aut virescentibus, maculis tribus elongatis rubris posteriore cuneiformi: posticis rubris, margine nigricante." He then goes on to say: "Real characters distinguish this *Zygaena* from *Z. minos*. It is usually somewhat smaller, the clubs of the antennæ less thickened, the wings more rounded and broader on the outer margin. The ground colour is darker, it may even be black-blue or green; the red spots are finer; the third is wedge-shaped, and shorter, fading off towards the outside into the ground-colour. The black border of the hind-wings broadens at the angle. The female is greenish, and has a white-grey border to the shoulder crests. Otherwise it resembles *Z. minos*. It is found in Hungary, and the neighbourhood of Vienna."

Another striking variety mentioned by Staudinger is *rubicundus*, Hb.; the diagnosis of it runs thus: "Alis anticis totis sanguineis, margine anteriore angusto cyaneo," and its locality is given as "Central Italy," with the "north and south of Italy" added with doubt. Hübner gives no description, but his named figure (*Samm. europ. Schmett.*, ii., fig. 137) has all the wings of an uniform fiery coppery-red, without spots, but with a narrow greenish border along the outer margin only, of the fore and hind-wings.

Lederer writes thus concerning *polygalae* and *rubicundus*:—"Heydenreich treats *polygalae*, Esp., as a synonym of *rubicundus*. If this be right, then Esper's name would have to supplant that of

Hübner. *Polygalae*, however, cannot possibly be the same as *rubicundus*, for Esper gives Brauenheim at Frankfort as its locality. *Rubicundus*, however, only occurs in Römischen and in Asia Minor; *polygalae* might rather be referable to Zeller's *heringii*, since it is described as of a fiery red colour in contrast to the thin scaling of *pilosellae* (*minos*). Whether *heringii* be a distinct species I cannot from my two males venture to determine. I find no sharp distinction from *minos*." The locality given by Lederer appears thus to differ from that given by Staudinger.

The principal forms of the species may be best classified as follows:—

1.—Small form, with the outer spot not dilated, but wedge-shaped = *pluto*, Och.

2.—With the three blotches narrow and ill-developed = *interrupta*, Stdgr.

3.—With the three blotches well-developed, but separated by strongly-defined nervures = *minos*, W. V.; *pythia*, Fuessly; *pilosellae*, Esp.; *nubigena*, Birchall.

4.—Like No. 3, but rather smaller = *graeca*, Stdgr.

5.—Poorly scaled, with three pale carmine spots and a broader margin at angle of hind wings (found at high altitudes), = *nubigena*, Led.

6.—With the three blotches united = *polygalae*, Esp.

7.—With the fore-wings entirely coppery-red, without any differentiation into spots, and with a narrow border on the outer margin only = *rubicundus*, Hb.

Macro-Lepidoptera taken in Keswick and district.

By H. A. BEADLE.

I do not claim perfection for the following list. My experience at Keswick has only extended over a little more than five years, and the time at my disposal for collecting is very limited. Most of my collecting has been at sugar (which is usually attractive here), supplemented by netting, larva-rearing, searching and pupa-digging. I have made use of a few notes in my possession by the late Wm. Greenip, a keen collector and student of Lepidoptera, who died at Keswick about three years ago.

The country round about is most beautiful and diversified; there are both cultivated and barren land, marshes, lakes, rivers, woods in abundance, and lanes with hedges and trees, many of the hedges never having felt the knife; we have also plenty of heath and heather. The valley is about 200 ft. above sea-level, and is completely surrounded by mountains, several of which are among the highest in England. The rocks are mostly volcanic with some Skiddaw slate. The trees are chiefly oak and larch, mixed with Scotch fir, beech, mountain ash, alder (unproductive, I believe, in the North), whitethorn, willow, sallow and many others. There is a great variety of both land and water plants, and I have no doubt that when the district has been better worked, many more species of Lepidoptera will be found than are here recorded. The area is all within walking distance of Keswick, the most distant locality being about nine miles off, up the Borrowdale Valley.

RHOPALOCERA.

PIERIDAE. *Pieris brassicae*, *P. rapae*, *P. napi*, all very common: the nervures of the latter are much suffused with black. *Euchloë cardamines*, not very plentiful; I have taken some very small males. *Leucophasia sinapis*, rare and very local; it has been taken in the Great Wood. *Colias edusa*, taken in small numbers in 1877. *Gonepteryx rhamni*, rather rare: much commoner Windermere way.———NYMPHALIDAE. *Argynnis selene* and *A. euphrosyne*, common locally: *A. aglaia*, common on the fells near woods: *A. adippe*, very rare. *Melitaea aurinia*, used to be common in a field on the west side of Derwentwater; I have not taken it, but have specimens taken by the late Wm. Greenip several years ago. *Vanessa polychloros*, a rare visitor, appearing only at uncertain intervals: *V. urticae*, common throughout the district; in 1894 I met it at an elevation of about 1,800 ft.; I took a few larvæ at Ashniss Bridge which produced small imagines in which the red was replaced by a pinkish colour: *V. io*, moderately common. *Pyrameis atalanta*, moderately common, generally distributed: *P. cardui*, rather rare.———SATYRIDAE. *Erebia epiphron*, locally abundant, though there are only three or four localities for it in the whole of the Lake district; var. *cassiope* is the commonest form, outnumbering the type by 100 to 1: *E. aethiops*, occurs in large numbers in several localities in the neighbouring counties; it has been reported as taken at Keswick, but I have not yet met with it. *Pararge egeria* and *P. megaera*, both rare. *Hipparchia semele*, found on Barrow mountain. *Epinephele ianira*, common in meadows: *E. tithonus*, rare: *E. hyperanthus* I have not taken, but have seen some captured by the late Wm. Greenip in meadows about Keswick. *Coenonympha typhon*, rare on Ullock Moss and near Watendlath on the Rosthwaite road: *C. pamphilus*, extremely abundant on the fells; I have met with no varieties.———LYCAENIDAE. *Thecla quercus*, rare: *T. rubi*, common on Ullock Moss; I have taken specimens which were suffused on the upper surface with ochre-coloured scales. *Chrysophanus phloeas*, not uncommon, widely distributed; I took one with a well-developed row of blue spots on the upper surface of the hind-wings. *Lycaena aegon*, *L. astrarche*, both rather rare: *L. icarus*, moderately common in some places, rare in others: *L. argiolus*, about hollies near Lodore and on the Borrowdale road.———HESPERIIDAE. *Nisoniades tages*, uncommon and local. *Pamphila sylvanus*, rather rare, occurs in the Great Wood.

HETEROCERA.

SPHINGIDES.—SPHINGIDAE. *Acherontia atropos*, found occasionally: *Sphinx convolvuli*, I have taken two: *S. ligustri*, rare. *Choerocampa celerio*, several have been taken in Keswick, one of these is in the local museum: *C. porcellus*, *C. elpenor*, both rare. *Smerinthus ocellatus*, rather rare: *S. populi*, not uncommon: *S. tiliae*, rare. *Macroglossa stellatarum*, seldom seen; I never saw more than one in a season.

BOMBYCIDES.—NYCTEOLIDAE. *Sarothripus undulanus*, I bred one two years ago. *Hylophila prasinana*, common about oaks: larvæ common on oak; pupæ commonly dug.———NOLIDAE. *Nola cucullatella*, *N. confusalis*, both rather rare.———LITHOSIIDAE. *Nudaria mundana*, common, here and there, throughout the district; larvæ common on stones at the boat landing. *Lithosia lurideola*, taken occasionally. *Gnophria rubricollis*, taken by Mr. Greenip, I have never seen it here.———

CHELONIIDAE. *Nemeophila russula*, not uncommon locally on heaths: *N. plantaginis*, common on Skiddaw and several other mountains. *Arctia caia*, decidedly not common; I have only seen two here; searching for larvæ last year yielded none. *Spilosoma fuliginosa*, a few on Ullock Moss; var. *borealis*, Stgr., common on Skiddaw: *S. lubricipeda*, rare: *S. menthastri*, moderately common everywhere; I have several which are almost brown, especially on the fore-wings.——— LIPARIDAE. *Dasychira pudibunda*, Mr. Greenip reared the moth from larvæ found on oak.———BOMBYCIDAE. *Trichiura crataegi*, rare, taken by Mr. Greenip. *Poecilocampa populi*, not common, pupa obtained by digging. *Eriogaster lanestris*, rare; I have not taken it myself. *Bombyx rubi*, common amongst the ling, on which it exclusively feeds: *B. quercus* var *callunae*, same habits as *B. rubi*, full-fed in June: *B. trifolii*, very rare. *Odonestis potatoria*, very rare.———SATURNIIDAE. *Saturnia carpini*, common, larva almost always found on ling, but in confinement will take several substitute foods.———DREPANULIDAE. *Drepana lacertinaria*, common in Ullock Moss: *D. falcataria*, common in Ullock Moss and many other woods. *Cilix glaucata*, rather rare, found occasionally about thorn hedges.———DICRANURIDAE. *Dicranura furcula*, *D. bifida*, both rare: *D. vinula*, occasionally found. (As we have few poplars in the district, insects that feed on poplar are not common).——— NOTODONTIDAE. *Pterostoma palpina* rare. *Lophopteryx camelina*, common and generally distributed: *L. carmelita*, has been taken at intervals for a good many years back. *Notodonta dictaea*, rare: *N. dictaeoides*, I have taken this on the wing amongst birches: *N. dromedarius*, pupa obtained by digging: *N. ziczac*, rare: *N. trepida*, once taken by myself and several times by Mr. Greenip: *N. chaonia*, *N. trimacula*, I dug a pupa last winter (1893-4) which died, but which I believe was that of one of these two species; I have two similar ones which I dug this winter at oak.———PYGAERIDAE. *Phalera bucephala*, larva common on oak. *Pygaera pigra*, rare.———CYMATOPHORIDAE. *Gonophora derasa*, common at sugar. *Thyatyra batis*, not so common as the preceding. *Cymatophora duplaris*, I have taken this in Ullock Moss. *Asphalia diluta*, common at sugar: *A. flavicornis*, rare: *A. ridens*, rare.

NOCTUIDES.—BRYOPHILIDAE. *Bryophila perla*, occasionally found. ———BOMBYCOIDAE. *Demas coryli*, several taken. *Acronycta tridens*, rare: *A. psi*, generally common: *A. leporina*, taken occasionally: *A. ligustri*, not uncommon by the river: *A. rumicis*, common. *Diloba caeruleocephala*, rather common.———LEUCANIIDAE. *Leucania conigera*, not uncommon: *L. lithargyria*, not uncommon: *L. comma*, common: *L. impura* and *L. pallens*, both common at sugar. *Tapinostola fulva*, common in marshy woods, flies just before dusk, may afterwards be found on grasses, when it is very quiet and easy to take. *Chortodes arcuosa*, I have only taken it on the side of Latrigg, about half-way up.——— APAMEIDAE. *Hydroecia nictitans*, common; the only form I have taken is large, with very distinct markings, and a red reniform: *H. micacea*, taken at sugar. *Xylophasia rurea*, both type and var. *combusta*, common: *X. lithoxylea*, common: *X. sublustris*, occasionally at sugar: *X. polyodon*, excessively abundant at sugar, very variable, ranging from lightish grey to black: *X. hepatica*, uncommon. *Dipterygia scabriuscula*, at sugar in Castle Head Wood. *Neuronia popularis*, very common. *Charaeas graminis*, very common everywhere, often found in shops and houses, attracted by light. *Luperina testacea*, taken occasionally: *L. cespitis*, rare. *Mamestra* *abjecta*, common and very variable: *M. brassicae*, only too common. *Apamea basilinea*, fairly common: *A. gemina*, common: *A. didyma*, very common at sugar, varies very much, a common form being black, with white reniform. *Miana strigilis* and var. *aethiops*, very common. *M. fasciuncula*, very common: *M. bicoloria*, not uncommon. *Celaena haworthii*, plentiful, in several woods near Keswick.———CARADRINIDAE. *Stilbia anomala*, rare. *Caradrina quadripunctata*, common everywhere. *Rusina tenebrosa*, common at sugar.———NOCTUIDAE. *Agrotis ypsilon* (*suffusa*), have taken a few at sugar: *A. segetum*, have taken several with the net: *A. exclamationis*, fairly common: *A. nigricans*, rare: *A. agathina*, I took five specimens at sugar in 1894; this is, so far as I know, the first capture of the species at Keswick: *A. lucernea*, found flying at the foot of the rocks under Falcon Crag, a dark form. *Lycophotia strigula*, common amongst ling on the hills. *Tryphaena ianthina*, uncommon at sugar: *T. fimbria*, plentiful in some seasons, but generally scarce: *T. orbona*, fairly common: *T. pronuba*, very abundant, and very variable. *Graphiphora augur*, very common. *Noctua baia*, several each season, at sugar: *N. glareosa*, netted occasionally, also at sugar, not common: *N. depuncta*, rare in Castle Head Wood: *N. c-nigrum*, occasionally in woods, at sugar: *N. brunnea*, very common and variable, varieties inclining to darker colour: *N. dahlii*, I take a few each season at sugar; I have one or two insects which might be vars. either of *dahlii* or *brunnea*, which, I cannot decide: *N. festiva*, common; var. *conflua*, I take a small moth along with *N. festiva*, which, from Newman's figure and description, I should call *conflua*, but it seems to me a very doubtful matter to decide: *N. rubi* and *N. umbrosa*, both rather uncommon at sugar: *N. xanthographa*, common: *N. plecta*, common anywhere.———AMPHIPYRIDAE. *Amphipyra tragopogonis*, fairly common. *Naenia typica*, common in gardens. *Mania maura*, very common near water, especially on the river banks; comes freely to sugar.———ORTHOSIIDAE. *Panolis piniperda*, thinly scattered. *Pachnobia rubricosa*, not uncommon in Castle Head Wood. *Taeniocampa munda*, fairly common, and very variable: *T. instabilis*, exceedingly common and very variable, both in size, markings and coloration: *T. opima*, rare: *T. gracilis*, not uncommon: *T. populeti*, rare: *T. gothica*, excessively common: *T. stabilis*, ditto: *T. pulverulenta*, very abundant; I have one pale variety. *Dyschorista suspecta*, fairly abundant in woods, some specimens are light and distinctly marked: *D. fissipuncta* (*upsilon*), I have taken two only, but believe it is common by the river. *Orthosia lota*, taken by Mr. Greenip: *O. macilenta*, common at ivy, on the road through the Great Wood. *Anchocelis helvola* (*rufina*), common at sugar: *A. pistacina*, occurs here, but I have not taken it: *A. litura*, fairly common. *Orrhodia vaccinii*, common at sugar and ivy: *O. ligula*, much commoner than the preceding. *Scopelosoma satellitia*, very common. *Xanthia citrago*, observed by the late Mr. Jas. Edmondson, in St. John's Vicarage grounds: *X. fulvago*, common everywhere: *X. flavago*, commoner than the preceding, but more local. *Mellinia circellaris*, very common at sugar, rather variable. *Cirrhoedia xerampelina*, occurs sparingly by the river side; I have not succeeded in taking it here myself, but have seen specimens in Mr. Greenip's collection; I took it on the banks of the Kent in three different places, and believe it to be sparingly but generally distributed more especially close to rivers; I have never seen either it or *A. ligustri* away from a river.———

COSMIIDAE. *Calymnia trapezina*, very common everywhere: *C. affinis*, one sitting on a fallen elm leaf.———HADENIDAE. *Dianthoecia carpophaga*, *D. capsophila* and *D. cucubali* occur sparingly. *Polia chi*, very plentiful on stone walls and trees. *Cleoceris viminalis*, fairly plentiful; its black var. also occurs here. *Epunda nigra*, not uncommon; well distributed. *Miselia oxyacanthae*, fairly common; richly coloured. *Dichonia aprilina*, pupæ abundant, varies towards a dark-banded form. *Brotolomia meticulosa*, abundant; 2nd brood very rich in purple shades and reflections. *Euplexia lucipara*, generally common. *Aplecta nebulosa*, common in Castle Head Wood: *A. tincta*, common in 1892, scarce in 1893, absent in 1894; all my captures were at sugar. *Hadena protea*, common and extremely variable: *H. glauca*, taken sparingly, by Mr. Greenip; I took one on a rail near the top of Latrigg, in 1894: *H. nana* (*dentina*), occurs sparingly: *H. oleracea*, very common: *H. pisi*, larvæ on ling, hazel, bramble, etc.: *H. thalassina*, fairly plentiful. *Hyppa rectilinea*, taken by Mr. Greenip.———XYLINIDAE. *Xylocampa areola*, a few on tree trunks, one or two feet from the ground. *Xylina semibrunnea* and *X. socia*, both taken on ivy by Mr. Greenip. *Calocampa exoleta*, rather rare. *Lithomia solidaginis*, fairly plentiful in woods on the west side of Derwentwater. *Cucullia umbratica*, in gardens.———GONOPTERIDAE. *Scoliopteryx libatrix*, a few each season at sugar.———HELIOTHIDAE. *Anarta myrtilli*, rather common here and there amongst the ling. *Heliaca tenebrata*, rare.———PHALENOIDAE. *Brephos parthenias*, fairly common amongst birch.———PLUSIIDAE. *Habrostola triplasia* and *H. tripartita*, both occur sparingly. *Plusia chrysitis*, fairly plentiful: there are two distinct shades in the metallic spots, green and yellowish-brass: *P. bractea*, rare, found on ragwort flowers in Castle Head field, by Mr. Greenip: *P. festucae*, rare: *P. iota*, common: *P. pulchrina*, common; I have found the last two flying over nettle-beds about the lanes and hedges, also at the boat landing: *P. gamma*, generally distributed, but never in any numbers: *P. interrogationis*, rare; found on the Borrowdale Road by Mr. Greenip.———EUCLIDIIDAE. *Euclidia mi* and *E. glyphica*, both occur about the road under Falcon Crag.———POAPHILIDAE. *Prothymia viridaria*, taken occasionally.———HYPENIDAE. *Hypena proboscidalis*, common in lanes and about railway banks. *Hypenodes costaestrigalis*, I have taken one. *Tholomiges turfosalis*, common in boggy places.———HERMINIIDAE. *Rivula sericealis*, taken occasionally. *Herminia cribrumalis* (*cribralis*), taken by Mr. Greenip: *H. grisealis*, taken occasionally.

GEOMETRIDES.—UROPTERYGIDAE. *Uropteryx sambucaria*, generally distributed, but rare.———ENNOMIDAE. *Epione apiciaria*, occasionally amongst birch. *Rumia luteolata*, common everywhere. *Venilia macularia*, in the Great Wood: these differ from southern specimens, the ground colour being of a purer yellow (not inclining to orange), and the spots blacker. *Metrocampa margaritaria*, very common in the woods. *Ellopia prosapiaria*, not scarce where the food-plant is abundant. *Eurymene dolobraria*, taken by Mr. Greenip and another collector. *Selenia bilunaria*, larvæ on hazel: *S. lunaria* and *S. tetralunaria*, I have bred several of each. *Odontopera bidentata*, common in most oak woods. *Crocallis elinguaria*, not uncommon. *Himera pennaria*, common, easy to find after dark by searching trees and bushes with a lantern.———AMPHIDASYDAE. *Phigalia pedaria*, very common, varies much in size. *Nyssia hispidaria*, uncommon (W.

Greenip). *Biston hirtaria*, uncommon (ditto). *Amphidasys strataria*, rare: *A. betularia*, rather uncommon, best obtained by digging.——— BOARMIIDAE. *Hemerophila abruptaria*, rare (W. Greenip). *Cleora glabraria*, rare, have not taken it myself: *C. lichenaria*, taken by Mr. Greenip. *Boarmia repandata*, not very plentiful but well distributed; some specimens are very beautifully and strongly marked: *B. gemmaria*, not very frequent. *Tephrosia crepuscularia*, taken by W. Greenip: *T. punctularia*, rare. *Gnophos obscuraria*, occurs on Barrow Mountain.———GEOMETRIDAE. *Pseudoterpna pruinata*, taken in 1893 about the foot of the lake. *Geometra papilionaria*, fairly abundant on the west side of the lake about Portinscale. *Iodis lactearia*, common in most woods. *Hemithea strigata*, taken by Mr. Greenip.———EPHYRIDAE. *Ephyra pendularia*, a few taken each season.———ACIDALIIDAE. *Hyria muricata*, not uncommon in some of the peaty bogs. *Asthena candidata*, occurs sparingly. *Venusia cambrica*, rather rare. *Acidalia dimidiata*, not uncommon: *A. bisetata*, ditto: *A. dilutaria*, I have taken this on the Borrowdale Road. *A. virgularia*, found sitting on honeysuckle in the town: *A. immutata*, common in woods: *A. remutaria*, very common in woods on bilberry: *A. fumata*, taken commonly by Mr. Greenip, but I don't know the locality. *A. aversata*, very common, the banded form is very seldom taken here.——— CABERIDAE. *Cabera pusaria* and *C. exanthemaria*, common in some of the woods, most abundant, I think, in damp places. *Bapta temerata*, rare, I have not taken any myself.———MACARIIDAE. *Macaria liturata*, not uncommon in woods on the west side of the lake. *Halia vauaria*, common in gardens.———FIDONIIDAE. *Panagra petraria*, in various woods and on St. Herbert's Island. *Numeria pulveraria*, in the Great Wood. *Ematurga atomaria*, excessively abundant in many places where ling grows; the ♂ varies from grey and reddish brown to black; I took one entirely black in 1893. *Bupalus piniaria*, common; the ♂'s are pure black and white with no yellow shades. *Aspilates strigillaria*, common locally on the heaths.——— ZERENIDAE. *Abraxas grossulariata*, common: *A. sylvata*, abundant in the Great Wood and on St. Herbert's Island. *Ligdia adustata*, have taken several in Fawe Park. *Lomaspilis marginata*, very common.——— HYBERNIIDAE. *Hybernia rupicapraria*, very common: *H. leucophaearia*, very common and variable: *H. aurantiaria*, very common: *H. marginaria*, not nearly so common as the last: *H. defoliaria*, very much the commonest and most variable insect in the genus, generally found in late autumn, but frequently newly emerged specimens are met with in early spring at the same time as *H. leucophaearia*. *Anisopteryx aescularia*, very common.———LARENTIIDAE. *Cheimatobia brumata*, very abundant everywhere: *C. boreata*, abundant in the woods. *Oporabia dilutata*, very abundant and variable: *O. filigrammaria*, not uncommon. *Larentia didymata*, very common, males inclined to be dark: *L. multistrigaria*, taken occasionally: *L. caesiata*, common in Great Wood and Cat Crag: *L. flavicinctata*, taken by Mr. Greenip: *L. salicata*, found on many of the surrounding hills: *L. olivata*, common in many places, as Great Wood, Ashniss Wood, and the sides and gills of Skiddaw: *L. viridaria*, common almost everywhere; varies from a rusty ground-colour to a bright green. *Emmelesia affinitata*, taken sparingly in various woods: *E. alchemillata*, common in the hedges, plentiful on the Borrowdale road: *E. albulata*, very common: *E.*

decolorata, taken occasionally; I netted one very large one by the road side at Castlerigg: *E. taeniata*, rare, Stonethwaite: *E. unifasciata*, rare, taken by Mr. Greenip: *E. minorata*, not so common as formerly, occurs on several mountains: *E. adaequata*, Watendlath, Borrowdale and near Friars' Crag. *Eupithecia venosata*, not very common: *E. pulchellata*, fairly plentiful: *E. oblongata*, not common: *E. subfulvata*, I have taken several: *E. pusillata*, taken by Mr. Greenip: *E. indigata*, I have taken several: *E. nanata*, common amongst the ling: *E. vulgata*, fairly common: *E. expallidata*, one taken on the Isthmus: *E. assimilata*, taken occasionally: *E. lariciata*, common in several fir woods above Lodore: *E. abbreviata*, common at sallow bloom: *E. exiguata*, I have taken several: *E. sobrinata*, on the fell behind Barrow House (W. Greenip): *E. pumilata*, not common: *E. rectangulata*, a few have been taken. *Lobophora sexalisata* and *L. viretata*, both taken by Mr. Greenip: *L. carpinata*, can be taken in Castle Head and several other woods: *L. polycommata*, ditto. *Thera simulata*, occurs among juniper, as on the fell behind Barrow Falls: *T. variata*, generally distributed; I have found this insect when the primroses were in bloom, also in summer, and again late in the autumn (October, 1891): *T. firmata*, frequently taken in fir woods. *Hypsipetes sordidata*, very common, larvæ on sallow and bilberry, the latter mostly produce varieties; I have taken in one evening specimens ranging from black to nearly white, and with very considerable variation in markings. *Melanthia bicolorata*, taken occasionally in woods on the west side of the lake: *M. ocellata*, common in woods on the Isthmus, and in Ashmere Woods: *M. albicillata*, I have taken this in the footpath of Latrigg. *Melanippe hastata*, the ordinary form occurs on marshy lands at the head of the lake: *M. tristata*, taken by Mr. Greenip: *M. unangulata*, one taken by the late Jas. Edmonson, whose collection is now in the Museum: *M. rivata* and *M. sociata*, both plentiful: *M. montanata*, one of our commonest geometers: *M. galiata*, not uncommon: *M. fluctuata*, common and variable, some forms closely approach *M. galiata*. *Anticlea badiata*, fairly plentiful in several woods: *A. nigrofasciaria*, rather rare. *Coremia munitata*, common on Skiddaw and several other mountains: *C. designata*, fairly plentiful: *C. ferrugaria*, common: *C. unidentaria*, several in Whithick Gill, occasionally in lanes: *C. quadrifasciaria*, new to the district; I took the first and only one at Honister in 1894. *Camptogramma bilineata*, common in the lanes. *Triphosa dubitata*, taken occasionally. *Eucosmia certata*, rare: *E. undulata*, taken by Mr. Greenip. *Cidaria siterata*, common about oak: *C. miata*, common on oak; when beating for these two I generally find the former high up and the latter on lower boughs and sometimes on bushes: *C. corylata*, not uncommon: *C. truncata*, common in all the forms mentioned by Newman: *C. immanata*, rather common, mostly in damp woods: *C. suffumata*, fairly plentiful: *C. reticulata*, the late Jas. Edmondson told me that he had taken it in the Great Wood, I have only taken it at Windermere: *C. silaceata*, taken in the Great Wood on the road side: *C. prunata*, common: *C. testata*, common in woods and on Skiddaw among ling: *C. populata*, common: *C. fulvata*, Lake road, Keswick and Newlands: *C. pyraliata*, taken in several woods, not very plentiful: *C. dotata*, not common, occurs in gardens.———EUBOLIIDAE. *Eubolia cervinata*, taken occasionally: *E. limitata*, found on the railway banks: *E. plumbaria*, not common, occurs on the fells amongst bracken. *Carsia paludata*, taken by Mr. Greenip. *Anaitis plagiata*, not very plentiful; I have taken it about Barrow House; varies much in size. *Chesias spartiata*, I found a large colony of this insect in 1892, in a field up the Greta opposite the Ash Tree Dub.———SIONIDAE. *Tanagra atrata*, common almost everywhere; plenty may be taken on the road sides and adjoining fields, especially on the Borrowdale road, and on the Lake road about Crow Park.

INCOMPLETAE.—SESIIDAE. *Sesia tipuliformis*, common in gardens.———ZYGAENIDAE. *Ino statices* occurs in the Great Wood but I have not taken it. *Zygaena lonicerae*, taken by Mr. Greenip: *Z. filipendulae* used to be taken in a field behind Lingholm, I have not found it myself.———HEPIALIDAE. *Hepialus humuli*, very common: *H. sylvinus*, not uncommon in Castle Head and Great Woods: *H. velleda*, common, especially on Skiddaw; var. *gallicus* I have taken on Ullock Moss: *H. lupulinus*, not common: *H. hectus*, common in many woods.——— COSSIDAE. *Cossus ligniperda*, very rare.

Including two or three doubtful species, the number of species recorded in the foregoing list is 392, which is, I think, a very fair show for such a small district, especially when account is taken of the short time I have been here, and the little time at my disposal for collecting. Many of the woods and likely-looking fells have never been worked at all, and neither moth-trap nor light has as yet been tried, so that I think that a collector with more leisure might reasonably be expected to add very considerably to my list. Keswick is a very interesting district to students of any branch of Natural history not directly appertaining to the sea. There are many rare birds and animals in the district as well as some rare fish, numerous species of flies, beetles, etc., and a very large variety of stones and minerals. It will, doubtless, have been noticed that many of the common showy species, such as *Arctia caia*, *Zygaena filipendulae*, and *Euchelia jacobaeae*, are absent or rare with us, and, if any entomologist will be so good as to help me, I should be glad of larvæ of such species to turn out, so as to make the district more attractive to visitors and young collectors, who occasionally bring their nets in the summer.

The Hadenoid Genera with Hairy Eyes.

By A. RADCLIFFE GROTE, A.M.

The study of the structure of the eyes of the Owlet moths was neglected by earlier systematists. The distinction between hairy and naked eyes was drawn neither by Schrank, Ochsenheimer, Hübner, Boisduval nor Guenée. In fact, so far as I am able to discover, it was not until 1857, when Lederer wrote, that this character was generally used as decisive. Although in the Diptera it would seem at times to be of less service, in the Lepidoptera it gives us a quick and reliable character for definition. But, naturally, in using this character in the modern systems, the generic associations made by the older authors without its use, become untenable. Not perhaps entirely owing to the use of the structure of the eyes, for the characters upon which older systematists as a rule founded their genera were of the vaguest. The present brief summary of the results obtained in applying the oldest generic names and ascertaining their exact types, will show the difficulties which beset the nomenclator in dealing with certain Hadenoid genera with hairy and others with naked eyes.

I have taken the type of *Mamestra*, Ochs. 1816, to be *M. pisi L.*, List N. Am. Noct., *Buff. Bull.*, 12, 1874. The generic name, in 1818, is restricted by Hübner to *pisi*, *unanimis* and *leucophaea*, and the designation of *pisi* as type encounters no objection, since this species falls in with the definition of the modern genus *Mamestra*, in fact, represents it typically, and is a good example of a hairy-eyed Hadenoid form. Nor am I able to find a single objection in literature to this course, in which I seem to follow precedent. The case of the generic name *Hadena*, used by Lederer as the name of a typical Hadenoid genus with naked eyes, is however very different. Originally proposed for twelve dissonant species, some with hairy, others with naked eyes, it contains among them the type of *Mamestra*. In fact, the earlier use of *Hadena*, and even at times its recent use, for the species in Europe, is indifferent in this respect. Lederer, in fact, seems to have taken a very old name (Schrank, 1802) for a genus of typical naked-eyed Hadenoid Owlet Moths, without reference to the characters of the species for which it was originally proposed, and equally without reference to its subsequent restriction, or to the generic names erected by Stephens for species referred in 1857 by Lederer to his genus *Hadena*. The name *Hadena* is the oldest for any of the group I have called *Hadenini*. The generic names *Agrotis* and *Hadena* are, in fact, names used by systematists of the past sixty years to conjure with. Almost everywhere they were used in a loose and improper manner. Now, by reference to the *Tentamen*, certainty is obtained as regards the use of *Agrotis*. Its type is *segetum*, and this application covers also the modern use of the generic name. But I have shown in *The Entomologist's Record*, that the type of *Hadena* prevents the further use of this name for the modern naked-eyed genus erected by Lederer and adopted by Staudinger, since this type, *cucubali*, has hairy eyes, and belongs to Boisduval's genus *Dianthoecia*. It is clear that the true type of *Hadena* must be one of the twelve species originally referred to the genus by its author. Not one of these twelve belongs to the modern genus *Hadena*, *in sensu* Lederer. Three of these original species of Schrank's are taken by Ochsenheimer, the next authority, in 1816, into the genus *Hadena*, and the other nine excluded. The three are *meticulosa*, *lucipara* and *cucubali*. The two first have naked, the last hairy, eyes. The next authority is Hübner (1818), and of the three included by Ochsenheimer (1816), he retains only *cucubali*. This is, then, the genuine "Trübeule," the true *Hadena*. All others would appear to be spurious. Nor will it help us to go back to Schrank and take our choice of types, even if the rules of nomenclature permitted such a course. The rest of the twelve are housed comfortably under different modern genera, and one of the twelve it must be. In looking for the original "Trübeule," I myself hoped to find a naked-eyed type for the name. It would have been pleasant to have been able to confirm *Hadena* in its modern use, as I did aforetime for *Agrotis* and *Mamestra*. But already in 1874, I could find no type for this name.

For the genus *Hadena* of Lederer and modern writers, I have now proposed the collective name *Helioscota*, with the provisional type *miselioides*. Under *Helioscota*, I arrange all the American species referred in Smith's *Catalogue* to *Hadena*. This genus differs from *Hadena* of Lederer, since there is first separated from that as generically distinct, the species of *Xylophasia*, Steph. and the species of *Miana*, Steph. There remains a series of moderately robust forms in America, of which our common *miselioides* seems a fair example. But all these species remain to be compared with the European, and, by farther restriction, *Helioscota* may come to have a different type, which may be any one of the thirty-four species listed by Smith, the residue of the contents of the former genus *Hadena* of my lists, in which I followed Lederer's extension of the term.

The material before me at this moment is quite insufficient to attempt any study which would clear this synonymy definitely. The generic names, the proper application of which is to be studied, are, first, *Xylena*, Hübn., 1806, with its type *lithoxylea*, which establishes this term as against *Xylophasia*. We then come to *Oligia*, Hübn., 1818. In America I have used *Oligia* for slight-bodied Hadenoid forms, presumably structurally identical with the *O. strigilis*, L. These American species are treated monographically by J. B. Smith (*Ent. Am.*, v. 145), where, however, *Verzeichniss* "404" is cited, apparently inaccurately. The citation is, 213, Nos. 2124–8. The type of *Oligia* I have taken to be *strigilis*, but it would seem from authors, that Hübner's genus has unmixed contents, all five species agreeing structurally. It is, I believe, to this genus that Stephens' type of *Miana* belongs, but in the absence of the work itself I cannot be certain. Another genus is *Calliergis*, Hübn., but the contents of this are so incongruous that the name is probably unavailable; one of the species, *ophiogramma*, may be congeneric with *strigilis*. I have assumed that *Celaena* has for its type *haworthii*, and that this species forms the type of a distinct and peculiar genus; whether this is really the same as *Luperina*, Led. (nec. Boisd., 1829), I have not the material to decide, nor have I been able to find the true type of Boisduval's genus. Smith's use of *Luperina* is unfounded. Whether the American forms referred by me to *Oligia* agree with this type, has not been ascertained by direct comparison. Mr. Smith, in addition to a quotation of the structural characters given by me, gives us as a peculiarity in maculation, that the t.p. line is always even and a little outwardly oblique from costa, while he also describes and figures the genitalia. What is needed, then, is a full comparison of all the species referred by Lederer in Europe to *Hadena* with our American forms and, the limits of generic groups being thus ascertained, the application of names extant in literature to these groups, after fixing the true type for each name.

To return to *Mamestra*. In America the species of *Dianthoecia* are not eliminated by authors, both genera having hairy eyes, while from cabinet material alone, the genera cannot be readily recognised and kept apart. When the larvæ and pupæ are known and the habits of the American species discovered, it appears to me certain that the two genera will be recognised also in America. At one time I made the attempt to separate the American species of *Dianthoecia*, but afterwards abandoned it, partly owing to my small material and partly to the absence of certainty in the characters of the imagines alone. The species indicated by me as belonging to *Dianthoecia*, *viz.*: *insolens*, Grt., *meditata*, Grt., *lustralis*, Grt., *capsularis*, Gn., etc., have been more recently distributed in various groups of *Mamestra* by Mr. Smith—groups based on different characters from those assigned to *Dianthoecia*. In my list of 1890, I gave twenty presumed species of North American *Dianthoecia*.

The results of these observations of mine upon the Hadenoid genera, may be summed up as follows. In fixing a structural type, systematists will do well to ascertain the correct application of the names of genera already extant, before giving their type a generic name in print. It is quite clear that each generic name must have as a type some one particular species, the structure of which becomes the model for the genus, and the criterion by which we are to decide when the generic limits are exceeded. In this way confusion will be avoided. Secondly, it is manifestly impossible to correctly study and arrange the North American Noctuids without reference to the European species and the European literature. The attempt to do this is the fundamental error of Mr. Smith's *Catalogue* and work. As an attempt at classification, the catalogue offers little that is new; there is no such thing as a "super-family Noctuidae"* announced in the title. The difficulty of obtaining what Mr. Smith calls "the ancients" (apparently under the impression that the authors were contemporary with Julius Cæsar, while Linné has not been dead one hundred and twenty years yet), has occasionally prevented us in America from getting at the bottom facts of European literature, and it would seem as though the literary basis of names in use in Europe is not always assured. There is also the other difficulty, that there are no large collections of European Noctuids in American Museums. During twenty odd years, while I was continually working on the American Owlet moths, it was very difficult for me to obtain the necessary European material. Mr. Smith's last *Catalogue* gives us the results of my and of his comparison of the types of our American species, so that the oldest names of the latter, though not without notable exceptions, are tolerably well ascertained. But it does not go farther than this, and beyond reinstating a fresh number of objectionable names of Mr. Walker's, based on comparison of "types," it has not altered the general aspect of affairs materially. There is plenty of opportunity for observation and study on both sides of the Atlantic before our nomenclature will become settled, while a mutual exchange of results in the field and a willingness to learn from each other, will hasten the advent of a better understanding on all hands of the faunæ of the two hemispheres, faunæ which are so intimately related.

SCIENTIFIC NOTES & OBSERVATIONS.

Notes on Pupæ.—*Castnia.*—I am indebted to Professor Poulton for the opportunity of examining a pupa of *Castnia*. The specimen is of one of the larger species, and is a female; it was preserved at the moment of emergence, so that a certain amount of the opening of segments and separation of parts that occur in dehiscence has taken place. The pupa resembles that of *Cossus*, not only superficially, but in great detail, so that it clearly belongs to the great group of families of which

* Mr. Smith's classification in the *Catalogue*, 1893, is copied from mine in the *Proc. of the American Philosophical Society*, June, 1883, p. 138, where I establish the three families, *Thyatiridae, Noctuidae, Brephidae*, using the first term I believe originally. No reference to this source is made by Mr. Smith. From Mr. Walker's method of working, no specimens shown as his "types" in Brit. Mus. can be considered, *ipso facto*, authentic. Yet this is what Mr. Smith virtually assumes. Mr. Smith's work is less a laborious testing of the true synonymy than a surface comparison of labels attached to specimens in different collections. It thus creates fresh difficulties.

we may make *Cossus* the type, including Tortricids, Sesiids and sundry Tineids, and smaller sections. These all have the first three abdominal segments fused into the thoracic mass, but opening on dehiscence, and have the three following segments [(4, 5, 6 (and 7 in ♂)] free. The specimen differs from *Cossus*, and agrees more with *Tortrix* in having no beak, which in *Cossus*, *Sesia*, &c., is always more or less developed in the inter-antennal and pre-oral region. It also differs in showing three (nearly four) joints of the tarsus of the 3rd pair of legs projecting free, beyond the wing-cases; in *Cossus*, two or three joints are visible, but rather between the slightly separated wing-cases than beyond them. In *Z. pyrina*, one or two joints so project; in *Sesia*, also, two joints project. A very decided difference from many of them is in the well-developed maxilla (proboscis), which here extends as far as the end of the wing-cases. In *Cossus*, this is extremely short; in *Sesia*, it extends about half-way in some species, but reaches the extremity of the wing-cases in others. In *Sesia*, *Cossus* and *Tortrix*, the dorsal head-piece is represented by a short narrow plate; in *Z. pyrina* it is not represented externally, though in dehiscence it carries the eye-covers, as in the other forms. This would seem to be the case in *Castnia*; no external indication of this head-piece can be detected, but, though dehiscence has not gone so far in the specimen before me as to make this certain, there can be little doubt that the dehiscence is as in *Z. pyrina*. The eye-collar (maxillary palp) is developed much as in *Cossus*, *Sesia*, &c. The femur shows between the maxilla and the first leg, but is narrow as in *Sesia*, and not broad as in *Cossus*, a result in that form no doubt of the stoutness of the maxilla. The anal armature consists of two forward tubercles, as in *Cossus*, that look like a persistence of the anal prolegs, and of two other tubercles a little further outward and backward that exist as points in *Cossus*. The variation in the anal armature in *Sesia* is, however, much greater than this, some species having it rounded and nearly smooth, while others (as *bembeciformis*), have a nearly complete circle of points. In the armature of the dorsum of each segment, it agrees with all these groups in having a larger anterior set, and a slighter posterior one on the 2nd and 6th abdominal segments, and the anterior set also existing in 7, 8 and 9. In *Cossus*, the same armament is quite distinct, though small on the first abdominal segment. In *Castnia*, it is very poorly developed even in the 2nd, otherwise the arrangement is the same to considerable detail, the forms of the individual spines being very similar. The spiracles are much alike, even to the marks of the circumspiracular tubercles, and both present marked impressions of the ventral prolegs. A dorsal ridge, indicating the line of dehiscence, is very marked in the pro-thorax, but not at all in the meso-thorax. This ridge exists in many butterflies. It is very marked in *Galleria mellonella*, and apparently exists in many distinct families. So far as the pupa goes therefore, *Castnia* is very close to *Cossus* and *Sesia*, and so far as its relations to butterflies is concerned, it is clearly not in the direct line of butterfly descent, since the dorsal head-piece is reduced to evanescence, yet still exists markedly in the Hesperids, whilst the other "micro" characters, that it still possesses so fully, hardly exist in the Hesperids. If it be at all then a branch of the main stem which carries the butterflies at its summit, it has diverged to some little distance from, even if it be, perhaps, a later variation than is *Sesia*.

Anthocaris (*Euchloë?*) *belia* and *A. ausonia*.—I have had sent to me this spring pupæ of these two species, which are said by some to be two forms of the same species—*A. belia* hybernating in the pupa, whilst *A. ausonia* is the summer brood. The pupæ of the two are extremely similar in form and markings; in fact, there is no difference that I can detect. That of *A. belia* is, however, easily distinguishable by its much darker coloration; the pupa of *A. ausonia* might be called green, that of *A. belia* brown, though the difference is chiefly caused by the markings being faintly indicated in the former, whilst they are brown or black in the latter. There is, however, a much more remarkable difference—an extremely remarkable one, indeed, if they be really only forms of the same species. The pupa of *A. belia* is solid, much like that of *A. cardamines* only a little straighter, whilst that of *A. ausonia* possesses movement between the 4th and 5th abdominal segments. In my paper on butterfly pupæ (*Ent. Rec.*, vol. vi., p. 127), I pointed out that I had not met with this form of pupa in any Pierid, but indicated that it probably existed in some group, classed either with the Yellows or with the Orange-tips. That it should occur in one brood of a particular species and not in the other is extremely interesting, and enables us almost to see how movement of segments is lost, and (perhaps not very profitably) to speculate as to how and why it is lost. The *A. ausonia* have already emerged; the *A. belia* have to wait till next spring. It is notable that the neuration of *A. ausonia* does not resemble that of *A. cardamines*, but is rather that described by Mr. Tutt (*Canad. Ent.*, 1894), as characteristic of *Pieris*. This confirms the idea suggested by the pupa, that *A. ausonia* is nearer the main stem than is *A. cardamines*, and, perhaps, renders doubtful my notion that the *Anthocarinae* were derived from the *Rhodocerinae*, indicating rather that *A. ausonia* is nearer *Pieris* and that, therefore, the *Pieridae* with curved pupæ, were jointly derived from *Pieris*, and there never was a curved-pupa form with two free segments. Further observation on the point becomes necessary.—T. A. Chapman, M.D., Firbank, Hereford. *May*. 1895.

CURRENT NOTES.

Mons. Danysz redescribes (*Bull. Soc. Ent. Fr.*, vol. lxxii, p. clxxviii., et seq.) an anatomical observation (first made by Professor Poulton some years ago) on the larvæ of *Ephestia kuehniella*. Many of the larvæ presented on the dorsal aspect of the 5th anal (?abdominal) ring, a large brown or black blotch. When the larva moved it was easy to see that this blotch was due to a pigmented body, situated underneath the cuticle. On dissection, two reniform corpuscles, strongly pigmented with red-brown, were discovered in the cellular tissue above the digestive tube; these seemed to have no connection with the other organs of the larva. Under the microscope, each of these bodies appeared to be formed of four segments separated from each other by pigmented films, which, viewed in profile, presented the appearance of bands deeper in colour than the rest. Each segment was filled with elements of two kinds: (1) bundles of very thin fibres, bordering on one side a cellule provided with a large nucleus; (2) spheres undergoing segmentation, more or less pronounced. Mons. Danysz kept a certain number of the larvæ that had this black blotch under observation, and found "the same organ, a little modified but sufficiently recognizable, in the pupa and in the imago, where the two reniform bodies had become united into a single ovoid body. In the latter, the pigmented body was connected by two long ducts with the genital armature." It was found that the larvæ with the black blotches produced exclusively male imagines, so that the writer concludes that the organ he had been observing was a testicle in course of formation. Another striking fact was, that, though all the other organs of the larva underwent complete histolysis in the pupa, the testicle formed in the body of the larva continued its development in the pupa without undergoing histolysis.

The Rev. W. C. Hey, M.A., of York, records (*Naturalist*, July) the recent capture in that city, by his nephew, Mr. Gilbert Hudson, of several specimens of the scarce beetle, *Ocypus pedator*, which has hitherto only been recorded from the extreme south of England.

Mr. F. J. Bridge, of Exeter College, reports (*Entom.*, July), that his father captured a specimen of *Deilephila livornica*, on June 2nd, about 8.30 p.m., in his garden at Egg Buckland, near Plymouth.

NOTES ON COLLECTING, Etc.

Larvae of Vanessa urticæ in Yorkshire.—The larvae of this species simply swarm in this part of Yorkshire at present. I have never seen anything like it before.—W. C. Gribble, Springfield, Stokeley. *June 14th*, 1895.

Food-plants of Gortyna ochracea.—What a number of different food-plants this species has! A few evenings ago, when looking for *Eupoecilia implicitana* a short distance from here, I noticed some tall rank stems of the common yarrow, one or two of which had "frass" sticking to the upper part. Thinking that I had come across the larva of *Platyptilia bertrami* (a species which I had not seen in the larval stage), I opened the stems, only, however, to find a half-grown larva of *G. ochracea* inside. In addition to this (to me) new food-plant, I have at various times found the larvae feeding in the following:—*Carduus palustris, Eupatorium cannabinum, Artemisia vulgaris, Arctium lappa, Digitalis purpurea, Sambucus nigra* (in young soft stems), *Scrophularia aquatica*, and on one occasion in potato stems—truly as varied a diet as any larva need wish for.—A. Thurnall, 144, Chobham Road, Stratford New Town, E. *June 16th*, 1895.

Wild Hop a Food-plant of Vanessa io.—On June 26th, 1895, I found a brood of larvae of *Vanessa io* at Kersey, Suffolk, on wild hop; they were nearly full-grown, and have now, in fact, all spun up. Though the wild hop, which was growing on a hedge, was twisting and twining in and about quantities of nettles, not a single larva was found on the nettles. I do not find this food-plant mentioned in any of my books.—F. Le Grice (Col.), 4, Shorncliffe Road, Folkestone. *June 30th*, 1895.

Plusia moneta at Bromley.—I bred yesterday a very fine specimen of this moth from a larva found on monkshood in my garden here.—Lewis F. Hill, 45, Freeland Road, Bromley, Kent. *July 1st*, 1895.

Notes from the books of the exchange baskets.—Mr. E. A. Bowles (Waltham Cross) writes on April 16th:—"The common spring

Geometers were very plentiful here. *Hybernia marginaria* showed a greater tendency to smoky suffusion than I have hitherto noticed. Larvæ of *Hepialus lupulinus* seem very small for the time of year; perhaps this is due to their long fast during the frost." The Rev. E. C. Dobrée Fox (Castle Moreton) writes on April 17th:—"I have much pleasure in stating my experience with regard to *Acontia luctuosa*. The insect is, I believe, double-brooded, but I have never been after the first brood; the second brood occurs at the end of July and beginning of August. My great locality for it is a barren grass field at Torquay (the first field you come to along the cliffs, after passing Kilmore, on the cliff path to Anstey's Cove). Here the insect usually abounds, although it appears to have certain favoured parts of the field in which it is more abundant. These spots, however, vary from year to year. It flies in the hot sunshine, and without sunshine you may search in vain by day for *A. luctuosa*, although I have taken it flying at dusk, but not commonly. The larvæ feed, I believe, on field bindweed, and it is where this plant occurs, that this pretty species is to be found in the greatest abundance. It is not a very easy one to capture, as it darts about quickly, never, as a rule, however, going very far, and with a quick eye you can mark its position, and then place your net over it; but whether your specimen is worth anything is quite another matter, for it is a species which quickly gets damaged, and alas! often when you think that you have a glorious fresh specimen, you find a piece out of the wings. Should anyone be tempted to go and try for *A. luctuosa*, in its favourite haunts, let me caution them against a possible disappointment that I once had, *viz.*, finding that the field had been ploughed up, and wheat growing instead of grass. Should this happen to anyone, go through a little wood at the end of the field, and work the next field you come to, keeping on the left side of the path. Here, *A. luctuosa* also occurs, but in nothing like the same abundance. I may add that the last time I was at Torquay, I took almost 120 of this species. I have also taken it at Lulworth and Portland, but only two or three in each place."

SOCIETIES.

The members of the North London Natural History Society made their usual excursion to the New Forest at Whitsuntide. Messrs. Robbins, Nicholson, Bacot and Harvey, joined later by Mr. Quail, made up the party, and arrived at Lyndhurst on Friday night. The following morning turned out cloudy and wet, and an early excursion by Messrs. Bacot and Nicholson produced no result worth mentioning. The morning continuing showery and unpropitious, Messrs. Robbins and Nicholson stayed indoors till just before dinner, when they essayed a little larva-beating in Beechen Lane, but the result was a decided failure. In the afternoon these gentlemen repeated the experiment of the morning in Denny Wood, and the principal captures were a fine *Notodonta trepida*, a good *Anaitis plagiata*, a brown specimen of *Grammesia trigrammica*, all evidently just out; larvæ of *Asphalia ridens*, *Brephos parthenias*, &c. were obtained. Messrs. Bacot and Harvey also visited Stubby and Denny Woods, and added *Taeniocampa miniosa* and *Amphidasys strataria*, among others, to the list of larvæ, and extended the records of imagines by *Tephrosia punctularia*, *Bupalus piniaria* and

Scodonia belgiaria, &c. &c. In the evening the party proceeded to sugar about half a mile of trees in Hurst Wood, and took the *N. trepida* with them for sembling purposes. Sugar however proved totally unattractive, as also did the *N. trepida*; the latter result was not surprising, as the specimen, on further investigation, turned out to be a male. The only captures made were some fine specimens of *Larentia viridaria*. The night was clear, cool, and damp, and there was a bright moon. On Sunday Messrs. Bacot and Harvey spent the day at Stubby and Denny Woods, and by beating obtained about 120 larvæ of *Taeniocampa miniosa*, and some two dozen of *Asphalia ridens*. *Euclidia glyphica* and *Thera variata* were also captured in fine condition, likewise two male *Pararge egeria*. After church Messrs. Robbins and Nicholson went for a stroll along the Minstead road, and took some good specimens of *Tephrosia biundularia*, *Thera variata*, and a freshly-emerged *Hadena thalassina*. These were found at rest on young firs growing on a piece of boggy land, which was plentifully besprinkled with the two Sundews (*Drosera rotundifolia* and *D. congifolia*) and the Bog Asphodel (*Narthecium ossifragum*). In the afternoon Mr. Quail turned up about four o'clock, having taken a fresh specimen of *Hadena genistae* on the way from the station. In the evening the whole party went to Matley Bog, but with the exception of some good specimens of *Hypsipetes trifasciata*, *Lobophora sexalisata*, *Eupitheeia nanata*, and *Pachycnemia hippocastanaria*, nothing fresh was turned up. A nice lot of *Scodiona belgiaria* were captured on White Moor afterwards in bright moonlight. On Monday morning Messrs. Bacot and Quail were out early, but did not take anything of note except a fine specimen of *Cuspidia leporina*. After breakfast the party set out to spend the day at Stubby Copse, capturing on the way some fresh specimens of *Tanagra atrata* and 12 *Nemeobius lucina*. Larva-beating produced about half a dozen *Poecilocampa populi*, two or three *Asteroscopus sphinx*, one *Thecla quercus*, and many other commoner species. Mr. Nicholson found a larva of *Limenitis sibylla* suspended from a grass-stem ready to pupate, and Mr. Harvey found another *C. leporina* at rest on a fir-trunk.

The Birmingham Entomological Society met on May 20th. Mr. R. C. Bradley showed *Pompilus viaticus* from Wyre Forest, and remarked on the extraordinary activity of the members of the family *Pompilidae* and the difficulty of capturing them. Mr. Valentine Smith exhibited a form of *Rhagium bifasciatum* from Edgbaston with the white colour much extended; also one *Elater balteatus* from Edgbaston, and three *Hister purpurascens* from New Street, in the centre of the City.

City of London Entomological and Natural History Society.—*March 19th*, 1895.—Exhibits:—Mr. Bate: living examples of *Amphidasys betularia*, a brood of which had been emerging since September last; also a specimen of *Noctua xanthographa* which bore a strong superficial resemblance, both in colour and markings, to some of the *Caradrinas*. Mr. May: a black specimen of *Hybernia leucophaearia* from Epping Forest. Mr. Bacot: a very perfect hybernated female of *Gonepteryx rhamni*, recently captured at Hayes Common. Mr. Camling: a series of *Selenia tetralunaria*, bred from Andover eggs; the males were all of the greenish form, as were also all the females except two, which were of the reddish form. Rev. C. R. N. Burrows: a dead pupa of *Acherontia atropos*, which had been dug up, and which he supposed to have been killed by the severe winter; all the tail segments were movable, owing to the rottenness of the pupa. Mr. May stated that a male *Nyssia hispidaria* had paired with three females, from each of which he had obtained fertile ova. Mr. Bayne remarked that *H. defoliaria* was still on the wing in Epping Forest, it being just six months since he saw the first specimen. Mr. Prout read a paper on "The British representatives of the genus *Caradrina*" (vide, *ante* pp. 198 et seq. and 223 et seq.).

April 2nd, 1895.—Exhibits:—Mr. Battley: a sprig of azalea, taken from a plant in his conservatory; the flowers of this plant were normally of the ordinary large, dark red variety, but this year all were very small, and each flower had a sort of calyx just below it, of the same colour and texture as the flower; he could not assign any reason whatever for this extraordinary departure. Mr. Riches said that the flowers appeared to be identical with those of *Azalea amoena*. Mr. Stillwell: a specimen of *Satyrus semele* from Epping Forest, having only one ocellus on the underside of the fore-wings. Mr. Bate: a series of *Caradrina taraxaci* from Honor Oak Park, the specimens being variable but mostly very dark. Mr. May: series of *Hybernia marginaria* from Chingford and Tooting Bec Common; the latter were larger and better marked than the former. Mr. Bayne: two specimens of *Agrotis obscura* from Epping Forest, one of which was very obscurely marked; also specimens of the second brood of *Pachycnemia hippocastanaria* from the New Forest. Mr. Sauzé: males, females and workers of *Formica nigra* and representatives of other species of ants. Rev. C. R. N. Burrows sent for exhibition the royal cell of a termite from Natal, also a photograph of the queen and two slides of the workers, with the following notes thereupon:—"The royal cell of the Natal termite is, as you will notice, much higher in the centre than at the sides. These sides are the galleries in which the workers move when they go to feed the queen, or to remove the ova. You will notice the passages in the sides, large enough for the workers. The queen is quite enclosed and never has a chance of walking out, but—poor thing—she rather resents the imprisonment, fancying, perhaps, that her figure is worth showing, and her legs are worn away with pawing the floor of the cell until mere stumps remain. When they first emerge, the females are winged, but they cast their wings and are at that time as active as the workers and have very decently formed legs. I remember well the very curious swarming of the termites, the clouds of flying insects, and the ground littered with the detached wings. One corner of a field was, I remember, one day quite white with wings. The females fly for a while, then settle and deliberately bite or shake off their wings. The sight is curious. All creation seems against the helpless creatures—birds, beasts, and insects too. Especially so are the other ants—black, red, etc. I saw several queer fights. Once a small ant got a female termite (winged) by one leg; up went Mrs. T. and with her went the ant; the flight was slow and low, so that I could watch the enemy swarm up her leg, mount on her back and snip off a wing, when . . . . . ! I saw the poor things on the ground being tugged off to prison or to death in dozens, but the first thing, always, was to remove the wings. I thought that I was, perhaps, occasionally misled, and that really in some cases it might be the male leading off a bride. But, as a rule, there was no room for mistake, as the captive was carried down into the den of healthy and active ants, who used often to come in for tit-bits—such as new-born rats, etc.—from my bounty." Mr. Tutt read a paper on "The development of sex in social insects" (vide, *ante* p. 193).

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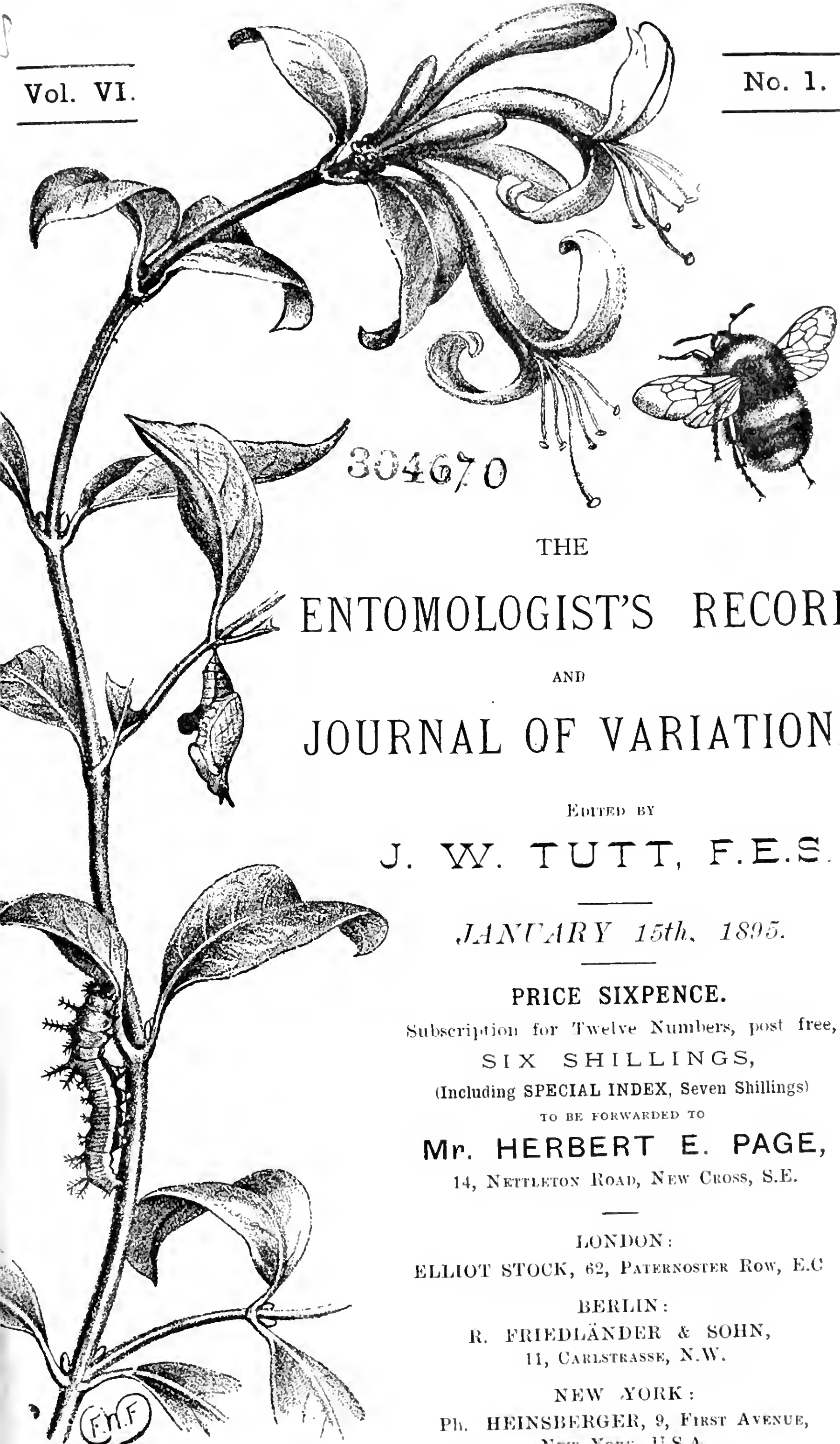

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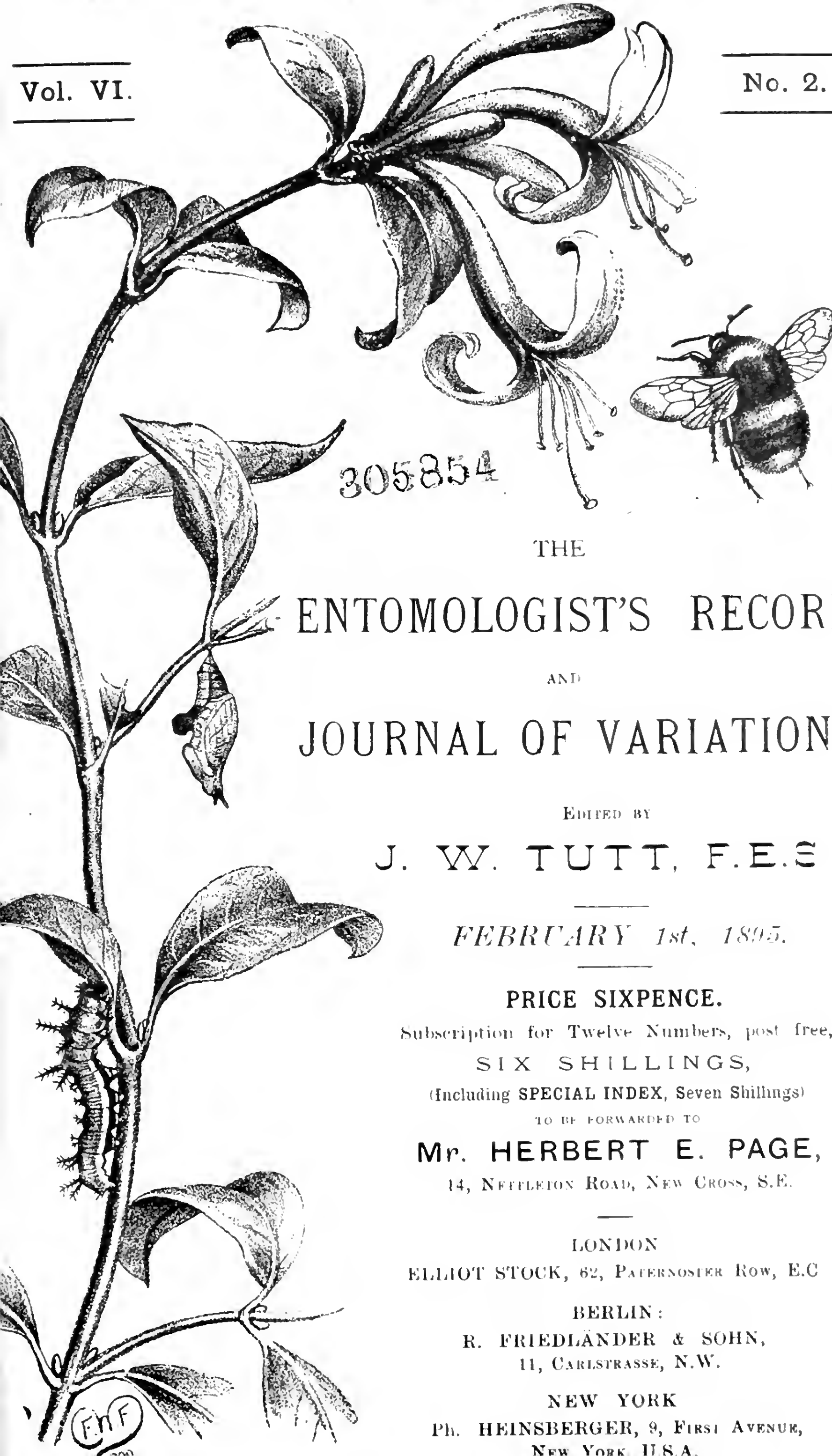

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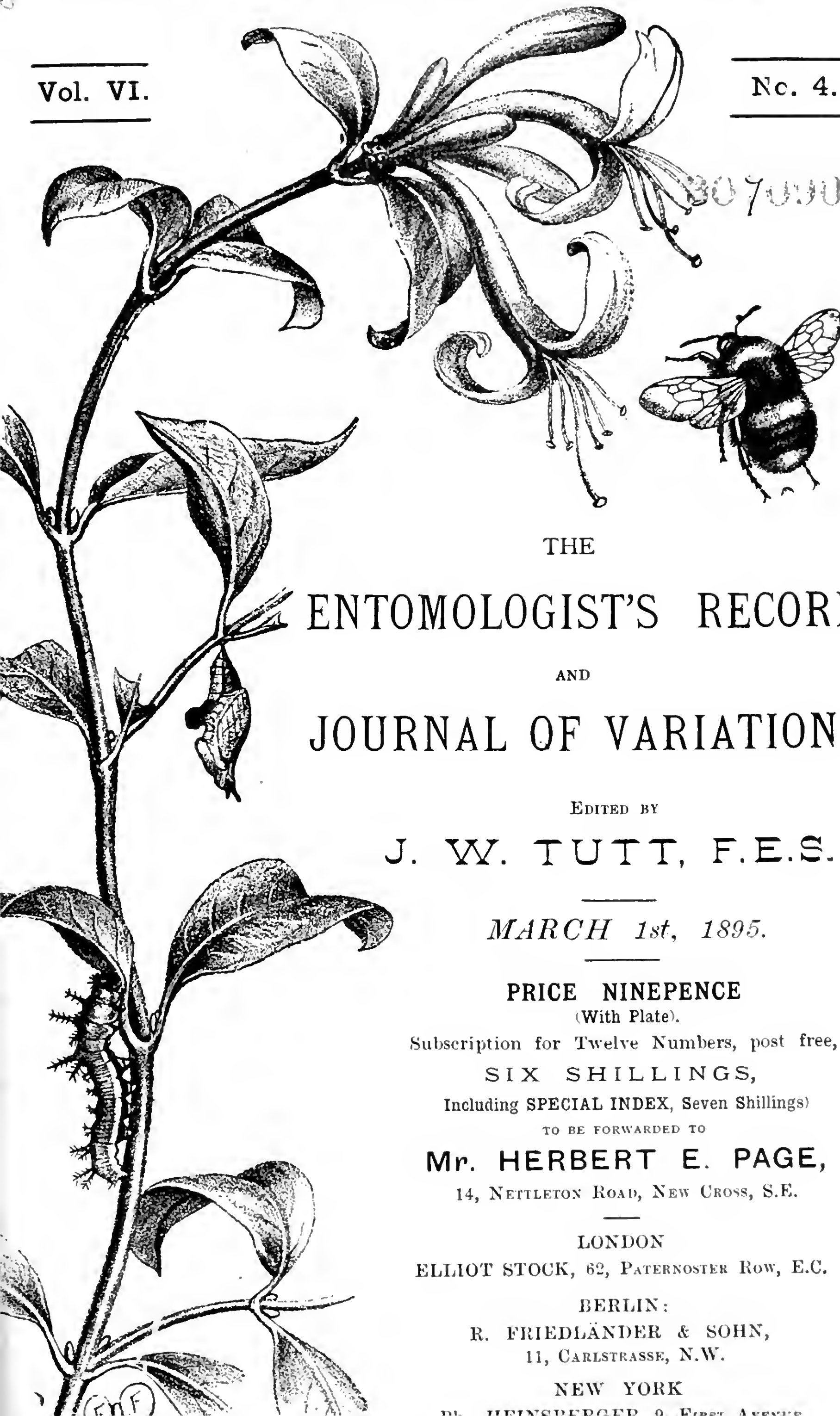

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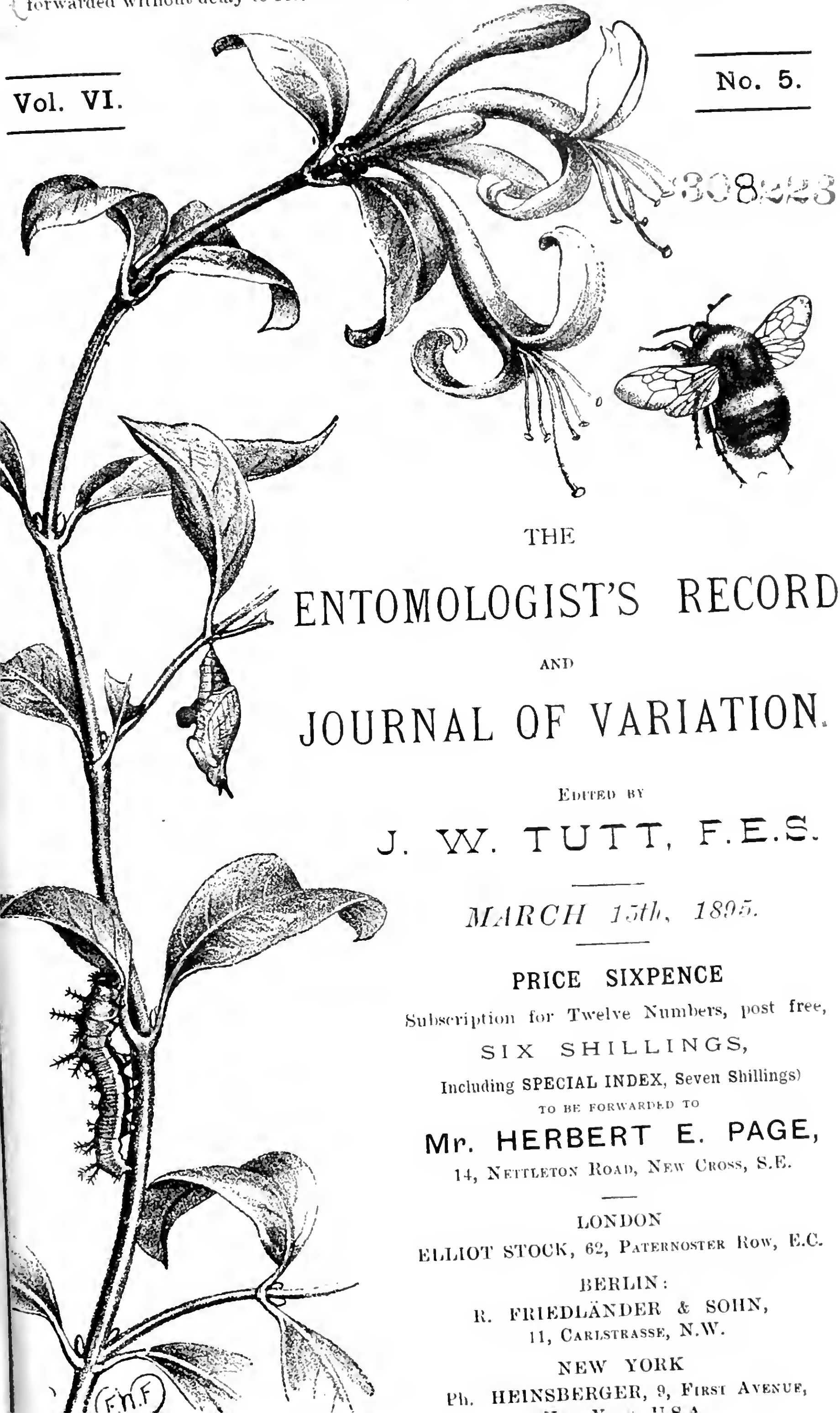

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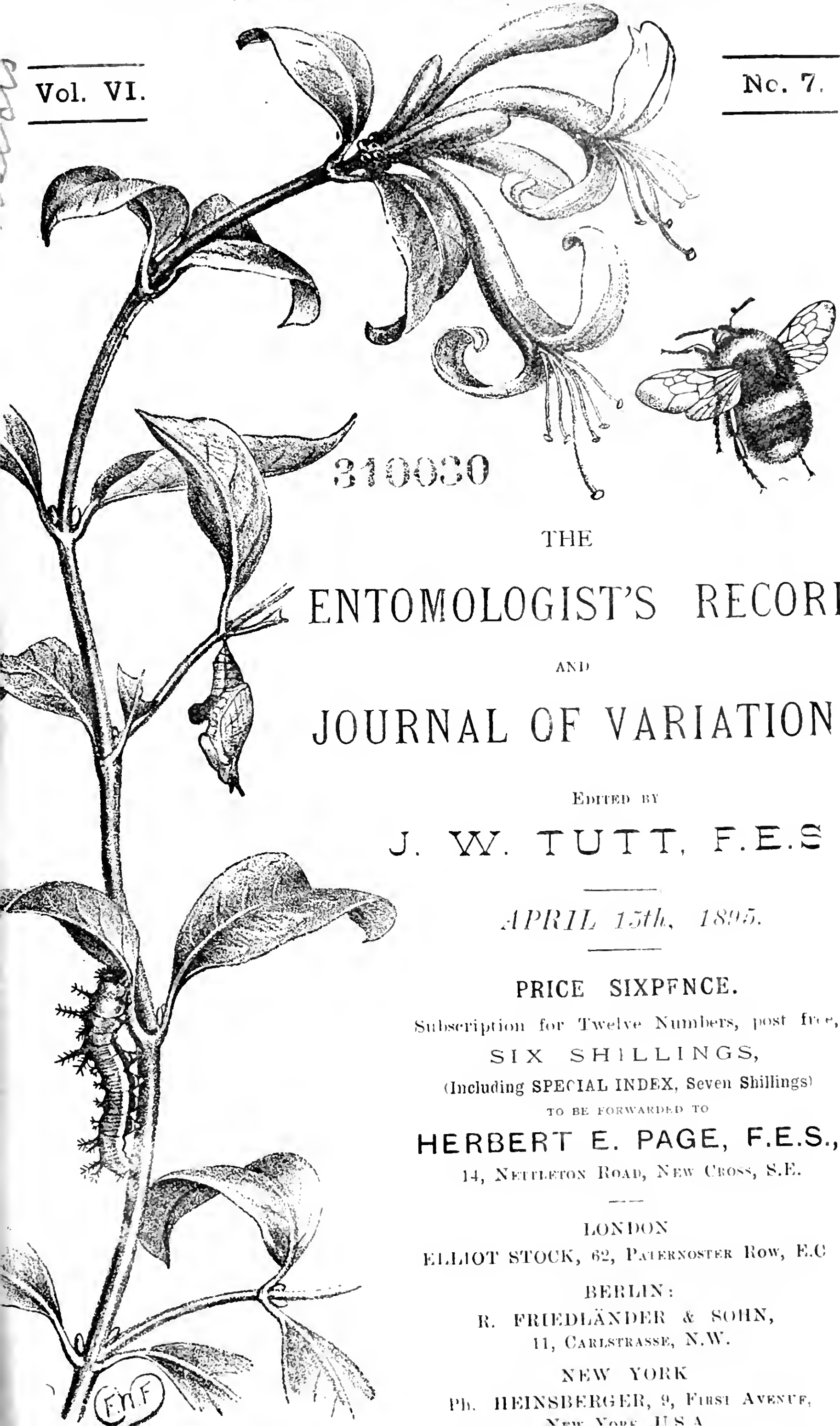

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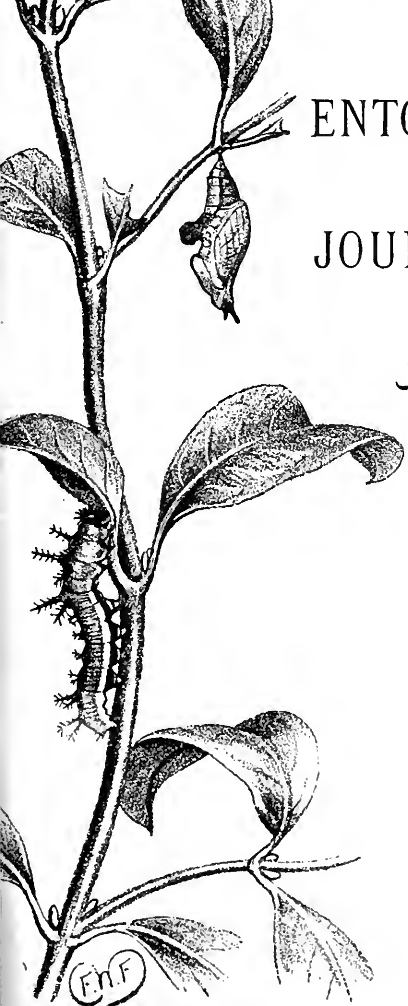

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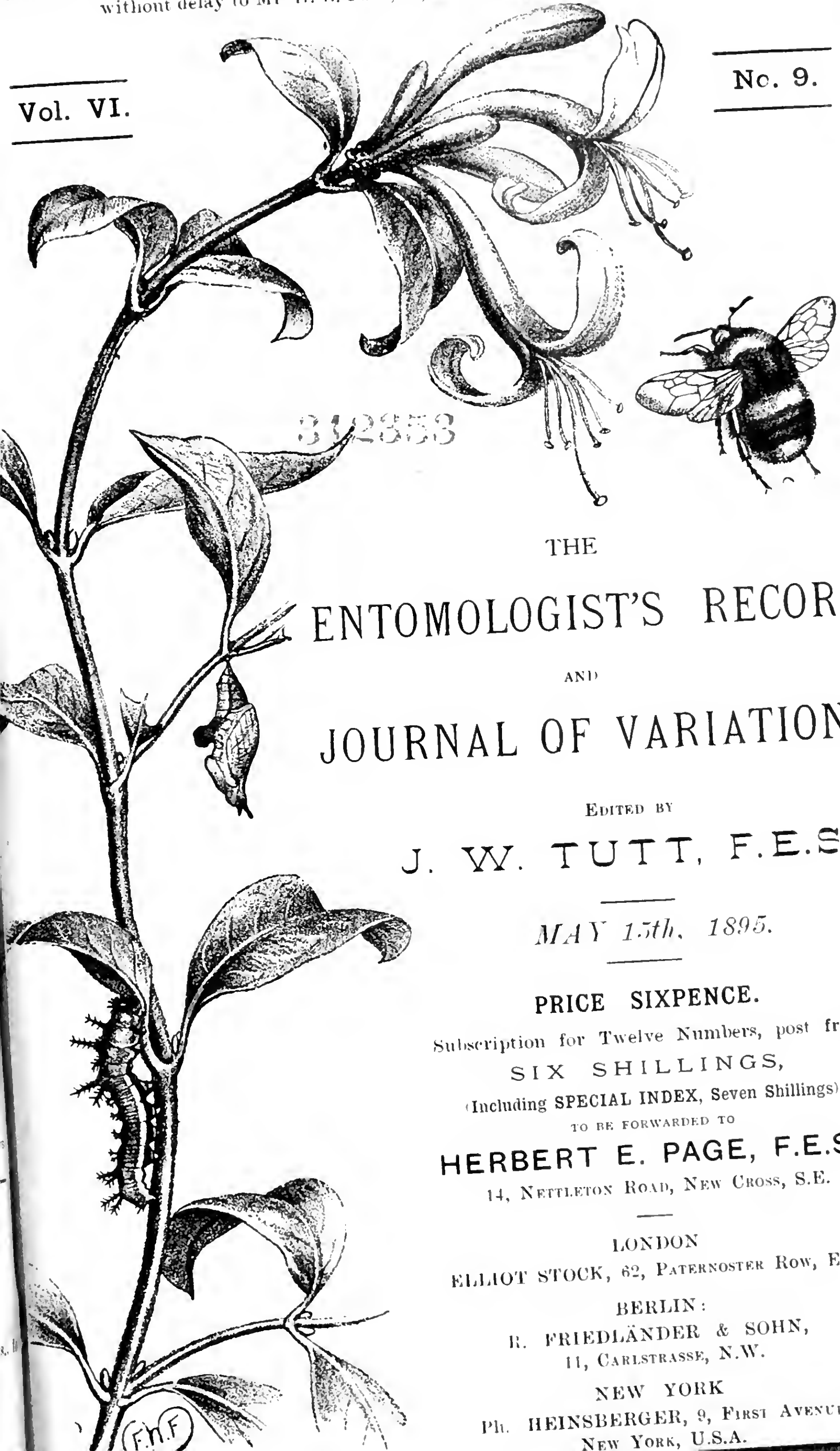

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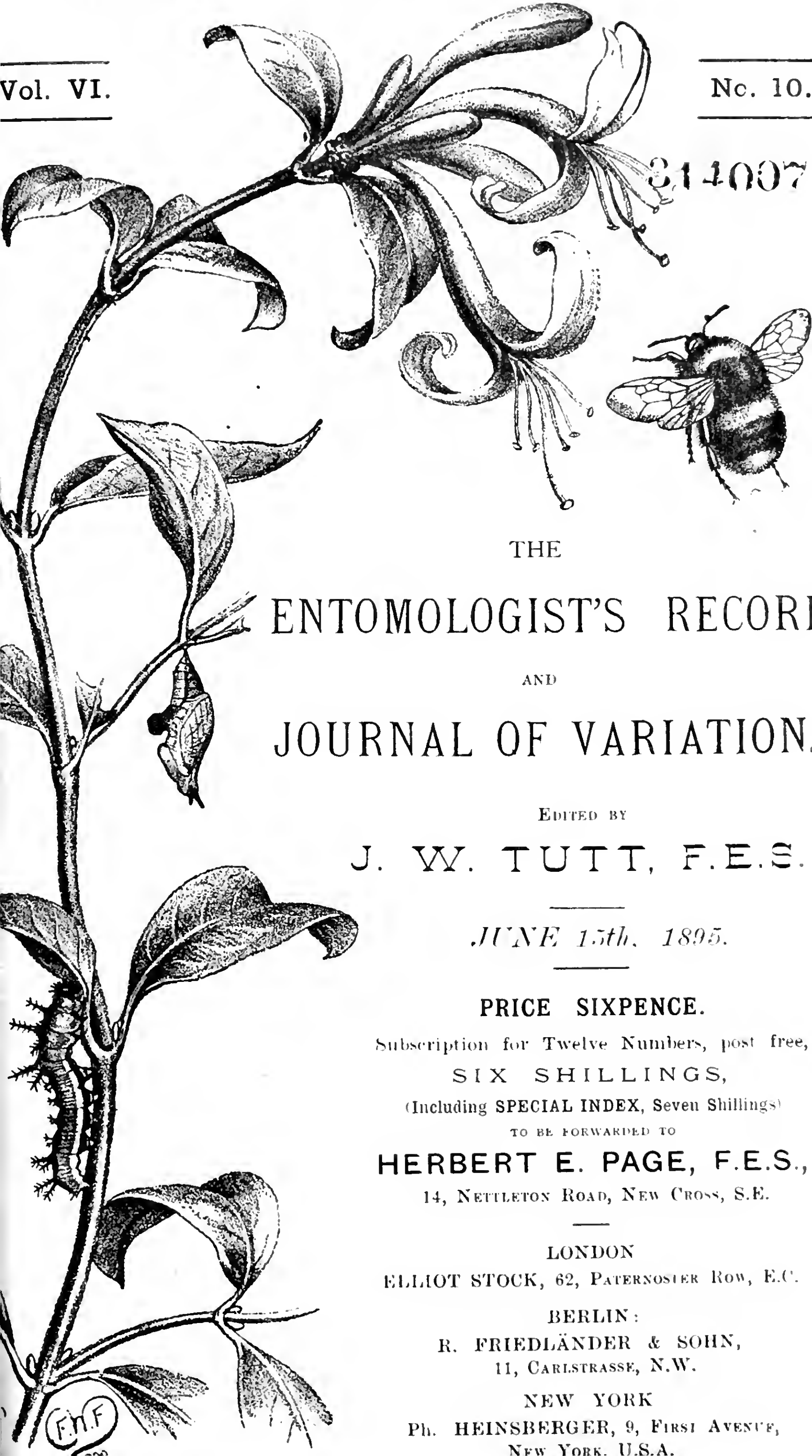

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Reprints of Articles or Notes (long or short) appearing in this Magazine can be arranged for by Authors at a very low price, on application to Mr. H. E. Page, F.E.S., 14, Nettleton Road, New Cross, S.E.

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Subscribers are kindly requested to observe that subscriptions to *The Entomologist's Record, &c.* are payable in advance. Those for Vol. VI. (which should, if possible, include an extra shilling for the Special Index to Vol. VI. to save trouble) is SIX SHILLINGS (including Special Index to Vol. VI. SEVEN SHILLINGS), must be sent to Mr. H. E. PAGE, 14, Nettleton Road, New Cross, S.E. Cheques and Postal Orders should be made payable to J. W. TUTT.

ADVERTISEMENTS of Books and Insects for Sale will be inserted at a minimum charge of 2s. 6d. (for four lines). Longer Advertisements in proportion. A reduction made for a series. Particulars of Mr. H. E. PAGE, 14, Nettleton Road, New Cross S.E.

Subscribers who change their addresses must report the same to Mr. H. E. PAGE, 14, Nettleton Road, New Cross, S.E., otherwise their magazines will probably be delayed.

EXCHANGE.

[EXCHANGES, which should consist only of the specific names of Duplicates and Desiderata, are inserted for SUBSCRIBERS without charge so long as there is available space, but they **MUST NOT** be written on Post or Letter Cards, the inconvenience arising from which is very great. No exact limit is placed on the length of lists of *Duplicates*, but lists of *Desiderata* should be as short as possible. Entomological Books wanted may also be inserted in this column.]

[The Editor wishes to state that the publication of Exchanges, Advertisements, etc., in this Magazine, is in no way to be taken as a guarantee of the authenticity, good condition, &c., of the specimens. This Notice is not intended to throw doubt upon the *bona fides* of Advertisers, etc., but to free the Editor from responsibility, should the privilege be abused.] *Marked * are bred.* N.B.—Exchange Lists addressed to J. W. TUTT, Westcombe Hill, S.E., must be received before the 6th for publication on the 15th, and before the 20th for publication on the 1st.

EXCHANGE BASKETS.—Forwarded :—June 1, No.1.—Messrs. Norgate, &c. Feb. 25, No. 2.—Will be detained until end of August. April 6, No. 3.—Messrs. Thornhill, Sinclair, Bowles, Christy, Norgate, Robinson, Burrows, Moberly, Finlay, King. Mar. 18, No. 5.—Messrs. Mason, McClean, Whittle, Fenn, Horne, Atmore, Richardson, King, Corbett, Finlay. April 6, No. 6.—Will be detained until end of August. Jan. 25th, No. 7.—Messrs. Mason, Riding, Dutton, Robson, Jones, Fox, Fenn, Webb, Robertson, Richardson. [Who has this basket ?] April 2, No. 8.—Will be detained until end of August. [It is useless for members to write to me about delays. When a basket is delayed the member who should have it, should write to his predecessor, and so on until the offender is brought up to scratch. Members who wish to be left out for a round owing to absence fromhome, etc., must write to their predecessors in above lists.—*J. W. T.*]. Members should also acquaint themselves with changes of address for last month and this.

EXCHANGE BASKETS.—Mr. King to be missed until September.

Duplicates.—Cardamines, Io, Atalanta, Cardui, Adonis, Corydon, Alsus, Argiolus, Linea, Lineola, Statices, Lonicerae, Mendica, Hispidaria, Crepuscularia, Biundularia, Omicronaria, Aversata, Pulveraria, Plumaria, Gilvaria, Leucophearia, Aescularia, Multistrigaria, Juniperata, Propugnata, Dubitata, Rhamnata, all in fine condition, well set, on black pins. *Desiderata.*—Very numerous.—*T. W. Jackson, 5½, St. John's Lane, Clerkenwell.*

Duplicates.—Healthy Pupa of G. flavago. Imagines: Monacha* (New Forest), Argiolus, Rhamni, Gothica, Capsincola,* Chenopodii, Lithoriza, Silago, Statices, Rubiginata, on black pins. *Desiderata.*—Numerous.—*Colin Murray, 47, Water Lane, Stratford, Essex.*

Duplicates.—Orbicularia,* Nanata,* Punctulata, Ocellatus,* Dromedarius,* Erosaria,* and Fuscantaria.* Pupæ: Populeti and Fuscantaria, latter very dark form. *Desiderata.*—Pupa of Fuscantaria from very light parents: Imagines of Roboraria, Duplaris, Ridens, &c.—*S. Walker*, 23, *Portland Street, York.*

Duplicates.—Pupæ: Betulae and T. crataegi. *Desiderata.*—Fluctuosa, Ocularis, Flavicornis, Ridens, Tridens, Rumicis, Auricoma, Menyanthidis, Myricae, Turca, Littoralis, Putrescens, Pudorina, Straminea, Phragmitidis, and many others.—*Dover V. Edgell*, 5, *Albert Road, Bognor.*

Duplicates.—C-album,* Adonis, Tipuliforme, Bifida,* Cucullina,* Carmelita,* Dictæa,* Anachoreta* (British), Curtula,* Dromedarius,* Alni,* Australis, Valligera, Xerampelina, Affinis,* Vetusta, Lunaria,* Zonaria,* Notata, Taminata, Dodoneata, Hexapterata, &c., &c. *Desiderata.*—Arion, Apiformis, S. urticæ, Chaonia, Agathina, Cæsia, Retusa, Occulta, Hispidaria (male), Rubricata, Straminata, Griseata and many others.—*C. Fenn, Eversden House, Burnt Ash Hill, Lee, Kent.*

Duplicates.—Continental Butterflies and Moths. *Desiderata.*—Almost any British species.—*Ludwig Endres, Nürnberg, Maxfeldstrasse* 34; *Germany.*

Duplicates.—Sinapis, Umbratica, Potatoria,* Aprilina,* T. crataegi,* Wavaria,* and others in fine condition, also Pupæ of Lanestris. *Desiderata.*—Pruni, W-album, Epiphron, etc.—*Wm. Foddy, Wolverton Road, Stony Stratford.*

Duplicates.—E. tenuiata* (black pins). *Desiderata.*—Consignata, Succenturiata, Subumbrata, Pernotata, Plumbeolata, Pygmæata, Egenata, Jasioneata, Trisignaria, Virgaureata, Valerianata, Irriguata, Innotata, Constrictata, Expallidata, Subciliata, Dodoneata, Coronata, types or in numbers.—*J. P. Mutch, 359, Hornsey Rd., London, N.*

Duplicates.—Edusa, A. crataegi, Lineola, Pygmaeola (type form), Dominula, Plantaginis, Lucernea, Pastinum, Stratarià, Dealbata, Carnella, Tages, Malvæ, Bellargus, Loniceræ, Taminata, Ornata, Strigillaria, Remutata, Candidata, Mi, Glyphica, Ænea, &c. *Desiderata.*—Carpophaga, Conspersa, Obscuraria, Biundularia (dark), Crepuscularia, Cerago vars., Obfuscata, Auroraria, Notata, Belgiaria, Hexapterata, Progemmaria (dark), &c.—*J. W. Tutt, Westcombe Hill, S.E.*

Duplicates.—A few Testudo. *Desiderata.*—Semibrunnea, Absinthii, Lychnitis, Chryson, Occulta, Chaonia, Cæsia, and other local species.—*J. W. Tutt, Westcombe Hill, S.E.*

Desiderata.—Assistance with the Coleophora in any stage during the season. Will do my best in return.—*Hy. J. Turner*, 13, *Drakefell Road, St. Catherine's Park, S.E.*

Duplicates.—Pupæ: Opima, Croceago. Larvæ: Conspersa (Irish). Imagines: Croceago,* C-album,* Ulmata, Edusa, &c. *Desiderata.*—Larvæ or Pupæ: Fuscantaria, Erosaria, Abruptaria, Ridens, Auricoma, Flavicincta, Retusa, Diffinis, Affinis, Suspecta, Furva, Ophiogramma, Ravida, Rubiginea, Occulta.—*Col. Partridge, Enniskillen.*

Desiderata.—During season a good batch of ova or healthy larvæ or pupæ of G. c-album; also healthy pupæ of M. artemis. Will do my utmost in return.—*H. E. Page*, 14, *Nettleton Road, New Cross, S.E.*

Duplicates.—A few Argentine Lepidoptera in papers (Province of Sta. Fé). *Desiderata.*—Many British species.—*J. H. D. Beales, West Woodhay Rectory, Newbury, Berks.*

Duplicates.—North American Lepidoptera—Papilio, Argynnis, Colias, Polyphemus, Cecropia, &c. *Desiderata.*—Exotics of all kinds, and European Noctuæ. Send list of duplicates or for list of desiderata.—*Chas. S. Westcott, Holmesbury, Philadelphia, Pa., U.S.A.*

Duplicates.—Luna, Angulifera, Imperialis, Regalis, &c., set specimens; the rarer pupæ, as Angulifera, Luna, &c.; many papered lepidoptera in Noctuidæ, Bombycidæ, Geometridæ, &c. Exchanged for Cocoons of Actias, Isabella, and other rare foreign moths.—*Emily L. Morton, Newburgh, New York (New Windsor Delivery).*

NOTICE.—All communications received and accepted will be printed as soon as space permits.—ED.

MEETINGS OF SOCIETIES.

The City of London Entomological and Natural History Society, London Institution, Finsbury Circus, E.C.—The first and third Tuesdays in the month, at 7.30 p.m. Papers and Notes at every Meeting. Non-members cordially invited.

The South London Entomological and Natural History Society, Hibernia Chambers, London Bridge.—The second and fourth Thursdays in each month, at 8 p.m. Papers are promised by Messrs. Billups, Tutt, Robson, Step, Mansbridge, South, Hewett, etc.

Entomological Society of London, 11, Chandos Street, Cavendish Square, W. Wednesday, at 8 p.m. October 2nd, 16th; November 6th; December 4th; January 15th, 1896. Annual Meeting.

1895