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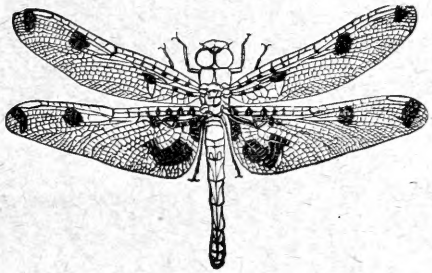

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Edited by William Saunders,

London, Ontario,

ASSISTED BY

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NOTES ON LYCAENA PSEUDARGIOLUS AND ITS LARVAL HISTORY.

BY W. H. EDWARDS, COALBURGH, W. VA.

On one of the last days of June, 1877, I observed a female *pseudargiolus* hovering about a flower-stalk of *Cimicifuga racemosa*, and it occurred to me that here might be the food plant of the summer brood of this butterfly, which I had for years been in search of. And thereupon I captured this female and confined her in a muslin bag upon one of the stalks. Two days after I found several eggs and also young larvæ, which last must have come from eggs laid some days before. This led me to examine other stalks, and I found quite a large number of both eggs and larvæ. The plant is called hereabouts "rattle-weed," and grows abundantly in the edges of the woods throughout this region. It sends up a stalk, sometimes branching, four or five feet, terminating in a spike or spikes, six to ten inches long, of round, greenish-white buds, which stand upon short stems and are arranged in rows about the stalk, diminishing in size till they reach the pointed top. The lower buds, when about the size of a pea, open first, and the flowering proceeds gradually up the spike, so that buds are found through a period of from four to six weeks. The flowers exhale an intensely sweet odor. The larva of *pseudargiolus*, during its younger stages, is white and so near the color of these buds that they are well protected and difficult to find. In the later stages it may be white or greenish, and often there are a few black or brown patches irregularly scattered over the surface. When mature it is one-half inch long, and is onisciform, like all Lycaenid larvæ. The head is very small and is placed on the end of a long green neck, which, at the junction, is of the diameter of the head, but gradually enlarges and seems to be fixed at the extreme hinder part of the next (or second) segment, which segment is hollowed out to form a sheath for it. In the last larval stages the top of this segment is elevated and transversely compressed, and leans forward, shielding

the head as the larva moves about. When at rest the neck and head are wholly withdrawn, and as the former, when fully extended, is considerably longer than the depth of the second segment, it must possess much elasticity.* The larva feeds on the inner part of the bud, and to get at this cuts away the surface on one side till a hole is made just big enough to admit its head; and as it feeds the second segment is pressed hard against the bud so as to permit the utmost elongation of the neck. Thus it is enabled to eat out the contents of the bud, and only desists when there remains but the empty shell. When so engaged the anterior segments are curved up and the others rest on the stalk of the plant. But very small larvæ rest wholly on the bud, curving about it. I have not seen

* NOTE.—In a recent paper by Mr. Scudder, "On the Classification of Butterflies with special reference to the position of the Equites or Swallowtails," Trans. Am. Ent. Soc., vi., 69, 1877, the special object of which is to argue for the degradation of the Papilioninæ, I find the following lines: "The Equites and Ephori" (by this last obsolete appellation the uninitiated may understand some division which includes the Lycaenidæ) . . . "*are closely related to each other and disagree with all other groups in the retractility of the head of the caterpillar.*" This sweeping assertion is fortified by a quotation thus: "I do not know that attention has ever been drawn to this feature in the caterpillars of Equites since the time of Denis and Schiffermuller, who say, Syst. Verz. Schmett. Wien., 161, 1775, 'When at rest the head is nearly half concealed by the extended epidermis of the first body segment, and can be compared with nothing in other butterfly caterpillars, excepting the complete retractility of the head in Lycaenids.'" I observe that the authors quoted by Mr. Scudder do not say that the head is retractile, but that it lies "nearly half concealed by the extended epidermis of the next segment." There is nothing that can properly be called retractility of the head in any *Papilio* larva ever bred by me, and this will cover *ajax, troilus, asterias, turnus, cresphontes* and *philenor.* The head of *Lycaena* pushes out like the upper joint of a microscope and it is as completely retractile as the head of a turtle. The head of *Papilio* is partly covered by the extended epidermis of the next segment, which forms a sort of collar, and this segment is unusually broad as compared with larvæ of other families, probably in order to afford room for the tentacles and muscular apparatus connected with them. As the larva feeds, the head has a vertical movement, and when the jaws are raised, the top of the head is turned down a little into the collar. But as to any ability in *Papilio* to push out and draw in its head beyond that of any species of the Nymphalidæ, for example, it does not exist. A caterpillar of *Argynnis* will rest on its hinder legs and extend its body fifty per cent. beyond the length it assumes when at rest, and unless its joints were cast iron, some power of extension must belong to every jointed creature; and the neck of the caterpillar, which is nothing but the connection between the first and second segments, stretches just as the rest of its body stretches, perhaps a little more, but in no different manner. That is another thing from "retractility." One might as well say that a man's head is retractile when he wears a high shirt collar.

one of the larvæ on this plant eating an opened flower, but they destroy the buds extensively, and on examining any of the spikes many buds will be found drilled, though often no larva is seen upon it. This disappearance of the larva I attribute principally to spiders, as I found many of them on the plants.

I very soon noticed that ants also frequented the spikes and supposed that the honey-sweet flowers drew them, but presently saw an ant running up and down the back of one of the larvæ, drumming and gesticulating with its antennæ, and was surprised to find that the larva, though feeding, did not seem in the least disturbed at the treatment, neither withdrawing its head from the bud nor wincing in the body. It evidently knew well who was treating it so familiarly. Had it been touched by an ichneumon fly or had such an insect approached it nearly without touching, it would have displayed alarm instantly. A little farther search showed other ants, and sometimes several of them, busy about other larvæ, running from one to another on different parts of the spike and always repeating the same drumming motions, stopping often to lick the surface, as it seemed to me, and the presence of ants became a sure indication of larvæ and saved me much trouble in searching for the latter.

The next day I went to the wood with my hand glass and watched for a long time to see what the ants sought. The first day I had seen two species of ants engaged, each of medium size, but I now found a third and very small species operating in the same manner, and in one case six of these were busy over one larva. But the movements of all the species were similar. They ran up and down and across the bodies of the larvæ, working their antennae violently, keeping their mandibles close to the surface, which they often stopped for an instant to lick. The whole upper side of this larva is covered with little glassy stellar processes, five or six rayed, scarcely raised, and from the centre of each springs a short filamentous spine. Where the surface is white these processes are white, but on the dark spots they are dark, and on these last they seemed to be less regularly stellate. The ants attended most diligently to the last two or three segments, and especially to the back of the 11th, but they certainly licked the surface at the junction of these segments and elsewhere along the body towards the head. I thought there might be some exudation from the surface, and perhaps from the stellar processes, as I saw no special organs for excreting.

Some of these larvae I sent to Mr. Lintner, at Albany, N. Y., asking

him to subject them to a more powerful glass than any I had, and give me the result. He presently (10th July) wrote: "Mr. Peck and myself have both carefully examined the larvae for the gland which you thought might exist on the abdomen (11th segment), but we find none. . . But why did you not speak of the two processes near the hind end of the body and suggest that these might be secretory organs? If the ants really obtain some sweet matter from the larvæ, then these are the organs through which it is emitted. They could hardly have escaped your notice, as they are visible to the naked eye, and distinctly under the magnifyer. They are two short cylindrical projections, of perhaps twice the length of their diameter, giving out at their tops twenty or more barbed hairs. I could not determine whether these hairs covered the entire top, but I rather thought that they proceeded from a fissure extending across it, which perhaps could be dilated or contracted at will."

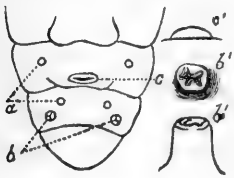
On reading this I at once made an excursion for more larvæ (now 13th July, and the flowers fast disappearing), and was fortunate in finding half a dozen. I also captured two of the ants and confined them with larvæ in a glass; so kept them for two days, examining them repeatedly. The ants were not restive under confinement, but devoted themselves to the larvae, being almost all this time near them, going from one to another, at intervals operating after the manner before described. But at the end of the second day, getting impatient at the decrease or withholding of the object they sought, and making no allowance for the deficient food and untoward circumstances of the larvae, they began viciously to bite and mangle them, and I was forced to conclude my observations and save any unhurt subjects in alcohol. All this time I was unable to discover the organs to which Mr. Lintner had called my attention. I was more certain, however, that whatever the ants were after came from the last three segments, and they constantly returned to the 11th. I had to regret that my attention had not been called to the whole matter a few weeks earlier.

But I sent one of the larvae obtained 13th inst. to Mr. Lintner, and he wrote me thus on the 16th: "The larva came safely, but has since died from want of proper food. We could not find the organs on it of which I wrote you. They were not visible. After its death I discovered one, and by means of pressure disclosed the other. In the latter the armature of hairs was not thrown out, but I could discover them within the organ. I think they will prove to be excretive."

I had a large number of chrysalids from the larvae obtained, and at intervals a single butterfly would emerge. Thus one male 19th Aug., after about thirty days in chrysalis. Sept. 1st, one male; and during my absence from home, some time between 3rd Sept. and 20th, one female emerged, and these were all. The other chrysalids will give butterflies next spring. During the period between the forming of the chrysalids and 1st September I occasionally saw a few examples of the butterfly on the wing, one here and one there, but there certainly was no regular brood subsequent to July. And all the butterflies seen were smaller than those of June, and corresponded in this respect with those that emerged in my boxes. Such of the females as appeared in September were just in time for the fall food plant of the species, *Actinomeris squarrosa*, which begins to bloom then. I have formerly related the discovery of the larvae of *pseudargiolus* on the flower heads of this plant by Mr. T. L. Mead, and that the butterflies which emerged in the spring from the chrysalids of *pseudargiolus* were proved to be *violacea;* CAN. ENT. vii., p. 81. This fall I was absent till 20th Sept., and until the few plants of *Actinomeris squarrosa* known to me and near at hand were nearly or quite out of bloom, and I failed to find any of the larvae. It is true that in confinement they will eat the flowers of *Actinomeris helianthoides*, an excessively common plant here, but it would be useless to search on this for the larvae because it is so common, and I am confident they always prefer the other when to be had. But 12th October I chanced to be some miles away from home and to find on the edge of a corn-field several plants of *squarrosa* in full bloom. These I examined one by one till I found twelve larvae in various stages up to last. It is worth notice that whereas the summer larvae, feeding on *Cimicifuga*, are white and of the color of their food, in the fall, feeding on a yellow flower, they are dusky and green. I watched carefully for ants and presently had the satisfaction of seeing one come across the flower head to one of the largest larvae. It manipulated it for a moment and then departed, and seemed to me to have expected something from the larva and to have gone off disappointed. This *Actinomeris* is as bitter as the summer plant is sweet, and it is less likely that the larvae living on such food would exude or secrete saccharine matter than in the other case. I immediately sent the largest larva to Dr. Hagen, and in due time received a card with his reply: "Dr. Mack found directly three secretory organs." The next day a letter, thus: "I have examined carefully your larvæ, and some in alcohol of *Lycaena argus* and *corydon*. All

have the organs alike. On the penultimate segment you find outside and behind the stigmata two large white spots, each one of which evaginates a white membranous tube, just like the finger of a glove, the top of which is not entirely drawn out. I have seen the tube frequently, and if I blow a little the tube is invaginated instantly. On the antepenultimate segment is a larger and transversal opening behind and between the stigmata near the apical border. It looks like a closed mouth with its lips, but I have not seen anything protruding from it. But in an alcoholic larva of *argus* I saw an ovoid evagination." Recently I sent Dr. Hagen mature larvæ of *comyntas* in alcohol, and he writes: "I was able to ascertain exactly the same parts and in same situations as in *pseudargiolus*."* Dr. Hagen also referred me to a paper by M. Gueneé, Ann. Soc. Ent. de France, ser. iv., vol. 7, 1867, pp. 696–7, and plate 13, in which are described and figured similar organs in *Lyc. baetica*. Gueneé relates that while observing the larva of *baetica*, he noticed two openings altogether like those of the stigmata and nearly of same size. At first he thought they were superfluous stigmata, and puzzled himself with conjecturing the object of them; but as he turned the caterpillar about in order to see the partings of these openings which seemed to be different from the stigmata, the larva, which this handling disturbed, suddenly made to leap out of these holes a peculiar body which he cannot compare to anything better than to the tentacles which certain polypi put forth at will. "This is a soft, cylindrical organ, the extremity of which is furnished with little fleshy points resembling hairs, some standing upright, some radiating from a point on the summit. This singular object placed under the highest power of the microscope, these apparent hairs are seen to be long tentacles and themselves bristle with fleshy spines. Those at the circumference

* The accompanying figure represents the last segments of *pseudargiolus* larva, and the position of these organs:



a—stigmata on 11th and 12th segments; *b*—spots resembling stigmata on 12th segment; b^1—processes issuing therefrom; *c*—opening on 11th segment; c^1—ovoid membrane.

The processes b^1 are but partly protruded and as Dr. Mack saw them.

are pretty regularly arranged, and sometimes lie flat on the cylinder (probably when they have just emerged from the opening, or are about to return), sometimes stand out in a threatening manner. But it is on the summit that these tentacles are most numerous, piled up, lying one upon another and in all directions, so that it is impossible to count them. The caterpillar has the power of protruding these organs at its will, either one alone or both together. It throws them out like the tentacles of *Papilio* or the horns of snails. Sometimes it shows but half their length, and then the tentacles expand but little or none at all; sometimes it projects them fully, making the tentacles radiate in all directions. Most often it allows itself to be handled, tickled, pricked, without exposing them, which seems to exclude the idea that these organs are means of defence or of intimidation. . . . The observer will readily cause them to appear by pressing the larva from head to anus.

"But this is not all, and our caterpillar presents another singularity. At the summit of the 10th segment" (*i. e.*, 11th, counting the head as first) "is found still another opening, this time unique, placed transversely and surrounded by a raised pad, about which the granulations which cover the body of the caterpillar become particularly dense. From the middle of this opening (boutonnière, button-hole), comes forth, at the will of the caterpillar, a sort of transparent, hemispherical vesicle, which gives escape to a fluid sufficiently abundant to form a good sized drop, which reproduces itself when it is absorbed. The caterpillar only secretes this fluid when it is disturbed, imitating in this respect *cucullia* and many other larvae which disgorge by the mouth a colored fluid, doubtless with the intention of driving away their enemies. As to the end which nature proposes by this exceptional structure, it is not easy to divine it. The explanations which one has imagined in some analogous circumstances appear to me too forced that I should expose myself in risking new ones." The figures illustrating this description represent a cylindrical tube, bulbous toward the summit, and bristling with feathery-looking tentacles. This corresponds with Mr. Lintner's description of "barbed spines," and with a pen and ink sketch which he also sent me. But he represented the tube as wholly cylindrical, not at all bulbous, and there is probably a specific difference in this respect.

I learned from Mr. E. T. Cresson, to whom I had mentioned the facts observed in June, that Rev. H. C. McCook, of Philadelphia, had seen something of the same nature, and I wrote Mr. McCook to inquire. He

replied that he saw, last spring, a small green larva on the blossoms of *Cimicifuga racemosa* and a black ant attending it. "The ant directed strokes of its antennae upon the tail of the larva incessantly ; larva moved a little ; ant ran up and down and up other stems and returned ; strokes renewed upon the tail ; larva moves its head ; strokes directed toward the head ; larva moves round the stem ; ant off, and in a moment returns, with strokes." He observed this proceeding from 10 a. m. to 12 m., and adds : "I am at a loss to explain these strange manipulations. My first idea was that the ant was seeking to tempt the larva to loosen its hold upon the plant and then seize it for food. But I soon found that the purpose was at least friendly." The plant, it will be noticed, is the same as that fed on by *pseudargiolus* in Virginia.

It is clear, therefore, that the larvae of several species of *Lycaena* have one or more special excreting organs, and that one species at least is regularly attended by formicidians for the sake of the excreted fluid. And it is probable that the quantity of this and perhaps its attractiveness depends on the nature of the food plant. Also that all the organs are generally concealed. I was not able to distinguish them upon any living larva even after my attention was called to them, though I saw the mark on 11th segment, which proved to be one of the openings. I took those on 12th segment for stigmata, which they resembled. But in one larva now in alcohol I find the two tubes partly protruding and easily to be seen with the naked eye. And as the ants were eagerly licking the surface in the vicinity of these organs, as well as just at them, the fluid may escape without their protrusion and overflow the surface. That either of these organs is used for defence is not shown by any evidence, and, as M. Guenée intimates, the probability is all the other way. The secretion is attractive, not repulsive like that which poisons the air from the tentacles by the head of *Papilio*.* Whether

* In the paper "On the Classification," &c., Mr. Scudder supports his argument for degradation of Papilio by this discovery of M. Guenee. Mr. Wallace had claimed, and properly, that the possession of such a peculiar structure as the scent organ of Papilio larva, with tentacle, muscular apparatus, &c., for frightening away its enemies, is a mark of high development, and that its presence in one group and absence in every other is a proof of a very ancient origin and of very long-continued modification, Nat. Select. Am. Ed., 135. Mr. Scudder thus disposes of the whole matter : "*Extensive fleshy organs* do occur in other groups. Guenee discovered them *on the abdominal segments of certain blues*," &c. . . . "yet nobody on that account claims for them a high rank."

the secretion is confined to the opening on 11th segment, or is also given by the tubes on 12th, remains to be determined by farther observations.

I find no mention in any author accessible to me of ants attending lepidopterous larvae. Kirby & Spence (Longman, 1856), p. 336, say: "Not only the Aphides yield this repast to the ants, but also the Cocci, with whom they have recourse to similar manœuvres and with equal success; only in this case the movement of the antennae over their body may be compared to the thrill of the finger over the keys of a pianoforte." (This describes well the movements over our larva.) "Even beetles are occasionally made cows of by *Formica flava*, which keeps in its nest *Claviger faveolatus*, and obtains from the bristles terminating its elytra a gummy secretion which it uses for food," &c. And Mr. Belt, "Naturalist in Nicaragua," p. 227, describes the attending of larvae of leaf-hoppers by ants, but even this careful observer does not seem to have noticed the ants with lepidopterous larvæ.

The history of *pseudargiolus* in Virginia is this: In the early spring *violacea* appears, a very distinct form, and characterized by dimorphism in the female, some of that sex being blue, others black. The eggs laid by *violacea* give larvæ from which comes *pseudargiolus* last of May, but the food plant of such larvæ is not yet known—possibly *Cornus*. The female *pseudargiolus* lays eggs on *Cimicifuga racemosa*, and most of the resulting butterflies over-winter, to produce perhaps *violacea*, but also perhaps the typical *pseudargiolus* again (which of the two I hope to ascertain by March, 1878). But a small percentage, say five, of these chrysalids give butterflies at irregular intervals during the same year, at least as late as September, and the earliest of these, if I may judge by what I have seen in the field as well as by the results in my boxes this summer, are males, the females mostly if not wholly emerging latest. These butterflies are always smaller than the parents (the typical *pseudargiolus*), some not much, however, but nearly all considerably, and these last are nothing more nor less than what I named, described and figured (But. N. A., I, pl. 50) as *neglecta*. I cannot see any distinction between them and examples of *neglecta* from New York. Besides the difference in size there is usually but not always some in the shade of upper surface between these and *pseudargiolus*, and on the under side the marginal crescents and discal spots are usually but not always more decided than in the latter. The intermediate examples may be called small *pseudargiolus* or large *neglecta*. There is no regular second summer brood—that is, there are

but two regular annual broods of this species, the *violacea* of March and *pseudargiolus* of May. The individuals which chance to emerge in July, August and September are *neglecta*, and irregular. But their females lay eggs upon *Actinomeris squarrosa*, and the chrysalids then resulting give *violacea* the next spring. That is a peculiar history, and I know no other which runs parallel with it. In the case of *L. comyntas*, one brood succeeds another all the season and there are four or five of them here. And I have found none of the early chrysalids to over-winter. The chrysalis period in *comyntas* is very short, about eight days, whereas it is from thirty to sixty in case of *pseudargiolus* where the butterflies emerge the same season.*

The typical *pseudargiolus* is also found in Pennsylvania, but *neglecta* is most common there, and farther north to Canada, except in rare instances, this last is the only one. Mr. Scudder, in the paper referred to, ENT., viii., gives the history of *neglecta* in N. England, and it corresponds curiously with the history of *pseudargiolus* which I have related, though he derived it almost if not quite altogether from field observation of the butterfly: "The eggs are probably laid in the middle and latter end of June and most of the caterpillars become full grown in the early part of July; how long a time is passed in the chrysalis is unknown, but the earliest butterflies of the second brood appear about the first of July, and continue to emerge until the first of August . . . and in spite of their great delicacy these insects may still be seen in September; . . . probably the eggs are laid in August, the caterpillars attaining their growth in the latter part of September, and transforming to chrysalids before winter." I have no doubt this conjectural account is in the main a correct one, or in other words, that *neglecta* behaves at the north just as its other form and other self does here.

And I fully believe that *lucia* is nothing but a northern spring form of the same species—that is, it either occupies the place of *violacea* in some, or is a co-form with it in many, localities. I suggested the relation-

* Mr. Scudder, CAN. ENT., viii., 64, says: "Mr. Abbot, in Georgia, years ago raised *pseudargiolus* (or what he called *argiolus*) in March from caterpillars which went into chrysalis the last of April of the preceding year." I do not know where Mr. Scudder learned this, for it is not so stated in the Insects of Georgia. The text says that the caterpillar was found, and "the first change (*i. e.*, to chrysalis) took place on the 16th of June and the fly appeared nine days afterward."

ship between *lucia* and *neglecta* in my paper first referred to, ENT., vii., 82, and Mr. Scudder made the matter more probable by his relation of the history of these two forms or species, ENT., viii., 64, considering it possible that *lucia* was a boreal and colline form of *violacea*, but appearing a little earlier in the season. I have undoubted *lucia* in company with *violacea* from Anticosti; in same way, both forms from Maine; also from New York, and *lucia* grades into *violacea* unquestionably. From Colorado I have *lucia*, *violacea* and *neglecta*. In the account given in But. N. A. of *neglecta*, I find a statement which was not explainable at that time, but which the observations of this year make clear, namely, that "in June, 1866, at Coalburgh, *neglecta* appeared in large numbers, while I scarcely saw a dozen *pseudargiolus*, usually so abundant. In the following years (1867–1868) *neglecta* has again been rare in this district." Plainly enough, owing to insufficient food for the larvæ sprung from eggs of *violacea*, caused by an unpropitious spring, the butterflies were reduced in size, and while I could find few *pseudargiolus*, everywhere *neglecta* had taken its place. Being one and the same species, that is exactly what would occasionally take place, and it is to abundant food on the other hand and unusually favorable larval conditions that here and there to the northward a few typical *pseudargiolus* appear when all the others flying are *neglecta*. Now after writing these last lines, it occurred to me to look up my journals for 1866. I find therein that the season was late, the first examples of *violacea* being seen April 1st, whereas in other years I had found them from 10th to 15th March. On 4th April the mercury reached 90° and *violacea* is recorded as abundant. Immediately after which followed cold and wet (always disastrous to butterflies after extreme heat, which has caused them to emerge from chrysalis prematurely), and this bad weather lasted through April and most of May. Up to 10th June all butterflies are mentioned as being very scarce (because the early brood had been more or less destroyed by the cold). On 16th June, and again 28th June, I record that not a *pseudargiolus* had so far been seen that year, but that all which had appeared were *neglecta*. How, two years after, I came to state that a dozen *pseudargiolus* had been seen in 1866 I cannot now remember, but probably I then concluded that the larger and paler examples of what I first called *neglecta* were properly small *pseudargiolus*.

DESCRIPTION OF THE PREPARATORY STAGES OF L. PSEUDARGIOLUS.

EGG—Diameter, .02 inch; round, flat at base, flattened at top, the

micropyle depressed ; color delicate green, the surface covered with a white lace-work, the meshes mostly rectangular, with raised points at the angles. Duration of this stage 4 days.

YOUNG LARVA—Length, .04 inch ; onisciform, sub-cylindrical, flat beneath with retractile legs ; the dorsum high, rounded, smooth, shining ; color, pale greenish-white ; on either side of the medio-dorsal line a row of white clubbed hairs, one at the posterior end of each segment ; other similar hairs about base of body ; head very small, obovoid, black, retractile.

AFTER FIRST MOULT—Length, .1 inch ; nearly same shape, the dorsum sloping posteriorly from 4th segment ; the sides sloping ; the segments distinctly separated, rounded ; color, yellow-white or buff ; surface pubescent ; head as before.

AFTER SECOND MOULT—Length, .14 inch ; sub-cylindrical ; thickest at 2nd and 3rd segments, the dorsum sloping posteriorly ; segments well separated, rounded, the anterior edge of each on dorsum a little depressed ; the 2nd broadened at top and covering the head ; color yellow-white or buff ; surface velvety, with a few recurved hairs along dorsum, others straight at base of body ; the anterior edge of 2nd segment on dorsum fringed with rather longer and straight bristles.

AFTER THIRD MOULT—Length, .25 inch ; flattened at base, the dorsum elevated into a rounded ridge, sloping posteriorly ; the last segments flattened and 13 terminating roundly ; the sides excavated ; the 2nd segment compressed transversely, arched at top, bent forward ; color variable, some examples greenish-white, some sordid buff ; on middle of dorsum a dark vascular line ; the dorsum from 3 to 11 pale, and occupied by a series of sagittate spots, each truncated at the next segment ; the whole surface velvety ; head obovoid, dark brown.

AFTER FOURTH AND LAST MOULT—Length, .36 inch.

MATURE LARVA—Length, .5 inch. Nearly as at preceding stage ; onisciform, flattened at base ; the legs retractile ; the dorsum elevated into a rounded ridge which slopes back from 6th segment ; the sides deeply excavated, and on middle of each segment from 3 to 11 a vertical narrow depression ; the last segments flattened, the last of all terminating roundly, its sides narrowed and a little incurved ; the 2nd segment flattened, arched, bent nearly flat over the head ; the dorsal ridge is of a tubercular nature, standing on the body, and on each segment from 3 to

11 this ridge is distinct, cleft to the body ; color variable, some examples being white, some decidedly greenish ; many have the posterior slope of the 2nd segment black or dark brown ; some also have most of the dorsum dark brown, irregularly mottling the light ground ; some have only small brown patches disposed without rule on the dorsum, and mostly on the anterior segments ; the whole surface velvety ; this appearance is caused by minute stellate glossy processes, scarcely raised above the surface, only visible under a magnifyer, mostly six-rayed, and sending from the centre a concolored filamentous spine a little longer than the rays ; these stars are arranged in pretty regular rows, and are light except on the brown patches—there both star and spine is brown ; on the 11th segment, near posterior edge of dorsum, is a transverse slit, in a sub-ovoid spot, from which proceeds an ovoid membranous process ; and on 12, back of and between the stigmata, on either side is a mark like a stigma, but a little larger, from which proceeds a membranous tube, in form of a truncated cone, ending in a crown of feathery tentacles ; these three special organs are exposed or concealed at the will of the larva ; (similar openings are found in the two preceding stages of the larva, but less easily seen) ; head small, obovoid, dark brown, placed at the end of a long, pale-green, conical neck, which is retractile, both neck and head being covered by 2nd segment.

The foregoing descriptions are taken from the summer larvæ, feeding on flowers of *Cimicifuga racemosa*. The larvæ in the fall, feeding on flowers of *Actinomeris squarrosa*, differ much in color from the description after second moult, being generally in last two stages yellow-green and olive-green, the sides darkened, the dorsum lighter, and there is an absence of the brown patches seen in the summer larvæ ; the back of 2nd segment sometimes green, sometimes brown. On the dark shades of the sides the stellate processes are often pink.

Before changing to chrysalis the summer larvæ sometimes turn pink and from pink to brown, or become brown without the pink stage ; but others remain white, changing to sordid ; the body contracts to about .3 inch, and becomes rounded. Duration of larval stages 19 days.

CHRYSALIS—Length, .28 inch ; greatest breadth, .12 inch ; the ventral side straight, the dorsal rounded and evenly except for a very slight depression below the mesonotum ; both ends rounded ; the abdomen broadest ; color dark brown or yellow-brown, varying ; on dorsal part of abdomen on either side is a row of blackish dots, continued to

the mesonotum; some examples have the wing cases green tinted. Duration of this stage, in the few instances in which the butterfly emerges the same season, from 30 to 60 days, but most chrysalids pass the winter.

NOTES ON THE LARVA OF LYCAENA SCUDDERI.

BY THE EDITOR.

The announcement of the interesting discovery of honey tubes in the larvæ of *L. pseudargiolus*, and consequent attendance of ants, as detailed by Mr. W. H. Edwards in the present issue, brought to our mind the fact that we had observed ants attending the larvæ of *L. Scudderi* some ten years ago. We were under the impression that we had subsequently published a description of the larva and drawn attention to this fact of ant attendance, but on examination find that we omitted doing so, and take this early opportunity of giving the results of our observations in confirmation of this curious discovery by Mr. Edwards.

On the 22nd of July, 1867, we visited a locality where some three weeks previous *Lycaena Scudderi* had been very abundant, our object being to search for the larva of that species. After considerable effort we succeeded in finding a larva on the common blue lupin (*Lupinus perennis*), which afterwards proved to be that of *Scudderi*. This larva was feeding on the upper side of the leaf, and we were surprised at seeing several ants actively running about the leaf and repeatedly over the body of the caterpillar, without disturbing it in the least. The search being continued, several more larvæ were found, their discovery being made comparatively easy from the invariable presence of these active attendants, otherwise their color being so closely like that of the leaf, they would have been very difficult to find. We were unable then to account for the cause of the attendance of the ants, and for the placid behavior of the larvae under the circumstances. Doubtless this species in the larval state is furnished with similar secreting tubes to those described and figured by Mr. Edwards as occurring in *pseudargiolus*.

The following description of the larva was taken at the time:

Length half an inch; body somewhat onisciform, distinctly annulated.

Head very small, black and shining, and drawn within the second segment when at rest.

Body above dull green with a velvety appearance, occasioned by the presence of many short, fine, whitish hairs and minute dots of a brownish color, neither of which were plainly visible without a magnifyer. A dorsal stripe of a deeper shade of green margined with a faintly paler hue. Sides of body striped obliquely with lines of a slightly paler shade of green. A lateral cream-colored stripe close to under surface extending from the anterior portion of third segment backwards.

Under surface similar in color to upper, with a darker shade having a faintly bluish tinge along the middle; feet and prolegs tipped with pale brown.

One specimen became a chrysalis on the 28th of July, and produced the imago on the 8th of August.

MISCELLANEOUS MEMORANDA.

BY C. E. WORTHINGTON, CHICAGO, ILL.

Larva of *Arzama obliquata* Grote.—Found April 23rd, under the bark of a dead maple about three feet from the ground, where it had made for itself an oval cavity in the dust.

Head small and black; head and first four segments flattened above; 1st segment black, edged with light brown and with a light brown dorsal stripe; remaining segments dull olivaceous brown, slightly pubescent, and having the greasy appearance of an *Agrotis* larva. No dorsal stripe back of 1st segment; 1st and 2nd segments project laterally over stigmata; immediately below the stigmata on each side is a faint, narrow, brown stripe, below which the color is much lighter. Anal segment with a fleshy fold slightly resembling that of *Catocala crataegi.*

Length 2 inches. Diameter not taken, but is small in proportion.

Pupated April 27th, without spinning a cocoon. Pupa light reddish brown without markings, 1½ inches long and very slender. Imago—May 18th; ♂.

The situation in which the larva was found, the small head and general appearance indicate a subterraneous habit, and, indeed, aside from its extreme slenderness, the resemblance to some species of *Agrotis* is striking.

Larvæ of *Hemileuca maia*, May 30th, in considerable numbers on Willow. These larvæ are gregarious while young, but after the 3rd moult scatter, and deserting the willows, appear to eat anything that falls in their way. I have seen during the summer (July and August) individuals several miles from the marshes and upon almost every plant I can name. Imagoes abundant in October in the morning, but on every occasion, though hundreds might be taken before 12 o'clock, not one could be found after 1 o'clock.

Pupæ of *Smerinthus excaecatus* beneath willows. Imagoes in June. Much larger and more highly colored than in eastern examples.

S. modesta from larva found on Cottonwood.

August 6th—*Erebus odora* ♀ in the water closet of a business block in the heart of the city. The apparent fondness of many rare species of Lepidoptera for a fetid-odor leads me to suggest the experiment of sugaring a few trees apart from the others with ale and molasses, in which some assafœtida has been dissolved.

August and September—Larvæ of *Ennomus alniaria* abundant on maple. This larva evidently changes its color somewhat with different food, as these closely resemble the bark of this tree. Imagoes in Sept.

Larva of *Apatela americana* abundant in same locality, but later in the month to be found clinging to the twigs, completely honey-combed by some species of *Chalcis (?)*.

Larvæ of *Sphinx chersis*, *S. gordius* and *D. undulosa* in company on black ash.

September 20th–October 3rd.—Eight examples of *Macrosila 5-maculata* from larvae which pupated in July. My experience with *P. achemon* would apply to this species also, as I had nearly full-grown larvae this year before my over-wintering pupae had fairly begun to emerge. I am informed that perfect imagoes are usually taken here in July and late in September, but have never seen one in the spring.

Early in August I took a *Papilio asterias* ♀ with large blotches of a yellow fungus, as yet unidentified, on the wings. The growth mentioned by Mr. Aaron may be something of this nature.

DESCRIPTION OF A NEW DREPANODES.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

Notwithstanding the variability of *D. varius* Grote, of which species *D. sesquilinea* is stated by Dr. Packard to be the ordinary male form, there can be no doubt that a very interesting species from Maine (Prof. Fernald) and Massachusetts (Mr. Roland Thaxter) is distinct from any previously described. In this form the exterior line is *without* a costal angulation. It may be called

Drepanodes Fernaldi, n. s.

♀. Larger than the other species, light purplish brown. The two transverse lines composed of broken black lunules shaded with white. A black discal point on primaries. A median diffuse brown shade near the exterior line and continued on hind wings. The exterior line extends straight to costa near apices and is here not angulated; it is continued on hind wings, but merely as a white sub-lunulated line with black pointlets on the veins. Terminal space on fore wings shaded with brown. Fringes on both wings pale. Edge of secondaries brown. Beneath paler than above, sub-irrorate. A common white exterior lunulated line marked by black pointlets on the veins. Discal dots on both wings.

Expanse 31 mil. Two specimens examined, not differing in any way. The apices are acute, but not falcate. The costal edge is paler than the rest of the wing. The more brownish color and the peculiarities of the transverse line will at once distinguish this species. I am greatly indebted to Mr. Roland Thaxter for the type taken at Newtonville, Mass., June 16th, 1877.

A NEW HEPIALUS FROM NEW YORK.

BY A. R. GROTE, BUFFALO, N. Y.

Hepialus auratus, n. s.

This species is smaller and slighter than *argenteomaculatus*, and differs from any previously described from our territory by the gilded primaries, which are as brilliant as those of *Plusia verruca*. Dull lilac or pinkish fuscous. Fore wings falcate, with a fine brown line on submedian fold. Between the subcostal vein and submedian fold the wing is covered centrally with large patches of dead gold. There are two brown costal patches, between which are double pale lilac marks, the inceptions of the transverse lines, of which the outer beyond the outer brown patch is alone continuous, broad, irregular. Some dead gold patches about the discal mark, which is finely margined with brown, pyramidal, bright gilded. Three similar bright gilded, triangulate, brown-edged spots, form part of the subterminal line opposite the cell. Else the s. t. line is narrow and brownish, broadly margined by dead gold shading on either side. Hind wings pinkish fuscous with orange fringes. Beneath fuscous, without marks; external margin of primaries touched with orange; the short fringes shaded with orange on both wings.

Expanse 48 mil. Lewis Co., New York, July, Mr. W. W. Hill.

ENTOMOLOGICAL INDEX TO AGRICULTURAL REPORTS.

We have lately received through the kindness of the author, Professor Townend Glover, a most valuable publication entitled "Manuscript Notes from my Journal," being an Entomological index to the names, &c., of insects occurring in the annual agricultural reports published by the Department of Agriculture at Washington from 1854 to the present time, with a list of the vegetable and animal substances injured or destroyed by them.

This work is published in quarto form, and uniform in style with the previous works of the same author on Diptera, Hemiptera and Orthoptera, noticed in the earlier volumes of this journal. The first 77 pages is occupied with an alphabetical list of the names of the insects referred

to in the various reports, with brief explanatory references. Following this we have a list of insects to a greater or less degree beneficial by destroying noxious insects, a paragraph on other agencies referred to as useful in the destruction of insects, concluding with a list occupying 21 pages, also alphabetically arranged, of vegetable and animal substances injured or destroyed by insects.

The compilation of this work has been attended with much labor, and furnishes another evidence of the untiring industry of the author. It will prove an invaluable help to all who desire to consult the pages of these reports for information on Entomological subjects, and it is much to be regretted that the edition is not sufficiently large to make it accessible to all who may be interested in Entomology.

NOTE ON THE STRUCTURE OF NEPHOPTERYX ZIMMERMANI.

BY A. R. GROTE, BUFFALO, N. Y.

The following note on the structure of *Zimmermani* is taken from a MS. paper on the N. Am. *Phycidæ* which I am preparing for publication. I would be glad of more material in this group from any correspondents.

"*Pinipestis (sub-gen. nov.).*

Maxillary palpi alike in both sexes, concealed by the porrect labial palpi, which have the third article erect and exceed the front. Ocelli present. Male antennæ very slightly bent at base, where they show slight continuous scale-tufts; ciliate beneath. Fore wings with veins 4 and 5 running close together at base; these veins are seen to have a separate origin, 5 on the cross-vein close to 4, divaricating at one-third from base. Hind wings 8-veined; vein 5 running close to 4 at base, but separate and continuous with the discal cross-vein. Head behind with a thick transverse ridge of scales; clypeus with a bunch-like projection of scales centrally."

I have corrected my former statement as to vein 5, having made a fresh observation under a 1-inch objective. This correction will not allow of the species remaining under the sub-genus *Dioryctria* as defined by Heineman, and presumably establishes *Pin. Zimmermani* as distinct from the European *Dior. abietella*.

CORRESPONDENCE.

By this mail I send you a pair of *Nephopteryx Zimmermani* Grote. If I am not mistaken, they will interest you as a new and very destructive insect; and I think you are more interested in noxious insects than Entomologists generally are. There is scarcely a Pine more than 4 ft. high, on our grounds, that is not more or less affected by this borer.

I have found it on *Pinus strobus*, *P. rubra* or *resinosa*, *P. austriaca*, *P. sylvestris*, *P. cembra*, Corsican, Lofty Bothan and Russian Pines. *P. sylvestris* seems to suffer most, as the limbs, and often the main stem, are constantly breaking off. Only a few days ago one of our finest specimens of *P. strobus* (a tree over 30 ft. in height and almost perfect in shape) had about 6 ft. of the top broken off—the effects of this borer. I am in hopes that the small parasitic flies I found in the larva will soon get the upper hand, so as to keep them in check.

I have been after this borer for several years, but did not succeed in getting the perfect moth until the summer of 1876, and until then supposed they were only on *P. sylvestris*. CHAS. D. ZIMMERMAN.

571 Main St., Buffalo, N. Y., Dec. 26, 1877.

[The specimens so kindly sent by our esteemed correspondent reached us in good order and will prove a valuable addition to our collection, for which we tender our sincere thanks.—ED. C. E.]

May I suggest that the "seeming growth" on the eye of *Papilio philenor*, to which Mr. E. M. Aaron calls attention at p. 200, is probably the pollinia or pollen masses of one of the Orchidacea, objects which have before now puzzled unbotanical Entomologists. Of course, without seeing the things in question, I can only suggest this as a probable explanation. In Mr. Darwin's work on the "Fertilization of Orchids," as well as in the works of other authors on the same subject, will be found lists of the insects on whose proboscises (generally—or at least near that organ) pollinia have been noticed. Examples have also come under my own notice. Mr. Aaron should watch the butterflies, and if he finds them visiting any Orchidaceous flower, let him take a fine pin or grass stalk, and inserting it into some of these flowers, gently, and in the same manner in which the insect would insert its proboscis, the result will probably show him the way in which the apparent growths are deposited.

F. BUCHANAN WHITE, Perth, Scotland

No. 2.

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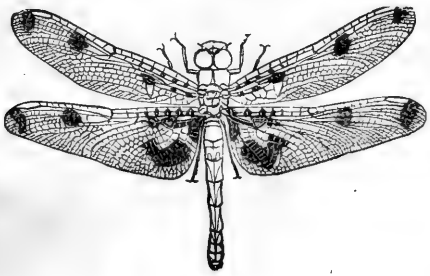

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OBSERVATIONS ON THE EGGS OF CLISIOCAMPA SYLVATICA AND AMERICANA.

BY THE EDITOR.

Some time during the month of October last we were informed by Mr. B. Gott, nurseryman of Arkona, Ont., that he had observed on cutting into clusters of the eggs of *Clisiocampa* that the larvæ were at that time fully formed, a fact he had discovered by the use of a magnifying lens. It was our intention to take an early opportunity of verifying this statement by examination of the eggs under higher powers of the microscope, but delayed doing so for want of time. During the latter part of November Mr. A Puddicombe, one of the members of our Society here, a careful observer and good microscopist, independently made the same discovery by cutting into clusters of these eggs with a sharp knife. He submitted the results of his observations at a meeting of the London Branch of the Entomological Society, held early in December, where the eggs were opened and examined under the microscope. We found the interior of the eggs perfectly dry, with a pearly lustre, the larvæ fully developed and only awaiting warmth before making their escape. When the upper end of the egg was removed, the larvæ would frequently push their heads out and move them actively about, occasionally crawling almost or entirely out of the shell. Examinations have thus since been frequently made with eggs both of *C. sylvatica* and *C. americana*. In several instances where the egg clusters have been kept in a warm room for a week or two, the larvæ, mistaking the warmth for that of spring, have eaten their way out of the shells, and finding no food, have died. These details, we think, are sufficient to establish the interesting fact that the larvæ of both these species mature early in the fall and hybernate inside the egg, waiting the warmth of spring before eating their way out.

Recently we devoted an evening to the microscopic examination of these egg clusters, having previously collected a number of them for this purpose. In many instances it was found that the glutinous coating which covers the clusters was imperfect, that a piece here and there had disappeared, leaving the eggs bare, and in some cases patches of the exposed eggs were empty. To ascertain, if possible, the cause of this, some of such affected clusters were cut into, when they were found to be colonized by mites. The outside gummy matter is of a sufficiently porous texture to afford abundant shelter to these little friends, who had evidently eaten into the eggs and devoured the young larvæ, and had also consumed the missing portions of the gummy covering. In the range of a single section of an egg mass some eggs would be found inhabited by the larvæ uninjured, while out of others would proceed several (in some cases as many as five) active little mites, who, when thus disturbed, would run in and out of their dwelling places, and keep up a peculiar drumming motion with their tiny antennæ. We found what were probably two different forms of the same species of mite, the one so small that four or five or more could find ample room and to spare within a single egg-shell, and these were very active and nearly transparent; the other much larger, of a pale red color, with bright red eyes, sluggish in its movements and only one in each egg; indeed, one specimen nearly filled an egg. On the outside of some of the clusters were found some round pale red eggs, which we presumed were the eggs of these mites. From their structure the mites appeared to belong to the genus *Trombidium*.

We have submitted examples of these insects and egg clusters to Dr. H. Hagen, of Cambridge, Mass., and he has kindly and promptly examined them and confirmed the correctness of the views above advanced. Dr. Hagen says that he found the supposed mite eggs both empty and full of the small, active, white creatures, that these active specimens are doubtless the young of the larger red form, which latter is .04 inch long, and he is of opinion that it belongs to *Trombidium*. He further says: "In the whole European literature I have not been able to find anything about Acari eating eggs, so the fact seems new and is very important."

On almost every cluster we have examined we have found more or less of these mites, and if they are thus generally distributed over the whole district inhabited by the moths, they must prove a most efficient check to the undue multiplication of *Clisiocampa*. In No. 8 of our last

volume we drew attention to the fact of the enormous abundance of the larvæ of *C. sylvatica* last year in many of the western portions of Ontario, and to the further fact that we had found a large number of the larvæ to be infested by parasites, both Dipterous and Hymenopterous. Notwithstanding this, large numbers matured and their egg clusters are numerously distributed over almost every forest and fruit tree. We have no evidence that birds devour many of them, hence we warmly welcome this new found friend, who has doubtless been silently working in our interest for many years past. In 1868 the larva of *sylvatica* was almost as abundant as it was last summer, while in 1869 very few were to be found. By the light of these observations it is easy to see that these destructive insects may be decimated by one of two methods, or by both; in the first place by the enormous increase of these mite enemies, or by the occurrence of a severe frost following a few warm days in spring, during which by the heat of the sun the larvæ have been incited to activity, and having left their snug winter quarters, have, while in a feeble and comparatively unprotected state, been destroyed by cold.

NEW PYRALIDES.

IV.

BY A. R. GROTE, A. M.,

Director of the Museum, Buffalo Society Natural Sciences.

I am indebted to Mr. Jas. Behrens for some Californian Pyralides. Among them is a specimen of *Orobaena octonalis* of Zeller, hitherto found in Texas and Kansas. The specimen is labelled "San Diego, Aug., 1874." Two specimens of *Eurycreon chortalis:* "Soda Sp.," and two of *Botis unifascialis:* "Sauzalito, May 27," are also present.

In the present paper I continue my descriptions and corrections. There are yet a large number of new species of *Botis;* I regret that I cannot identify many of Lederer's from his figures and descriptions.

Arta olivalis, *n. s.*

♂ ♀. A small species allied to *statalis*, but differing by the olivaceous cast of the fore wings above, crossed by two even parallel faint pale lines, the inner at the middle of the wing, the outer within the middle of the terminal portion ; fringes vinous. Hind wings pale purplish with vinous fringes. Beneath the costal and external margins are bright wine-color ; a pale common line. Abdomen beneath vinous ; legs pale yellowish and purplish. Labial palpi divaricate ; ocelli present ; ♂ antennæ scaled above, pubescent beneath ; shape of the wings much as in *Asopia*, but the costa and internal margins are even more parallel.

Expanse 14 mil. Hab. Texas, Belfrage (No. 405, July and August). This is even a slighter species than *Condylolomia participialis*.

Botis venalis, *n. s.*

♂ ♀. Allied to *dasconalis* by its plain appearance, but smaller and differently ornamented. Fore wings ochreous, varying in intensity of color, with darker diffuse longitudinal shades along the veins, without lines or spots. Hind wings pale, sub-pellucid, saturated with ochreous, without lines or spots. Beneath whitish, fore wings streaked with fuscous, without lines or spots. Thorax, head and palpi above ochrey, beneath white ; abdomen pale ochrey above, beneath with legs whitish ; fore tibiæ within darker.

Expanse 26 mil. Not uncommon about Buffalo, N. Y., in June. Easily recognized by its simple ornamentation, which differs from that of any other species known to me.

Botis trimaculalis, *n. s.*

♂ ♀. Clay-yellow ; fore wings narrower and more pointed than usual. Terminally the wing is more or less distinctly shaded with fuscous. Three *open* spots on median space. The orbicular round, reniform lunate and a third and smaller spot on submedian fold also open and spherical, varying in size. The stigmata are annulate with fuscous, their centres are perhaps a little darker yellow than the wing. Interior line even, bent. Exterior line not very uneven ; after touching vein 2 it runs inward, rising on the interspace till it nearly meets the lower extremity of the reniform which extends over the base of veins 3 to 5. Head and thorax ochrey ; abdomen ochreous on the segments above, annulated with white, beneath

whitish fuscous. Hind wings yellowish, sub-pellucid, with borders of yellowish (♀) or fuscous (♂); an extra median fuscous line and discal streak. Beneath as above, duller and more fuscous.

Expanse 25 mil. *Hab.* Texas, Belfrage, August and October, two specimens, No. 376. Resembles somewhat *Stenophyes serinalis*, but the color is different and the species is stouter.

Botis fuscimaculalis, n. s.

♂ ♀. Resembles *trimaculalis* so closely that it is difficult to distinguish it. The color is a duller yellow, the markings are all fainter, the veins are indicated by pale fuscous. The hind wings are whitish fuscous and the line is only fragmentary. Beneath the wings are more purely fuscous, without the yellowish stain. The three open spots on median space are present, but the reniform is upright, medially constricted and does not spread over the submedian nervules at base, consequently the exterior line does not come so near it inferiorly. Interior line more irregular, also the exterior line, but similarly shaped; the interior line is however deflected on the interspace between submedian vein and vein 1. But the species may be at once separated by the abdomen being whitish or fusco-whitish, not ochreous above as with *trimaculalis.*

Expanse 25 mil. *Hab.* Texas, Belfrage, No. 374; June and November; three specimens. Much narrower-winged and with more pointed apices than *Botis submedialis.*

Botis flavicoloralis, n. s.

Dull yellow, allied to the preceding species. Primaries concolorous, powdery, yellow, not shining; fringes whitish. Reniform open, very faintly outlined. No spot on submedian fold. Exterior line almost obliterate, very faint. Orbicular sub-obsolete, open. Hind wings whitish, with whitish fringes, stained with yellow exteriorly; extra mesial line narrow, lost inferiorly. Beneath hind wings whitish, with the mesial line fragmentary. Thorax above yellow; palpi brown at the sides, whitish beneath. Fore wings beneath pale, with the markings traced in pale fuscous.

Expanse 21 mil. Texas, Belfrage, Oct. 11, No. 374; one female.

Smaller than *fuscimaculalis*, with the lines obliterate and of a brighter yellow.

Botis unifascialis Packard, Ann. N. Y. L. N. H., 1873.

One ♀ specimen resembles Packard's description except that the primaries have the external margin shaded with pale color like the fascia. A second ♂ has the pale shading on hind wings above no more noticeable than in the European *opacalis*, with which the Californian specimens agree in the immaculate secondaries beneath. The European representative of this species, unknown to Packard, is *opacalis*, and it resembles the Californian examples very closely.

Botis subolivalis Packard, Ann. N. Y. L. N. H., 1873.

♂ ♀. This Eastern form has the secondaries in the ♀ rayed beneath and in both sexes immaculate above; it is less like *opacalis* than the Californian examples. Packard's description takes no note of the sex, but, as in *unifascialis*, the female has the wings less pointed. *B. hircinalis* Grote is a synonym. The males have the wings more pointed, the pale fascia sub-obsolete and the hind wings beneath not rayed with fuscous and the ground color more gray.

Botis stenopteralis, *n. s.*

♀. Allied to *hircinalis*, narrower-winged and darker colored. Fore wings very dark brown; a discal black mark; outer line pale, even, slightly bent. Hind wings black with yellowish basal shades and a mesial yellowish broken band continuous with exterior line on primaries. Abdomen blackish above, annulate with white; beneath white. Wings beneath pale reddish ochrey, with common outer line and discal marks; external margin of both pair fuscous; primaries with the anterior (orbicular) dot present. Palpi black at the sides, whitish beneath.

Expanse 18 mil. *Hab.* Maine, Prof. C. H. Fernald.

Differs from *ablutalis* by the darker color, stouter body, narrow, even exterior line, and black discal mark on primaries above; it is not very nearly related to that species.

Botis talis, *n. s.*

♂. Form of *adipaloides*. Fore wings bright purple. An irregular-shaped, brown-margined, light yellow patch resting on internal margin within the middle and projected upwards on the cell; preceded on the cell by a small partially confluent similar spot. A similar quadrate patch

over the veins beyond the cell open to costa, along which the yellow color spreads towards the base. Hind wings bright purple with a very broad yellow central fascia tapering inferiorly, edged with brown or black lines. Fringes pale. Beneath paler, but as above; base of hind wings entirely yellowish. Thorax brownish purple; beneath body and legs whitish.

Expanse 20 mil. *Hab.* Marengo Co., Ala., coll. Grote.

So brightly colored and distinctly marked that it can be mistaken for no other species. The fine dark lines edging the yellow patches on primaries may be taken for the ordinary lines and the annuli of the purple stigmata.

Eurycreon anartalis, n. s.

Size of *sticticalis* and *cereralis*, but resembling a species of *Anarta* in color. Fore wings blackish, somewhat grayish about the exterior line, which is broken and fragmentary. Two black discal stains and a black curved streak below submedian vein all faintly visible. Hind wings yellowish white, blackish at base, with broad black borders; before the black borders a curved line of black points. Beneath this curved line is repeated on the yellowish white color which extends to the base of the wing, relieving a rather long curved linear discal streak, the black border as above, interlineated with pale at anal angle. Primaries blackish, with an extra median pale shade. Abdomen yellowish white beneath, blackish above, annulated with white. Clypeus tuberculate.

Expanse 22 mil. Soda Springs, Cal., Mr. Jas. Behrens, two males.

Eurycreon communis Grote.

Mr. Belfrage has sent this variable species under the Nos. 372, 373 and 375. This latter number covers specimen which, from Lederer's Taf. 12, fig. 3, I take to be *rantalis*. Under the name *communis* I have originally described paler, more yellowish specimens (373 of Belfrage) of this same species. They are not *crinitalis* Led., Taf. 12, fig. 2, for they have the interior line present as in the typical form figured by Lederer of *rantalis*. Perhaps Walker has described *communis* under the name *crinisalis*, as he gives the interior line present, and *crinitalis* Led. Zell., which I do not know, may be a different species. Again, it seems to be doubtful whether the Texan species is really the *rantalis* of Guenée. On page 106 of this volume, line 3, read "a paler form than *rantalis*" for

"a darker form than *rantalis*." Provisionally I retain this name of *communis* for the species; if *rantalis* of Gueneé proves identical, the name *communis* will apply merely to the paler, yellowish specimens as a color variety. There is a tendency in several fuscous brown species of this family to vary in the direction of pale yellowish or ochreous, as for instance, *Botis fracturalis* of Zeller and *Botis argyralis* of Hübner.

Crocidophora Led.

C. tuberculalis Led., Taf. 2, fig. 19.

I have taken this species near Buffalo, N. Y., in June.

C. pustuliferalis Led., Taf. 12, fig. 11.

I have taken this species in Alabama. My single ♂ specimen is larger and does not agree very well with Lederer's figure.

C. serratissimalis Zeller.

I have taken one ♂ near Buffalo, and I find that my *Botis subdentalis* is the ♀ of this species, and consequently a synonym, Prof. Zeller's description being earlier.

Homophysa albolineata.

Lipocosma albolineata G. & R., 1, 28, pl. 2, fig. 22.

The ocelli are present. It is not improbable that this is the *glaphyralis* of Gueneé

Homophysa peremptalis, n. s.

♂. The smallest species, much smaller than *fulminalis* Led., of which latter I have a specimen from Texas (Belfrage, No. 394) and two from New York. Ocelli present. Fore wings ochre-brown, darker, somewhat fuscous at base. The uniform dark tint unbroken by any paler shading. Interior line exceedingly fine, composed of white scales, forming two large teeth, of which the upper is much the more prominent; the lower outward angulation on submedian fold being less obvious. The outer white line is very faint, near the external margin, evenly and widely arcuate, running inwardly submedially. Both lines very faintly relieved by dark scales. On external margin below apices are three interspaceal dark dots followed within by white ones. It is the commencement of a discontinued series, of which another is faintly visible at internal angle.

Fringes concolorous. The markings must be studied under a microscope to see them clearly. Hind wings pale at base, with a diffuse external ochre-brown patch cut by a narrow white line. A series of terminal dark points and a dark line on the ochrey fringes, both discontinued superiorly. Beneath paler, glistening, shaded with ochre-brown outwardly and with the exterior marked in a darker shade on primaries. Body and legs pale.

Expanse 10 mil. Amherst, Mass., Mr. L. W. Goodell, No. 708.

Homophysa eripalis, n. s.

♀. Size and color of *reniculalis* of Zeller, of which I have a specimen from Texas (Belfrage, No. 396, Oct. 16), but differing by the want of discal maculations on primaries. The fine white relieved lines more distinctly marked on costa of fore wings. Head and appendages ochrey and whitish; thorax ochreous. Fore wings entirely fuscous, with a very fine inner slightly waved line, and the outer line very near the margin, arcuate above, running in submedially and very slightly angulated on internal vein. The concolorous fringes are white tipped. In a second specimen from Alabama the base of the wing is slightly ochre-shaded. Abdomen above fuscous, finely white ringed. Hind wings concolorous, more fuscous exteriorly and inferiorly, where they show the white mesial line relieved by dark scales more distinctly. Beneath the common white relieved exterior line is continuous.

Expanse 16 mil. Texas, Belfrage, No. 394, June 7.

Chalcoela Zeller.

Beitr. 1, 82 (528), Tab. 11, fig. 12, *a* and *b*.

Chalcoela aurifera Zell., Beitr., 1, 83 (1872).

This smaller of the two species which I refer to this genus is yellow ochre in color; the median lines blackish, disconnected, the outer line with an inferior sinus and situate well towards the outer margin of the wing. Median space washed with gray, which spreads over the terminal space inferiorly. Taken in Texas by Belfrage; No. 417.

Chalcoela Robinsonii.

Cataclysta Robinsonii Grote, CAN. ENT., 3, 181 (1871).

The ocelli are absent. This is larger than its ally and darker colored, of a honey brown. Median lines white; outer line with a more acute

discal projection, and without an inferior sinus. The median space is much narrowed inferiorly. The grayish shade over median space is continued to costa ; in its ally the costal region is of the ground color of the wing. I do not detect the brilliant line on the external margin of the fore wings in *C. Robinsonii ;* the curved apical line is present in both forms. The hind wings are darker in *C. Robinsonii*, and show a clear white line before the series of black and golden marginal dots. The inner line on primaries is white and curved, not straight as in its ally, and the terminal space is wider and freer from grayish shades in *C. Robinsonii.*

OBITUARY NOTICES.

Death has of late been making serious inroads among the ranks of our fellow laborers in the Entomological field. An old veteran among American Naturalists, Dr. J. P. Kirtland, of Cleveland, Ohio, has passed away, while recent advices from across the Atlantic announce the deaths of Mr. Andrew Murray and Mr. T. V. Wollaston. Most of the details given in reference to the lives of the two latter are condensed from memoirs which have just appeared in *The Entomologist*, of London, Eng.

DR. JARED P. KIRTLAND

was born at Wallingford, Conn., on the 10th of November, 1793. His youthful studies were pursued at Wallingford and Cheshire Academies, and being a bright, active boy and an earnest student, he soon made rapid and substantial progress in the classics as well as in English studies. As a boy he was enthusiastic in the study of natural objects ; he knew the habits of almost every animal and bird that frequented his youthful haunts, and at twelve years of age was engaged in practical experiments in the cultivation of silk worms. About the same time he began the study of Botany, and soon applied his knowledge to a series of valuable experiments in the crossing of fruit trees with the view of improving the quality of fruits. His success in this department is well known to all intelligent cultivators of fruits in America, his hybrid cherries having won for him a

fame which time can never obliterate. His grandfather was a physician in Connecticut, and at his death his promising nephew, now eighteen years of age, inherited his grandfather's medical library and a sufficient legacy to enable him to acquire a medical education. He had made arrangements to pursue his studies in Edinburgh, when the war with Great Britain prevented him. About this time the medical department of Yale University was opened, and young Kirtland was the first student on its matriculation roll. Subsequently he graduated at the University of Pennsylvania, and in 1815 returned to his native place, where he practised medicine for two years and a half, devoting all his leisure moments to the study of natural science, for which he had developed a passion which influenced all his after life. He next removed to Durham, Conn., where he enjoyed an extensive practice for several years, when the death of his wife and child again unsettled him, and he removed to Poland, Conn. Five years later he was elected to the Legislature, where he served three terms, after which he was called to fill the chair of Theory and Practice of Medicine in the Ohio Medical College at Cincinnatti, which he did with distinguished ability for five years, when the duties becoming irksome to him, he resigned the position.

When in 1848 the first Geological Survey of Ohio was organized, Dr. Kirtland was appointed to superintend the natural history department, and in due time presented a series of reports which attracted general attention. He labored diligently among the Fishes, Birds, Mollusks, Reptiles and Insects of Ohio, sketching many of them with his own pencil and describing them with an enthusiastic fidelity. During his researches he collected a large and valuable cabinet of specimens with the design of forming a State Collection, but Ohio refused the substantial aid which this enterprise required, and as his collections had been made largely at his own expense, he retained possession of them and they were ultimately donated to the Cleveland Society of Natural Sciences, where they are now treasured as a priceless heritage.

In 1837 Dr. Kirtland had purchased a choice fruit farm five miles west of Cleveland, and had there settled, as it proved, for the remainder of his busy life. Four years after this he was appointed a Professor in the Medical Department of the Western Reserve College, in Cleveland, a position he filled with honor for twenty-one years. In 1861 Williams College conferred upon him the degree of L L. D., in recognition of his services, and many learned societies during his lifetime delighted to do

him honor. Among his Entomological papers, that which perhaps attracted most attention was his Notes on the Diurnal Lepidoptera of Western Ohio.

During the summer of 1872 it was our privilege to visit this veteran naturalist. We found him enjoying his quiet retirement among his flowers, fruits and insects, actively interested in everything that was going on about him. He gave us a most cordial welcome, and we spent a delightful afternoon together scanning his botanic and insect treasures. Although nearly 80 years of age, he retained all his faculties in apparent perfection, his eyesight being so well preserved that he could read ordinary print with the greatest ease. He died after a short illness at his home, on the 11th of December, 1877, at the ripe age of eighty-four years. He was among the most genial and winning of men, with a heart warm and steadfast. His temperate, well-ordered life preserved him in the full vigor of manhood far beyond the years at which men ordinarily grow old. He had no dissipation but hard work, no extravagance but lavish generosity to his friends and overflowing charity for the poor. In his seventieth year of patient labor he wrote as his motto over his desk : "Time is money; I have none of either to spare." Thus this tireless man of science labored to the end, laying down the work he loved so well after fourscore and four years of labor and usefulness, only at the call of the Master.

MR. ANDREW MURRAY, F. L. S.

This accomplished naturalist died at his residence, 67 Bedford Gardens, Kensington, on the 10th of January last. Mr. Murray was the eldest son of Wm. Murray, Esq., and was born in Edinburgh on the 19th of February, 1812, where he resided until 1860. In his early years he manifested a fondness for natural science which strengthened as he matured. He was educated for the law, and subsequently devoted some attention to the study of medicine. During the last few years of his life in Edinburgh he labored hard in the interests of science ; in 1858 he was elected President of both the Botanical Society and Physical Society, and just previous to his removal to London he contributed an elaborate paper to the Royal Society of Edinburgh, on the "Pediculi Infesting the Various Races of Man." In 1860 Mr. Murray came to London, and was appointed Assistant-Secretary to the Royal Horticultural Society, and from this time he devoted himself to his work as a scientific Botanist and

Entomologist, becoming celebrated in the former as the monographer of the *Coniferæ*, and in the latter as the monographer of the *Nitidulidæ*. From 1852 to 1863 he published thirty-eight separate papers. In 1866 he published his well-known work on the "Geographical Distribution of Mammals," in which he bestows especial attention on the habitat during geological as well as glacial and present epochs, with copious synonymic lists, including locality past and present, geographical classification and colored maps of distribution, showing the result of his own careful research. In 1869 he accompanied Sir Joseph Hooker to the Botanical Congress of St. Petersburgh, as one of the representatives of British Science, his services there being complimentarily acknowledged by the presentation by the Emperor Alexander of a malachite table of great beauty. In 1871 he was entrusted with the superintendence of the arrangements connected with the British contributions to the International Exhibition of Moscow of the following year. He was Secretary to the Oregon Conifer Collection Committee, and in 1873 undertook an expedition to Salt Lake and California, with various scientific objects. On his return from the West he visited Canada and spent a few days with some relatives in London, Ont., during which time we were happy in making his acquaintance and of forming with him a warm friendship which only terminated with his life. During his short sojourn in Utah he contracted an illness which greatly increased in severity, and, indeed, almost prostrated him on his return to Europe. Subsequently he rallied and for several years enjoyed moderate health. In the course of last season further indisposition followed, and he gradually sank, but so assiduously occupied with his labor of scientific usefulness to his latest days, that few were prepared to hear of their close.

But it is with Andrew Murray as an Entomologist that we are most deeply interested. In early life he aided his relative, John Murray (Lord High Advocate), in his wish to provide some practically useful reading for village schools, by writing the little pamphlet, "The Skipjack, or Wire-worm and the Slug," which, though published without his knowledge, may be looked upon as his first contribution to Economic Entomology. He contributed many papers on Entomology to various scientific societies and publications, both home and foreign, but his great work was done in the last ten years of his life, which he devoted to illustrating the study of insects in its natural and practical bearings. It was in 1868 that the charge of receiving and arranging a government collection of Eco-

nomic Entomology was placed in his hands officially, and from the first he devoted himself unceasingly to the task of making this as perfect as possible. Himself an accomplished draughtsman, and a patient worker and compiler, with a great love for the subject, he spared no pains in his work, whether in availing himself of scientific co-operation or in shaping the aid placed at his service by those less gifted than himself, in the details of field observation, and of museum illustration by colored drawings or fac-simile modelling. This collection is already a nucleus of a very valuable, popular and illustrated history of insect friends and insect foes, the practical value of which is already appreciated and bearing good fruit for public benefit. On this collection, of which one hundred and fifty cases are more or less complete, Mr. Murray was working up to his latest days, leaving a large collection of oak-galls and illustrative drawings still in progress of arrangement. To assist in the circulation of information a series of guides to the collection were projected. These were to take the form of popular hand books to Entomology, and were to be prepared by Mr. Murray and published under government supervision. Of the eight intended volumes only one has appeared ; this treats of the Aptera or wingless species, and was noticed in the CANADIAN ENTOMOLOGIST for July, 1877. In the midst of his busy labors he was called away. We have lost in him a man of varied accomplishments, a thorough, painstaking Entomologist and a good Botanist. Those who knew him best will deeply feel his loss ; not only will they miss the gifted naturalist, they will also grieve for the sudden removal of a friend so kind and true hearted.

MR. T. V. WOLLASTON, M. A., F. L. S.

This talented Entomologist died on the 4th of January last, at his home in Teignmouth, Devonshire, at the age of 56, from disease of the lungs, with which he had been more or less afflicted for thirty years past. In early life Mr. Wollaston became well known for his valued researches into the Coleoptera of the Maderian, Canarian and Cape Verd Archipelagos, which he personally explored. His valuable writings on the Coleopterous fauna of these islands, and especially his account of the insects of the Madeira group, are well known to Entomologists in the "Insecta Maderiensia," published in 1854. Subsequently he published catalogues of the Coleoptera collected by him in these several groups of

islands. His volume on the variation of species, dedicated to Mr. Chas. Darwin, and published in 1856, is well known. His shorter papers, chiefly relating to Coleoptera, embodying the results of original research, contributed to English and foreign scientific journals, range over a period of more than 30 years. In the autumn of 1875, feeling it desirable to seek a warmer climate, he visited St. Helena, where he devoted himself assiduously to the study of the Coleoptera inhabiting the island, of which work we have the record in his "Coleoptera Sanctæ Helenæ," lately published. This was Mr. Wollaston's last contribution to Entomological science, and is characteristic of its author in the finished elegance as well as clearness of its style. He returned to his home in the early summer of 1877, and thenceforward devoted himself to the task of arranging the valuable mass of information he had accumulated during his absence, and of which he leaves us the record in the work just referred to. He was a man of highly refined and accomplished mind, as well as of great scientific attainments, and will be much missed from the ranks of our leading naturalists, as well as by those whose progress he aided by his encouragement and counsel.

NORTHERN OCCURRENCES OF PAPILIO CRESPHONTES.

BY THOS. E. BEAN, GALENA, ILLINOIS.

The *American Naturalist* for November, 1877, contains on p. 688 the following paragraph :—

"PAPILIO CRESPHONTES IN NEW ENGLAND.—On the 6th of last September Mr. N. Coleman captured in the vicinity of Berlin, Connecticut, the only specimen of this Southern insect ever recorded from New England. As the larva is not known to feed on any other plant than the orange, the butterfly probably hatched from a larva accidentally transported with trees from Florida, or emerged from a chrysalis sent North as a curiosity."

The writer of the paragraph appears to have mislaid certain pages of recent Entomological literature.

The CANADIAN ENTOMOLOGIST has comments upon this butterfly in several of its volumes :—

Vol. 1, p. 19.—*P. thoas* captured at Amherstburg, Ontario, in 1868; said to be quite common there.

Vol. 6, p. 140 (1874).—"*Papilio thoas*—several taken. This insect was quite common in almost every clover field in that neighborhood"—a locality in the county of Essex, Ontario. . . . "Mr. Lowe took two specimens of *thoas* last season on the River St. Clair, near Port Lambton."

Vol. 7, p. 181 (1875).—"Mr. Cook said that *thoas* had been found this year at Lansing," Michigan—"that it occurred there to his knowledge some three years ago, and that last season it was quite common, the larva feeding on prickly ash."

In Vol. 9, p. 160 (1877), Mr. J. M. Denton records capture of *eleven P. thoas* on 1st and 2nd of August, in a field near Amherstburg, Ontario.

In *Proceedings Davenport Academy Nat. Sci.*, vol. 1, Mr. J. D. Putnam cites occurrence of *cresphontes* at Davenport, Iowa, and at Aledo, Illinois, 30 miles south of Davenport.

The insect is known to have occurred in West Virginia, Kansas, Illinois, Wisconsin, Connecticut (as above), Michigan and Ontario.

The fullest note I have found is by Prof. F. H. Snow, in *Trans. Kansas Acad. of Sci.*, vol. 4, p. 30: "Common in 1873 and 1874; rare in 1871, 1872 and 1875; feeds upon the prickly ash and the hop-tree in this region—upon the orange tree in the Southern States."

For this locality (Galena, Illinois) I have only a meagre record :—1872, ♀, August 15, new; 1873, a worn specimen, Sept. 8; 1874, several seen toward end of August.

The record of *cresphontes* in Ontario seems to indicate two broods. Mr. Lowe's captures in Essex County in 1874 were made between 10th and 20th June, and again in 1875 he observed the butterfly in the same locality between 6th and 30th June (CAN. ENT., vol. 7, p. 139–40). But Mr. Denton—as above cited—took eleven specimens early in August, near Amherstburg.

The foregoing references will serve to show that *cresphontes* is in some degree habituated in the North, as regards both climate and food plants, and that no special theory is required to account for the disclosure of an imago in New England.

NOTES ON ARGYNNIS ALCESTIS Edw.

BY C. E. WORTHINGTON, CHICAGO, ILL.

The occurrence of this species in considerable numbers in this vicinity has afforded an opportunity for comparison with *A. aphrodite*, the results of which are appended.

It should be stated that although the number referred to is small, yet the unrecorded comparison of over two hundred examples of both species during the past summer has agreed fully with this. In the line before me are five females each of *alcestis* and *aphrodite*. In every case the general color of the upper surface is duller in *aphrodite*, the basal shading heavier and more extensive, and the black markings on *primaries* heavier; in two examples the color approaches that of *A. cybele*, while the examples of *alcestis* exhibit a uniform clear color with hardly any variation.

On the secondaries the submarginal lunules are serrate in two cases in *alcestis*, all the other black markings being uniformly lighter, especially the ∩ spot in the disk, which is nearly or quite separated into two black spots. No other differences discernible. Beneath *aphrodite* exhibits a narrow, irregular, bright band on secondaries, between the two outer rows of silver spots; this is conspicuous in all the examples I have examined; there are also spots and patches of lighter color on the disk.

The under surface of the secondaries in *alcestis* differs widely from this; the whole of the wing is one sheet of uniform color, broken only by the usual silver spots and some *black* spots, one immediately behind the largest silver spot being very conspicuous in three examples. The silver spots are proportionately larger and closer together, and partially margined with black, much more conspicuously so than in any example of *aphrodite* that I have seen. In none of these is there the faintest trace of a band, while the general color is darker than in any examples of *A. idalia* taken here.

Five males of *aphrodite* and three males of *alcestis* exhibit the same differences above as females, though in a less degree; beneath the band is conspicuous in *aphrodite* ♂ as in the ♀, but obsolete or indicated by a faint shade in *alcestis*. The spots and patches of lighter color are nearly or quite absent in the latter, and the comparative size of silver spots as in ♀. In all cases these spots are more symmetrical in shape in *alcestis* than in *aphrodite*.

It should be added that the males approach each other more closely than the females.

Alcestis is quite abundant on the prairie west and north of this city in July and August ; it seems to be quite local, as examples taken a few miles north in a timbered region are almost uniformly *aphrodite*. I have been greatly surprised at the readiness with which a strong *aphrodite* upon the prairie can be distinguished while on the wing from the surrounding *alcestis*, owing mainly to a slight difference in its manner of flight, which resembles that of *cybele*.

The difference of time of the appearance of the sexes in *alcestis* appears rather to exceed that in other species, the order of capture of the first examples of the larger *Argynnidæ* being as follows : *Alcestis* ♂, *idalia* ♂, *aphrodite* ♂, *aphrodite* ♀, *cybele* ♂, *cybele* ♀, *alcestis* ♀, *idalia* ♀.

The habitat of *alcestis* extends farther west and not so far south as that of *aphrodite*. Since the publication of Mr. Edwards' Catalogue I have received good examples from Michigan, and am informed that it has been taken in New York.

In faded examples of *alcestis* (Sept.) a faint shade is observable in certain lights between the outer rows of silver spots on secondaries, but broad and regular like the band of *cybele*, and not in the least resembling that of *aphrodite*.

ANNUAL MEETING OF THE LONDON BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Annual Meeting of the above Branch was held on the evening of Jan'y 15th, 1878, at the residence of Mr. Chas. Chapman, when after the routine business had been transacted, the following gentlemen were elected as officers for the current year :—

President, J. M. Denton ; Vice-President, A. Puddicombe ; Sec'y-Treasurer, J. H. Bowman ; Curator, Chas. Chapman ; Council—H. Bock, W. Saunders, J. Williams ; Auditors—H. Bock, W. Saunders.

A pleasant hour was then spent in discussions on insects and their habits, after which the members adjourned.

BOOK NOTICES.

Descriptions of Noctuidæ, chiefly from California, by A. R. Grote. Extracted from the Bulletin of United States Geological and Geographical Survey; large 8vo., pp. 18, containing descriptions of thirty-three new species, chiefly of *Agrotis* and *Hadena*.

New Tineina from Texas, Food Plants of Tineina, and Index to the Described Tineina of the U. S. and Canada, by V. T. Chambers; also from the Bulletin of the U. S. Survey; large 8vo., pp. 88. In this pamphlet there are forty-two new species described. A catalogue of the food plants of the Tineina of America, as far as they are known, is given, followed by a very complete and useful index embracing all the described American species.

President's Address before the Appalachian Mountain Club, by Sam'l H. Scudder. Reprinted from Appalachia, Vol. 1, No. 4.; large 8vo., pp. 32. Our thanks are tendered the several authors of the above for their kindness in sending us copies of these pamphlets.

CORRESPONDENCE.

PIERIS VERNALIS AND P. PROTODICE.

DEAR SIR,—

In confirmation of Mr. Bean's conclusions, as given in the November number, I would state that I have long known *vernalis* to be but the spring form of *protodice*, and believe I so wrote to Mr. Edwards some time ago. What is probably the first record of this opinion will be found in my 9th Report on the Insects of Missouri (p. 57). My experience accords with Mr. Bean's as to there being every possible gradation between the extreme *vernalis* form and the typical *protodice*. What is true of these two supposed species will, I am confident, be found to be equally true of several other of Mr. Edwards' described species, especially in *Colias*; but no one perhaps is more willing to admit the fact at present than Mr Edwards himself, or is doing more by careful breeding to decrease the number of his own species.

C. V. RILEY, St. Louis, Mo.

DEAR SIR,—

Having been requested some years ago by Prof. Just, of Carlsruhe, to co-operate in the annual botanical review, I have now agreed to take upon myself the preparation of a report in reference to those vegetable excrescences known as galls, produced by insects.

The greatest difficulty in this work arises from the fact that the literature treating on the subject is scattered throughout a great number of works and various journals, of which we find only a part in our libraries; also, those which we possess, and particularly the later publications, are often of difficult access. It is therefore quite impossible to write a complete report if the editors do not send us the various papers which issue from the press You or your readers will oblige me greatly by sending copies of any writings in reference to galls which have appeared since 1875, as well as those which may be published from time to time. Parties sending extracts from journals will please add the date of publication. As an equivalent I shall be happy to send to any one helping me copies of my own writings on this subject. DR. F. A. W. THOMAS.

Ohrdruf, near Gotha, 14th Sept., 1877.

[We trust that our readers will do what they can to aid Prof. Thomas in this matter.—ED. C. E.]

I have the pleasure of noting the capture, June 23rd, of a fine specimen of the very rare Geometrid, *Eubyja quernaria* Smith & Abb.; it was taken resting on the trunk of a Hickory tree. Early in September I took sixteen specimens of *Aspilates Lintneraria* Pack., among which were several perfect examples of the female. It is an exceedingly variable species, scarcely two specimens being alike. The females were submitted to Dr. Packard, who determined them as the *liberaria* of Walker.

L. W. GOODELL, Amherst, Mass.

I have found *Melitaea phaeton* in large numbers this season in a large swamp on the east side of Mt. Tom, four miles from Holyoke; also *M. Harrisii* in the same locality. Since the middle of August up to the present time I have found over 300 larvæ of *Deilephila lineata* feeding on Purslane. They seem to be very plentiful this year; never found but a few before. JOSEPH E. CHASE.

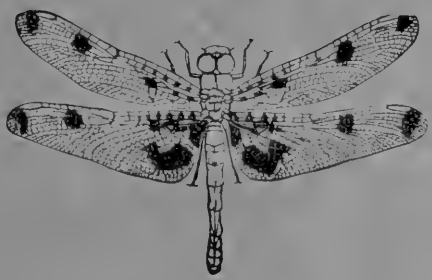
Holyoke, Mass., Sept. 20, 1877.

No. 3.

THE

Canadian Entomologist.

VOLUME X.



EDITED BY

WM. SAUNDERS,

LONDON, ONTARIO

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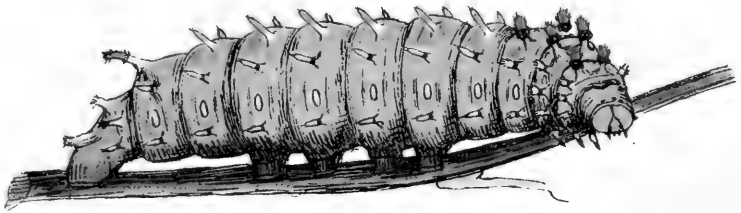

G.J.Bowles

The Bunland Desbarats Lithe Comp.y

MATURE LARVA OF SAMIA COLUMBIA

The Canadian Entomologist.

VOL. X. LONDON, ONT., MARCH, 1878. No. 3

SAMIA COLUMBIA.

For the beautiful colored figure of the larva of this remarkable insect we are indebted to the kindness of Mr. G. J. Bowles, of Montreal, who made the drawing and prepared the stones from which it was printed. The printing is the work of the Burland Desbarats Lithographic Co., of Montreal, and is in every way creditable to that enterprising company.

It is not a little remarkable that two descriptions of the larva of this rare insect should have reached us at the same time, and since they record observations independently made, and the subject is so interesting, we have thought it best to print them both in full, even at the risk of a little repetition.

NOTES ON THE LARVA OF SAMIA COLUMBIA Smith.

BY F. B. CAULFIELD, MONTREAL, P. Q.

(Read Before the Montreal Branch of the Ent. Society of Ontario, Aug. 7, 1877.)

Form same as *S. cecropia;* number and position of tubercles also the same. General color green; bright yellowish green on dorsal surface; pea green on head, sides and under surface. Length when at rest exactly two and a quarter inches; when in motion almost two and three-quarter inches.

Head pea green, mouth parts pinkish grey, mandibles black.

Dorsal surface—First segment with four small flattened transversely oval warts, consisting of a black ring with a white centre; 2nd, 3rd and 4th segments each with two large bulbous tubercles, cream color, at base; above this there is a raised or swollen ring of black; remainder coral red, with seven upright spines on top; 5th, 6th, 7th, 8th, 9th and 10th segments each with two simple tubercles, basal half white, remainder brigh

yellow ; the tubercles on 5th segment are tipped with three upright black spines, the others with only one each ; 11th segment with one large central tubercle, the extreme base of which is white, remainder yellow with an irregular circlet of small black warts about the middle, tipped above with three small blunt black spines ; 12th segment with four short white tubercles, anterior pair largest, tipped with four short black spines, posterior pair with a single black spine.

Lateral tubercles white, the upper row with a brown ring at base, the lower with a black ring at base ; 2nd and 3rd lateral tubercles tipped with seven black spines, 4th with five, remainder with one each. Spiracles white, surrounded with a narrow black ring. Feet green, claws black, prolegs green, claspers mauve.

I received the larva from which the above description was taken by mail, on August 1st, 1877, from J. C. Stockwell, Esq., of Danville, P. Q. Unfortunately no details were given of its capture or food plant. In the box in which it was sent were some black currant leaves ; as these were withered, I obtained a fresh supply from the garden of a friend ; it fed on these, but did not appear to be quite satisfied with them. I then tried it with apple, maple, elm and various other leaves, but it would touch nothing but the currant, and of that it ate less and less, finally, to my very great disappointment, pining away until it died. It occurred to me afterwards that it might have been found on the wild currant, as the leaves sent with it seemed to be finer than those of the cultivated species.

Although the form of this larva and the position of the tubercles is similar to that of *cecropia*, the difference in coloration will at once distinguish them, the ground color being much lighter in *columbia*, and the green inclining as much to yellow in that species as it does to blue in *cecropia*. The tints of the larva of *columbia* are more decided, not having the watery appearance noticeable in *cecropia*, the yellow being brighter and the red more intense ; but the great points of distinction are the additional red tubercles (as noticed by Mr. Bowles in 1864, see CAN. ENT., vol. 3, p. 201), and the absence of blue, the tubercles that are blue in *cecropia* being white in *columbia*. That this larva is generically the same as *cecropia* is undoubted, the only distinctions being those of size or coloring. The absence of blue in the larva of *columbia* seems to be against the supposition that it is produced by the union of *cecropia* with *promethea*, the larvæ of both these species being conspicuously marked with that color.

ON THE EARLY STAGES OF SAMIA COLUMBIA Smith.

BY C. H. FERNALD, ORONO, MAINE.

On the night of the 7th of last June my wife captured at light a fine female *Samia columbia*. The moth was at once secured, her wings pinioned, and she was placed in a cage with the hope that specimens of the other sex might be attracted, but none made their appearance; and on the night of the 12th she laid five eggs, glueing them to the gauze on the side of the cage, two in one place and three in another. During the following day (13th) none were laid, but on the night of the 13th she laid fourteen more in several different clusters, and on the night of the 14th she laid six more. None were laid during the following day and night, and as she was injuring herself with the pinion, she was killed and spread. Whether she would have laid any more had she been kept longer, or whether she had laid any before her capture, I cannot say.

On the morning of the 26th one of the eggs hatched. I then began to look about for their food plant. Smith states, Proc. Boston Society of Natural History, vol. ix., p. 344, as follows: "They [the cocoons] were mostly attached to *Nemopanthes canadensis* and *Rhodora canadensis;* a few were found upon *Kalmia angustifolia* and maple, and one upon the larch. The larvæ undoubtedly feed upon the first two plants, and perhaps upon the others; but the cocoons were always where the larvæ might have fed upon the *Nemopanthes* or *Rhodora*."

Dr. Packard, in his Synopsis of the Bombycidæ, Proc. Ent. Soc. Phil., vol. iii., p. 380, says: "It *(S. columbia)* feeds upon *Rhodora canadensis*, spinning its large cocoons upon the terminal twigs of that shrub."

Guided by these statements, and remembering that *Nemopanthes canadensis* does not occur in this region to my knowledge, I first collected *Rhodora canadensis*, and gave them, but they never so much as tasted it, though I kept a few on it till they were nearly starved. I cut the edge of the leaf so they might have easy access to the soft juicy parts of the interior, but all to no purpose. I tried them on *Kalmia angustifolia*, *Amelanchier canadensis*, maple, beech, white birch, ash, apple, pear, willow, ilex, gooseberry, currant and larch. They just tasted of the last four, but would not feed upon them. I should say that the trial on larch was not

satisfactory, as I put but one on it and kept it there less than half an hour. Finally I put them on elm, upon which they fed a little, but died one after another.

My friend, Mr. Charles Fish, had been fortunate enough to secure a female which laid twenty-five eggs, I think, and with the young hatched from these he was having a similar experience to my own. He finally succeeded in getting the remaining few of his to eat wild red-cherry (*Prunus pennsylvanicus*). I was obliged to leave home at this time, and got my friend, Mr. Anson Allen, to take the care of my young *columbias* in my absence. Learning of Mr. Fish's success with wild cherry, he put a part of the remaining number on that plant, leaving a few on elm, all of which died, while those fed on the wild cherry succeeded in passing the first moult, and I have been able to carry three through and see them spin up their cocoons successfully. About the time these were in their later moults Mr. Allen found two *columbia* larvæ feeding on larch (*Larix americana*), so remote from other trees that there could be no possibility of their having crawled on to it from any other tree, and further, these same larvæ continued feeding on the larch in confinement for several days, and then spun their cocoons. Mr. Fish also found one or two larvæ feeding on the larch, several miles from where Mr. Allen's were found. These were all in a very healthy condition, and, it is hoped, will yield good imagines next year.

I have observed this striking peculiarity in the habits of the larva of *columbia*, that from the time they hatch till they are done feeding they never wander about, but remain upon a leaf or twig entirely unsuitable for food till they starve, even though there be fresh food within half an inch of them.

When they are fully grown and are done feeding, they evacuate their bodies and then begin to travel around their enclosure, continuing their travels sometimes for twenty-four hours, till they find a suitable place in which to spin their cocoons. At first they spin a certain amount of white or silver-colored silk, and after that has been expended, the brown silk. One of the larvæ wandered about for a long time before it appeared to get ready, or to find a suitable place in which to spin its cocoon, and all this time it was wasting its silvery silk, spinning it freely as it crawled slowly over the surface of the glass forming one side of the breeding cage. At last a satisfactory place was found, and the cocoon spun, but almost entirely without the characteristic silvery bunches upon

the outside, for the simple reason, as it would seem, that the larva had no white silk remaining to give the appearance usually seen upon the outside. I further observed that those which spun up immediately, without wandering about much, make cocoons with the most complete silvery bunches upon them. After the first long threads of the cocoons have been extended, the larva moves its mouth back and forth for a considerable length of time in one place, as far as it can move its head, thus depositing a large amount of the silvery silk in this place; then moving to another place, the same operation is performed, and so on over the whole *exposed* parts of the cocoon. I did not see that they deposited any of the silk in this way against the under surface of the glass when the cocoon was placed against it. Nearly all of the cocoons which have been found here were on the larch, and these silvery bunches certainly give them a very close resemblance to the bark of that tree.

Egg—Sub-globose, slightly compressed, the compression being least upon the side from which the young escapes; cream-colored, clouded with reddish-brown, and attached to the object upon which the female deposits by means of a dark brown adhesive substance, which appears to be the same as that which is clouded over the surface of the egg, but the greater abundance of it at the point of attachment produces a much darker color. Greatest diameter, 2 mil.; medium, $1\frac{1}{2}$ mil.; least diameter, $1\frac{1}{3}$ mil. The eggs hatched in fourteen and fifteen days after they were deposited.

Young Larva—Length immediately after escaping from the egg shell, 4 mil. Color black; some of the individuals show a greenish tinge around the base of the tubercles. Body cylindrical, slightly tapering towards the posterior extremity; head large, rounded, sparsely clothed with long hairs. The second (first after the head), third, fourth, fifth and sixth segments each with eight tubercles, the lowest one on each side much smaller than the others. The seventh, eighth, ninth, tenth and eleventh segments have each six tubercles, rather smaller than the corresponding ones on the preceding segments. The twelfth segment has five tubercles, two on each side corresponding with those on the preceding segment in size, and one on the middle of the dorsum of the same size as the upper ones on the third segment. The thirteenth segment has four tubercles on the anterior edge and one at the base of each anal proleg. The tubercles are smooth, cylindrical, gradually enlarging towards the base and at the summit, the least diameter being about two-thirds the way up; length equal to about three times the least diameter, surmounted with

from two (on the smallest) to six finely serrated, radiating bristles which are about twice the length of the tubercles. Duration of this stage eight to nine days.

After the First Moult—Length (taken a short time before the second moult), 15 mil. Color pea green. Tubercles and bristles, mandibles, palpi and antennæ, a spot about the eyes, a stripe on each side of the clypeus, the legs and a spot on the outside of the prolegs, black. Second, third and fourth segments each with four black spots on the posterior edge and a row of black spots on each segment after the head, on the line of and behind the stigmatæ. Duration of this stage five to seven days.

After the Second Moult—Length (taken soon after the second moult) 20 mil. Color pea green with a bluish tint upon the dorsum. Black markings as in preceding stage. Duration of this stage four to five days.

After the Third Moult.—Length 35 mil. Color pea green, lighter on the dorsum. Marked with black as in the two preceding stages. All the tubercles with the basal portions blue, except those on the second segment and the lower one on each side of the third to the sixth segments inclusive. Duration of this stage six to nine days.

After the Fourth Moult—Length 50 mil. The head at the time the larva escaped from the egg-shell was proportionally large, but during the succeeding stages it did not grow so fast as the other parts of the larva, and at the beginning of this stage, but more especially at its close, it was proportionally small. Duration of this stage ten to twelve days.

Mature Larva—Length 76 mil.—about three inches. Thickness between the segments 13 mil., of largest part of segment 15 mil.

Head pea green, sparsely clothed with fine yellowish hairs. Mandibles, outer joints of antennæ and palpi, spot about the eyes, two spots on the gular (these may have occurred in the previous stages, but were not observed), and a stripe on each side of the clypeus, black, the latter sometimes wanting. Basal joints of antennæ and palpi and the labrum greenish blue. General color of the body pea green, rather lighter than the head, and lighter above than on the sides, with the faintest tinge of blue between the segments. Last joint of the legs and claw black. Stigmatæ oval, white, surrounded by a fine black line.

The tubercles were greatly changed at the fourth moult, both in form and color. The first and lowest on the second segment is small, conical, black and surmounted by a few short, stout, black spines. The second is

more rounded at the top, shining black at the base, and resembling white glazed porcelain at the apex, with four black spines. The next two are smaller, about 2½ mil. apart on the front edge of the segment, the lower of which is about 5 mil. from No. 2. These are very small and black, the upper one having a trace of greenish-white at the apex, and both are surmounted with several short black spines. The lowest tubercles on segments three to six inclusive are small with black bases, apices resembling white glazed porcelain, and generally two black spines. The tubercles of the next row above, extending from the third to the last segments inclusive, are very similar in form and color, but larger; those of the row above this are slightly pear-shaped, a very little thickened towards the outer end, of the same color as the preceding, and surmounted with from four to six short stout black spines. Those of the next row on the third, fourth and fifth segments, and the corresponding ones on the opposite side of the dorsum—by far the largest on the larva—are pear-shaped, largest outwardly, porcelain white at the base, with a band of shining black above, and a bright coral-red top, with from six to eight stout black spines. The tubercles of this row on the sixth to the eleventh segments inclusive are nearly as tall, but slimmer than those preceding, slightly curving backward, porcelain white at the base, a very light straw color above and armed with two black spines at the top. The dorsal tubercle of the twelfth segment is very similar, but larger, and armed with several black spines. The tubercle at the base of the anal proleg is smaller than those before it, of a light bluish color, with black at the base outside.

The most striking differences observed between *P. columbia* and *P. cecropia*, in a brood of the latter raised by the side of the former, are—first, the smaller size of *columbia* at each of the stages; the mature larva of *columbia* is about three inches in length, that of *cecropia* about four. Secondly, *columbia* is of a clear light pea green color, *cecropia* a dull bluish green, giving a much darker aspect to this larva. This distinction of color is so marked that if once observed, the one can never be mistaken for the other. Thirdly, *columbia* has *three* pairs of coral-red tubercles, one pair each on the third, fourth and fifth segments; *cecropia* has *two* pairs, one pair each on the third and fourth segments. Then the color of these differ; those of *columbia* are a true coral or vermilion-red, while all the *cecropias* I have seen have these tubercles a color somewhat approximating that of resin. The remaining dorsal pairs of tubercles to the twelfth segment, and the central one on the twelfth, are lemon yellow, while in

columbia they are white at base and a very light straw color above. The remaining tubercles of *cecropia* are black at the base and blue above; in *columbia* they are black at the base, but with the look of white glazed porcelain above. These distinctive characters showed no tendency to run into each other in any of the examples I have seen. As perhaps having a bearing upon the question whether *columbia* is a hybrid between *cecropia* and *promethea*, I will say that in six years of careful collecting at this place I have never taken a *promethea*, nor has one ever been taken here to my knowledge; yet the empty cocoons of *columbia* have occasionally been found, mostly in larch trees, in one instance about forty feet from the ground.

I am therefore convinced that *columbia* is a good species, but whether distinct from *Gloveri* I am not prepared to express an opinion.

In my observations on *columbia* I have been greatly assisted by Messrs. Allen and Fish, who rendered every possible aid and placed their notes at my entire disposal.

ON FOOD PLANTS OF PAPILIO CRESPHONTES (THOAS).

BY THE EDITOR.

In September last we were much gratified, although somewhat surprised, at receiving a number of the larvæ of this beautiful butterfly from Mr. S. Eccles, of St. Thomas, Ontario, a town situated about 17 miles south of London, and about half way between it and Lake Erie. They were found in Mr. Eccles' garden, feeding on *Dictamnus fraxinella*, a perennial herb which is a native of Southern Europe, but cultivated in this country for ornament in gardens. The larvæ were in different stages of growth, from one to two inches in length, and were feeding greedily on the plant referred to. We had never seen this larva before, but its markings are so peculiar that we recognized it at once from recollection of the figure given in Boisduval & LeConte, pl. 13. As this description may not

be accessible to many of our readers, we append the following free translation of it :—

" The caterpillar is of a very mixed color ; its under surface is brown as well as the feet. On the four first segments there is a white lateral and longitudinal band, beginning from the head. Between that band and that of the opposite side there is a large brown patch marked by large brownish-black spots, and behind this on the middle segments there is a large white patch in the shape of a lozenge, which covers the back and a part of the sides, one of the angles of which reaches the first pair of membraneous feet. On the middle of that band there are some brown spots. The posterior part of the body is covered by another large white patch marked anteriorly with some brown spots ; the lateral part comprised between the lozenge-shaped and the last white patch, is of a uniform dark brown color. It feeds on all the trees of the genus *Citrus*, and is in some parts of America a sort of plague to the cultivators of the orange."

For a few days, while fresh food of *Dictamnus* was at hand, the larvæ did well and grew rapidly, but the supply failing, they were transferred to a young orange tree, which was enclosed in a gauze bag to prevent their escape, when they lost their vigor and activity, and although they ate more or less of the foliage every day, they lost flesh and one after another died, until only three or four remained. These lingered for a long time and two of them spun up and went into chrysalis, but the chrysalids were small and one of them deformed, and finally the remainder all died. Subsequently the chrysalids became stiff and hard, and on opening them they were found dead and dry.

Cresphontes has been taken on the wing at Chatham, 60 miles west of London ; also at the western extremity of the Province, at Amherstburgh. A dead specimen has also been found washed up on the shore of Lake Ontario, near Grimsby, but this is the first instance, as far as we know, of the larva having been found in Ontario.

Dictamnus belongs to *Rutaceæ* or the Rue family, under which there are also grouped in Gray's School and Field Botany the following genera and species : *Ruta*, Rue, sp. *Ruta graveolens*, common rue, exotic, but much cultivated in gardens ; *Zanthoxylum*, prickly ash, sp. *Z. americanum*, northern prickly ash, and *Z. carolinianum*, southern prickly ash, both indigenous ; *Ptelea*, hop-tree, sp. *Ptelea trifoliata*, indigenous ; *Skimmia*, sp. *S. japonica*, exotic from Japan, and *Citrus*, which includes both the

sweet and bitter orange, the lemon, lime and citron. In the south the larva feeds on the various trees belonging to this latter family. In the west it is said to feed on the prickly ash, and Prof. Snow says that in Kansas it feeds on the hop tree. Having now been found on *Dictamnus*, it becomes highly probable that the larva will also feed on *Rue* and *Skimmia*.

TINEINA.

BY V. T. CHAMBERS, COVINGTON, KY.

GELECHIA.

G. thoracefasciella Cham.

Sometimes the thorax is ochreous with a transverse brown band between the wings, instead of brown with an ochrey band, and the wings are blotched irregularly with ochreous. The proportion of the two colors varies.

G. ochrestrigella Cham.

In one specimen sent to me by Mr. Behrens the entire space from the end of the cell to the apex, between two of the discal branch veins, is brown.

G. obliquistrigella Cham.

Varies a good deal, without, however, altering the pattern of ornamentation. In a specimen now before me there is a distinct black dash near the apex in one wing, which is represented on the other wing by two minute dots. The base of the wing and the costal margin near it are nearly always brownish, and the other markings of the wings vary in their distinctness.

G. pravinominella.

I suggest this name for the species described by me under the name of *G. 4-maculella*, from Colorado, in the *Cin. Quar. Jour. Sci.*, v. 2, p.

290. The species was named and described by me while in Colorado—away from libraries and collections—and the previous use of *4-maculella* was forgotten.

G. solaniella, ante v. 5, p. 176, and v. 4, p. 193.

The former accounts of this species are so meagre that I annex the following description :

Palpi simple; second joint more than half as long as the first.

Palpi grayish brown externally, more yellowish internally ; entire insect otherwise grayish brown and ochreous intermixed, microscopically dusted with white ; the ochreous and brown on the primaries take more or less the form of narrow longitudinal streaks, and the relative proportions of each color vary in different specimens, some being distinctly ochreous and others nearly brown. *Al. ex.* $\frac{7}{16}$ to half an inch. Kentucky.

Two specimens which I have received from St. Louis, from Miss Murtfeldt, are paler and more gray, with a distinct blackish dot on the fold about midway of the wing, and another small one between it and the costal margin which I have not detected in any of my specimens. These two specimens are also smaller than my own, but that they are of the same species is shown not only by their resemblance in other respects, but by the habits and appearance of the larvæ. The following account of the larvæ is furnished to me by Miss Murtfeldt, and agrees with my own observations, except that so far as I have observed, the entire larva turns blue when it is mature, while Miss Murtfeldt remarks it only of the first three segments. I have published a very brief account of the mine and larva, *ante v. 5, p. 193,* and the following is Miss Murtfeldt's account :

"The larva mines and crumples the leaves of *Solanum Carolinense,* turning them brown. Inside of the mine the larva inhabits a tough, silk-lined gallery, formed externally of frass. This gallery extends around the edge of the leaf until the latter appears as if a gathering string had been run between the tissues. The larva is nearly cylindrical, about 0.40 inch. in length, of a translucent green color, with transparent piliferous spots arranged in the usual transverse rows on the thoracic segments, and in the form of a trapezoid on the abdominal segments. Head and cervical shield bright brown, polished and edged anteriorly with whitish green. The thoracic segments turn blue when the larva is mature. Legs and prolegs short, yellowish green. The larva leaves the mine and pupates

on the surface of the earth in a slight cocoon, and the imago appears in about ten days, except the last fall brood, which hybernates in the chrysalis."

I have, as stated in a former number of the CAN. ENT., also received specimens of it from Texas. And *G. ciliælineaella* only differs by the white lines at and in the ciliæ.

G. Hermannella.

In vol. 4 I have copied from the *Nat. Hist. Tin.* a description of this species; and in *The Ento. Mo. Mag., v. 11, p. 279,* I have given an account of a variety found in Kentucky and Missouri, and probably further south, which I copy here for the benefit of American readers and for the purpose of adding some additional particulars. The specimens of the variety which I have bred—something over twenty—were from larvæ taken at various localities in Kentucky, and all that I have captured in Kentucky belong to the variety likewise, and Miss Murtfeldt writes to me from St. Louis that the variety only has been bred there. If the old, well-known form occurs at all in this latitude, it must be very scarce.

"So far as I can learn, no variety of this species has yet been found in Europe, though the species occurs from Lapland to Naples. Some three years ago I found the larvæ mining leaves of *Chenopodium* on the shore of Lake Michigan, lat. 43 deg. N.; and from them I bred several specimens differing in no essential particular from the figure in *Nat. Hist. Tin., v. ix., plate 8.* Afterwards I often found them mining the same leaves in Northern Kentucky, lat. 38 deg. (nearly), but as I had as many specimens as I then wanted, and never thought of a variety, I did not attempt to breed them until the summer of 1874. The larva was the same, the mine was the same, and the mined leaves were of the same plant that I had found in Wisconsin, but, to my surprise, all the specimens that I have bred differ so decidedly from the ordinary *G. Hermannella* that probably any Entomologist would have considered them, if only captured, as of distinct species. Yet a little ingenuity on comparison of the specimens will show how the one pattern of ornamentation is readily resolvable into the other. One who knows this 'micro,' or the figure of it before mentioned, will remember the silvery fascia dark-margined on both sides, the small silvery spot before the fascia beneath the fold, and the larger one just above the fold behind the fascia. Now, suppose the dark margins of the fascia increased in quantity, especially the posterior dark margin

then suppose all the dark margin *behind* the fascia gathered on the costal margin, forming a velvety black spot so large that it touches the small silvery spot above the fold behind the fascia ; in like manner, suppose the anterior dark margin of the fascia gathered together in a velvety black spot *before* the fascia beneath the fold ; then suppose the fascia widely interrupted in the middle—and you have the variety. The costal part of the fascia thus becomes the anterior silvery margin of a large velvety-looking black costal spot, which, by its confluence with the silvery spot above the fold, appears to be margined with silvery at that point, and sometimes has a few silvery scales scattered through it ; and the dorsal portion of the fascia becomes the hinder silvery margin of a large velvety-looking black dorsal spot, which, by its confluence with the silvery spot beneath the fold, appears to be margined with silvery at that place, and sometimes contains a few scattered silvery scales. Except that the quantity of black and silvery scales is increased somewhat, the insect does not differ from the old form."

But, as I find by specimens bred and captured since the above was written, I have only described above the specimens which most nearly approach the old form, and the variety is by no means a constant one. As the fascia in the old form is a little oblique, so the anterior margin of the costal spot is nearer to the base of the wing than the hinder margin of the dorsal spot ; sometimes both spots are silvery margined entirely both before and behind, and sometimes also within ; and in one bred specimen there is no dorsal spot at all, but the dorsal margin from the base to the ciliae is silvery. There are some other more minute differences which it might be necessary to mention if one were describing a new species ; and perhaps where the word " silvery " occurs above it would be more accurate to write violaceous-silvery.

HAMADRYAS (Clem.)

H. Bassettella Clem.

The only variation that I have observed in this species is in the ground color, which ranges from sulphur to almost brick-red. It is abundant in all the Texas collections, and though originally described from Connecticut, I have never met with it in Kentucky or in Colorado.

PHÆTUSA.

P. plutella Cham.

The statement in the description of this species that the white streak

before the ciliæ is absent is incorrect. It should read that it is present.

EPICORTHYLIS Zell.

I copy the brief generic diagnosis from *Bei. Z. Kent., 1873, p. 48:*

Capitium depressum elongatum. Ocelli nulli. Antennæ crenulatæ. Palpi labiales porrecti, thorace multi longiores, articulo secundo sub-arcuato subtus lævis supra posticæ squamis erectis crestato; terminali setaceo, erecto. Haustellum brevissimum. Alæ anteriores angustæ, marginibus oppositis subparalellis; cellula media simplici, vena apicali furcata; posteriores anterioribus latiores, trapeziformes, margine postico infra apicem levitu impresso, vena mediana trifida. Tibiæ posticæ in dorso piloso-cristatæ.

E. inversella Zell.

Until I saw the species I supposed that it might be congeneric with *Sagaritis gracilella* Cham. It, however, seems to resemble it chiefly in having the tuft on the upper side of the second joint of the palpi. It is a heavier-bodied, clumsier-looking insect than *S. gracilella.* Prof. Zeller's specimens were probably a little worn, as he describes and figures the fore wings as having the spots arranged 1, 2, 1, as some of mine have them; but these are a little worn. The best specimens have large spots, or perhaps I might call them short transverse bands, arranged 1, 1, 1.

The species is dark gray, the scales tipped with hoary. The palpal tuft is whitish on its internal surface. Antennæ annulate with dark gray. The dorsal half of the fore wings is paler than the costal, and the disc is whitish or almost hoary, and behind this whitish part of the wing and not distinctly separated from it, is a whitish fascia concave towards the apex. The spots above mentioned are in the whitish discal part of the wing. *Al. ex.* about ½ inch. It is as yet known only from Texas.

DESCRIPTION OF A NEW GRAPHOLITHA.

BY A. R. GROTE, BUFFALO, N. Y.

Grapholitha taleana, n. s.

♂. Fore wings brownish fuscous; under the glass the scales are seen to be blackish with white tips. Thorax concolorous. Fore wings with

three orange-ochre costal lines; the outer two ante-apical, outwardly oblique and joining a marginal line of the same color; the inner a little less oblique, just without the middle of the wing. The marginal line only extends to the outer border of a black patch situate below the median fold and containing four or five ochre dots. Fringes silky, concolorous with the wings. Hind wings a little darker than primaries, immaculate. Beneath concolorous brownish fuscous, with the exterior margins of both wings shaded with pale. Costa of primaries above at apices narrowly yellowish, enclosing fuscous streaklets. No costal fold.

Expanse 18 mil. Illinois, Mr. Thos. E. Bean, No. 630. Seems to be rather distantly allied to the European *arcuana*.

NEW NOCTUAE.

BY LEON F. HARVEY, M. D., BUFFALO, N. Y.

Agrotis Hilliana, n. s.

♀. All the tibiæ spinose. Allied to *perconflua*, but much brighter colored and with larger and distinctly annulated stigmata. Bright rusty ochre, shaded with lilac gray. A fine black basal streak reaches to the small black marginal claviform. Base of the wing ochreous, basal half line double, the inner line distinct blackish brown. Sub-basal space washed with lilac gray. Inner transverse line a little oblique, nearly straight with a slight outward curve below submedian vein on the margin, double, the outer line distinct, the inner fades out below costa. Median space rusty ochre; orbicular large, ochreous, with faint internal annulus, oblique, ringed with black; reniform similar in color, upright, very near the exterior line, which commences on the costa just above it. Exterior line lunulate, nearly straight, faintly indicated below costa. Sub-terminal space dark, washed anteriorly with lilac gray, contrasting with clear ochreous terminal space and fringes. Hind wings pale ochreous with faint lunule and double shaded lines. Abdomen above pale ochreous. Thorax rusty and dark. Head and collar pale ochreous. Palpi brown at

the sides; third joint pale. Beneath ochre-yellow, powdered with red with faint markings. Abdomen and thorax beneath rusty brown.

Expanse 36 m. m. *Hab.* Lewis Co., N. Y. Collected by Mr. W. W. Hill, of Albany, after whom I take pleasure in naming this handsome species.

Polia diffusilis, n. s.

♂. Size large. Eyes naked, lashed. Tibiæ unarmed; thorax with a mesial crest; abdomen untufted. Antennæ with the joints prominent, brush-like, bristled beneath. Concolorous, dark gray, at first sight recalling *Apatela americana.* Median lines blackish, dentate and denticulate, approaching a little toward internal margin. No basal dash. Orbicular concolorous, small, rounded, oblique, dark ringed. Reniform renal in shape, dark ringed, touched outwardly with whitish, moderate, not quite upright. Subterminal line very deeply dentate, dividing the more blackish or fuscous blackish terminal space from the remainder of the gray wing. The median space is perhaps a little darker than the subterminal and basal spaces. The subterminal space is narrow, widening to costa, where there are four costal dots; between veins two and four it widens; it is cut into large gray teeth by the line. A fine black terminal line. Fringes gray, interlined. Hind wings concolorous whitish gray, shaded with fuscous. Beneath whitish gray with common line, and discal dot on hind wings. Head and thorax dark gray; abdomen fuscous gray.

Expanse 52 m. m. *Hab.* Lewis Co., N. Y., July. W. W. Hill.

Tricholita fistula, n. s.

♂ ♀. Antennæ of the male pectinate, eyes hairy. Superior wings olivaceous, not tinged with red. T. a. line faintly visible, irregular; t. p. line evident, waved. Subterminal space broad, lighter in shade, glistening. Orbicular spot concolorous; oval, black margined, uniform, pipe-shaped bowl turned to the base of the wing, white, broken; outer portion of costal margin cut with white; fringes concolorous. Inferior wings fuscous, beneath arcuated line and discal spot; fringes lighter in shade. Thorax concolorous, abdomen fuscous; a black line on upper portion.

Expanse 32 m. m. No. 40, J. Behrens. *Hab.* California.

This species is congeneric with *T. semiaperta* Morr. It is the first Californian representative of the genus.

Copablepharon, n. g.

The genus resembles *Arsilonche* in the lashless naked eyes, and *Om-*

matostola somewhat in ornamentation and habit, though not in color. It differs from either in the spinose tibiæ. It is the only form of the Heliophilid genera which has this peculiarity. The single species, *C. absidum*, was formerly referred by me to *Ablepharon* (= *Arsilonche* teste Staudinger). It is from California; one specimen before me is from Webber Lake, July 22, collected by M. v. Osten Sacken. The thorax and fore wings are pale lemon yellow, with the veins somewhat paler and accompanied by dark powderings. Hind wings and abdomen white; the former slightly dusted with fuscous and with a more or less evident mesial line of dots on the veins.

Heliophila amygdalina, n. s.

♀. Allied to *ligata*, but the wings are more almond-shaped. Costa curved. Eyes hairy. Of the usual pale testaceous ochreous color, with a brighter shading on the cell. Costa broadly whitish rosy gray; veins obsoletely pale marked. The t. p. line is expressed by a continuous series of venular black dots, running more inwardly obliquely below vein 4 than in *ligata*. Hind wings white, very slightly soiled. Abdomen and thorax pale ochreous. Beneath the whitish hind wings show a terminal row of black points; the ochrey primaries a black mark at the ception of the exterior line on costa.

Expanse 34 m. m. *Hab.* Orono, Maine. Prof. Fernald, Coll. B. S. N. S.

Caradrina subaquila, n. s.

♂ ♀. Closely allied to *conviva*, but the thorax and fore wings are of a bright brown, somewhat purply. The terminal space pale, somewhat ochrey, and in one specimen broken into spots. The lines and spots as in *conviva;* the reniform resolved into two blackish points, more or less prominent and faintly pale ringed. Hind wings and fringes white; the former more or less soiled exteriorly.

Expanse 23 m. m. *Hab.* Bostrop Co., Texas. M. von Meske.

Caradrina clara, n. s.

♀. Fore wings and thorax blackish brown, paler shaded. Veins on primaries obsoletely powdered with white. Median lines sub-obsolete; the inner almost wanting; the outer geminate, shaped as in *grata*, and like as in that species, very near to the white marked narrow reniform.

Orbicular wanting. Fringes concolorous. Hind wings pale yellowish white, sub-pellucid. Beneath with distinct discal black spot visible above; a dark waved exterior line and indications on costa of a sub-terminal line; costal region shaded with fuscous. Fore wings dark with a waved perpendicular exterior line and a sub-obsolete sub-terminal line.

Expanse 26 m. m. *Hab.* Texas. M. von Meske, No. 2,611.

Graphiphora rubrica, n. s.

♀. Thorax yellowish fuscous or gray. Collar marked by a faint black line. Superior wings of a yellowish gray, suffused sometimes with a ruddy brown tinge; a black dash at base of fore wings. T. a. line geminate, waved; outer line black, more prominent on inferior border. T. p. line geminate, faintly black, commencing on costa above the reniform, boldly exserted and passing to the inferior border of wing directly in a line with the internal border of the reniform and terminating in a black dash. Sub-terminal commencing with a yellowish white apical patch and continuing as a clearly cut even yellow line to the inferior angle; orbicular spot oval, concolorous, light annulus, oblique; reniform concolorous with a black spot in the lower portion, light ringed, with inner margin most expressed. Costal margin with black and white markings; fringes concolorous with sub-terminal line; inferior portion of wings nearly concolorous with thorax. Inferior wings whitish, discal spot and arcuated line black; terminal line a series of black dashes; beneath same lines, only more marked.

Expanse 32 m. m. *Hab.* Rafael, Cal., April, No. 4, M. v. Osten Sacken.

The distinctive character of this species is the pale even sub-terminal line arising from a pale apical patch.

CORRESPONDENCE.

EGG-FEEDING MITES.

DEAR SIR,—

In the February number (p. 22) you quote Dr. Hagen as saying that "in the whole European literature I have not been able to find anything

about Acari eating eggs, so the fact seems new and is very important." The *Dermalcichus* figured in my 5th Mo. Rep. (p. 87) feeds upon the eggs of *Mytilaspis pomicorticis*, as well as upon the insect proper under the scale. In fact I find it more often feeding on the eggs. Dr. Packard long since observed and figured a mite *(Nothrus ovivorus)* that preys on the eggs of the Fall Canker-worm *(Anisopteryx pometaria* Harr.); while the beneficial effects of the Locust Mite *(Trombidium locustarum)* in destroying the eggs of the Rocky Mountain Locust have been frequently referred to of late years in my Reports, and recently in the February number of the *American Naturalist.*

C. V. RILEY.

St. Louis, Mo., March 8, 1878.

ARCTIA ANTHOLEA, Boisd.

DEAR SIR,—

Assuming that the figure of this species given in Stretch's Zygaenidæ and Bombycidæ, plate 3, fig. 8, is correct, and I have no doubt of it, then this species is identical with the European species, *Euprepia judica* Esp., and as this name has priority, *antholea* falls.

W. V. ANDREWS, Brooklyn, N. Y.

CATOCALA MARMORATA.

DEAR SIR,—

Three good specimens of *Catocala marmorata* were collected by me at sugaring the latter part of August last, and also one fine specimen of *relicta.*

S. H. VAN WAGENEN.

Rye, Westchester Co., N. Y., Jan'y 29, 1878.

SAMIA COLUMBIA.

DEAR SIR,—

From cocoons of *columbia* kindly sent me by Mr. Anson Allen, of Orono, Maine, "found on larch trees many feet from the ground, where

they would be exposed to all the changes of winter weather," a single male escaped in the warm room where I kept the chrysalids. I found the specimen February 14th, but it had broken its wings, and I have no doubt it escaped one or two days previously. I had no immediate expectation of the chrysalids hatching, and hence did not examine the cocoons daily. I think it worthy of record that this species has the peculiar smell characteristic of *cecropia*.

A. R. GROTE, Buffalo, N. Y.

DEAR SIR,—

I would like to refer to a statement of a correspondent (in July No. of ENTOMOLOGIST) regarding the appearance in large numbers, in the vicinity of this city, of *Melitaea phaeton*. Although collecting nearly every day during the summer, I did not observe a single specimen of this butterfly, nor have I seen one collected by any one else. *M. tharos* is one of our most common butterflies; perhaps this was the one intended.

W. H. HARRINGTON, Ottawa, Ont.

DEAR SIR,—

In the summer of 1876, while examining the paper bands placed in our orchard to entrap the larvæ of the Codling Moth (*Carpocapsa pomonella* Linn.), I found quite a number of their larvæ and chrysalids apparently eaten by some *cannibal*, which, after close watch, proved to be *Tenebrioides laticollis* Horn. On several occasions I found them half way into a fresh chrysalis of *C. pomonella*.

This beetle, as well as *T. castanea* Mels., is very common here, and I will try to encourage this useful taste of theirs.

CHARLES D. ZIMMERMAN, Buffalo, N. Y.

DEAR SIR,—

Four specimens of *Papilio cresphontes* were captured in Fairfield Co., Conn., last summer, about the 25th of July. Others were seen

GEO. W. PECK.

New York, March 10th, 1878.

No. 4.

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VOL. X. LONDON, ONT., APRIL, 1878. No. 4

NOTES ON THE LARVA AND CHRYSALIS OF NEPHELODES VIOLANS.

BY G. H. FRENCH, CARBONDALE, ILL.

During the last of April and through the month of May, 1877, I found the larvæ of this moth in grassy places in Washington County, Illinois. When full grown they were 1.75 inches long, robust, the head four-sevenths the width of the middle of the body. The color of the under side yellowish gray. Above the line of the lower part of the stigmata, four broad dark brown stripes alternating with three narrow grayish yellow ones, the latter in the dorsal and sub-dorsal regions, and much lighter at the extremities of the body. Head gray, mottled with brown, brown border to the inner part of eyes. Cervical shield very dark brown, crossed by dorsal and sub-dorsal light lines. No hairs noticeable except with glass.

Changed the fore part of June, under ground, to dark brown chrysalids, .80 of an inch long, very thick through the central part, rapidly tapering to the next and so on to the last segment. The terminal segment nearly cylindrical, rough, joined to the back part of the preceding, tipped with two short, diverging bristles. Imagines appear about the middle of September.

While in confinement fed freely upon corn, grass and *Polygonum aviculare*. They fed mostly at night, remaining concealed during the day time, either under the rubbish of the box, or in the dirt, resembling in this respect the cut worms (*Agrotis*, etc.)

THE BEATING NET.

BY JAMES S. BAILEY, A. M., M. D., ALBANY, N. Y.

The uses of the beating net are obvious and can at once be appreciated in the collecting of Coleoptera and larvæ. A convenient and simple form is here presented, with directions for its construction.

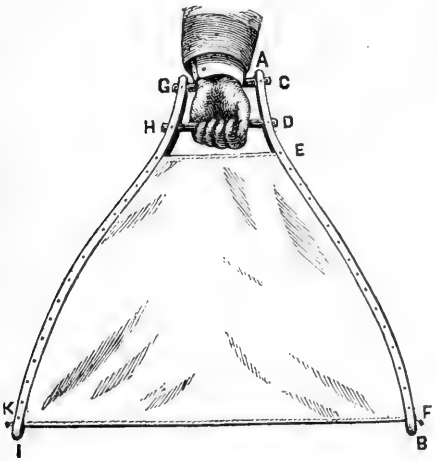

Fig. 2.

Fig. 3.

This particular form of net was invented and presented to me by my friend, Mr. T. B. Ashton, of Tonganoxie, Kansas, who has not only distinguished himself as a Coleopterist, but has shown himself to be an excellent mechanic.

By grasping the net with the left hand, as shown in fig. 2, thrusting it under a shrub, and giving the bush a quick shake, or blow with a walking-stick, every living thing upon it will instantly fall upon the apron of the net. If Coleoptera, they can be secured with the fingers or a small net held in the other hand for that purpose. If caterpillars, they can be gently rolled into a receptacle prepared for them.

The frame work is made of well seasoned hickory. The sides, A, B and G, I, are composed of strips 37 inches long and 1¼ wide at the ends A and G, and tapering uniformly until they are ⅝ of an inch wide at the other ends, B and I. Each piece should be ½ inch thick when dressed. After these pieces are steamed or boiled in water until thoroughly pliant, the wider ends A and G can be placed together and securely fastened in a vice, the free ends B and I separated widely and a block of wood forced between at the point E, and securely fastened, while the ends B and I can be secured with a piece of strong twine until dry enough for the frame, to maintain its shape. Then the sides should be sand-papered until smooth and two holes bored in each piece for the rounds G, C and H, D to pass through; for this purpose a half-inch bit will be sufficient, its point being inserted in the stick ¾ of an inch from the end of the widest part C, G, and again 5¼ inches at D, H. A round should be turned of the same material to fit the hole, and should be 6½ inches in length. The other round must be of the same size and 8½ inches long. One end of each round can now be fastened into one side piece by a hickory peg ⅛ of an inch in diameter; the other side is fastened in the same manner, but the pegs on this side must be fitted so that they may be taken out to enable the net to be folded for transportation.

Now that the frame work is constructed, each side must be ripped centrally with a saw for 29 inches, commencing at the point B and extending to E. Through this slit a piece of unbleached domestic cloth must be drawn, a hem ¾ of an inch wide having previously been made across the ends at the points E and F. Fourteen screws are now inserted into each blade two inches apart, which will hold the sheeting firmly and form the apron. The outside edges can now be cut closely to the frame work with a sharp knife. Previous to this operation a stout twine should be passed through the hem at the points F, K, and a knot tied at each end, but the twine should be an inch or two shorter than the apron, which will cause it to sag and better hold its contents. Where the twine passes through each side piece a gimlet hole ⅛ of an inch in diameter must be made to accommodate the twine.

The drawing is introduced not only to assist in constructing the net, but to represent the manner of handling it when collecting. Fig. 3 represents the net folded for transportation.

LARVAL AND PUPAL HISTORY OF DARAPSA VERSICOLOR Harris.

BY GEORGE D. HULST, BROOKLYN, N. Y.

Last summer I was so fortunate as to obtain fifty eggs of the rare Sphinx, *Darapsa versicolor*. They were found between June 26th and July 20th, on the under side of the leaves of the common swamp button bush, *Cephalanthus occidentalis* Linn., and, with two exceptions, were laid singly. The egg is round and slightly flattened—about the size of rape seed. It is at first light green and translucent, afterwards milky and opaque; a few before hatching became, about the spot where the larva emerged, russety. The longest any egg continued without hatching was six days, and it is almost a certainty that the duration of the egg state is seven days.

The larva, just emerged, is a uniform pale white, three lines in length. The caudal horn, from four to five hours after the emerging of the larva, becomes dark purple. The caterpillar gradually becomes pale green. The first caterpillar hatched June 27th, and completed its first moult early July 2nd. The moult occupied about 30 hours.

After First Moult—Length 6 lines. Head nearly spherical, with greenish tint. Body linear, light green in color. A lateral whitish line extends from the mouth to the caudal horn, which, as the age advances and size increases, is revealed to be composed of several lines as follows: A sub-dorsal line extending from each side of the mouth to the upper part of the eyes, and thence back to the rear of the 4th segment of the body; a similar line runs obliquely from the lower part of the 4th segment, under and just including the stigmatal point, upwards and backwards to the rear of the 5th segment, meeting it just below the dorsal line. This is followed by five other and parallel lines, each beginning and ending one segment further back, except the last, which extends across the three last segments up to the base of the caudal horn. There are faint indications of other lines at the lower part of the 10th and 11th segments. The caudal horn is a violet purple, becoming towards the end of the age lighter in color, and during the age is always held parallel with the body. The second moult was completed early July 6th, occupying about 24 hours.

After Second Moult—Head and body light green. Body finely granulated ; markings as before, but more distinct. Stigmata marked by red points. Caudal horn reddish, darker in front and behind than on the sides. During this age the head almost ceases to develop, so the body increases rapidly in size from the head to the fifth segment. The third moult ended July 10th, occupying about 30 hours.

After Third Moult—Head somewhat triangular, and with the body green. Markings as before. Fore legs pink. Stigmatal points red ; body covered with granulations, and much swollen at 4th and 5th segments. Caudal horn straight, greenish white in front and behind, almost white on the sides. The fourth moult ended early July 16th, occupying about 40 hours.

After Fourth Moult and Mature Larva—Head small, somewhat triangular and elongate. Head and first four segments yellowish green ; the rest of the body pea green. Markings as before, without granulations, which have become white specks. The body more heavily marked with these on either side of the back, forming a green dorsal line. Stigmatal marks red, oval, with yellow point at each end. Horn stout, curved backward, sharply pointed, black in front and at the end, red on the sides.

About one in five varies from this normal form in having the ground color a pinkish brown instead of green. The shadings are then pinkish white.

The larva when full grown is from 2½ to 3 inches in length. It becomes bluish black before pupating, and several, before leaving the food plant, were noticed rubbing the mouth over the entire body as if covering it with saliva. The food plant was left during the night, July 21st–22nd. The pupation was on the ground under leaves, in a slight cocoon made by drawing together leaves and grains of dirt with some silk. The larva became a pupa in from three to four days after leaving food plant.

The pupa is of a dirty light brown color, with dark chocolate brown spots—these almost covering the wing cases and anterior parts. The eyes and stigmata are black. The pupa is, as well, black between the segments.

The imago appeared Aug. 12th. The later broods remain in the pupa state of the same early brood ; some emerged ; others, exposed to the same conditions, remain pupæ.

The larva from the beginning is very quiet in its habits, never leaving a stem of the food plant so long as a leaf remains. In eating it always hangs from the mid-rib of the leaf below (or, when small, from one of the minor ribs), and eats usually from the extreme end, finishing a section across the leaf as it goes. It generally eats midrib and petiole down to the woody stem. It is easily reared and will endure almost any hardship. Like others of our Sphingidæ, it is but partially double-brooded on Long Island.

NOTES ON THE EARLY STAGES OF SOME MOTHS.

BY L. W. GOODELL, AMHERST, MASS.

Euloncha oblinita Grote.

Larva, one specimen—Body black; a broad coral-red band on the back of each ring and a row of bright yellow blotches on the sides. The black ground color is variegated with white on the sides. On each ring are ten small warts, each of which bears about eight short, stiff, spreading brown spines, which sting severely when touched. Head roundish, coral-red, with two brown spots on the crown. Length when full grown, 1.4 inches. Feed on the smooth alder *(Alnus serrulata)*. Changed to a pupa within a tough cocoon attached firmly to a twig. Imago June 6.

I am indebted to Prof. A. R. Grote for the identification of this species, and to Dr. A. S. Packard, jr., for the following Geometrids:

Eumacaria brunnearia Pack.

Larva, eight specimens—Body smooth, stout and uniform; black with a large, indistinct, grayish blotch on each side of the five middle segments. Head black, as wide as the body, not bifid. Length when full grown, 0.6 to 0.7 of an inch. Feeds on the apple tree. Pupated Aug. 30th to Sept. 15th.

Pupa—Length 0.33 to 0.42 inch; dark brown; subterranean. Imago early in June.

Eubyja cognataria Guen.

Larva, two specimens—Body thick and of uniform width, carinated on the sides; brown tinged with olivaceous and punctated with dark brown, thickest on the back and anterior part of the segments. On the first ring are two small angular tubercles, and two still smaller sub-dorsal conical ones on the 8th. The 11th segment is slightly humped and on the back are two large, kidney-shaped, pale ochreous spots, which are edged with dark brown; and there are two small dorsal grayish spots on the anterior part of each ring. The tubercles on the first ring are brown tipped with reddish, and those on the 8th are gray thickly spotted with black. Spiracles red. Head sub-quadrate, deeply bifid, with a crescent-shaped indenture in the middle of the front; color yellowish brown, banded with darker brown and the lobes tipped with dull red. Feeds on apple and pear trees. One specimen became fully grown Aug. 18th, and the other Sept. 16th, and measured respectively 2.3 and 2.4 inches in length.

Pupa—Length 0.7 inch, obtuse, dark shining brown; subterranean. Imagines last of June.

Cymatophora crepuscularia Pack.

Larva, one specimen—Body smooth and of uniform thickness; pale yellow on the sides, shading to creamy white above; a straight, light brown stripe on the back, and below this, situated close together, are several narrower, wavy, dark brown stripes. All the stripes are obsolete on the last segment. Head roundish, a little wider than the body and reddish brown in color. Venter bluish white. Found May 30th, on the plum tree. Length when fully grown, 1.3 inches. Pupated June 6th.

Pupa—Length, 0.5 inch, of the usual form and color; subterranean. Imago June 19th.

NEW SPECIES OF ACOPA AND HELIOTHIS, AND NOTE ON HAMADRYAS.

BY A. R. GROTE, A. M.,

Director of the Museum, Buffalo Society Natural Sciences.

In *Acopa carina* Harvey, from Texas, the accessory cell on the primaries is smaller than in a new species which I have received from Prof.

Snow from Southern Kansas. In this genus the body is linear and slight, tibiæ unarmed, ocelli small, male antennæ brush-like with distinct joints, thorax with a tuft behind, abdomen untufted, linear. Fore wings 12-veined with accessory cell, from the outer apex of which spring veins 7 and 8; 9 out of 8, a long furcation to costa. Hind wings 7-veined; median vein 3-branched; 8 out of 7 not far from the base. Primaries with oblique outer margin and produced apices. Front with a clypeal plate. Labial palpi narrow, linear, improminent; legs slender, tibiæ unarmed.

Acopa perpallida, *n. s.*

♂ ♀. Larger than *carina*, with white secondaries. Primaries white, shaded with ochrey and with narrow fuscous lines. Basal line indicated; anterior line upright, forming two large teeth; outer line denticulate, outwardly prŏduced opposite the cell; orbicular obsolete, reniform concolorous, obscured by a dark shade. Subterminal shade line fuscous, even, continued to vein 7 from internal angle, above which it appears as an inwardly oblique shade from costa to vein 7. A terminal interrupted line; fringes white. Hind wings white, very slightly soiled, with discal mark and in distinct line; fringes white. Beneath yellowish white, shaded with fuscous on primaries; fringes white. Body whitish. *Expanse* 28 mil.

The median lines on primaries are further apart than in *carina*. This species was sent me by Prof. Snow under the number 504.

Heliothis nuchalis, *n. s.*

♂. Wings ample; body comparatively slight. Eyes naked. All the tibiae armed; fore tibiae with an inner terminal spine and an outer one of same size, the latter followed by two smaller spinules. Fore wings with pale whitish ochrey ground, much shaded with fuscous. All three stigmata present, very large, sub-equal, and dark. The reniform has an internal annulus and a central pale streak, likewise the smaller rounded orbicular; the broad claviform is cut by the narrow submedian shade. Posterior line narrow, fuscous, angulated on subcostal vein, roundedly produced opposite cell, interrupted by the pale marked veins. The terminal fuscous field is cut by the whitish subterminal shade; fringes dark. Hind wings whitish ochreous, with thick discal mark, central discally angulated line and with a series of irregular pale interspaceal blotches cutting the fuscous terminal shading of the wing; fringes white, interlined at base. Beneath whitish with faint ochrey tinge. Discal marks large,

black, distinct on fore wings. Outer line narrow, distinct, discally bent; subterminal shading obvious. On the secondaries there is a discal mark, a central narrow uneven line and terminal shading; fringes white with faint interline. On fore wings the fringes are here whitish at base. Body whitish beneath, above fuscous. *Expanse* 33 mil. Prof. Snow, Kansas, number 371.

This species is wider winged and smaller bodied than *cupes*, differs by the presence of the large claviform and in the armature of the fore tibiæ. The fuscous margin of the hind wings above is much more broken up with pale blotches than in *umbrosus* and *phlogophagus*.

Fam. TINEIDÆ.

For Dr. Clemens' genus *Hamadryas*, preoccupied in the Lepidoptera by Hübner and Boisduval, I propose the generic name *Euclemensia* for *E. Bassettella*.

NOTES UPON GRAPTAS COMMA AND INTERROGATIONIS.

BY W. H. EDWARDS, COALBURGH, W. VA.

I. COMMA; dimorphic forms HARRISII and DRYAS, both figured in But. N. A., Vol. 1.

In CAN. ENT., v., 184, Oct., 1873, I gave the result of breeding this species from eggs laid by the form *dryas*, viz., 6 *dryas*, but many more of *Harrisii*, establishing the dimorphism. Since that time I have raised several broods from the egg, and both before and after 1873 recorded in my journal the history of several lots of larvæ found by me. I have therefore some material for illustrating the peculiarities of the species. At Coalburgh there are three broods annually, and the butterflies of the third brood hybernate. The hybernating females deposit their eggs last of April or early in May, and the first brood of the butterflies emerges from chrysalis about 1st June; but should the weather be cold during May, then from the middle to last of June.

The second laying of eggs occurs in July, between 15th and 30th, and the butterflies from these appear last of Aug. or first of Sept.

And the third laying occurs in September, the butterflies therefrom emerging in October. The several broods are accelerated or retarded in their periods by the weather, great heat quickening every one of the preparatory stages.

So far as I know from breeding, or from very extended observations in the field, the last laying of eggs produces *Harrisii* only, and the series therefore begins in the spring with eggs laid by that form.

The result of the eggs laid by *Harrisii* has in all cases been *dryas* only, with a single exception, when one *Harrisii* ♂ emerged.

The next brood of the season, the eggs having been laid by *dryas*, has sometimes consisted wholly of *dryas*, but again, as in the instance recorded in the ENT., and first above mentioned, of both forms, *Harrisii* considerably outnumbering *dryas*.

The third brood, from eggs laid by *dryas*, has resulted in *Harrisii* wholly, and closed the season.

Harrisii is the winter form of the species, and *dryas* the summer. The first brood of the summer is *dryas*, and were the season here as short as it is in the Catskill Mountains of New York, these two broods would comprise the whole round. In the Catskills the first eggs are laid in June, a full month after the first are laid in Virginia, and the butterflies emerge in July, all *dryas*, and eggs laid by these produce *Harrisii* in August, and this form hybernates. So that the two northern broods correspond with the first and third southern broods, and the second brood at the south is the interpolated one, and consists of both forms of the species. In some years *comma* is excessively common here in October and November, and in no season is it rare. I give a statement of results obtained :

FIRST BROOD : Eggs laid by HARRISII.

1871—Between 10th and 18th May, found larvæ. Result from 20th May to 2nd June—7 *dryas*.

1873—20th May, found larvæ. Result about* 12th June—4 *dryas*.

* I. e., a few days before and after the date named.

1874—10th May, obtained eggs from ♀ *Harrisii* in confinement. Result about 27th June—34 *dryas.*

1875—14th May, obtained eggs from ♀ *Harrisii* in confinement. Result about 18th June—19 *dryas.*

1869—18th June, obtained from chrysalis 1 ♂ *Harrisii.*

This last is the only exception to the rule which I have noticed.

SECOND BROOD: Eggs laid by DRYAS.

1873—30th July, obtained eggs from *dryas* in confinement. Result about 2nd September—6 *dryas*, many *Harrisii.*

1875—29th July, obtained eggs from *dryas* in confinement. Result about 24th August—5 *dryas* only.

THIRD BROOD: Eggs probably laid by both forms.

1870—Last of Sept., found 70 larvæ which must have come from eggs laid early in Sept. Result, in Oct.—all *Harrisii.*

I have never taken or observed an example of *dryas* in the fall or in the spring after hybernation. This form is recognizable at sight, as both sexes have the hind wings black on upper side, whereas in *Harrisii* these wings are red.

II. INTERROGATIONIS; dimorphic forms FABRICII and UMBROSA, both figured in But. N. A., Vol. 1.

I have raised several broods of this species, obtaining eggs by confining the females, during the past six years, and have also recorded the results obtained from eggs or larvæ found. There are at Coalburgh three full broods annually, as with *comma*, but there is an effort towards a fourth, more or less successful, depending on the length of the season or the temperature in the fall months. Some individuals hybernate, and the females so surviving lay their eggs in the last days of April or early in May. From these eggs come butterflies last of May or first of June.

The second laying occurs early in June and the butterflies therefrom appear early in July.

The third laying takes place last of July and the butterflies appear in September, some as early as first, others late in the month. The females of this brood, which is the third of the year, or some of them, lay eggs about middle of September and the butterflies emerge in October. But

the larvæ now are apt to be caught by cold weather and destroyed, or their food plant is cut off, so that few can reach chrysalis. Once in the chrysalis stage they are safe, and sooner or later, as the weather may permit, the butterflies will emerge. I am inclined to think that the butterflies of the third brood do not hybernate, and that the continuance of the species here depends on the few individuals which survive from this fourth brood. In no other way can I account for the scarcity of this species as compared with *comma*. Both these species feed on same plants, hop, early in the season, then nettle and *Boehmeria*, then *Celtis* and elm, and neither suffer to any extent from parasites. But *comma* is fifty times more abundant than *interrogationis*, and in the spring while many of the former are seen, I rarely see an *interrogationis*. In midsummer and early fall this last becomes common, and if the individuals of the third brood generally hybernated, surely the species ought to be common in the spring. If *umbrosa* ever passes the winter here I have failed to discover it. All the spring examples noticed by me have been *Fabricii*.

First Brood—The eggs obtained from ♀ *Fabricii* in April gave in May 21 *umbrosa*, no *Fabricii*.

The results of the next succeeding, or second, brood have been variable, just as in second brood of *comma*, and both forms have appeared from eggs laid by one female.

The result of the third brood has also been variable, both forms resulting. This, therefore, differs from the corresponding brood of *comma*, in which all the butterflies were of the one form, *Harrisii*.

The only examples of the fourth brood raised by me to imago came from larvæ found on elm 10th October, and when found were past third moult. They must then have proceeded from eggs laid about the middle of September. The chrysalis period was much protracted, but in December there resulted 4 *Fabricii*, no *umbrosa*. I have, however, in several years seen the larvæ of this brood late in the fall. As some individuals of every brood of any species of butterfly appear earlier than the average time and others later, so individuals of this fourth brood of *interrogationis* doubtless appear early enough in the fall to ensure early hybernation. And if the chrysalis stage is reached the butterfly is sure to emerge at last unless destroyed by a parasite or an enemy. In the case of *comma*, when compared with the behavior of that species to the northward, where there are but two annual broods, it is the second brood which is interpolated in

this region. In the case of *interrogationis*, when compared with the species northward, it is the second and third broods which are interpolated in this region, and when compared with *comma* of this region, it is the third brood of *interrogationis* which is interpolated. To the southward the fourth brood would have ample time to reach the imago before winter set in, and the species should be as abundant, where the food plants are found, as *comma* is here.

I say nothing of *interrogationis* in the Northern States, because I find nothing immediately bearing on the periods of the broods in my note books, and by correspondence I have failed to obtain special information. I simply know from experience that in the Catskills there are two annual broods, but whether the hybernating individuals are altogether *Fabricii*, or whether the brood which proceeds from these is wholly *umbrosa*, I do not know and cannot learn. I think *Fabricii* will be found to be the winter species there, and *umbrosa* the summer, but this is conjecture. I hope some lepidopterist at the north will examine this matter and report.

I give a statement of results obtained:

FIRST BROOD: Eggs laid by *Fabricii*.

1877—28th April, obtained eggs from ♀ *Fabricii* in confinement. Result about 4th June—21 *umbrosa*.

I had watched for years for a ♀ *Fabricii*, but this was the only one I was ever able to take.

SECOND BROOD:

1871—4th June, eggs laid by *umbrosa* in confinement. Result about 1st July—11 *umbrosa*, 6 *Fabricii*.

1869—5th June, found larvæ. Result about 25th June—26 *umbrosa*, no *Fabricii*.

1873—June, found larvæ. Result last of June—19 *umbrosa*, no *Fabricii*.

1870—4th July, found eggs. Result 10th August—1 *umbrosa*, 2 *Fabricii*.

THIRD BROOD:

1871—1st August, confined 11 *umbrosa* and obtained multitudes of eggs. Result 1st September—63 *umbrosa*, 34 *Fabricii*.

1877—15th August, from eggs of *umbrosa* in confinement. Result about 22nd September—2 *umbrosa*, 9 *Fabricii*.
1870—1st August, found larvæ. Result 13th September—6 *umbrosa*, 16 *Fabricii*.

FOURTH BROOD:
1872—10th October, found larvæ past third moult. Result 8th to 18th December—4 *Fabricii*.

MICRO-LEPIDOPTERA.

BY V. T. CHAMBERS, COVINGTON, KY.

TORTRICINA.

It is not my purpose to enter upon the difficult field of this family. My acquaintance with the literature of the subject, and with the characters of the multitude of very unnatural genera into which it has been in modern times divided, is too limited to justify me in so doing; the more especially as Prof. Fernald is now working it up. But the two species mentioned below are sufficiently interesting to induce me to publish the following observation upon them.

EXARTEMA, Clem.

E. fagigemmæana, n. sp.

A single specimen of this species is in the Museum at Cambridge, labelled *Coleotechnites fagigemmæana*, by which name it stood in my cabinet before it was recognized as an *Exartema*. Prof. Fernald having examined it, informs me that it is a true *Exartema*, which genus, though withdrawn by Dr. Clemens, is retained by Zeller.

Palpi ochreous, with terminal joint brown, and with two small brown spots on the outer and one on the inner surface of the second joint. Head ochreous, with a dark brown line across the vertex between the antennæ; eyes green; thorax ochreous, stained with fuscous on the dorsal surface; fore wings from the base to beyond the middle sordid olive green, the

remaining portion brick red, both portions being marked with silvery gray or silvery white, according to the light, and the basal third entirely suffused or overlaid with the silvery hue, except three spots, one of which is just within the dorsal margin, another oblong larger one is within the costal margin and a much larger elliptical one is on the fold. From the silvery part of the wing, at about the middle of the disc, a silvery streak curves obliquely backwards to the brick red color at the fold, where it intersects another silvery streak, which leaves the dorsal margin before the ciliae (at the junction of the olive green and brick red) and curves obliquely backwards to a point in the middle of the apical part of the wing, where it intersects still another silvery streak, which leaves the apical margin near the hinder angle and curves obliquely forwards to a point within the costal margin at the junction of the olive green and brick red colors. On the costal margin, and opposite to the end of the last mentioned streak, is a small ochreous spot, and in it begins another silvery streak which curves obliquely backwards to the apical margin before the apex, running nearly parallel to the last above-mentioned silvery streak, and being intersected by a small costal silvery streak which also arises from a small costal ochreous spot; further back are two other small costal ochreous spots, each of which contains a small black line. Ciliæ dark bluish brown, with two ochreous spots *beneath* the apex, and a dark brown hinder marginal line at the base, before which is an indistinct line of black atoms. From about the basal third of the wing length to the apex the *extreme* costa is dark brown interrupted by ochreous spots, and the basal third is ochreous interrupted by three or four dark brown spots. Thus the basal half of the wing is olive green suffused with silvery, except upon the three spots before mentioned, while the apical half is brick red divided by anastomosing silvery lines. Under a lens the silvery parts of the wing appear to be dusted with brown.

The hind wings are fuscous, pale at the base, deepening towards the apex. Ciliae yellowish silvery with a dark brown hinder marginal line at the base. Abdomen dark brown above, ochreous below. Legs ochreous, the first pair dark brown on their anterior surfaces, and the tibiae of the hind pair fuscous on their anterior surfaces; tarsi dark brown on the outer surface, annulate with fuscous. *Al. ex.*, ♂, 9½ lines; ♀, 8 lines. Kentucky.

This insect is chiefly interesting from its larval habits. I have known the larva long, and it is mentioned, I believe, in a previous paper in the

CAN. ENT. It is sordid yellowish white, with the head piceous and the next segment stained with fuscous. It feeds inside the leaf buds of the beech *(Fagus sylvatica)*, and when it has well eaten out the contents of one bud, it cuts it off at the base, and using it as a case, travels off to another bud, to the apex of which it affixes its case and proceeds to eat out this bud also, and then cuts it off, as it had done the first, and proceeds to another bud. I have known it to attach four buds together in this way, thus making a case nearly two inches long. It pupates in its case, which it attaches to a leaf, and the imago emerges in Kentucky in the latter part of June.

BRENTHIA, Clem.

B. pavonacella Clem.

Not having seen Dr. Clemens' specimens, and being unable to recognize my bred specimens in any descriptions by him or any other author within my reach, I had proposed to describe this species as new under the name of *Microcthia amphicarpœana*, and specimens so labelled are in the cabinets of various Entomologists. Prof. Fernald, however, on comparison with Clemens' types, recognizes my specimens as identical therewith. I have no doubt this determination is correct, though having again examined Dr. Clemens' description, it seems to me singularly incomplete.

In the "Tineina of North America" (Mr. Stainton's republication of the Clemens' papers) p. 134, Mr. Stainton, who had seen Dr. Clemens' types, writes that it is "probably a *Simaethis*," and at p. 41, again, that he is disposed to consider the insect "not a *Tineina*, but one of the *Pyralidina* allied to *Simaethis*"; and on p. 38, Dr. Clemens states that having "examined a specimen of *Simaethis*, I must acknowledge that *Brenthia* seems congeneric with it"; but he thinks its proper location is among the *Tineina*, and not the *Pyralidina*. Zeller refers *pavonacella* Clem. to *Choreutis*, which is Stephens' section "A" of *Simaethis*. The species appears to me to have some decided affinities with the *Tineina*, but upon the whole to be rather referable to the *Tortricina*.

Dr. Clemens mentions that it has the habit of "strutting about on leaves," but Mr. Stainton "has never observed this habit in any of the English species." The appearance of the insect in repose is decidedly *strutty*, and full of self-importance. A human being who would make the same effort to display his or her adornment, would subject himself to a well-founded charge of egregious vanity, but perhaps the insect is no more

chargeable with vanity than is a peacock. I have, however, never seen it strut about on a leaf, and after having bred a great many specimens, I do not believe that it can walk or run. At all events, I have never seen it do either, its modes of progression being by flight or by little jumps. It sometimes jumps more than an inch at a time, that is, about six times its own length. It is the only insect that I can now call to remembrance which has the under side of the wings of both pair as gaily ornamented as the upper side, and which manages to make a full display of its entire ornamentation of body and wings at one and the same time. It does this in the following manner: The fore wings, without being laterally extended, are elevated so as to display anteriorly the ornamentation of their upper surface, and posteriorly that of their lower surface; at the same time the hind wings pass out beneath them at the side, and fully expanded, getting a twist at the base which brings the costal margin up and the dorsal margin down, so that the ornamentation of their upper surface is displayed in front, and that of their under surface behind. The under surface of the wings are rather more gaily ornamented than the upper. This is its position always in repose, and the ornamentation of the abdomen is also thus exposed. I have bred both ♂ and ♀, and observed no difference between them either in ornamentation or position.

The larva is very pretty. It is pearly white, prettily spotted with piceous, with the integument somewhat indurated. It attains a length of more than one-third of an inch. It feeds on the under surface of leaves of *Amphicarpaea monoica*, in a slight web by which the leaf is a little curved downward, and in this web it passes the pupa state concealed in a rather dense, flattened, lozenge-shaped cocoon. The larva is very common in Kentucky in June and July, and I have also found it in September. I have never met with the imago except when I have bred it, and my specimens emerged from their cocoons in the latter part of July.

TINEINA.

STROBISIA.

S. albaciliœella, n. sp.

I describe this species from a single specimen presented to me by Mr. Chas. Dury, of Cincinnati. Tongue, palpi and face white. Antennæ and vertex brown, with a bronze lustre and paler than the thorax and fore wings, which are shining blackish brown, with greenish, violet reflections;

apical ciliæ of fore wings white. Thorax above and the anal tuft bronzy brown, with a deep purplish lustre; under surface white. Legs white tinged with fuscous on their anterior surfaces, especially so at the apex of the tibiae and on the tarsi. On the fore wings behind the middle are a very few white scales, forming an indistinct, short, transverse, white line. *Al. ex.* 5 lines. Taken at the light at Cincinnati, Ohio.

This and the three species described by Dr. Clemens are closely allied structurally and in ornamentation, and yet it is difficult to separate them structurally from the heterogenous assemblage of insects known as *Gelechia.*

ON A NEW ARCTIAN FROM FLORIDA.

BY A. R. GROTE, BUFFALO, N. Y.

The student is referred to my papers on the Bombycidæ of Cuba for remarks on a generic group closely allied to *Halisidota (Halesidota)* which I have called *Euhalisidota*, describing under it the species *luxa*, *fasciata*, *scripta* and *alternata.* Closely allied to the first of these is a species from Florida, the male of which I have from Mr. Schwarz, the female from Mr. Dury. It is hardly so large, and without the black thoracic marks, although I can make out two black points on the collar in one specimen. It seems to differ by the streak of dusky speckles about the median vein at the extremity of the cell, and the distinct subterminal series of isolated black dots. The color is dusky ochre, with the thorax darker and the inside of the fore tibiæ orange. The male antennæ are bipectinate. The secondaries are paler, with a slight apical mark in the male.

It must be remembered that my type from Cuba was a little rubbed. In comparing my figure and the present female specimen I think there is a great probability of the species being the same. The object of the present notice is to record the occurrence of the group in the United States, and to show that the West Indian fauna must be well understood before we describe, as new, species from the extremity of the Floridian peninsula.

Mr. Schwarz captured the male *Euhalisidota* at Enterprise, May 26, together with several other interesting moths, some of which I have already mentioned in this journal, and others I hope to be able to publish on a future occasion.

BOOK NOTICES.

Lepidoptera Rhopaloceres and Heteroceres, by H. Strecker.

Part 14 of Mr. Strecker's work reached us by mail on the 28th of March, and on enquiry, we find that other subscribers received it within a day or two of that date. We desire to call particular attention to this fact, as this part of the work, in which a number of species are described as new, bears the date of 1877. In Dr. Hayden's last report Mr. S. H. Scudder describes a *Satyrus* larger than *Ridingsii*, and like it, from Utah, as *dionysius*, which seems to be identical with Mr. Strecker's *ashtaroth*. Mr. Strecker's *M. imitata* is also doubtless a synonym of *ulrica* Edwards, C. E., v. 9, p. 189, his *M. larunda* the same as *dymas* Edwards, C. E., v. 9, p. 190, his *Pamphila similis* Edwards' *Amblyscirtes nysa*, C. E., v. 9, p. 191, and his *Charis Guadeloupe* identical with *C. australis* Edwards, *Field and Forest*, Nov., 1877.

It is somewhat singular that Mr. Strecker, who in his work so often expresses his abhorrence of the practice of creating synonyms, and who has not hesitated to heap abuse on the heads of those whom he considers to have fallen into such errors, that he should himself so grievously err in this respect. The dating of a work of this sort 1877, which does not appear until March, 1878, can scarcely be called honest, especially if it be done with the view of establishing a claim for priority in the descriptions of species. We would also here take the opportunity of expressing our regret that Mr. Strecker's work, which in some respects has much to commend it, should be marred by such gross personal abuse as he so frequently indulges in. Such low and ungentlemanly language is entirely unworthy of any one aspiring to the humblest position in the scientific world, and can only result in injury to himself.

Entomological Collecting Tour.—Mr. Wm. Couper, of Montreal, purposes visiting again the Lower St. Lawrence on a collecting tour this summer. He leaves on the 10th of May, and expects to return about the end of July. Parties wishing to correspond with him while absent will address their letters to Godbout River, Province Quebec, *via* Rimouski. This will be Mr. Couper's fourth collecting tour along the coast and among the islands of the St. Lawrence.

CORRESPONDENCE.

ONE WORD MORE ON L. PSEUDARGIOLUS.

DEAR SIR,—

It occurred to me to examine the genital organs of a black *violacea*, one day last week, and to my surprise, the individual was a male. Since then I have taken eight other blacks, and all are males. As it has been taken for granted that the black examples of *Lycaena* were in all cases female (at any rate where there is a blue male) I thought it best to send one of these so taken by me to Dr. Hagen for examination. And he replies :— "This morning I have carefully examined the abdomen of *L. violacea*. It is without any doubt a male. The organs are so fairly protruded that no section is needed." Now I have doubts whether there is any black female to this species. In a paper on Sexual Dimorphism in Butterflies, 1877, Mr. Scudder states that "wherever partial dimorphism is confined to one sex, it is always to the female ; there seems to be no exception to the rule."

I have thought it possible that the female of *violacea* deposited its eggs on Dogwood flowers, as there seemed to be no other flower in bloom here at this season long enough to allow the maturing of the larvae, which, so far as is known, live wholly on flowers, and three days ago I tied a female in a gauze bag over the end of a branch of Dogwood, enclosing three of the flower heads. Next day I found about forty eggs had been laid, some on each of the flower heads, and among the flowerets, which are still in bud only, and search among the Dogwoods subsequently made led to the discovery of several eggs. We therefore have the food plants of the three broods, *Cornus* in spring, *Cimicifuga* in June and *Actinomeris* in fall.

W. H. EDWARDS.

Coalburgh, W. Va., April 16th, 1878.

ERRATA.—In the description of *Tricholita fistula*, published in the March number, read : Orbicular spot concolorous, oval, black margined ; reniform pipe-shaped, bowl turned to the base of the wing, white, broken. —LEON F. HARVEY, Buffalo, N. Y.

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The Canadian Entomologist.

VOL. X. LONDON, ONT., MAY, 1878. No. 5

TORTRICIDÆ.

BY PROF. C. H. FERNALD, STATE COLLEGE, ORONO, ME.

The present is the first of a series of papers on the *Tortricidæ* of North America which the writer hopes to be able to prepare from the material now in hand, and collections that may be made hereafter by Entomologists in various parts of the country.

I was first led to the study of the *Tortricidæ* by the advice of Mr. A. R. Grote, who, with a generosity rarely met, placed his entire collection of Tortricids in my hands to work up, and further gave me his collection of European *Tortricidæ* for comparison, and loaned me his types for study. I fear I may never be able to make anything like an adequate return to this gentleman who has placed me under so great obligations.

I am very deeply indebted to Mr. E. T. Cresson, of Philadelphia, who gave me every facility for a careful and critical study of the types of Clemens, and also those of Robinson. I think it would have been impossible to have recognized some of Clemens' species without having seen his types. Some of his descriptions were made from very much damaged and mutilated specimens, others from single specimens which prove to belong to very variable species, and his descriptions in some instances are insufficient. Dr. Clemens' great mistake was in attempting to make descriptions from imperfect and insufficient material. His genera have also proved a stumbling block to those who have attempted to make out his species. Notwithstanding, this pioneer student of the North American *Tortricidæ* did an admirable work, and his papers will remain a monument to his zeal in the study of Entomology.

It is useless to deplore that he did not have access to the works of the continental authors; had he lived to revise his work, no doubt it would

have been far more satisfactory ; or had he lived and done his work in our time, and with the facilities now afforded, no doubt it would have been very different from what it now is.

I refrain from expressing any opinion on the work of Walker upon the North American Tortricids till I have an opportunity to examine his types in the British Museum.

Robinson's paper is a valuable contribution, and his excellent plates and descriptions leave but little to desire so far as he carried his work. It may be necessary, in the light of more recent knowledge, to re-place some of his species.

The next most important and pains-taking paper on the North American *Tortricidæ* is that of Prof. P. C. Zeller. I take pleasure in acknowledging the great obligations I am under to this veteran Entomologist for good advice, suggestions and valuable assistance in my work. Prof. Zeller has without doubt added considerably to the synonymy of our Tortricids, but as I have already shown, it was not possible to prevent it without access to the types.

I would also acknowledge the many favors I have received at the hands of Dr. Hagen, of Cambridge, who gave me an opportunity to examine the types of Prof. Zeller, and has aided me in other ways in my work.

Some time since I saw a request that workers on special groups would give directions for collecting and preserving the insects they are working on, and it may be well for me to act upon that suggestion, since very few collections sent to me are in as good condition as I could desire. Without doubt, the most perfect specimens can be obtained by breeding, and I should be very glad if collectors throughout the country would breed and send to me as many as possible, not only of different species, but different individuals of each species, together with notes on their early stages.

For some time I collected Micros in a cyanide bottle, and they became so denuded by rolling over in the bottle that even with the best of care they were nearly worthless. I have since adopted the plan of carrying a supply of pill boxes, into which I put the Tortricids alive. The advantage of this is that they cling to the inside of the box and are not injured by rolling over. One roll over the bottom of a box or bottle is sufficient to remove the thoracic tufts or other characters of great importance.

When one is ready to pin and spread them, they can then be put into the cyanide bottle, or killed with chloroform, pinned and spread at once. I cannot urge too strongly that *Tortricids should not be touched with the thumb and finger*, but should be handled with a pair of fine forceps, laid upon a piece of pith held between the thumb and finger, and the pin inserted and passed down through the middle of the thorax so as not to injure in any manner the thoracic tuft.

For the larger and medium-sized Tortricids I prefer japanned pins, leaving one-fourth the length of the pin above the insect in case the long or German pin is used. For the smaller ones silver wire may be used, which, with the insect upon it, should be inserted in one end of a neatly cut, brick-shaped piece of fungus, through the other end of which a pin of any desirable size may be passed, and the specimen put in its place in the cabinet. By far the best, and the only fungus known to me, suitable for this purpose, is the *Polyporus betulinus* Fr., which grows in abundance upon decaying white birch. This fungus should be thoroughly dried, after which it may be cut with a razor into pieces of any desired form. A collection of Micros mounted upon neatly cut pieces of this clear, milk-white fungus, shows to very good advantage.

Another kind of pin which is very good for Micros is one of German manufacture, of silver, for sale by B. P. Mann. The great objection to this pin is its high price. A desideratum seems to be a fine silver pin as short or shorter than the English pins, of suitable size for the smaller Tortricids, to be used with the fungus as described. I very much dislike the common insect pins for Tortricids, for they corrode so much, in many instances, as to nearly ruin the specimens.

Of course the collector should spread his captures as soon as their muscles are well relaxed, or else before they become rigid, if he has time, otherwise they may be put aside, softened up and spread at leisure. I would prefer to have all sent to me for determination spread, provided the collectors are skillful at this, but if not, they had better not attempt it lest they ruin the specimens.

Paedisca Worthingtoniana, n. s.

Palpi, head, thorax and fore wings lemon yellow, inclining to straw color in some specimens; outside of the middle joint of the palpi stained with brown; costal edge of the fold of the males and a spot over the

middle of the cross-vein in the fore wings of both sexes dark brown; fringe tinged with fuscous. Hind wings fuscous, darker apically; fringe lighter. Under side of fore wings dark brown, with violet reflections in some specimens. Under side of hind wings much lighter than above. Fore and middle legs fuscous, hind legs lighter. Expanse of ♂, 35 to 39 m. m.; ♀, 43 m. m.

Described from two male and four female specimens, collected by C. E. Worthington, in "North Illinois, at dusk about wild phlox on the prairie, flying like *Plusias*." I also received from Mr. Worthington three females taken at the same time and place, which have the fore wings, especially between the veins, of a light brown color, the discal spot showing plainly through the general color of the wing. I regard this as simply a brown variety of the above.

NOTES ON LARVÆ, ETC.

BY C. G. SIEWERS, NEWPORT, KY.

Last summer, near the end of July, in skirmishing through a wood overgrown with White Snake-root weeds, I struck a large find of the *Callimorpha interrupto-marginata* moths, and collected some 50 specimens. Others collected as many more. The weeds were covered with their larvæ, of a bright yellow color, with a white lateral stripe, mottled along its upper edge with bright red, the anal end being also faced with red markings. The length about 1½ inches. I collected altogether some 200 of them, but utterly failed to bring one to pupa. As they stopped feeding they were taken with a white scouring, leaving nothing but empty skins. Others tried them with like result. The bushes were also strung with their dead bodies. Still some must have escaped, as the brood this year was just as large. But the larvæ failed again to pupate. I think the fault is in the food plant, as cattle will not touch it, and such as are knocked off may take to other food and escape. Cannot some of your correspondents explain this?

About the same time last year I found a remarkably handsome green larva on our Western Coffee-nut tree (*Gymnocladus canadensis*). Length

over two inches ; lateral red and white stripes similar to *Saturnia io*, with an anal red horn and two pairs of similar horns on each of the 2nd and 3rd thoracic segments, with short red spines along the dorsal line. In appearance much like *Citheronia regalis*, though but one-third its size, of a hard stony make, evidently an *Anisota*. The pupa has the long spur and indented segments common to the species. I collected quite a number. They are two-brooded, and may be three, as I found them of all sizes at the same time. Female moth measures 2½ inches between the tips of wings, the male 2 inches. Primaries light brown in the females, with and without the central discal brown blotch ; the male with darker primaries, with the outer third slightly roseate, and with two white discal superposed spots duskily fringed. Hind wings rose color on both sexes, darkest near the body. The wings of both mottled with brown on the primaries. Should like to have it named.

I had so much trouble with ground for larvæ last year that I concluded to try sand, and got a lot of fine yellow sand similar to that used by moulders, moistened it thoroughly two months since, and it is as moist and loose as ever, and if I may speak for the larvæ that have tried it, they are just delighted with it and plunge right in.

I find empty butter tubs very convenient, having wooden caps and not warping like boxes, but it is necessary to scald them out thoroughly and then lime the sides. Failing to do this last summer, I found some *E. imperialis* larvæ covered with small house ants that had eaten the epidermis full of holes nearly through ; they, however, all got over it, though covered with black spots.

ON THE NATURAL HISTORY OF GALL INSECTS.

BY DR. H. HAGEN, CAMBRIDGE, MASS.

The natural history of the interesting gall insects is still somewhat mysterious. A large number of observations have been made here and in Europe by prominent Entomologists ; nevertheless, a careful study

of the most detailed papers always gives the impression that something is still wanting to explain the various facts related by the authors. Among the Hymenopterous gall insects important progress was made in the discovery by the late B. Walsh of the dimorphism of *C. q. spongifica* and *C. q. aciculata*, the latter one a parthenogenetic species. But even here new observations are wanted to fill some gaps in the history of those species. Mr. W. F. Bassett, of Waterbury, Conn., draws my attention to the fact that in a letter in the Proc. Entom. Soc. Lond., April, 1873, p. xv., he "did state most emphatically his belief that all one-gendered gall flies were the alternate of a two-gendered brood from galls of a different form."

Two papers by Dr. Adler, from Schleswig—"Contributions to the Natural History of the Cynipidæ," and "On the Ovipositor and on Oviposition of Cynipidæ," in Berlin, Entom. Zeitschr., vol. xxi., 1877, Decbr., which have just arrived here, are prominently remarkable. I believe the way so long sought for is found, to understand the complicated relations not only of the Hymenopterous gall insects, but probably of all other gall insects, and perhaps, also, of some other insects not gall-producing. These papers are equally remarkable both by the manner of the experiments, the judicious conclusions drawn from them, and the clear and plain description of what he has observed. Dr. Adler has raised the species through several years. In Cynipidæ the raising is less difficult, as the eggs are mature the moment the insect has passed its last transformation; the females are usually disposed to lay the eggs directly, and are, at least many of them, not disturbed by observation; therefore the experiments with them followed through several years become more reliable.

The parthenogenesis of *Rhodites rosae* was proved by direct raising through three years. The fact is, indeed, more remarkable as males exist in a very small number, about one to a hundred females; but a copulation was never observed. The females carefully separated after their transformation, laid the eggs in confinement. Moreover, a number of females were dissected and showed always the receptaculum seminis empty, therefore proving that the eggs were not impregnated.

Other series of observations lead to the interesting discovery of alternating generation by a number of species, which were considered to belong to different genera, but are now proved to be the winter form and the summer form of the same insect.

Neuroterus fumipennis was raised from the galls, the imagines placed

on oak buds, the oviposition observed, and the plants isolated. The galls originating from them were entirely different from those galls out of which *N. fumipennis* was raised. By further growth they proved to be the well known galls of *Spathegaster albipes*, which species was raised from them in due time. These two Cynips belong to two different genera, and differ in size; *Neuroterus*, the winter form, is agamous, only females known, and the receptaculum seminis was always empty; the eggs are laid deep in the buds. *Spathegaster*, the summer form, is bisexual, males and females in regular proportion and copulating; the receptaculum seminis of the egg-laying females being always filled with spermatozoa. The eggs are laid on the leaves. To complete the cycles, *Spathegaster* galls carefully confined were raised and gave in due time *Neuroterus*. The experiment was made repeatedly on a large scale and with excellent precautions, so that no doubt is possible. Now as the fact is known, it is rather remarkable that it was not sooner discovered, as it is entirely impossible for *Spathegaster* and for *Neuroterus* to produce the galls out of which they are always raised. *Spathegaster* possesses a short and somewhat degraded ovipositor, just fit to injure the superficies of a leaf and to lay the egg; *Neuroterus* possesses a long, bent and complicated ovipositor, able to perform the rather difficult act of entering the bud and laying the eggs in the basis of the bud, but would be scarcely able to injure the superficies of a leaf in the same manner as *Spathegaster*. I think this admirable discovery is of the greatest importance for further observations. If we find again a species with an ovipositor not fit to make the galls of the species, we are justified in presuming a similar alternating generation with some other species.

The difficult question how the eggs of Cynips are able to pass through the comparatively small ovipositor is described with much detail and acumen. The observation was only possible by the ingenious device of chloroforming the insects in the act of oviposition, and making an anatomical investigation of the parts. By repeating the observation many times in different stages of the act, a full series of observations, one completing the other, gave a clear and satisfactory result, and at the same time the place was ascertained in which the egg was laid. A large number of other interesting details concerning the formation, structure and the growth of the galls, are given, which must be studied in the original paper. I may only add the surprising fact of the continuous rotation of the embryo in the egg, till it is hatched. The rotation is not

made as in mollusks, by vibrating cells, but by the alternate contraction of long spindle-shaped cells, which are attached to the hypodermis.

Similar experiments with similar results followed also through the whole cycles, proved that *Neuroterus lenticularis* is the winter form of *Spathegaster baccarum*, and *N. numismatis* the winter form of *Sp. vesicatrix*. Dr. Adler adds that experiments with all three species are not very difficult, and he believes that every student will be able to repeat them.

It seemed to the author more than probable that such alternating generation would not exist alone in *Neuroterus*. Similar observations and experiments followed through all the cycles proved that *Dryophanta scutellaris* is the winter form of *Trigonaspis crustalis*, and *Dryophanta longiventris* the winter form of *Spathegaster Taschenbergi*, but for the last species only half the cycles was till now ascertained.

Direct observations proved that the egg of *Dryophanta* is laid with the egg-body downwards and the stem of the egg upwards. The situation is just reversed in *Neuroterus*, and as the egg is always hatched through the hind portion, the larva of *Dryophanta* is obliged to make its galls downwards in the cambium, and the larva of *Neuroterus* upwards on the leaves.

Another agamous genus, *Aphilothrix*, possesses an ovipositor similar to *Neuroterus*, and it seemed impossible that the large galls out of which it develops could be made by such an ovipositor. Similar observations gave the result that *Aphilothrix radicis* is the alternating generation of *Andricus noduli*, and *Aphilothrix Sieboldi* of *Andricus testaceipes*. Neither *Aphilothrix* nor *Andricus* develop in the same year ; each of those genera needs two years for its development; therefore the whole cycle runs here through four years, and till now only half the cycle of *Andricus* bred from *Aphilothrix* galls has been ascertained by observation.

I think there can be no doubt that the agamous *C. q. aciculata* is the winter form of the bisexual *C. q. spongifica*, just as *Neuroterus* and *Dryophanta ;* but here both species have the same kind of gall, and both species are less different than those above quoted.

The remarkable success of Dr. Adler's experiments with the Hymenopterous galls induced me to compare the rather large collection of Dipterous galls from Europe and America belonging to the Museum. I found directly some forms entirely similar and corresponding to the alternating galls of Cynips ; but the collection is rather poor in bred specimens of the

insects. Just in the presence of the judicious and sober observations of Dr. Adler, it would not be proper to say more than that it is not difficult to point out galls of *Cecidomyia* similar to both forms of the alternating *Cynips* galls. It is to be presumed that in *Cecidomyia*, as well as in *Cynips*, the form of the ovipositor will be different, but such investigations can scarcely be successful with dry specimens.

I may add one observation made by myself, by which it is at least probable that bisexual species of *Cecidomyia* may also propagate by parthenogenesis. Some twenty years ago, occupied with the study of insects obnoxious to agriculture in Prussia, I had stalks with cocoons of *Cecidomyia destructor* in corked glass tubes. In one of them I raised a single female, and was sure that no other cocoon was present. The female laid a number of eggs on the glass, which after a few days began to develop so far that the embryo and the segmentations of it were clearly visible. By some mischance the glass tube was left in sunlight and the development stopped. Though I have not been able since to repeat the observation, I am sure that I was not mistaken. I think it is justifiable to presume a possible parthenogenesis for *Cecidomyia*, which, if proved, may lead to successful results concerning the destruction of this dangerous pest.

After having studied Dr. Adler's papers, I remembered directly some similar facts given by Mr. Lichtenstein in Stettin. Entom. Zeit, 1877, on the Hemipterous genus *Phylloxera*; the alternation is here very remarkable. The bisexual form originates from pupæ, which are produced by larger winged forms, which possess no external sexual organs and can therefore not copulate. Mr. Lichtenstein calls this form of propagation anthogenesis. A certain similarity with *Cynips* consists in the fact that the different forms of *Phylloxera* emigrate in spring and return in the fall. So the well known *Ph. vastatrix* emigrates from the leaves to the root of the same plant, and needs therefore no special winged forms for the purpose of emigration. But *Ph. quercus* changes to another tree, and needs therefore two winged forms, which are different one from the other. One parthenogenetic form brings the summer colonies from *Ilex* to *Robur*, and another anthogenetic fall form brings them back from *Robur* to *Ilex*. The fact that some species possess two different winged forms will probably reduce the number of the described winged species. Till now it is only known that *Ph. Lichtensteini* is the anthogenetic form of *Ph. quercus*, and *Ph. Signoreti* probably the same form of *Ph. florentina*. Mr. Lichtenstein presumes that many *Pemphigus* and *Adelges* will possess similar

forms, and observations made by myself on one species in the last year seem to favor his opinion.

Such alternations stated without doubt for Hymenoptera and some Hemiptera, and probable by analogy for some Diptera, will certainly not fail to occur in other orders, and are probable in some Lepidoptera heterocera.

A paper by Mr. P. Cameron, in the *Scottish Naturalist* for April, 1878, the substance of which is incorporated and fully approved in the President's Address to the Entomological Society of London, arrives at conclusions entirely unfavorable to Dr. Adler's memoir. To corroborate my views about the memoir I wish to give a few statements.

Dr. Adler gives the facts upon the discovery "of the Parthenogenesis of *Rhodites rosae*" on ten pages, about two-thirds of the first part of his memoir.

In May, 1872, *Rh. rosae* in large numbers was observed; some few males appeared, which were put, together with several females, in the breeding cabinet; but no copulation was observed. For further experiment were chosen females appearing later, of which, by careful observation, it was certain that none of them had been with any male. Those females were put on bushes of *Rosa canina* on May 10th—12 wasps, May 13th—16 wasps, May 26th—10 wasps, June 2nd—6 wasps; together, 44 wasps. Of those 26 wasps were observed in the act of oviposition, and the twigs were marked with a thread around each. The first formation of a gall was observed June 5th, and in all only nine twigs formed galls; giving the positive result that unimpregnated eggs had developed. The experiment was tried again for the purpose of having surer results by repetition and to investigate why the first experiment was without result in so many cases. In 1874 there were put, June 22nd, on rose bushes 8 wasps, 4 of which were observed in oviposition, none producing galls; June 23rd, of 10 wasps, 4 observed in oviposition, 2 producing galls; June 27th, of 12 wasps, 5 were observed in oviposition, producing 3 galls.

Of the 13 wasps observed in the act of oviposition, 4 were dissected, and the receptaculum seminis stated to be entirely empty (without spermatozoa). Every one of the wasps spoken of was carefully observed and not lost sight of till the wasp had begun the oviposition, in which act some persevered for more than 24 hours. Of course observation was not followed through this whole time, but every few hours it was again observed

that the wasp was continuing the oviposition. The five produced galls were in November preserved for the experiment of the following year. In the spring of 1875 there were raised from them 35 wasps, all females, and a large number of parasites. These wasps were put again on rose bushes as soon as they appeared on May 26th, June 2nd, 5th, 7th, and oviposition observed on 11 twigs. After 11 days some of the eggs were examined, and the embryo found in different stages of development (more details are given). Of the 11 twigs 6 produced galls, out of which were raised in spring, 1876, 28 wasps, all females. Those wasps were put on rose bushes June 26th, July 2nd, July 4th, and oviposition observed on 13 twigs, which produced 8 galls. Therefore, through three years parthenogenetic-propagation was observed. The objection that in experiments thus made in the open air oviposition could have been made on the same twigs by other wasps, can not be refuted directly; but if it has been noticed so many times that only galls were produced in the observed and marked places, I believe it is allowable to conclude that none except the observed oviposition had been made.

The other question, if the unimpregnated eggs are regularly developed, was answered in the affirmative by repeated experiments, which are very simple and very easy to be repeated. I put female wasps, raised by myself, which had not been with a male, on shoots of rose put in a jar in water. As soon as the wasps began oviposition, the shoot was placed in a breeding cabinet. After oviposition had ended, the wasp was examined anatomically, and the vesicula seminalis found to be empty. The eggs were examined after 12 hours, and the peripherical layer of cells around the dark yolk was seen; in the following days the development advanced in the regular manner.

Dr. Adler gives on five pages more the most interesting details upon the formation and growth of the gall. As *Rh. rosae* is common here, this part of the memoir is of great value for American students. If we look in Mr. P. Cameron's paper, we find about this matter on p. 156, as follows:

"With the bisexual Cynipidæ the males are in some species nearly as common as the other sex; in others, as in *Rhodites*, they are very rare." That is all!

On the alternation of generations in Cynipidæ the first part of Dr. Adler's memoir contains only (6 pg.) the beginning of the experiments

with *Neuroterus fumipennis*. The second part (24 pg.) was published three months later than Mr. Cameron's paper, which contains, nevertheless, some of the names of the species (5 out of 7) treated in the second part, probably out of a provisionally published notice, unknown to me.

Dr. Adler having raised in 1874 out of all *Neuroterus fumipennis* galls nothing but *Spathegaster albipes*, decided to observe them more exactly. The experiments with *Neuroterus fumipennis* were made in 1875 in the following manner:

The galls were collected in the autumn before. When the wasps began to appear, they were put on a small oak tree in a tub in a cool room. When a wasp began oviposition each twig was enclosed in a glass tube, after the bud had been marked with a thread. There were marked March 14th—12 buds, March 19th—10 buds, March 24th—8 buds, March 26th—6 buds; in all, 36 buds. Besides those, other wasps were put on cut oak twigs placed in damp earth or sand (in which manner the twigs keep well three weeks and longer as good material for observing the eggs), and after oviposition was observed, the isolated twig was covered with a glass bell. The wasps were examined after the oviposition and the receptaculum seminis found to be empty. The receptaculum is in the agamous species always somewhat atrophied; in the bisexual species the external membrane is pigmented, and even if empty, forms a ball.

Besides those experiments, others were made at the same time in the open air. The oviposition was observed March 31st on 5 buds, April 1st on 7 buds, April 2nd on 12 buds, April 7th on 12 buds, April 10th on 40 buds, April 12th on 38 buds; altogether on 114 buds. A curious fact is related that in 42 buds the ovipositor of the wasp was found left in the bud.

The results of the different experiments were as follows: The small oak tree in the tub was kept in the room and began to bud in the beginning of May, and the leaves were developed enough May 14th to see if galls were forming. Of the 36 marked buds, 13 had no galls produced; on the others in all 36 galls were counted. It is to be remembered that here oviposition was made and observed in the room, the twigs carefully isolated by glass tubes, and kept in the room till the tree began to bud. Therefore it is impossible that eggs could have been laid by other wasps. The galls were those of *Spath. albipes*. Concerning the experiments in the open air, the leaves of the tree were May 20th so far

developed that the formation of galls could be observed, and again the galls were those of *Spath. albipes*. Out of the 144 buds marked, galls were found on 68, with about 300 galls. The oak chosen was a small shrub four to five feet high, easy to be examined, and showed no where any other galls.

Out of the collected galls a large number of *Spath. albipes* was raised in the first half of June, and were put in a breeding cabinet with a small oak tree. As no copulation nor oviposition was observed, Dr. Adler decided to try observation in the open air. He succeeded June 3rd in finding several females of *Spath. albipes* in the act of oviposition, and secured six wasps, several leaves, and marked four leaves on which he had observed oviposition with a thread. The lens showed that an egg was deposited. The secured wasps were put on the small oak in the breeding cabinet, and now the wasps were observed ovipositing on two leaves. The next day the wasps were examined, and showed the receptaculum seminis full of spermatozoa. On June 5th and 6th several more wasps in the act of oviposition were observed, and six leaves marked. In the first fortnight no change in the leaves was seen ; in the third week the substance of the leaf where the egg was deposited was visibly thickened, the larva had left the egg, and the formation of the gall began. Then the progress was very slow ; after four to five weeks, in the beginning of July only a very small hairy disk was seen, and only in the end of July the galls could be recognized with certainty as those of *Neuroterus fumipennis*. On all ten leaves such galls were produced.

I have given here the substance of Dr. Adler's experiments only for one pair of individuals, but in the same manner the memoir contains them for seven pairs ; two of these, *Neuroterus laeviusculus* and *Spathog. tricolor*, *Aphilotrix Sieboldii* and *Andricus testaceipes*, are not mentioned by Mr. P. Cameron.

I think every student will be puzzled to find such detailed observations unmentioned in Mr. Cameron's paper, when he asks if a consideration of the biology of the species named affords *any reasonable evidence in favor of this rather startling hypothesis* (p. 154). The only evidence Mr. Cameron tries to give against it is that, if the species are correlated in the way indicated, we ought to find the two forms equally abundant, and in close proximity to each other. He states that only one of the five pairs quoted by him are found together, the other four are not. This fact, *if true*, would be certainly of importance ; nevertheless, I

should have preferred in the face of apparently so carefully made experiments to examine first, if one of the two authors, either Dr. Adler or Mr. Cameron had not determined wrongly one species of the pairs. But a stronger objection against Mr. Cameron's assertion is that I possess two of the four doubted pairs from the same locality. The May number of the Ent. Month. Mag., just arrived, has on its first page a notice by Mr. J. E. Fletcher, stating that galls made by *Neuroterus numismatis* proved to be those of *Spathegaster vesicatrix*. This is the third of the four pairs doubted by Mr. Cameron. After all I may quote against such kind of evidence the following remarks of the late Mr. B. D. Walsh in his Cynips paper (p. 11):

"I once argued in print that it was impossible that the army worm moth should exist in the Eastern States, for if it did it must have been found there either by Dr. Harris or by Dr. Fitch, and that scarcely had the argument been printed, when it was proved by indubitable evidence that it did exist."

Mr. P. Cameron's objections against the fifth pair, *Aph. radicis* and *Andricus noduli* show simply that the German text was not understood.

Now where are the direct and well continued observations of facts to blow to the winds this theory? I may add that the unprecedented observation that he put some specimens of *Aphilotrix radicis* in spirits for a week (!) and that they revived, when taken out, would be rather difficult to be repeated.

If such facts, as given by Dr. Adler, are not to be accepted as true, I think they can not be called "hypothesis or theory," but simply a fiction, or in plain English, a forgery—which nobody able to understand the German text will accept.

ON EUPROSERPINUS PHAETON.

BY A. R. GROTE,

Director of the Museum, Buffalo Society Natural Sciences.

The fact that Mr. Strecker has seen fit to misstate the circumstances under which this species was named has induced me to correct the impression he may have created as far as possible.

In our Synonymical Catalogue (1865) the species is entered as follows:

Euproserpinus Grote & Robinson.

16. phaeton.

Proserpinus Phaeton Boisduval MSS.

Euproserpinus Phaeton Grote & Robinson (1865).

Habitat—Western District!

In the descriptional part (p. 30) we say: "We are indebted to Mr. J. W. Weidemeyer for the information respecting this singular little species, which, we believe, has not been hitherto described, while an excellent figure, shown us by Mr. S. Calverley, enables us to present the present description and to fix the species. It appears that Dr. Boisduval has etiquetted a specimen in his cabinet as *Proserpinus Phaeton.*"

So that both in the Catalogue itself and in the description we give Dr. Boisduval credit for the name *Proserpinus Phaeton.* What more it was possible for us to do I cannot see. There is not the faintest desire on our part to avoid giving the fullest credit to all parties known to us to have anything to do with the species. Mr. Calverley's figure came probably from Dr. Behr or Mr. Hy. Edwards with the name *Phaeton.* This figure was engraved for a hitherto unfinished work on the Sphingidæ. Of this work I have an incomplete copy; the last plate is numbered xxvi. The plates are headed: "North American Lepidoptera." The first two plates have in the lower left-hand corner: "Published by J. W. Weidemeyer and S. Calverley, New York." Plate iii. *et seq.* have the name of Mr. W. H. Edwards added. I believe the plates were lithographed and colored by Chas. Walo between 1863 and 1868; possibly these dates are not strictly accurate. To the last plates I contributed originals. Two of the plates (Nos. 18 and 19) were executed in England; W. West, imp.; E. W. Robinson, delt. On plate 19, fig. 1, is a figure of *Lapara* (not *Lipara*) *bombycoides* Walk., which I have long ago shown the reasons for believing to be *Ellema harrisii* or a closely allied species. On plate 13, fig. 5, "*Proserpinus Phaeton*" is figured. In 1868, three years afterwards, we redescribed this species from a specimen loaned us by Dr. Boisduval. The specimen was not labeled to my recollection, and as we were under the impression that Dr. Boisduval knew our Synonymical Catalogue, there could be no question as to the name. We were much puzzled afterwards by Dr. Boisduval disowning the name *phaeton*, describ-

ing the insect as *erato*, and overlooking our Synonymical Catalogue. In his larger work on the Sphingidæ Dr. Boisduval adopts our name for the insect and again overlooks the fact that we had described the species nearly *three years* previous to our acquaintance with himself (though he quotes our work), and supposes that we have chosen a fresh name for the species, when we had never heard of the name *erato* until Dr. Boisduval published it, and, moreover, we had credited the name *phaeton* to him in 1865! How the misunderstanding came about it is now difficult to say. Perhaps Mr. Weidemeyer or Dr. Behr can give the proper light as to where the name *phaeton* came from. I have previously suggested either that the name *phaeton* came from Lorquin or Dr. Behr, or that a transposition of names occurred between Dr. Boisduval and the Californian Entomologists. That Lorquin gave names to species which Dr. Boisduval adopted as his own in some cases is, I think, suggested in the case of the species of *Nemcophila* and others, where the insects are named after the food plants. It is evident that Walker has used Dr. Boisduval's MSS. names without credit. With regard to mistakes of names by transposition, the student need only be reminded of the error with regard to *Oeneis semidea* and an *Aegerian* (See Scudder, Proc. Ent. Soc. Phil., 1865, 13, and elsewhere). As to Dr. Boisduval's inattention to previously published papers Mr. A. G. Butler says this "author's worst fault is a too great appreciation of his own MS. names, for which he does not scruple to sacrifice both genera and species long described by other authors." I do not think, in conclusion, that there can be the slightest ground for the suspicion that we intended any wrong in the matter of the name of this species, since we gave Dr. Boisduval full credit for the manuscript name *phaeton*, giving him precedence in the synonymy, a fact which it suits Mr. Strecker to omit. There remains also no doubt that the correct name of the species is *phaeton*, since our original description is perfectly recognizable and since Dr. Boisduval himself adopts this name in his important work on the Sphingidæ in preference to his own later name of *erato*, giving us credit for the species. I do not think that it will be possible to consider the species either a *Macroglossa* or a *Proserpinus*, and that the generic name *Euproserpinus* must stand.

I feel also at liberty to state, what many of Mr. Strecker's readers may have suspected, that there is a very different reason for his personal attacks upon me than that they are called for by my publications. But I am quite confident that in all my writings I have endeavored to give full

credit to every other writer; where I have failed it has been through unacquaintance with the work of others. And I very much regret that there is an unavoidable jealousy which remains strongest with those whose mental resources are narrowed down to the field of descriptive Entomology. In conclusion, I think I can be spared a lengthy exposition of Mr. Strecker's breaches of the ninth and tenth commandments, and leave the matter to those interested in a subject which has nothing to do with the advancement of science, but rather offensively illustrates the principle of self-preservation.

ENTOMOLOGICAL APPOINTMENT.—We learn with pleasure that Prof. C. V. Riley has received the appointment of Entomologist in the Department of Agriculture at Washington, rendered vacant by the retirement of Prof. Townend Glover, whose failing health necessitated this rest from active labor. While we sincerely regret the severe illness of our good friend, that laborious worker and painstaking Entomologist, Prof. Glover, we cannot help congratulating the Department in having secured the services of such a thorough and vigorous laborer in Entomological science as Prof. Riley is known to be. His long experience and natural fitness for the work in which he is now engaged will, we feel confident, make him a most efficient officer.

CORRESPONDENCE.

ON A COVERING SUPERIOR TO PAPER FOR CORK-LINED BOXES FOR THE CABINET.

DEAR SIR,—

Four years ago I first used a white wash for covering the cork in my cabinet, and I have found it so much superior to paper that I feel induced to recommend it very highly to all Entomologists.

It is cheap and easily applied. I take French zinc (dry) and after adding a little blueing, I mix with it as much milk as will make it about

the consistence of thick cream. With this I give the first coat to the cork, rubbing the stuff with my hand well into the little holes of the cork until these are all closed up. As soon as dry I give it another coat, using the white wash somewhat thinner, and apply with a brush.

Since using it I have never found a single specimen of the tiny paper louse in my cabinet, while prior thereto these pests gave me a good deal of trouble. *Anthrenncæ* also give me hardly any trouble, as their places of retreat, the cracks and worm holes in the cork, are entirely covered up with the zinc.

If applied carefully it will have just as even an appearance as paper, and the white will keep fresher and cleaner than paper. Give it a trial.

EDW. L. GRAEF, Brooklyn, N. Y.

ERRATUM, ETC.

DEAR SIR,—

P. 59, vol. 10, line 17, for *Euprepia judica* read *Euprepia pudica.*

During the latter days of March I saw *Pieris rapæ* in considerable numbers at Asheville, N. C.; and on April 2nd I saw many scores of *Æthilla bathyllus* S. & A., near the same place, the elevation of the spot being between 4,000 and 5,000 feet. These were playing around damp places by the road side. I was informed by the farmers that *Doryphora 10-lineata* had never yet appeared there.

W. V. ANDREWS, Brooklyn, N. Y.

DEAR SIR,—

A scientific friend who attended the last monthly meeting of the Entomological Society in Boston, wrote to me the next day of a very interesting communication made by Dr. Packard on the exodus of a luna moth. He "heard a rustling in the cocoon and a curious cutting sound, and saw two black points sticking out, which worked back and forth, cutting the silk until a slit was made large enough for the moth to crawl through. Then he discovered that the black points were *two spines* on the submedian nerve of the fore wings. As the wings expand these spines become covered with the wing scales and do not show." Dr. Packard said these spines exist in nearly all the Bombycidæ, but he did not find that this use of them had been mentioned in any of the treatises to which he had time to refer, it being supposed that moths work their way through the silk, first softening it by a liquid exuded from the mouth.

The information received I brought before the Montreal Branch of the Ontario Entomological Society, and it caused some surprise, as members had never heard of the process. During the evening the President, Mr. G. J. Bowles, exhibited a *Polyphemus* moth just out of chrysalis, which got away and flew into the gas, so burning itself that it had to be killed. The moth was examined, and close to the base of each fore wing a spine was found, quite long and sharp, which could certainly be used by the insect for scratching and tearing the silk of the cocoon so as to facilitate the egress of the moth. The inside of the cocoon at the opening seemed to bear marks of its work. This discovery has excited quite an interest among our members, and we await the opinion of other Entomologists on the subject.

JOHN G. JACK, Montreal.

DEAR SIR,—

During last summer we were visited by an insect which attacked our White Pine trees *(Pinus strobus)*. I refer to Abbot's White Pine Worm, *Lophyrus Abbotii*, a gregarious worm of some note in the south and west. I have not seen it noticed by any of our Canadian Entomologists, and consequently do not know whether it is a common insect in this country or not; but I *do* know that should it become very numerous it would shortly be a very heavy blight on our White Pine, either in grove or forest growth. I have not yet seen any on the imported pines, such as the Scotch and Austrian; indeed the insect seems tenaciously to prefer our native species, probably because of its soft and tender foliage. It appeared here in July and August (I neglected to note the exact date), but in such flocks that they soon defoliated the branches on which they were working, and were thus easily detected. When nearly full grown these saw fly worms measure from three-fourths to one inch in length, are heavily marked by black spots on a dull whitish ground, and have the habit of bending the fore part of their bodies backwards on being approached or disturbed. According to Prof. Riley, the parent saw fly deposits her eggs on the slender leaves of the pine in autumn, where they remain in the egg state all winter, hatching early in summer. The remedies recommended for this pest are hand-picking, the use of dry air-slacked lime or powdered hellebore mixed with water and sprinkled on the affected parts.

B. GOTT, Arkona, Ont.

DEAR SIR,—

As correspondence is invited respecting the habits, localities, occurrence, etc., of insects, I take the liberty to offer a few remarks on the *Doryphora 10-lineata*, and also to send you a list of the Geometridæ that I have thus far taken in this locality.

Wishing to ascertain if the domestic fowl were likely to be of any value in reducing the numbers of *D. 10-lineata*, I procured the assistance of a neighbor who kept fowl (I do not keep them myself), and the following is the result of our experiments:

Our first experiment was to offer both larvæ and beetles to the fowl, but they refused to touch them, and acted as if somewhat afraid. Next we mixed the insects with the corn and other food that was given them, but they refused even to eat the corn for a time; by-and-by, however, they began to eat the corn and soon lost all fear of the insects, although they still refused to eat any. After a few days, by keeping the insects in their food all the time, some of the bravest of the hens began to eat a few insects, and it was not long before the rest joined them, and in a few days more they appeared to relish the beetles about as well as the corn. Up to this time I did not observe any of the fowls eat a beetle from the potato vines, but they now began to do so, and we were obliged to put them in their food no longer. After this the beetles were so reduced in number in this garden that they did no material damage.

It would seem from the above that although the beetles were naturally repugnant to the domestic fowl, yet an appetite for them may be acquired. If the substance of the above has been published I was not aware of it, and give it for what it is worth.

I noticed in the last report of the Entomological Society of Ontario, in the experiments on the Colorado Potato Beetle, by W. Brodie, the remark that "it is very doubtful if *Doryphora*, either in the larva or imago state, will feed on *Solanum dulcamara* or *Datura stramonium*." I have found the insect in both these stages plentifully on *S. dulcamara*, which grows quite abundantly near this place, and they wholly consumed both leaves, flowers and fruit of every plant in this vicinity. They were more abundant on these plants than on my potato plants, which were not more than five rods from some of the former.

I took a few examples of *Brephos infans* Mos., March 23rd, which is some two weeks earlier than I ever made a capture of them before.

J. E. BATES, South Abington, Mass.

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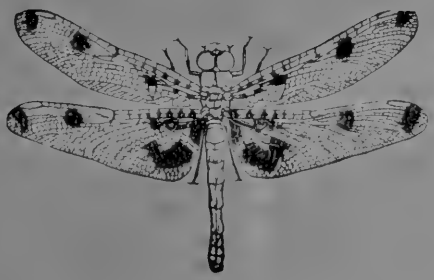

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The Canadian Entomologist.

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THE ACHEMON SPHINX—*Philampelus achemon* Drury.

BY THE EDITOR.

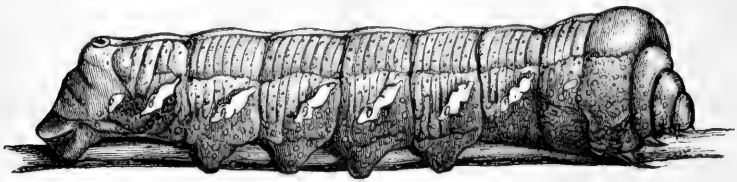
The Achemon Sphinx is not common in Ontario; occasionally, but rarely, we have found the larva both on the Grape-vine and Virginia Creeper *(Ampelopsis quinquefolia)*, and once or twice captured the perfect insect.

Fig. 4.

The moth (fig. 4) is a handsome one, and having the usual strong and rapid flight of the Sphinges, is not easily captured. It may be met with on the wing late in June, about dusk, hovering like a humming-bird over flowers and sipping their sweets through its long proboscis. Its color is brownish-gray, variegated with light brown, and with the dark spots

shown in the figure of a deep brown. The hind wings are pink with a dark shade across the middle, a few still darker spots below, and with the hind margin widely bordered with gray.

The caterpillar (fig. 5) is a formidable looking creature, measuring when full grown, if at rest, about three inches, but when in motion three



a

Fig. 5.

and a half inches. They feed singly, and hence, when young, do not attract much notice, but as they mature they consume enormous quantities of food, so that a single specimen will in a short time render long branches of the vine entirely leafless. This larva varies much in color; when young it is usually green, with a long, slender, reddish horn rising from the last segment but one, and curving backward, but after each moult this horn gradually lessens in size until, as it approaches maturity, it disappears entirely, its place being occupied by a polished tubercle. When full grown the general color is sometimes green, but more frequently a pale straw or reddish-brown, deepening in color at the sides, and finally merging into a rich brown; there is also a broken line of brown along the back, and another unbroken, with its upper edge fading gradually along each side. It has six scalloped, cream-colored spots on each side, and the body is covered more or less with minute spots, which are dark on the back, but light and annulated at the sides. There are also from six to eight transverse wrinkles on all but the thoracic and caudal segments. The head, anterior segments and spiracles incline to flesh color, the prolegs and caudal plate deep brown. The largest segment in the body of the larva is the third behind the head, and into this, when at rest, is usually withdrawn the head and two anterior segments as shown in the figure.

When full grown and about to transform to a chrysalis, the color of the caterpillar often changes to that of a beautiful pink or crimson. It then descends to the ground and burrows underneath, and there undergoes its transformation to the pupa state within a smooth cavity.

The chrysalis (fig. 6) is of a dark shining mahogany color, roughened especially on the anterior edge of the segments in the back. It remains

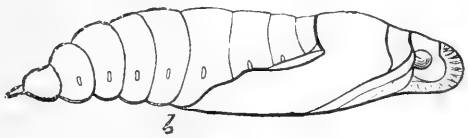


Fig. 6.

in the ground through the fall, winter and spring months, producing the moth the following summer.

VARIATIONS IN THE WING EXPANSE OF PEZOTETTIX.

BY G. M. DODGE, GLENCOE, NEBRASKA.

In the CAN. ENT., vol. ix., p. 112, I have described as a new species, under the name of *Caloptenus volucris*, a long-winged variety of *Pezotettix autumnalis* Dodge. I separated it because of its great length of wing, in which respect it equals many specimens of *Cal. spretus*, while in the typical *autumnalis* the elytra are very short, ovate and pointed. It also exhibited some variations in color. The latter I have since seen paralleled in *autumnalis*, and having found long-winged varieties of two other species of *Pezotettix*, I am now fully satisfied of the varietal character of *volucris*.

All the authorities agree in making the lack of wings, or the abbreviated character of those organs, the principal reason for separating the genus *Pezotettix* from *Caloptenus*. My experience shows, however, that the length of wing in these insects cannot be relied upon as a specific distinction even. It is plain that these long-winged varieties by in-breeding might establish a local variety of what would appear to be *Caloptenus*, but which would in reality be *Pezotettix*. It is possible, then, that all our species of *Caloptenus* were originally *Pezotettix*; that, by acquiring additional means of locomotion, were enabled to survive their ignoble relatives. This would certainly accord with the natural law of the "survival of the fittest."

One of my species, *Pezotettix alba* Dodge, seems to exhibit a transition from something still lower. I have an example in which the elytra are barely one-tenth of an inch in length, only half as long as in the typical or common form. In this specimen the cerci are much smaller than usual, although the insect is of the common size.

I do not yet know whether these variations in wing expanse are common to both sexes or not. I have so far found them only in male specimens, but that is no proof that winged females do not also occur.

Lest any should imagine that I am wrong in determining these long-winged specimens to be varieties rather than species, I will say that these species of *Pezotettix* are not liable to be confounded with any *Caloptenus* and that the varieties do not, with the exceptions already mentioned, differ in form or color from the types.

Pezotettix alba is particularly distinct, being white or greenish-white in color, and occurring only upon a native plant whose stems and foliage are also white. This plant, commonly, but incorrectly, called wild sage, grows in clumps many rods apart upon the prairie; but the insect is never found upon the intervening grass. The winged variety was also found upon the same plant.

The following shows the comparative length of wing in these varieties:—

Pez. alba Dodge.

Variety, ♂—Length of elytra, .10 inch.
Type, ♂ — Length of elytra, .175 inch.
Type, ♀ — Length of elytra, .20 inch.
Variety—Length of elytra, .50 or .60 inch.

Pez. junius Dodge.

Type, ♂—Length of elytra, .40 to .45 inch.
Type, ♀—Length of elytra, .45 to .50 inch.
Variety, ♂—Length of elytra, .70 inch.

Pez. autumnalis Dodge.

Type, ♂—Length of elytra, .20 to .23 inch.
" ♀ " " .26 inch.
Variety " " .70 "

The Caloptenoids are not more constant in color than other genera of Acrididæ, red-legged ones producing blue-legged varieties, and *vice-*

versa. Worthy of special mention are two males and a female, of the red-legged *C. spretus*, with hind tibiæ pale blue. As I found them all in one locality, they were probably produced from one batch of eggs. *C. minor* Scudd. has a red-legged variety here. Have taken many specimens, but all were females.

DESCRIPTION OF THE PREPARATORY STAGES OF NEONYMPHA EURYTRIS.

BY W. H. EDWARDS, COALBURGH, W. VA.

EGG—Sub-globose, well rounded in every part, but somewhat broadest below the middle; wholly covered by fine, irregularly hexagonal reticulations, scarcely raised above the surface; color yellow-green. Duration of this stage 8 days.

YOUNG LARVA—Length .08 inch; cylindrical, thickest in middle, tapering pretty evenly either way, the last segment ending in two short tails; body covered with fine white hairs, slightly recurved; color pink-white, marked longitudinally by seven crimson lines, one of which is medio-dorsal, and three on either side; head sub-globose, nearly twice as broad as any body segment, flattened frontally, depressed slightly at top, and with a small conical process upon each vertex; color dark brown. To next stage 7 days.

AFTER FIRST MOULT—Length .16 inch. Body flat at base, rounded dorsally, and arched in middle segments, the sides sloping; the tails short, conical; color drab, either of a green or red tint, individuals varying; striped longitudinally with dull red, there being a narrow medio-dorsal stripe of this color, and two others on middle of each side; the whole surface finely but roughly tuberculated, the tubercles being irregular in size and length, sharp, and each emitting a short hair; colored also according to the ground they occupy; head sub-pyriform, flattened frontally, truncated at summit, and on each vertex a small rounded red process; color of head yellowish, finely mottled with red. Duration of this stage 6 days.

AFTER SECOND MOULT—Length .24 inch. Shape as at last stage; a fleshy ridge over the feet; color dull ochrey-yellow, striped with brown; the dorsal stripe broad and dark, and a similar one on the lower part of the side; two narrow stripes on the middle of each side, paler colored; the tails reddish at tips; surface of body as before; head shaped as before, yellow, the upper front crossed by two arched rows of rounded brown patches. To next moult 14 days.

AFTER THIRD MOULT—Length .44 inch. The middle segments stouter, the base broader, than before; color pale ochre-yellow somewhat mottled with reddish on dorsum, but variable in this respect; the lateral stripes sometimes nearly or quite obsolete, and in place of the upper one is a dark point or spot at the extreme hinder part of each segment from 4 to .10; behind this the side is mottled with a darker shade than the ground; the basal ridge buff; surface more roughened than before; head nearly as before, the spots on the face darker, and a third row appears faintly below the others. To next moult 30 days.

AFTER FOURTH AND LAST MOULT—To maturity——days.

MATURE LARVA—Length 1 inch. Body flat at base, the dorsum rounded, much arched on middle segments, the sides flat and sloping; over the feet a fleshy ridge; the second segment constricted much as in *Hesperia;* the last segment bifurcate, each fork short, pointed, divergent; color of dorsum yellow-brown; of sides, darker; a medio-dorsal band dark brown, and on either side of this on each segment from 4 to 11 is an indistinct dark patch; the lateral area separated from the dorsal by two wavy parallel lines, the upper one dark, the other yellowish; on the side of each segment from 5 to 11 is a dark oblique stripe; the basal ridge yellowish; the tails tipped with red; the whole surface covered with sharp tubercles of irregular sizes and colored as the ground, each emitting a short brown hair; feet and legs yellow-brown; head sub-pyriform, flattened in front, truncated at summit and slightly depressed; the vertices a little produced, pointed and compressed; color yellow-brown, finely tuberculated; the face crossed by three rows of rounded brown patches.

CHRYSALIS—Length .5 inch. Same shape as *sosybius;* cylindrical, the abdomen stout and larger than the anterior portion; mesonotum rounded, arched; the head case truncated abruptly from the base of the mesonotum, narrow; wing cases somewhat flaring at base; the neuration of the wings seen distinctly; color pale yellow-brown, the wing cases and

anterior parts streaked with fine, abbreviated, brown lines; on the margins of the wing cases a series of dark brown spots; beneath the abdomen two brown stripes, and on the middle of each side a row of brown points extending from the mesonotum to extremity. Duration of this stage 11 days.

Eurytris is a common species in this section of West Virginia, found in the borders of the forest and in the adjacent fields, especially if these last are more or less overgrown with brambles, &c. The eggs are easily obtained by confining the female in a box, or over a flower pot in which a bit of sod has been placed. They are laid upon the grass, or dropped loosely upon the sod or the earth. The first eggs so obtained by me were laid 30th May. The earlier stages were rapidly passed, as related above, but the last were very much prolonged. About 20th July, soon after the third moult, the larvæ all ceased feeding, and some appeared to be in profound lethargy. But others, after resting for several days, would arouse and eat a little, then sleep again. But every one, notwithstanding the lethargic condition, was found to have changed its position several times. After keeping them so two weeks, I left home for some months, and on my return found all were dead. But one larva that I had sent to Miss Peart before 20th July went on to imago, and I inferred that probably some of the others would have done so after sleeping for an interval, had I been at hand to feed them. This was in 1876. In 1877 I raised a small brood from eggs obtained 31st May. With these every stage of the larvæ, after the first, lingered. When about to moult the larva remained for three or four days before this event motionless, and as many after, and there were periods of several days between the moults when they rested and took no food. As I kept them in small glasses it was easy to determine this. The larva is sluggish at all times, moves very little and with great deliberation. Part of this brood at last ceased feeding altogether and contracted themselves for a long sleep. But I eventually lost all but one of these, probably from the heat of the weather, as one after another dropped off its support, dead. The single larva spoken of continued to feed and reached the length of about one inch, when winter set in, and I then set it in a cold room to preserve it till spring. By an accident this one was lost in January. It appeared to be healthy up to this time, and the imago would probably have emerged from chrysalis in early spring. It will be seen that breeding these larvæ is an excessively tedious matter, requiring months to perfect, and involving many risks. As fresh butterflies

of *Eurytris* are flying here in the fall, there are of course two broods, but breeding shows that some of the larvæ of the first brood became lethargic in summer, and so they pass the winter. The larvæ of the second brood doubtless pass the winter in their earlier stages, and begin again to feed early in the next season.

Mr. Scudder, Trans. Am. Ent. Soc., 1877, p. 74, has spoken of the marked resemblance between the imagos of the Satyridæ and Hesperidæ in many important features, and calls attention to the very great similarity between the chrysalids of the two families. I concur with him fully in these respects, but I would suggest that the resemblances between the larvæ and their behavior is often just as great. I am more and more satisfied from the study of the preparatory stages of the Satyrids, that their true place in classification is very near the Hesperidæ.

DESCRIPTION OF A NEW BRONCHELIA.

BY W. V. ANDREWS, BROOKLYN, N. Y.

Bronchelia gravilinearia, n. sp.

The general ground color of this species is a light brown, approaching a fawn color. The palpi, however, are of a dark brown.

F. w.—Wing stretch 1¾ in. There are five distinct, dark brown, transverse bands, all commencing on the costa. The first two basal, and rather close to each other; the inner of the two somewhat broken. The third very heavy. The fourth is much narrower than the third, and commences on the costa at about one-tenth of an inch from the third, curving until it touches it at about mid-wing, thence running nearly confluent with it to inner margin. The fifth band is not quite so heavy as the third, and is broken at about the third nervule. All the bands curve towards the base, but are not quite parallel. The space between the fifth band and outer margin is thickly covered with scales of the same dark brown as the bands. Outer margin slightly notched, with a row of dark brown lunar marks. All the bands, except one and two, are extended across the hind wings.

H. w.—The heavy third band of *f. w.* is equally heavy on *h. w.*, and is bisected at a right angle by a heavy brown line, forming a T mark. The slight fourth band commences on this wing at about the same distance from the third as it does on *f. w.*, and runs a zigzag course to inner margin. The fifth band is broken, as described on *f. w.* The outer margin of this wing is more deeply notched than the outer margin of *f. w.*, and the lunar marks are more distinct, and are larger. All the markings are of the same dark brown color.

In general appearance this species differs greatly from *hortaria*, the dark scales being much less diffused.

The under side of both wings is concolorous, or nearly so, with their upper side, with very few scattered brown scales. Of the *f. w.* under side all the bands of the upper side are distinct and clear except the first. Of the *h. w.*, the bands are much fainter, the third and fifth being the heavier, while the fourth is scarcely perceptible.

A single ♂ specimen from Indiana. Coll. W. V. A.

I hesitated for some time before venturing to describe this species, thinking it possible that it may be Guenée's *B. dendraria*, but Packard's statement that the third and fourth lines of *dendraria* were broad, confused and blended, does not apply to the example before me.

MICRO-LEPIDOPTERA.

BY V. T. CHAMBERS, COVINGTON, KY.

CORISCIUM.

C. 5-strigella Cham.

By a slip of the pen the description of this species contains the following sentence: "Annulus about its middle at the tip." It should read: "Middle and another at its tip." There are several indistinct costal streaks besides the five larger ones from which it takes its name, and there are four brown spots or longitudinal dashes along the line where the general brownish-gray color of the wing meets the white dorsal part.

COLEOPHORA.

C. gigantella Cham.

A typographical error in the original description makes it read "*these* are in the apical part of the wing" for "*three* are in," etc. The species was described from a single specimen from Canada, and was placed in the section "having the palpi simple." Since then I have bred it from cases found in May attached to Maple trees *(Acer saccharinum)*, in Kentucky. The specimen in Mr. Saunders' collection had probably been a little injured in setting, as in the bred specimens I find there is a minute tuft at the apex of the second joint of the palpi, and there is also an ochreous streak from the base along the dorsal margin of the fore wings.

Among the European species figured in the *Nat. Hist. Tin.*, *C. virgaurœ* most nearly resembles this species, which, however, is larger than *virgaurœ* and has no brown dusting on the wings. *Virgaurœ*, likewise, has the costa narrowly white to the middle, whilst in *gigantella* the extreme costa is of the same pale brownish ochreous with the streaks on the wing. The streaks on the fore wings are in other respects alike in the two species. The hind wings, abdomen and anal tuft are gray (in *virgaurœ* the tuft is yellowish ochreous). The ciliæ of the fore wings are a little paler and more grayish than the streaks on the wings, and the outer surface of the palpi is brownish ochreous. The larval case is of the same form in this species as in *virgaurœ*, except that it is a little more slender, and it is of a sordid brownish-yellow color. The imago comes out in the latter half of June.

C. shaleriella Cham. resembles *gigantella* closely, but is a little larger, having an *al. ex.* of $\frac{7}{16}$ inch, while that of *gigantella* is five lines; and in *shaleriella* the antennæ are not annulate with brown.

Both of these species approach *C. cratipennella* Clem. Dr. Clemens gives no measurements, and I have not seen his species; but from his account of it, it would seem to differ from *gigantella* and *shaleriella* by the unusual width of the streak which extends along the wing between the costal and subcostal veins, and by "the stripe along the subcostal vein which sub-divides into two branches terminating on the costa," and in the number and course of the streaks in the apical part of the wing; the color of the basal portion of the costa is not stated by Dr. Clemens.

I have no specimen of *shaleriella* for comparison now, and it may prove to be identical with *gigantella*.

C. fagicorticella Cham.

This species does not closely resemble any of those figured in *Nat. Hist. Tin.*; the larval case, however, resembles that of *C. murinipennella* in form. The imago is perhaps more like *C. Gnaphalii* than any other there figured. The palpal tuft is very small and the *al. ex.* varies from something over ⅓ to about $\frac{7}{16}$ inch. The wings are very indistinctly marked, and the yellowish tinge of the apical portion of the primaries is faint. There is a wide, pale yellowish-ochreous streak along the dorsal margin; indeed sometimes the entire dorsal part of the wing beneath the fold is of that color, and the furcate yellowish streak above the fold is so close to it that one sometimes may fail to observe that the fold itself is whitish. Very faint lines may also be observed along the course of the veins in the apical part of the wing, and their course in perfectly fresh specimens is made more distinct by lines of sparsely dusted brown scales which margin them; the streak along the costa is also very indistinct. Ciliæ of fore wings pale yellowish; hind wings and their ciliæ, and abdomen, gray; anal tuft white. Length of larval case 2½ lines.

C. unicolorella Cham.

This species was described from captured specimens, and I have since bred it. The larval case does not closely resemble any of those figured in *Nat. Hist. Tin.* It is most like that of *virgaureæ*, but is much shorter in proportion and smaller every way, with the anterior end curved downwards. It is grayish or ochreous, with little blackish specks adhering to it. Length 2¼ lines.

The imago is sometimes a little larger than the dimensions given ($\frac{5}{16}$ inch), reaching ⅜ inch *al. ex.* It is proper to add that the hind wings and upper surface of the abdomen are slate color, the under surface of the abdomen yellowish, and the antennæ very faintly annulate with yellowish. Otherwise the entire insect is as I have described it, of a grayish drab color. Of the species figured in *Nat. Hist. Tin.*, it seems to come nearest *siccifolia*, having the hind wings wider than in the other unicolorous species there figured; but the fore wings are rather darker than in that species. The case is very common in May, adhering to the bark of forest trees, but the food plant is unknown.

C. linea-pulvella Cham.

Palpi tufted; antennæ with the basal and a few following joints a little enlarged. Head and appendages pale ochreous, the outer surface of the

palpi brownish, and the antennæ with alternate annulations of dark ochreous and white. Fore wings ochreous, with *white lines so densely dusted with dark brown or blackish scales as almost to conceal the white;* one of these extends along the costal margin; another from the base to the apex, giving off three branches to the costal margin, the first being emitted just before the middle; another extends along the fold, and there is a more indistinct one along the dorsal margin. Hind wings fuscous; abdomen dark lead color above, paler and more ochreous below. *Al. ex.* 5 lines. Ky., June 21st (some specimens in Cambridge Museum are labeled by mistake *nigripulvella*). The basal joint of the antennæ is but little larger than those immediately following, but these are themselves a little enlarged.

C. argentella.

This is *C. argentialbella* Cham., CAN. ENT., v. 7, p. 75, and *Bul. Geo. Survey* (Hayden), v. 3, pt. 1, pp. 133 and 141—not *C. argentialbella* Cham., CAN. ENT., v. 6, p. 128. *Argentella* is heretofore known only from Texas and Colorado, but I have also since taken a single specimen in Kenutcky. When it was first described I had no means of reference to my collection of Kentucky species, nor to my notes or published descriptions, and the previous use of the name *argentialbella* for the smaller Kentucky species escaped my recollection. *Argentialbella* is retained for the smaller, and first described species, known as yet only from Kentucky; *argentella* for the larger species.

C. bistrigella Cham.

There seems to be much difference in the intensity of the yellow streaks on the fore wings and the amount of brown dusting along the margins of the streaks. The single specimen taken in Colorado was somewhat worn, and all my specimens from Texas had been captured for a good while, and the colors may have faded somewhat. It may turn out, on the examination of fresh specimens, that it is identical with *C. basistrigella* Cham. from Colorado, which is only known by a single specimen, which, however, is in perfect condition. Neither has been found except in Texas and Colorado as yet.

C. caryaefoliella.

C. cretaticostella? Clem.

C. rufoluteella Cham.

Dr. Clemens gave names to several species which were known to him only by the food plant, larval case or larva. Among these he mentions a species feeding on Hickory leaves under the name of *caryaefoliella*. He also describes a captured imago under the name of *cretaticostella*, but the description is so very brief and insufficient that without seeing his specimen I cannot be altogether certain that it is identical with that bred by me from larvæ feeding on Hickory leaves. His description, however, of *cretaticostella*, such as it is, is applicable to the Hickory-feeding species bred by me. I know three species feeding on Hickory leaves, but have only succeeded in rearing the imago from one, and as that one agrees in the characters of the case and larva with the case and larva mentioned by Clemens, I adopt the name suggested by him. His species *cretaticostella* was described in January, 1860, and his mention of the larva and case of *caryaefoliella* under that name was in 1861, so that the former name would be entitled to priority; but as there may be doubt whether the species are the same, and as the description of *cretaticostella* is so imperfect, and as, on account of the ease with which bred species may be identified, it is always desirable that the specific name should be derived from the food plant, I adopt *caryaefoliella* for this species.

C. rufoluteella Cham. is known only from captured specimens. I have always found it in abundance about the middle of July, resting upon palings in Linden Grove Cemetery, in Covington, Ky., a mile away from any Hickory trees. There it always makes its appearance suddenly and in considerable numbers, so that I have always supposed it to be a feeder on some species of plant found in the cemetery enclosure. I am, however, utterly unable to distinguish it from specimens bred by me in the latter part of June from larval cases found feeding on Hickory leaves in the manner described by Dr. Clemens for *caryaefoliella*, and I believe it to be the same species.

The species of this genus pass by such gentle gradations from those having the antennae densely clothed with scales, or the basal joint of it tufted or greatly enlarged, and with the second joint of the palpi distinctly tufted, to those in which both antennae and palpi are simple, that these characters afford little assistance in subdividing the genus. It is sometimes difficult to determine whether we should say "the basal joint of the antennae tufted," or only "enlarged," and so as to the palpi. Thus formerly (CAN. ENT., v. 6) I placed *rufoluteella* in the section "basal joint of antennae with a small tuft, palpi simple." But it now seems to me that

it would be more correct to say "basal joint of antennae somewhat enlarged; second joint of palpi with a very minute tuft."

The species is ochreous; the head and palpi pale or yellowish ochreous; the antennae white, annulate with brown; fore wings reddish ochreous, darker towards the apex, with the costal margin from base to ciliæ white.

The larval case is ochreous red, cylindrical, laterally compressed at the hinder end, and over three lines long. It is attached to the under side of the leaves of *Carya alba*, and the larva eats out the parenchyma in little patches approaching a square form.

The ornamentation of the imago is nearer that of *C. limosipennella* than to any of the other species figured in *Nat. Hist. Tin.* *Al. ex.* 4½ lines.

C. Vernoniæella, n. sp.

This species, like many others which I do not specially name, is known only by its larval case, and I refer to it simply on account of its great size. It is about an inch long and slender, reminding one somewhat of the basal half of a "darning needle." The larva feeds on leaves of the Iron-weed *(Vernonia)*. Miss Murtfeldt informs me that she has found it in Missouri, and I have found it in Kentucky.

There are two species besides *caryaefoliella* feeding on Hickory leaves. One of these makes a very small case, laterally compressed and but little more than a line long. Another makes a case about the size of that of *caryaefoliella*, but it is also somewhat laterally compressed, and the case having been cut out of the edge of the leaf, the upper edge of it shows the serrations of the leaf.

There is also a species making a pistol-formed case that feeds on Chestnut leaves. And the large blackish pistol-formed case of *C. tilliaella* Clem., the larva and case only of which are known, is also found here occasionally. I have also met with a small pearly-white case less than two lines long, and a white fusiform case one-half an inch long, besides many others found in this locality. A species which feeds on Blackberry leaves *(Rubus villosus)* makes a case out of the edge of the leaf, showing the serrations on the dorsal edge.

WINTERING VANESSA ANTIOPA.

BY C. G. SIEWERS, NEWPORT, KY.

This beautiful diurnal—the "Camberwell Beauty" of England, and very inappropriately styled the "Mourning Cloak" by Americans, for is it not clothed in a mantle of imperial purple, fringed with gold lace?—is well known to hybernate. It is occasionally found in stone piles in the winter, but I think its most common hiding-place is in the culvert walls of our country roads and turnpikes. It requires a cold, moist, dark place, or it will dry up.

Capturing a fine female on the 9th of October, 1876, I concluded to winter it. Placing it in a net cage with a dish of apple, sugar and water, I supposed my share of the performance over. It fed for several weeks, then fluttered a good deal and died the beginning of December. It had fairly dried up. This showed bad management. Last fall, on September 7th, passing a tree sugared the night before, I captured another female. This one I placed in a paper box eight inches square and high, removed the core of half an apple, sliced off a bit of the round side to steady it, placed it in a small two-inch dish, covered with sugar, and filled up with water. Once a week I renewed the water and sugar. It placed itself on the side of the box, directly over and within reach of the dish, and however I moved the apple I always found that it followed it around.

It evidently fed on warm days, but never opened its wings. I kept it in an up-stairs, cold room, where water would freeze, but still not as cold as out doors. It allowed me to handle it, and would lie flat on my hand without movement. In February I thought there were symptoms of weakening. It no longer perched on the side of the box, but remained on the bottom, leaning over very much to one side.

Placing it in sunshine the last week of February, it began to open its wings little by little, with short jerks, as if the tendons were loosening. When half open it was put away again. On the 11th of March, a warm cloudy day, I took it on my finger to an open window. While looking at its clear eyes the sun suddenly shone out, and the next moment it was gone. I had proposed to try and find a mate for it, but concluded to keep it till others were flying, and then take it to its old neighborhood and let it go. As it took the direction of its place of capture I was pretty sure

to see it again, and found it four days after in a sugar camp in the same woods. I recognized it at once by a bad bend in the tip of the wings, caused by a jam of the dish slipping on it.

On the 27th of March, two weeks later, the first *antiopa* appeared. I have so far failed to take the larva, but have just seen several imagines in a willow thicket, which gives me hope. They are usually rare, but some years their numbers make them a nuisance. Their color is dark purple with strong black spines. Food plants—Lombardy poplar and willow.

INSECTS OF THE NORTHERN PARTS OF BRITISH AMERICA.

COMPILED BY REV. C. J. S. BETHUNE, M. A.

From Kirby's Fauna Boreali-Americana : Insecta.

(Continued from Vol. ix., p. 156.)

[254.] V. HYMENOPTERA.

FAMILY MEGACHILIDÆ.

375. MEGACHILE MARITIMA *Stephens.*—Length of body 7 lines.

[271.] Body black, pubescent, thickly and minutely punctured. Mandibles very large, triangular, protended, not crossing each other, armed with four terminal teeth; face between the eyes thickly clothed with brown hairs, which grow tawny towards the mouth; antennæ filiform; back of the trunk clothed with brown hairs less thickly in the disk; wings a little embrowned, especially at the apex; nervures dusky; base-covers piceous; legs hairy with pale hairs; abdomen subovate with the three last segments fringed with pale hairs intermixed with black; the ventral hairs are tawny, paler towards the base, and darker towards the apex.

FAMILY ANTHOPHORIDÆ.

376. ANTHOPHORA BOMBOIDES *Kirby.*—Length of body 6 lines. A single specimen taken in Lat. 65°.

Body black, thickly punctured, clothed like that of a humble-bee with dense pallid hairs. Head triangular, upper lip subquadrangular, white with a black dot at each upper angle ; nose white, naked ; a bunch of whitish hairs conceals the base of the antennæ ; antennæ filiform, scarcely longer than the head ; vertex with some black hairs thinly scattered ; occiput fringed with whitish ones ; trunk subglobose, set with longish white hairs ; hairs of the legs mostly black ; tarsi piceous ; the first or dilated joint is armed with a strong and sharp tooth on the inner side at the base ; wings subhyaline with black nervures ; abdomen between globose and triangular, with the three first dorsal segments clothed with long whitish hairs, and the tail and ventral segments with black.

[272.] FAMILY BOMBIDÆ.

377. BOMBUS SYLVICOLA *Kirby*.—Length of body 7 lines. A single specimen taken in Lat. 65°.

General hirsuties of the upper side of the body yellowish. Head with a tuft of the same colour below the antennæ, and another at the vertex ; trunk with a broad black band between the wings ; hairs of the thighs yellowish ; those of the tibiæ black ; tarsi more or less covered with short decumbent pale hairs ; wings somewhat embrowned, with black nervures ; abdomen with a broad, mesal, ferruginous band.

378. BOMBUS BOREALIS *Kirby*.—Length of body 8 lines. Several taken with the preceding.

[273.] Body clothed underneath with black, above with tawny, hairs. Face and vertex with a tuft of yellowish ones ; thorax, between the wings, with a black hairy band ; wings somewhat embrowned with black nervures ; legs black ; abdomen above with a thick coat of tawny hairs palest at the base ; anus black.

379. BOMBUS TERRICOLA *Kirby*.—Plate vi., fig. 4.—Length of body 9 lines. Taken with the preceding.

♀. This species approaches very near to *B. terrestris*, but the whole upper surface of the abdomen is clothed with yellow hairs, with the exception of the first segment, the hair of which, and a band near the anus, are black ; the extremity only of the latter is dirty-white ; there are a few yellow hairs on the metathorax ; and the wings are embrowned. In *B. ter-*

restris the abdomen is black, with a yellow band, and the two last anal segments are white; there are no yellow hairs on the metathorax, and the wings are much clearer.

380. BOMBUS DERHAMELLUS *Kirby*.—Length of body 8 lines. Taken with the preceding.

♀. Body hairy, black. Head with a tuft of yellowish hairs on the vertex; thorax yellow, black between the wings; wings more embrowned than in the male; abdomen yellow at the base with a black posterior band; anus ferruginous.

[274.] 381. BOMBUS PRATICOLA *Kirby*.—Length of body 7 lines. Taken with the preceding.

♀. Body black, clothed above with yellowish hairs. Head with a tuft of yellowish hairs below the antennæ, and on the vertex; thorax black between the wings, which are embrowned; legs with yellow hairs at the base; anterior half of the abdomen yellow, posterior ferruginous.

382. BOMBUS VIRGINICUS *Linn*.—Length of body 8½ lines. Locality uncertain.

♀. Hairs of the body in general black, except a tuft on the vertex behind the antennæ, the anterior and posterior extremities, and sides of the thorax, and the first segment of the abdomen, which are clothed with yellowish hairs; between the wings the thorax is black; the tarsi are rufous; the wings are rather embrowned, most so at the apex; nervures black.

ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Annual Meeting of the above Club will be held in St. Louis, Mo., on Tuesday, August 20th, the day preceding the meeting of the Association. It is hoped that all Entomologists who can possibly do so will be present on that occasion.

BOOK NOTICES.

Manual of the Apiary, by Prof. A. J. Cook, Lansing, Mich. Octavo pp. 286, with 110 illustrations; published by Thos. G. Newman & Son, Chicago.

We are indebted to our esteemed friend Cook for a copy of the second edition of this excellent work on Bee Culture, treating of the art in all its different branches in a clear, concise and interesting manner, showing throughout the author's thorough knowledge of the subject on which he writes. The work is divided into two parts, the first of which treats of the natural history of the Honey Bee, the second on the Apiary, its care and management. It is well got up and the illustrations are very good; we feel a pleasure in recommending it to all those interested in Bee Culture. The fact that the first edition of 3,000 copies issued less than two years ago is exhausted, shows that the public have appreciated the author's efforts.

Antigeny, or Sexual Dimorphism in Butterflies, by Samuel H. Scudder, 8vo., pp. 8, from the Proceedings of the American Academy of Arts and Sciences, vol. x.

The Insects of the Tertiary Beds at Quesnel, British Columbia, by Samuel H. Scudder, 8vo., pp. 15. From the Report of Progress, 1875–76, Geological Survey of Canada, containing descriptions of twenty species of fossil insects.

Additions to the Insect Fauna of the Tertiary Beds at Quesnel, British Columbia, by Samuel H. Scudder. From the Report of Progress, 1876–77, Geological Survey of Canada, 8vo., pp. 8, containing descriptions of six species of fossil insects.

Fossil Coleoptera from the Rocky Mountain Territories, by Samuel H. Scudder. Extracted from Bulletin of the Geological and Geographical Survey of the Territories, Vol. ii., No. 1, 8vo., pp. 10., in which are described 31 species of fossil Coleoptera.

Notice of the Butterflies collected by Dr. Edward Palmer in the arid regions of Southern Utah and Northern Arizona, during the summer of 1877, by Samuel H. Scudder. From the Bulletin of the Survey, Vol. iv., No. 1, 8vo., pp. 5, containing references to 41 species. We are very greatly indebted to the author for kindly sending us copies of the above valuable papers.

Field and Forest. This excellent monthly journal of Natural History continues to be well sustained. Among articles of especial interest to Entomologists we notice papers in the January and March numbers, by W. H. Edwards, of Coalburgh, W. Va., containing descriptions of nine new species of butterflies found in Colorado and Texas.

The Journal of the Cincinnati Society of Natural History ; lge., 8vo. pp. 52, with two plates. Terms, $2 per vol. ; single numbers, 60 cts. The first number of this new quarterly journal of Natural History is at hand. Besides matters of local interest connected with the Society, the present number contains a paper "On the Tongue of some Hymenoptera," by V. T. Chambers ; a catalogue of the Lepidoptera observed in the vicinity of Cincinnati, by Charles Drury, including 475 species ; Contributions to Palæontology, by S. A. Miller and C. B. Dyer, and a description of *Pupa Cincinnatiensis*, by C. R. Judge.

Bulletin of the Buffalo Society of Natural Sciences. Part 5 of Vol. 3, the closing number of the volume, is at hand, containing papers by Henry R. Howland, on Recent Archæological Discoveries, illustrated by three photographic plates ; D. S. Kellicott, description of a new species of *Argulus*, and a new Check List of North American Sphingidæ, by Aug. R. Grote.

CORRESPONDENCE.

PAPILIO THOAS.

It may be of some interest to the readers of the CANADIAN ENTOMOLOGIST to know that one specimen of *Papilio thoas* was captured in Hamilton last summer, in the south-eastern part of the city, and one specimen on the G. W. R. track near Dundas. Both specimens were badly broken. Mr. D. Little has the one here, and Mr. R. Kyle, of Dundas, has the other.

WILLIAM MURRAY, Hamilton, Ont.

We captured at Center, N. Y., April 24th, *Smerinthus cerisii* in excellent condition. So far as I am aware, it has never been taken in this region before. You see Center still holds her own, and every season yields up new treasures. JAMES S. BAILEY, Albany, N. Y.

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THE GENERA OF THE HESPERIDÆ OF THE EUROPEAN FAUNAL-REGION.

BY DR. A. SPEYER.

(Translated from the Stettiner Entomologische Zeitung for 1878, pp. 167-193.)

[Of marked value, as is everything upon the Lepidoptera proceeding from the pen of Dr. Speyer, the present paper—an arrangement of the Hesperidæ which will generally be conceded to be quite in advance of any heretofore presented—will prove of special interest to the American student, in connection with the arrangement a short time ago presented by the same author, of some of our American species (Edwards' *Catalogue of the Lepidoptera of North America*), associated with the European species (my *Entomological Contributions*, No. iv., p. 71). The admirable discussion in this paper of the value and relative importance of the several structural features of the Hesperians, cannot fail of being of eminent service in the systematic arrangement of our numerous species. Great care has been taken with the translation to render it a faithful one. The thanks of the appreciative reader are due to Mr. W. H. Edwards and Mr. O. von Meske for providing for the translation, and to Prof. Uhler for its supervision. The remaining two-thirds of the paper will be given in the two following numbers of this journal.—J. A. LINTNER.]

A task set for me by American friends* induced me to undertake, in connection with the North American Hesperidæ in my own collection,

* I have been able to comply with the wish of my friends, to aid them in the arrangement of the Hesperidæ (for the purpose of publishing a new Catalogue of their Rhopalocera) only within the narrow limits to which I am confined by my very imperfect acquaintance with the American species of the family. In addition to the statement

also, a revision of the European species; the result of which I here submit, although the work is not so thorough as it should have been—some subjective deficiencies pertaining to it, as the non-examination of the neuration of the wings, etc.

The European Hesperian Fauna is so poor in species that, in comparison with the Fauna of the whole world, it is almost lost: even with the addition of the much richer Fauna of temperate North America, still appearing as only a small fragment of the whole, affording no satisfactory insight into the correlation of the forms, and causing the arrangement and limitation of the species to remain uncertain.

But so long as we are without a general system of the Hesperidæ which would meet present requirements, nothing remains to be done but to work up the individual Faunæ for one's-self: in order, in the first place, to meet the absolute wants of our collections and special catalogues, and secondly, to prepare the way for a complete work at some future time. That the attempts made hitherto to divide this multiform family into genera have remained rather unsatisfactory will not be disputed, and possibly least of all by the excellent authors themselves. Herrich-Schæffer, at least, who in the true scientific spirit undertook such a task in his *Prodromus Systematis Lepidopterorum* (1868), plainly understood its imperfection. It is, however, much to be regretted that this great work, based upon such comprehensive studies, has not been completed, for, as is known, it remains as a fragment.

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already made in the Catalogue which I have received through the kindness of the author (*Catalogue of the Lepidoptera of America, North of Mexico, Part I., Diurnals:* By W. H. Edwards, Philadelph., 1877), I would remark, that, of the one hundred and eleven species there included, only forty-four have been in my possession, and that the American representatives of the genera *Carterocephalus, Thymelicus, Lintneria,*† *Achlyodes, Erycides, Pyrrhopyga* and *Megathymus* have been entirely wanting. That the generic diagnoses prepared by me somewhat hastily should have the honor of publication, I neither expected nor desired. How far these diagnoses will be sustained in their extension to the species unknown to me, and whether, and how far especially, the entire classification would have been modified, if instead of a part only, the whole number of species in nature were known to me, I am at present unable to judge. Finally, that Mr. Scudder, and not myself, is the author of the genera *Amblyscirtes* and *Pholisora*, has already been mentioned by Mr. Edwards. The genus *Thymelicus* Herrich-Schæffer (*Prodromus*, etc., p. 44, 1867) had already been well characterized.

† [This name having been previously used by Mr. Butler, for a genus of the Sphingidæ, it has been withdrawn by its author, and *Systasea* substituted for it. See this journal, vol. ix., p. 120.—J. A. L.]

The Hesperidæ are regarded by me as a group equal in systematic value to all the other Rhopalocera, and one which forms a transition to the Heterocera. They approach the latter through the possession of an attachment to the anterior tibiæ, the double-spurred posterior tibiæ of most of the species, and in the pupa being enclosed in a net-work of threads. No other group of the Diurnals, so far as I know, has two pairs of spurs on the posterior tibiæ. Besides the Hesperidæ, the Papilioninæ (Equites) alone have the tibial epyphysis, and in these alone the thread-enclosed pupa is found, at least in one of the genera *(Parnassius)*. In other respects, however, the Papilioninæ are far removed from the Hesperidæ.

The Hesperidæ are still more decidedly characterized as a genealogical transition group, between the Heterocera and the Rhopalocera, in that they possess besides, in particular cases, two characteristic physiological and anatomical peculiarities—the position of the wings when at rest, and the catch-bristle *(haftborste)* of the hind wings.

Nisoniades Tages carries its wings, as I have observed towards evening in sleeping examples resting upon flowers, directed backwards and sloping like the roof of a house, as in the night-moths. The same observation had already been made by Prof. Zeller, not only in *Tages*, but in freshly excluded examples of *H. malvarum* O., which last had the antennæ placed sideways and laid along the thorax, and the abdomen turned upwards, so that the observer was reminded of a sleeping *Heterogenea testudinana* (*Isis*, 1847, p. 288). Whether others have also made the same observations with this or other species, I do not know. I have not myself given the subject much attention. So far as I remember, I have always found the other Hesperians, when at full rest, sitting with erect wings, in the normal position of the Diurnals; but not with separated wings, as has been mostly stated.

A fully developed *retinaculum** occurs only in the male of *Euschemon rafflesiae* Macleay, and it is remarkable that the home of this singular genus is Australia, where so many primitive forms have been preserved that elsewhere have been overthrown by terrestrial revolutions, or destroyed by the concurrence of more progressive rivals.

Looking away from these possibly single cases, the Hesperidæ form a very natural, in themselves closed, division of the Diurnals, and as such

* [The *frenulum* of many authors. —L.]

much easier to circumscribe than to analyse as natural and sharply defined genera. To their characteristic peculiarities belong (after the venation of the wings, etc.) as an easy and evident characteristic, the brush of stiff hairs which springs from beneath the base of the antennae, which Hübner thought to be, in his definition of *Astyci* (Verz., p. 102), like the "curve on the cone of the ear." It arises very near the base of the antennae, between them and the upper margin of the eyes, and almost on the place occupied by the ocelli, but a little farther forwards, near the middle of the base of the antennæ—the ocelli, when present, lying on the posterior margin. It is developed alike in both sexes, but varies in regard to length, form and color in the different genera and species. As a rule it is black, occasionally mixed with gold, rarely entirely rusty, or pale-yellow. Where it is particularly long and stout, as in *Pyrgus*, *Scelothrix* and *Nisoniades*, it is somewhat curved over the eyes, as if to serve as a shade for them. The inferior hairs are more elongated than the upper ones. It is very short in several *Pamphila (Goniloba)* species and in the American genus *Eudamus (Goniurus)*, but is not entirely absent from any species examined by me. In some American genera this otherwise simple hair-formed structure, in which the hairs are close set, takes the form of a plate of hairs, by reason of their being spread out at the end, as in *Copaeodes* sp., *Pholisora* Scudd. As a short character for this organ, we retain the name given by Hübner, "Lockchen" [a small lock of hair], although it is only by particular perfection to be compared to a lock of hair.

The appendage to the anterior tibiæ (epiphysis cruralis, *schienblatt-chen*)* a bare, mostly reddish-yellow, blunt thorn-shaped, or lancet-shaped, chitinous plate, projects, in the Hesperidæ, from the middle of the inner side of the tibiæ and reaches to their end. It lies quite close to the tibiæ, and its free surface is clothed with a flat tuft of hairs, so that the structure is sometimes not readily recognized. Its absence separates two (which perhaps should be united) natural genera, poor in species, from the remainder of the family.

That the presence or absence of the spurs on the middle of the posterior tibiæ is of as little use as elsewhere in founding genera, the already described genera will suffice to show. It even seems as if the Hesperidae were destined to add to the, until now, single example of variability in

[* The tibial epiphysis of Guenee and of Edwards' Catalogue.—L.]

the number of spurs in the same species *(Acidalia rusticata)*, a second instance of a varying species (see below *Pamphila Alcides*).

Of no more value in a systematic relation are the spines *(dornborsten)* of the tibiae, so far as I can judge from the limited number of species that I have examined. The genus *Pamphila* affords ample evidence of this; *Pyrgus*, also, attests to its truth, for its only spined species, *cribrellum*, no one would ever think of separating, because of this peculiarity, from *tessellum*, etc.

The spines the most generally occur on the middle tibiae, where they are always the most strongly developed; occasionally they are only present here. Then follow, both in frequency of occurrence and in their development, the posterior tibiae; and lastly the anterior tibiae. Often the spines of both these legs are so slight, or so covered up by hair and scales, that one has great difficulty in recognizing them, and their actual presence seems a matter of doubt. The manifold differences which are presented in the form of the club of the antennae are of value for systematic purposes; but, unfortunately, these differences are not often sharply defined and are difficult to express clearly in words. And there are not wanting species deviating from their generic association only in these points, that is to say, aberrent forms (such as *Pyrgus Poggei*), which could not be separated without an unnatural disruption of genera.

The palpi, particularly in the form and direction of their apical joint, afford some useful generic characters, while they offer, also, negative indications similar to those taken from the form of the knob of the antennae. Some other valuable systematic peculiarities are developed only in the male sex, while the female has in general remained a step behind. Their use as generic characters, therefore, cannot be recommended in this, as in other difficult groups, nor can they be wholly dispensed with. To these belong the costal fold and the discoidal stigma of the fore wings, the hair-pencil of the hind tibiae, the appendages of the hind breast,* and the abdominal fossa *(bauchgrube)*.

The costal fold affords in the European species, in which it is present, only unimportant differences. It begins near the base of the anterior margin and terminates on or near its middle. The portion of the anterior margin, which it here covers, is not clothed with scales, but with a peculiar

* [*Hinterbreast*:—Metasturnum (Burmeister), postpectus (Kirby).—L.]

coat of felt, the color of which differs from that of the rest of the surface. With only one exception *(Pyrgus Poggei)*, it is, in all the European Hesperians, either well developed or entirely absent; in this respect it is a good characteristic, but as a generic character, is only to be taken *cum grano salis*, unless we would separate, without good reason, forms which are naturally associated.

I call that the discoidal stigma which Dr. Herrich-Schaeffer has designated as "schuppenwulst" (a pad of scales), forming a peculiar structure in the disk of the fore wings. The expression employed by Herrich-Schaeffer would give a quite false idea of the nature of this structure. The deep black streak of which it consists wholly or in part, is neither a puffy elevation nor formed of scales, but is composed of a dense felt-like substance of very fine, short, stiff and bristly fibres, as may be seen by placing scrapings of it beneath the microscope. In its simplest form (*Thymelicus lineola*) it is nothing but a slender black streak, the surrounding part of the wing presenting no alteration in its normal scaly covering. In case of increased extension of the streak, however, the change affects also the surrounding area. The scales of the wing that encircle it are raised and undergo various alterations, some of them assuming the form of the antenna of a Diurnal butterfly. Still greater changes take place in the structure of the whole area in the midst of which this streak is placed in some American species (*Pamphila Huron* Edw.).

Less diversity appears in the situation and direction of the black streak. It generally starts from the dorsal-vein,* either at the end of the first third of its length, or a little before that point; then it runs across the first branch of the median-vein, where it is frequently contracted or sometimes interrupted by raised scales, advancing in an oblique course upward and outward to the origin of the second and third branches of the median at the lower corner of the middle cell. Among the species known to me, there occurs only in *Pamphila mathias* F., an essential deviation in the situation and direction of the stigma.

While the stigma furnishes good specific characters, it is of no generic value, since in nearly related species it is at one time present and at another absent. What appears to be of greater importance is the presence or absence of a hair-tuft on the posterior tibiae. Of the Hesperidae here

[Generally known to American Entomologists as the submedian vein.—L.]

referred to, only two genera possess it, *Catodaulis* and *Scelothrix*, and for which latter, in addition to the sheath-formed appendages of the meta-sturnum, it forms the most important separative character from the nearest related genus, *Pyrgus* (which see).

A more or less deep and extensive excavation on the side of the first abdominal segments (bauchgrube = abdominal cavity) may be observed in the males of a great many genera of Hesperidae, although not always easy to be recognized, as it is generally covered by long hair, which is either spread smoothly or matted in confusion. It is most fully developed in those genera whose males are provided with a costal-fold, particularly in *Scelothrix*, where the upper half of the abdomen appears as if eaten out. What seems most surprising is the apparent absence of it in some males belonging to species which show it very distinctly. These specimens being quite fresh and fully scaled, it is but natural to suspect that the cavity is first found or becomes visible after coition and the evacuation of the contents of their testicles. Nevertheless, the cavity actually exists in other specimens that are in equally good condition, and exhibit it as distinctly as the worn ones. A male of the American *Eudamus Tityrus* F., which I impaled immediately after its exclusion from the pupa, shows the cavity remarkably well developed. So there remains an enigma to be solved by further research, and especially by the examination of fresh specimens. The cavity seems, however, of little systematic value, on account of its gradual appearance, which allows no sharp limits to be drawn.

The neuration of the wings has not been examined by me to the extent required, nor with that accuracy which could only be attained by denuding the wings, so as to enable me to decide whether they furnish a more solid foundation for a natural division of the Hesperidae than the parts described above. This, I consider, the principal defect of my work. For he who would undertake to establish a natural system of this group could not possibly avoid performing that task. Neither have I examined the anal appendages of the males, although I do not suppose that the result of such an investigation would pay for the labor which it would involve.

The Hesperian Fauna of the European province (taken in the extent ascribed to it in my *Geographical Distribution of the Lepidoptera*, etc., I., p. 90, and II., p. 298) is by far poorer in species than any other of the six great zoological "Regions" into which, according to Wallace's latest

researches,* the earth is divided—the still little known region of Australia not excepted.

This poverty of species appears the more striking since the area of our Fauna is not only the largest, but also the most thoroughly searched. Although it does not extend to the tropics, that genuine home of the Hesperidae, it is, nevertheless, in this respect not less favorably situated than is North America north of Mexico, yet still falls far behind that country.

Kirby's *Synonymical Catalogue of Diurnal Lepidoptera* (1871) embraces eleven hundred and two species of Hesperians, known either by descriptions or figures. Staudinger's *Catalogue of Lepidoptera of the European*

* See this excellent work : "*The Geographical Distribution of Animals*, by A. R. Wallace; Authorized German edition by A. B. Meyer, 1876." I would here call attention to the fact that the boundaries of the first primary region of Mr. Wallace, which he names Palæarctic, almost exactly coincide with those of our European region. The only difference is that Wallace places the boundary farther south—in Africa to the Tropic of Cancer, in Asia to the Himalaya range, and farther eastward into the south of China. But this difference can hardly be considered as such, for, Lepidopterologically, we cannot determine the southern limit of these almost unknown regions, but hypothetically. Moreover, Wallace's boundary lines do not rest upon a very sure basis ; Japan and Northern and Central China are overlapping provinces of such mixed animal population that we are almost as well justified in adding them to the northern adjacent (Indian) Faunal-province as to the southern. Thus, then, nearly the same result has been reached in two different ways. Ours, which is only applicable to one order of insects, is based upon a plain comparison of the statistics of the local Faunas known to us, and the principle laid down by Schouw, according to which that part of the earth's surface which is to be established as a natural kingdom must possess at least one-half of its species and one-fourth of its genera as peculiar to itself. Wallace, in his investigations embracing the whole domain of zoology, lays the principal stress on the distribution of the Mammalia, and takes into consideration their present and also their pre-historic condition, as far as the latter may be determined from the fossil remains in former epochs of the earth. Now, if two divisions of the animal kingdom, so widely distinct, both by their organization and means of distribution, as the mammals and butterflies, return essentially the same answer to the zoographer respecting the extent of the region to which our division of the world belongs, this, certainly, may be considered a strong guarantee of the probability that we have made no mistake, but that we have, indeed, found a region which is consistently natural in all its belongings. For the present I retain the old name of European Faunal-region, together with its accustomed boundaries, which will be in conformity with Staudinger's Catalogue. Staudinger, as is well known, annexes thereto Arctic America, and for good reasons, although on no better grounds than our Transatlantic colleagues would have in adding to their Faunal-region the Arctic portion of the Eastern hemisphere.

Fauna, published the same year, includes only forty-six species, including certainly by error the assumed European species, *Hesperia Ætna* Bdv. Meanwhile, to restore due proportion, there should be deducted from the number given by Kirby, the varieties which he admitted as distinct species and those which he mentions under more than one name. The number of such seems to be quite considerable, if I may judge from those known to me, of those which I do not know. Nevertheless, I suppose it will not amount to more than one-tenth of the whole, so that, by accepting the round number one thousand, and placing to account the discoveries of the last six years, this number may perhaps be regarded as too low rather than as too high. Hence the proportion (46 : 1000) of the number of our Hesperians to the total number known, would be about as one to twenty-two. Europe, strictly, has only twenty-eight species, and it is hardly probable that this number will be increased by new additions.

The Fauna of North America claims particular interest because of its many close relationships to ours, and the impossibility of separating its Arctic products from those of the Eastern hemisphere. Edwards' later Catalogue enumerates, as before stated, one hundred and eleven Hesperians as inhabitants of the Extra-tropical parts of North America, including *Sylvanus* and *Tages*, but excluding a number of Scudder's species which Edwards regards as varieties. North America is thus far more than twice as rich in species as our Faunal-region ; but still, in proportion to her vast territory, is poor in comparison with the tropical parts of the earth, and above all if compared with South America, where not only the Hesperian Fauna, but the Diurnals especially, have developed in their greatest abundance.

The genera common to both the American and European Faunas are *Carterocephalus*, *Thymelicus* (from both of these I have as yet seen no American species), *Pamphila*, *Pyrgus*, *Scelothrix* and *Nisoniades ;* the ten other genera adopted by Edwards have no representatives in our Faunal-region. North America is poorer than Europe in species of the genera *Pyrgus* and *Scelothrix*, but as an offset to that, it is far richer in species of *Pamphila* and *Nisoniades*, especially of the former, of which Edwards mentions fifty-eight. The southern portions of the Union are populated by tropical forms, of which certain representatives (*Eudamus Tityrus* Fab. and *E. Pylades* Scudd.) extend to New York and farther north.

(To be Continued in Following Number.)

THE ABBOT SPHINX—*Thyreus Abbotii* Swainson.

BY THE EDITOR.

The subject of this illustration is another of the large grape-feeding insects which is found occasionally on both cultivated and wild vines, as well as on the Virginia Creeper. In fig. 7 we have the full-grown larva

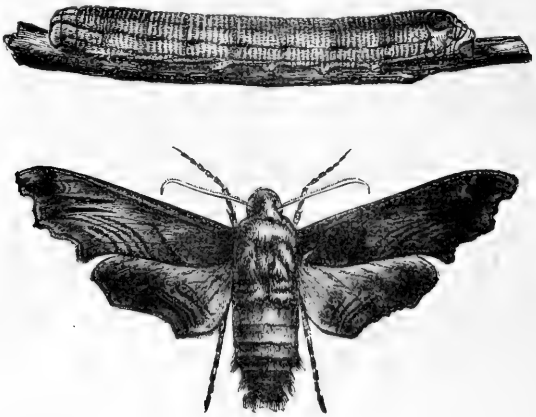

Fig. 7

figured, as well as the moth. This larva is said to vary considerably in appearance, the ground color ranging between reddish-brown and dirty yellowish.

As we have never met with the larva ourselves, we shall copy Mr. Riley's description of it as it was found by him in Missouri: "I have reared two individuals which came to their growth about the last of July, at which time they were both without a vestige of green. The ground color was dirty yellowish, especially at the sides. Each segment was marked transversely with six or seven slightly impressed fine black lines, and longitudinally with wider non-impressed dark brown patches, alternating with each other and giving the worm a checkered appearance. These patches become more dense along the sub-dorsal region, where they form two irregular dark lines, which on the thoracic segments become single with a similar line between them. There was also a dark stigmatal line, with a lighter shade above it, and a dark stripe running obliquely

downwards from the posterior to the anterior portion of each segment. The belly was yellow with a tinge of pink between the prolegs, and the shiny tubercle at the tail was black with a yellowish ring round the base. The head, which is characteristically marked, is slightly roughened and dark, with a lighter broad band on each side, and a central mark down the middle, which often takes the form of an X."

The chrysalis, which forms in a superficial cell on the ground, is black inclining to brown between the segments.

The moth is of a dull grayish-brown color, with the fore wings somewhat lighter beyond the middle and variegated with dark brown. The hind wings are yellow, becoming paler near the body, with a broad border of a dark brown hue. The margins of both wings are irregularly cut.

This moth has been taken in the vicinity of Hamilton, and we believe also in Amherstburg, Ontario, but we have not heard of its having been captured anywhere else within our Province; but as it is widely distributed, being found in nearly all the Eastern and many of the Western States, it is likely to be yet met with in other localities among ourselves.

ON THE LARVÆ OF LYC. PSEUDARGIOLUS AND ATTENDANT ANTS.

BY W. H. EDWARDS, COALBURGH, W. VA.

In ENT., x., p. 80, I stated that Dogwood was found to be the spring food-plant of this species, that is, of the larvæ proceeding from eggs laid by the form *violacea;* but probably there are other plants serving the same purpose, some of which bloom earlier than Dogwood, for fresh examples of the butterfly, form *pseudargiolus*, were taken on 21st April and on several subsequent days, and this was long before any of the larvæ feeding on Dogwood could possibly have produced them. Prof. J. H. Comstock has recently sent me quite a number of mature larvæ taken by him at Ithaca, N. Y., feeding on the flower heads of Viburnum acerifolium, and in confinement the larvae will eat Clover, Nasturtium, Begonia, Asclepias, &c., eating the anthers. But I have been unable to make the females lay eggs on Clover in confinement. On the Dogwood, so long

as anthers are to be had, the larvae live on them, but as the flowers mature and fall off, they are forced to eat through and into the hard seed vessel, and I have even seen them boring into the woody stem below. These were belated larvae, and such as when mature produce the variety *neglecta*. The larvae being starved are small, and the resulting butterfly is small. *Neglecta* is flying now, and many examples are very diminutive. The color of the larvae feeding on Dogwood varies much from the color of those which feed on Cimicifuga racemosa, few being white in the last stages, but nearly all dull crimson or green, or a mixture of the two. Nevertheless a small percentage of the larvae on Cimicifuga are also green or crimson, though most are white. I have not seen ants about the Dogwood, and on introducing them to larvae confined in glasses, they manifested no knowledge of the larvae, and were wholly indifferent to them. And only on rare occasions have I been able to discover the tubes on 11th segment protruded even partially with any of the Dogwood caterpillars kept in the house. When I did see them, they pulsated incessantly, out and in at least once a second. In two instances, after repeated examinations, I chanced to see the tubes fully expanded, but accompanied by this pulsating movement, the withdrawal being more or less complete. No teasing or irritating at any time availed to make them appear, but severe pressure, resulting in the death of the larva, applied to the sides of the 11th segment, did produce them. But even by this pressure I could not discover the organ of 11th segment, nor force any fluid from it. As with the fall food-plant, Actinomeris squarrosa, the Dogwood is neither sweet nor juicy, and it may be that the larvae feeding on these plants do not secrete the fluid. Prof. Comstock found it different with the Viburnum, and stated that the "tubes on the penultimate segment were seen to evaginate repeatedly at the solicitations of the ants."

From Cimicifuga I have collected many eggs and scores of larvae, and day after day I have watched the latter on the stems of the plant. So long as the larvae were small no ants were seen attending, but they have been constantly found with nearly mature larvae. The ants have been of four species, the first scarcely more than $\frac{1}{16}$ inch long, the second $\frac{2}{16}$ inch, the third $\frac{2}{16}$ inch, and the fourth $\frac{3}{16}$ inch, but the specific names I have not yet ascertained. Most often it has been the second of these which attended the larvae, and from two to eight in company, on the same stem, with from one to three or four larvae. The third species is frequently seen, but only from one to three have been seen on the stem. Of

the fourth I have seen but a single ant and in one instance. I have watched and experimented in various ways on both larvae and ants, shifting either from one stem to another, fresh larvae to ants and ants to larvae. The ants, when discovered on a stem, will invariably be on or near the larva. They run over the body, caressing with antennae, plainly with the object of persuading the larva to emit a drop of the fluid on 11. Most of this caressing is done about the anterior segments, and while the ants are so employed, or rather, while they are absent from the last segments, the tubes of 12 are almost certainly expanded to full extent, and so remain, with no retracting or throbbing, until the ants come tumbling along in great excitement, and put either foot or antenna directly on or close by the tubes, when these are instantly withdrawn. The ants pay no heed to the tubes, do not put their mouths to them, or to the openings from which they spring, nor do they manipulate that segment. They seek for nothing and expect nothing from it. But they do at once turn to 11, caress the back of the segment, put their mouths to the opening, and exhibit an eager desire and expectancy. By holding the glass steadily on 11, a movement of the back of this segment will soon be apparent, and suddenly there protrudes a dull green, fleshy, mamilloid organ, from the top of which comes a tiny drop of clear green fluid. This the ants drink greedily, two or three of them perhaps standing about it, and they lick off the last trace of it, stroking the segment meantime. As the drop disappears this organ sinks in at the apex and is so withdrawn. The ants then run about, some seeking other larvæ on the same stem, some with no definite object, but presently all return, and the caressings go on as before. The intervals between the appearance of the globule varied with the condition of the larva. If exhausted by the long continued solicitings, some minutes would elapse, and the tubes meanwhile remained concealed ; but a fresh larva required little or no urging, and one globule followed another rapidly, sometimes even without a retracting of the organ. I have counted six emissions in seventy-five seconds. The larva did not always await the approach to the 11th segment, but gave out the drop unsought and as soon as it was aware of the presence of the ant. Now and then the drop was preceded by a bubble several times larger than itself.

As I have stated, the tubes are usually expanded when the ants are absent from the last segments, and are certainly retracted when they come near. I counted the length of these periods of expansion, 10, 20, 50, and

in one case 82 seconds, the period always ending with the approach of the ants.

When I placed a fresh larva, taken from the house, on the stem, as soon as the ants discovered it there was immense excitement among them, and a rush for the last segments. The larva forthwith relieved itself by the excretion of the fluid, and the tubes stood out with domes expanded between the times of secreting. If I placed a fresh larva on a stem on which were no ants, there was no excitement in the larva, no appearance of the tubes and no movement in 11th segment. I have watched repeatedly to make sure of this. But if ants were now transferred to the stem, the moment the caressings began the larva changed its behavior.

From what I have seen, I am led to believe that these tubes are merely signals to the ants, and that when the latter discover them expanded they know that a refection is ready, and rush to the orifice on the 11th segment. If the tubes serve any other purpose, I have failed to discover it. There is no duct visible on the dome of the tube when largely magnified, and the ants seek nothing of the tube or on the 12th segment. It might be supposed that the tubes are used for intimidation, to frighten away enemies, but they certainly are not. They are in some way connected with the organ in 11, and in the younger stages, when the larvae suffer most from enemies, neither tube nor this organ is available. The outward openings, and the orifice in 11, are visible in the youngest larval stages, but till near maturity the larva has no use of the tubes and cannot emit the secretion. The ants rarely attempt to caress or solicit young larvae, but pass them by with indifference. When I have occasionally seen an ant run about one of these, the larva manifested great annoyance, throwing up the hinder segments to drive away the intruder. The larva plainly considers the ant as a something to be got rid of—as an enemy. If the tubes could now be thrust out the ant would be attracted, not repelled. But the moment that the tubes are free, and the secretion ready to flow, which I believe to be immediately after 4th and last moult, but may perhaps be just after 3rd moult, and is certainly not earlier than that, the larva submits quietly to the attentions of the ants, and invites and rewards them. Dr. Weismann wrote: "You should try and observe what enemies the larvae have. It is conceivable that there are such enemies as are afraid of ants." I find four species of parasites about these larvae. Two are Dipterous. These are of the size of the common house fly. They deposit eggs on the skin of the larva (in an instance observed, on the

back of 2nd and 3rd segments, near the junction, and at the second larval stage), and as the grubs hatch they eat their way into the larva, to emerge when both they and the larva are full grown—of course, destroying the latter. Another is Hymenopterous and minute. Its egg is deposited in the very young larva, probably at first stage. The grub eats out when the larva is half grown, at once spins a silken cocoon, from which in a few days the new parasite comes forth. The destruction of larvae by these, and very likely, other similar parasites, is immense. Of about a dozen mature larvae received from Prof. Comstock, but one reached chrysalis, all the rest giving out one of the Diptera spoken of. If any parasite attacked the mature larva, the grub of the former would live within and destroy the chrysalis, and instead of a butterfly therefrom, the parasite would emerge. Multitudes of chrysalids of other species of butterflies are thus destroyed; but in *pseudargiolus* there appears to be a singular immunity from enemies at this stage. I have never yet seen a parasite emerge from a chrysalis. Why this species, and doubtless many other *Lycaenæ*, are thus favored will perhaps in some degree appear from a little incident to be related. On 20th June, in the woods, I saw a mature larva on its food-plant, and on its back, facing towards the tail of the larva, stood motionless one of the larger ants (designated above as the third in size). At less than two inches behind the larva, on the stem, was a large ichneumon fly, watching its chance to thrust its ovipositor into the larva. I bent down the stem and held it horizontally before me, without alarming either of the parties. The fly crawled a little nearer and rested, and again nearer, the ant making no sign. At length, after several advances, the fly turned its abdomen under and forward, thrust out its ovipositor, and strained itself to the utmost to reach its prey. The sting was just about to touch the extreme end of the larva, when the ant made a dash at the fly, which flew away, and so long as I watched—at least five minutes—did not return. The larva had been quiet all this time, its tubes out of sight and head buried in a flower bud, but the moment the ant rushed and the fly fled, it seemed to become aware of the danger, and thrashed about the end of its body repeatedly in great alarm. But the tubes were not protruded, as I was clearly able to see with my lens. The ant saved the larva, and it is probable that ichneumons would in no case get an opportunity to sting so long as such vigilant guards were about. It strikes me that the larvae know their protectors, and are able and willing to reward them. The advantage is mutual and the association is friendly always.

There is no compelling by rough means on the one part and no reluctant yielding on the other. The demonstrations made by the ants are of the most gentle nature, caressing, entreating, and as the little creatures drink in the sweet fluid, lifting their heads to prolong the swallowing with manifest satisfaction and delectation, then lick away the last trace, caressing the back of the segment with their antennae as they do so, as if to coax for a little more, it is amusing to see.

The tubes in this species are white, cylindrical, of nearly even size, rounded at the top, and studded there with little tuberculations from which rise the tentacles. These last are tapering, armed with little spurs disposed in whorls, and stand out straight, making a white hemispherical dome over the cylinder, and none of them fall below the plane of the base of the dome. Nor do they ever hang limp or lie across the dome, as described by Gueneé in *L. bætica*. When the tube comes up, the rays are seen rising in a close pencil, and as the dome expands they take position. On the contrary, when the tube is withdrawn, the top of the dome sinks first and the rays come together in pencil again. The expanded tube and its dome are beautiful objects to look upon.

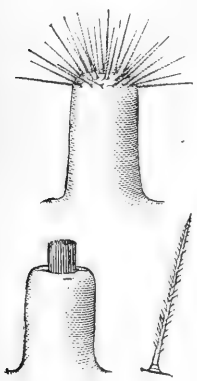

Fig. 8.

I desire to express my obligation to Dr. J. Gibbons Hunt, of Philadelphia, for microscopical observations made on these larvae. Aided by him, Miss Peart has been able to make several drawings, some of which I give herewith, showing the expanded tube and one of the rays, and the pencil of rays described.

The same organs are found in larvæ of *L. comyntas*, and their shape is precisely as in *pseudargiolus*.*

I stated on page 80 that all the black individuals of *violacea* taken proved to be males. I find no black female of this species, and presume there is none.

Coalburgh, 15th July, 1878.

* In Newman's British Butterflies, London, 1871, p. 125, I find this sentence quoted from Prof. Zeller: "I could not perceive that these caterpillars (*L. medon*) had a cone capable of being protruded, like that which we find in *L. corydon*, and which the ants are so fond of licking."

INSECTS OF THE NORTHERN PARTS OF BRITISH AMERICA.

COMPILED BY REV. C. J. S. BETHUNE, M. A.

From Kirby's Fauna Boreali-Americana : Insecta.

(Continued from Vol. x., p. 118.)

[275.] VI. HEMIPTERA.

FAMILY PENTATOMIDÆ.

383. PENTATOMA CARNIFEX *Fabr.*—Length of body 2½ lines. Several specimens taken in the road from New York to Cumberland-house.

Very near *P. oleracea*, and probably its American representative. Body black, a little bronzed ; grossly and thickly punctured, the punctures on the upper surface the deepest. Head subtrapezoidal ; promuscis pale in the middle ; antennæ longer than the head ; prothorax wider than long, with the lateral angles obtuse ; signed with a sanguine cross, the arms of which extend from angle to angle ; lateral margin, as well as that of the hemelytra and abdomen, white ; scutellum longer than the thorax, obtuse with a subtriangular sanguine spot on each side near the apex ; penultimate ventral segment of the abdomen margined with white ; membrane white.

[276.] 384. PENTATOMA VARIEGATA *Kirby.*—Length of body 3 lines. A single specimen taken in the road from New York to Cumberland-house.

Upper surface of the body punctured. Head, excluding the prominent eyes, subtrapezoidal, black, with the margin below the eyes, white ; promuscis extending to the base of the hind legs, pallid, black at the tip ; antennæ black ; prothorax transverse with lateral angles obtuse ; pallid with a tint of flesh-colour, especially at the angles, with a broad anterior and narrow posterior black band, both abbreviated on each side, and the latter almost divided into two ; scutellum an isosceles triangle, obtuse at the apex, black with the lateral margin pallid ; hemelytra black with a pallid lateral margin, membrane embrowned ; underside of the trunk black spotted with pallid and sanguine, punctured ; tibiæ and apex of the thighs

black; base of the thighs sanguine; abdomen below punctured at the sides, sanguine, with a large black discoidal spot, rather nearer the anus; nearly divided into two; on the sides and at the base naked, but a quadrangular space of the inner side of each division is covered with decumbent subcinereous pile.

N. B. The antepectus is entirely pallid, but the socket, if it may be so called, of the legs is redder at the margin than the rest.

385. PENTATOMA TRILINEATA *Kirby*.—Plate vi., fig. 6.—Length of body 3 lines. One specimen taken with the preceding.

[277.] Body underneath and the head black, a little bronzed; thickly punctured with rather deeply impressed punctures; antennæ reddish at the base, with the two last elongated and incrassated joints black; prothorax black anteriorly, posteriorly lurid with the lateral margin and an intermediate longitudinal impunctured line, which extends nearly through the scutellum, white; the scutellum has also a white linear spot and dot on each side at the base; the punctures of the thorax, scutellum, and hemelytra are black; the membrane of the latter is white; the legs and sides of the breast are lurid spotted or punctured with black; the elevated basilar portion of the bed of the rostrum is concave and has a semicircular outline, and its margin, viewed under a strong magnifier, is minutely serrulate.

FAMILY EDESSIDÆ.

386. EDESSA NEBULOSA *Kirby*.—Length of body 3–4 lines. Three specimens taken in the journey from New York to Cumberland-house, and in Lat. 65°.

Body pale yellowish, sprinkled with black impressed punctures, most numerous and largest on its upper surface, which is clouded with reddish-brown, or blackish shades; the antennæ are of a reddish-yellow; the lateral angles of the prothorax are more acute than in the *Pentatomæ*; the scutellum is acuminate or attenuated at the apex; the lateral margin of the abdomen has a black spot on each segment, which sometimes appears on the ventral segments.

VARIETY B. Smaller, with the ventral segments of the abdomen rufescent, and the clouding of the upper surface of the body blacker; the thorax also is black posteriorly.

FAMILY CAPSIDÆ.

387. MIRIS PUNCTULATUS *Kirby*.—Length of body 3 lines. Two specimens taken in Lat. 65°.

[278.] Body oblong, pale, somewhat lurid with a very slight tint of green. Head triangular, impunctured ; eyes a little embrowned, prominent ; antennæ as long as the prothorax, subtestaceous with the two last joints and the underside of the first black ; thorax, scutellum and hemelytra very minutely punctured ; a small portion of the prothorax adjoining the head is separated from the rest by an impressed sinuous line and is not punctured ; legs pale ; abdomen subpyramidal, black above, pale underneath.

388. MIRIS VENTRALIS *Kirby*.—Length of body 3 lines. Taken with the preceding.

Very similar to *M. punctulatus*, and perhaps only a variety, but the hemelytra are faintly clouded with black, the underside of the abdomen is dusky with two longitudinal reddish spots or stripes.

ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Annual Meeting of the Club will be held at St. Louis, Mo., on Tuesday, the 20th of August, 1878, at 3 o'clock, p. m. All Entomologists who are interested are invited to assist, and will report at the headquarters of the Association at the Lindell Hotel, on the 19th or 20th, where they will be informed of the exact place of meeting. The meetings of the Association will begin on the morning of the 21st of August. Prof. J. K. Rees, at St. Louis, will give information to members about car fares and accommodation.

B. PICKMAN MANN, Secretary.

NOTICE.—In consequence of a series of uncontrollable mishaps, the issue of the present number has been delayed nearly a month beyond its usual time.

CORRESPONDENCE.

ON THE SCARCITY OF PAPILIONIDÆ.

DEAR SIR,—

I have seen very few *Papilionidæ* of any species this season up to date, except *ajax*, which has been abundant as ever. But of *turnus*, usually exceedingly plenty in spring, I have seen scarcely half a dozen examples. No *troilus* and few *philenor*. So *Colias philodice* and all Pierids have been remarkable for their absence. But butterflies from hybernating larvæ, or hybernating imagos, in contrast with those from hybernating chrysalids, have been abundant — Melitæas, Argynids, Vanessans and Satyrids. On 2nd June, 1877, I rode for several miles along a creek not far from where I live, and *Papilios* swarmed. Passing a flat rock by the side of the creek, a space on it, which I computed as not less than four feet square, was studded with *Papilios* as thick as they could stand. When they rose it was like a cloud. Nine-tenths of these were *turnus*. Allowing one square inch to each butterfly, and this is ample, there were upwards of 2,300 butterflies in that mass. And I passed lesser groups with every mile as I rode; so that the total absence of the species this year is remarkable. It would seem possible that the extreme mildness of last winter allowed of the existence or activity of enemies (insect probably) who sought out and destroyed the chrysalids, but why *ajax* should have escaped is beyond my conjecture.

W. H. EDWARDS.

Coalburgh, W. Va., 16th June, 1878.

DEAR SIR,—

Mr. Bates is quite right in saying *Doryphora* will eat *Solanum dulcamara* and *Datura stramonium*; they have preferred these to tomatoes in my garden. A friend found them eating *Hyoscyamus*. The present season seems exceedingly favorable to production of *Nematus* and other grubs destructive of the currants and gooseberries.

H. H. CROFTS, Toronto, Ont.

DEAR SIR,—

A single specimen of the rare Sphinx, *Lepisesia flavofasciata*, was taken here on Lilac blossoms, May 28th.

CHAS. FISH, Old Town, Maine.

THE SCOTTISH NATURALIST.

TORTRICIDÆ WANTED.

CHECK LIST OF NORTH AMERICAN NOCTUIDÆ.

THE AMERICAN NATURALIST.

NEWMAN'S ENTOMOLOGIST

Canadian Entomologist

VOLUME X

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The Canadian Entomologist.

VOL. X. LONDON, ONT., AUGUST, 1878. No. 8

SOME OBSERVATIONS ON DERMESTES.

BY CAROLINE E. HEUSTIS, ST. JOHN, N. B.

Having read in the Report of the Entomological Society of Ontario for 1877 an article by Prof. J. T. Bell, of London, Ont., entitled "How to Destroy Cabinet Pests," I thought it might not be unprofitable to record my own observations on *Dermestes*.

Early in the summer of 1876 I captured four beetles, three males and one female, and placed them in a glass jar with a piece of the meat on which I found them feeding. I observed the female deposit a number of eggs on the meat, but before any were hatched I left home, and was absent about five weeks. On my return I found a large and flourishing colony of larvæ, most of them full grown.

My object in rearing these insects was not to study their natural history, but to find out the best means to destroy them. I put a piece of camphor gum in the glass as a first experiment. The effect on them was very slight. They appeared a little uneasy at first, but in a minute or so commenced crawling over the camphor quite unconcerned. I had heard of a clothier who rolled tallow candles up in webs of woolen cloth to preserve them from the attacks of "moths," and I resolved to try its effects on *Dermestes* larvæ. With this view I put a small piece of tallow in the glass, and the effect was almost instantaneous. It was quite ludicrous to see the stampede which commenced. Never did insect evince more terror or disgust than did these pests. They fled pell-mell to the side of the jar, but as there was no way of escape, they were obliged to yield to "circumstances over which they had no control." The closest observation failed to detect one going near the tallow. They remained for several days huddled together by the side of the jar in a confused mass.

Satisfied with my experiment, and being very busy at the time, I put the jar away, and on looking at it about a fortnight afterward, I found but one beetle, and that one *dead*, of all that large family. As all the larvæ and three of the four beetles had disappeared and "left no trace behind," I naturally concluded that they had been driven by starvation to prey upon each other. There was no possibility of escape from the jar, and my conclusion seems reasonable, even if I cannot prove it.

I have ever since kept tallow in trunks or presses where there are woolen garments, blankets or furs, and I have had nothing eaten up to the time of writing. In preparing my boxes for mounted specimens, I put bits of tallow between the strips of cork and cover with paper gummed to the sides of the box, and I have not had a single specimen injured by *Dermestes* or any other cabinet pest. As tallow is cheap and can be obtained in either town or country, I would heartily recommend it to both housekeepers and naturalists. To the former it would be much better and less disagreeable than the snuff, tobacco, pepper and other preventives which are put on furs with such unsatisfactory results. Although such a remedy as Prof. Bell recommends might do for the cabinet, it would be neither pleasant nor safe to have about our clothing.

MAMMALS ATTRACTED BY SUGAR.

BY JAMES S. BAILEY, A. M., M. D., ALBANY, N. Y.

It has not been supposed that animal life would be attracted by sugar, but while sugaring for Lepidoptera the contrary has been proven. On a number of occasions we have taken deer mice while in the act of feeding on sugar, and more recently we have taken a flying squirrel while lapping the sweet on a sugared patch.

Not long since, in making our rounds while sugaring, we discovered a skunk endeavoring to taste the sugaring, and so intent was he that our

approach was unobserved until a piece of dead wood was hurled at him, when he reluctantly left. The throwing of a second missile quickened his pace and caused him to distribute his perfumery, which rendered the air rather more fragrant than Lubin's Ext. of new-mown hay. It is unnecessary to state that our recreation for the evening was at an end.

We have frequently taken at sugar tree toads and various species of Coleoptera. A Texan correspondent says it is not uncommon for him to take at sugar Scorpions, and also species of Lizards, which are numerous in that latitude.

TETRAOPES TETROPHTHALMUS Forst.

BY W. L. DEVEREAUX, CLYDE, N. Y.

In the early part of June, 1876, while plowing through a patch of *Asclepias cornuti* (the plant upon which beetles of the above genus are found), I observed numerous Cerambycidian larvæ in the bottom of the furrow, stirring about in the soil. Two of the larvæ were put in a glass jar with a growing milk-weed plant. Although they were put in the soil near the roots, they soon came to the surface and wriggled about for a week, and then pupated, and finally came out perfect specimens of *T. tetrophthalmus.*

I have endeavored to find them in or about the roots of the milk-weed since, but have failed to find a trace of any. To judge from the black scars and other appearances of the roots, it seems the larvæ live in the soil and wound the roots with their mandibles, and thereby subsist on the milk or juice which flows so readily at the slightest abrasion.

Recently I saw a larva of *Corymbites cylindriformis* which had captured an imago of *Harpalus Pennsylvanicus.* It had crushed in one elytron with its mandibles, and still held it firmly, though the beetle was striving hard to get away.

THE GENERA OF THE HESPERIDÆ OF THE EUROPEAN FAUNAL-REGION.

BY DR. A. SPEYER.

(Translated from the Stettiner Entomologische Zeitung for 1878, pp. 167–193.)

(Continued from July No., p. 129.)

Among the North American species known to me in nature, there is not one identical with, or even similar to any European; and the opinions of prominent Transatlantic colleagues, as to whether identical species occur in the two countries (*Scel. centaureæ* excepted, which is common to the Arctic regions of both continents) are very far divergent. Edwards on the authority of Boisduval cites in his Catalogue, *Sylvanus* and *Tages*, and besides, also, *comma* as American; while he places *Pamph. Juba*, *Manitoba*, *Colorado*, *Nevada* and *sylvanoides** (which are regarded as good species by Scudder) as varieties of *comma*. I refrain from expressing any opinion in this question of species, not knowing any of the forms. As to *Sylvanus* and *Tages*, I would prefer to drop them from the list until their right to be classed among the indigines of America shall have been based upon more reliable authority than that of Boisduval. If we may trust Lederer's statements, Boisduval's Californian *Tages* var. *Cervantes*, would appear to be not only a distinct species, but also of a different genus from *Tages;* for it is said to deviate "not only in coloring, design and in its diaphanous, glassy spots, but also in the cut of the wings and in the posterior legs of the male, which have only apical spurs and a long hair-pencil" (*Wiener Entom. Monatschr.*, 1857, p. 78). Thus there would remain no resemblance whatever to *Tages*, and the carelessness shown in declaring identical two such radically distinct forms, would hardly be expected even from Boisduval, although he is so little scrupulous in such matters. Possibly Lederer's statements may have resulted from a confusion of species.

* In the *Memoirs of the Boston Soc. N. H.*, Vol. II, P. III, No. IV, these species, and also *comma*, are minutely described and well figured, and the anal appendages (which Mr. Scudder estimates as of special value) are explained. He also represents, in the same paper, the times of appearance of the species as different.

The friendly assistance of Messrs. Grentzenberg, Mœschler and Dr. Staudinger have placed me in a position to bring together, with but a few exceptions, the known Hesperidæ of the European Faunal-region. To the latter gentleman, especially, I am indebted for a knowledge of the Eastern-Asiatic species, so difficult to reach. But four of these have remained inaccessible to me, namely, *Pamphila sylvatica* Brem., *Pyrgus gigas* Brem., (possibly only a var. of *tessellum* H.), *Eudamus guttatus* Brem.-Grey, and *Thanaos popoviana* Nordm. It seemed to me more advisable to leave out these altogether, than to give them a place which their particular investigation might not warrant. In the arrangement I have placed first, those genera which, from the absence of the tibial epiphyses and generally of the middle-spurs of the hind-tibiæ, are closely related to the other *Rhopalocera*; and last, those which carry their wings when at rest in the manner of the moths. I do not, however, intend to assert that these particular features are of paramount importance in a systematic arrangement of the Hesperidæ.

It would be very desirable to divide this large family into convenient groups, but, if it were possible, it would be difficult to find exact distinctive characters for them. Mr. Scudder has made an attempt in this direction. He believes that he is justified in adopting two large groups corresponding nearly to the Fabrician genera *Thymele* and *Pamphila*, and calls the one HESPERIDES and the other ASTYCI; the latter a name chosen by Hübner for the whole family. To the latter would belong 1 to 4 of the European genera given below, and to the former 5 to 9. The most important character of the Hesperidæ (for the other differences which he adduces are not valid) Mr. Scudder describes in the following words :—

"In the male HESPERIDES the posterior extremity of the alimentary canal is protected beneath by a corneous sheath, which extends beyond the centrum or body of the upper pair of abdominal appendages, sometimes nearly to the extremity of the appendages, carrying the vent beyond the centrum; while in the ASTYCI, the extremity of the canal is not protected by any extruded sheath, but opens at the very base of the inferior wall of the centrum." (*The two principal Groups of Urbicolæ.* By S. H. Scudder. *Bull. Buffalo Soc. Nat. Science*, I, 195.)

I have not examined the abdominal appendages of the male Hesperidæ, and therefore, I do not know whether this corneous anal sheath would really supply a generally valid mark of distinction between the two tribes of Mr. Scudder. But even if that be not established,—as I fear it

will not,—there appears to me to be no ground for refusing to those two great groups a certain natural right, at least so far as concerns the Europeo-North American Fauna. A costal-fold occurs only in the males of the one group (although not invariably), and a stigma only in those of the other (but still less constantly). The spines of the tibiæ while here a rule, are there a rare exception. There appears, moreover, a difference in the color, in so far that the usual black or dark brown ground-color in the Scudderian Astyci is very often reduced or quite supplanted by reddish yellow in the Hesperides. The remarks of Mr. Scudder relative to the early stages of these insects will scarcely be supported by extended observations so as to be fully conclusive.

Of the eggs he states that those of the Hesperides are always distinctly ribbed in the vertical direction, and almost invariably higher than broad, whilst on the other hand, those of the Astyci are broader than high, smooth and pretty regularly hemispherical. "The caterpillars of the Hesperides feed usually on leguminous plants [but this is not true of the European ones] and dwell in horizontal leaf-cases; while the Astyci feed on grasses [but not all] and build vertical cases between the blades."

In the nomenclature of the genera I have followed Herrich-Schæffer's Prodromus, without being able (because of the insufficiency of my literary material) to guarantee their unexceptional authority.

I now present, first, a Systematic Synopsis of the species of the European-region which I have investigated; then an Analytical Table of the genera, and lastly will follow the more precise description of their generic characteristics.

HESPERIDES Latr.

1. Cyclopides H. (p.)

1. Morpheus (Pap. m.) Pall. *Steropes* WV.*
*2. Ornatus Brem.

2. Carterocephalus Led.

1. Palæmon (Pap. p.) Pall. = *Paniscus* F.
2. Silvius (Pap. s.) Knoch.

[* This Synopsis is copied *literatim*, except that the original is without the digram æ.—L.]

*3. Argyrostigma (Steropes a.) Ev.

3. THYMELICUS H. (p.)

1. Lineola (Pap. l.) O.
2. Thaumas (Pap. th.) Hufn. *Linea* WV.
*3. Hyrax (Hesp. h.) Led.
4. Actæon (Pap. acteon) Rott.

A 4. PAMPHILA F. (p.)

1. Comma (Pap. c.) L.
2. Sylvanus (Pap. s.) Esp.
*3. Ochracea Brem.
(Ætna Bdv. spec. Americana ?)

B (Goniloba HS.).

*4. Alcides (Hesp. a.) HS.

C (Goniloba HS.).

*5. Mathias (Hesp. m.) Fabr.† = *Thrax* Led. non Lin.
*6. Zelleri (Hesp. z.) Led.
7. Nostrodamus (Hesp. n.) F. = *Pumilio* O.

D.

*8. Inachus (Pyrgus i.) Mén.

5. CATODAULIS n. gen.‡

*1. Tethys (Pyrgus t.) Mén.

6. PYRGUS H. (p.)

A. a. (Carcharodus H. Spilothyrus Bdv.).

1. Lavateræ (Pap. lavatheræ) Esp.
2. Althææ (Pap. altheæ) H.
Var. b. Bæticus (Spil. b.) Ramb. = *Floccifera* Zell.
3. Alceæ (Pap. a.) Esp. = *Malvarum* O.

A. b.

4. Proto (Pap. p.) Esp.

† The name, which has also been accepted by Kirby, rests upon the authority of Felder: "H. Thrax Lin., Don. (haud Led. Verhandl. Zool.-Botan., Ver. 1855, p. 194, taf. 1, f. 9, 10, which is H. Matthias Fabr., in tota India vulgaris)." *Wien. Entom. Monatschr.* 1862, p. 183.

‡ Kato *subtus*, daulos *hirtus*.

5. Tessellum (Pap. t.) H.
*Var. b. Nomas (Hesp. n.) Led.
6. Cribrellum (Hesp. c.) Ev.
B. a.
*7. Poggei (Hesp. p.) Led.
B. b.
8. Phlomidis (Hesp. phl.) HS.
9. Sao (Pap. s.) H. = *Sertorius* O.
10. Orbifer (Pap. o.) H.

7. SCELOTHRIX Ramb.

*1. Maculata (Syricht. maculatus) Brem. et Grey.
2. Sidæ (Pap. s.) Esp.
3. Cynaræ (Hesp. c.) Ramb.
4. Carthami (Pap. c.) H.
5. Alveus (Pap. a.) H.
Var. b. Fritillum (Pap. fr.) H.
Var. c. ? Cirsii (Hesp. c.) Ramb.
Var. d. ? Carlinæ (Hesp. c.) Ramb.
6. Serratulæ (Hesp. s.) Ramb. HS. *An præced var. ?*
Var. b. Cæca (Hesp. cæcus) Fr.
7. Cacaliæ (Hesp. c.) Ramb. HS.
8. Andromedæ (Syrichth. a.) Wallengr.
9. Centaureæ (Hesp. c.) Ramb.
10. Malvæ (Pap. m.) L. = *Alveolus* H.
Ab Taras (Hesp. t.) Meig.
*Var. b. Melotis (Hesp. m.) Dup. = *Hypoleucos* Led.

8. NISONIADES H. (p.)

*1. Montanus (Pyrgus m.) Brem.
2. Tages (Pap. t.) L.

9. THANAOS Bdv. (p.)

1. Marloyi Bdv. = *Sericea* Fr.

Those which occur only in Asia are marked with a star (*). I deem it unnecessary to give more special localities and citations, since both are to be found in Staudinger's Catalogue.

Diagnostic Table of the Genera.

A. Anterior tibiæ without the appendage (Hind tibiæ, as a rule, with only one pair of spurs).

a. Antennæ less than half the length of the front-margin of the fore wings. Apical joint of the palpi thick, blunt, conical. Body very slender. . . . . 1. CYCLOPIDES.

b. Antennæ half as long as the fore wings; apical joint of the palpi slender, conical, rather acute, clothed all around with hairs from the middle-joint to the end. Body stouter. . . . . 2. CARTEROCEPHALUS.

B. Anterior tibiæ with appendage, hind tibiæ with two pairs of spurs.

a. Antennal club ovate or elongate, without a hook or acute point at the end.

a. Apical joint of the palpi slender, subulate, erect. . 3. THYMELICUS.

b. Apical joint of the palpi short, conical.

o. Hind-tibiæ of the ♂ without a pencil of hairs.

x. Fringe unicolored, club of antennæ curved, ♂ without costal-fold. . . . . 9. THANAOS.

xx. Fringe checkered. . . . . 6. PYRGUS A. & B. b.

oo. ♂ with costal-fold, and tuft on the tibiæ. . . . 7. SCELOTHRIX.

b. Club of antennæ lunate-falcate; ♂ with costal-fold, and without the tuft on the tibiæ. . . . . 8. NISONIADES.

c. Club of antennæ slender, fusiform, at about two-thirds of its length bent at right angles; ♂ without costal-fold, but with tibial tuft. . . . . 5. CATODAULIS.

d. Club of antennæ ovate or oblong, with a little hook or point at the end. Either with costal-fold or with tibial tuft. . . . . 4. PAMPHILA A, C and D.

e. Club of antennæ oblong, the apical fifth slender and somewhat bent up, and rounded at tip. The rest as in d. . . . . 4 PAMPHILA B.

f. Club of antennæ bent behind the middle, thence narrowed to the tip. All the rest as in PYRGUS B. . . 6. PYRGUS B. a.

The exotic species unknown to me should answer the question, whether the separation of these two genera could be directly sustained. Lederer has separated *Carterocephalus* particularly on the ground of the absence of the middle-spurs; but this difference is not decisive. *Cyclopides ornatus* has only apical spurs, whilst in other respects it is close to *Morpheus*. The different habitus and the striking differences in the palpi, etc., have determined me to accept the separation provisionally.

If the genera should be united *(Cyclopides)*, there will be besides the want of the tibial-epiphysis (which separates them from all the other Hesperians known to me), the following characters common to them: Club of antennæ elongate oval, terminating conically, slightly curved. Apical joint of the palpi conical, projecting almost horizontal. Tibiæ armed with spines, at least the middle ones. Abdomen longer than the head and thorax united, the posterior wings uplifted. Male without the costal-fold, the stigma, and the tuft on the tibiæ.

CYCLOPIDES. Antennæ short, the club of smaller size. End-joint of the palpi thick, bluntly conical, rather free. Body slight, with short thorax, and very long, slender abdomen; the latter somewhat compressed and only sparingly pilose. Wings comparatively large, not remarkably hairy; the hairs along the inner margin of the slightly developed, abdominal suture of the upper surface of the hind wings can only be recognized by very close examination. Hind tibiæ with two pairs of spurs *(Morpheus)*, or with only one pair *(ornatus)*.

Of *ornatus* I have been able to examine only one specimen (from the Amur, Staudinger), which appears to me, because of the slender abdomen, to be a male; but I cannot be quite sure of the sex. It was much narrower-winged than the male *Morpheus*, and in this respect agreed better with the female of the European species.

This genus appears not to be represented in North America.

CARTEROCEPHALUS. Antennæ equal to half the length of the fore wings, with elongate-ovoid club. Apical joint of the palpi slender, conical, moderately acute, quite concealed by the long hairs of the middle joint. Body moderately robust, with thickly haired (in *argyrostigma* also very long haired) abdomen. Surface of the wings more hairy, with notably a conspicuous streak of still longer and thicker, prominent hairs along the inner margin of the abdominal suture of the hind wings.

Here belong, according to Edwards, two North American species, *Mandan* Edw. and *Omaha* Edw., which last was separated by Scudder (*System. Rev. of Amer. Butterflies*, p. 54) from *Mandan* into a genus, Potanthus.

Thymelicus.

Antennæ half as long as the fore-wings, with elongate-ovoid, conically-tipped club. Apical joint of the palpi nearly erect, moderately long and slender, subulate, hidden to beyond its middle by the long, stiff hairy clothing of the middle-joint Middle tibiæ with a longitudinal series of short spines. Hind-wings somewhat produced at the inner angle. Male with a discoidal stigma, without a costal-fold, and without a tibial tuft.

It differs from the next related genus *Pamphila* in the slender, subulate apical joint of the palpi and in the absence of the hooklet on the end of the antennal club (*Pamph. Alcides*, in which the antennal hooklet is curved, has a very short, thick, conical apical joint to the palpi).

Edwards places here two North American species which are unknown to me—*Hylax* Edw. and *Garita* Reak.* The Texan species, *Waco* Edw., placed by Scudder in *Thymelicus* must, because of essential differences, form a separate genus, *Copæodes*,† to which, according to Edwards, *Arene* Edw. also belongs.

Pamphila.

Club of antennæ ovate, or elongated, on the end more or less curved into a much thinner, acute hooklet, which may be shorter or longer, but always shorter than the club itself. The length of the hooklet depends upon the number of the antennal joints of which it consists (in the American *Phylæus* Dr. it is represented by the single terminal joint which sets upon the thick end of the club in the form of a short spine). Palpi placed close to the front, at most extending a little beyond the eyes, the middle-joint broad anteriorly, closely set with long, brush-like hair-scales; the apical joint conical, either short and thick, or moderately long and more slender, yet not so thin and subulate as in *Thymelicus*. Tibiæ

[* Dr. Speyer has subsequently received these two species from Mr. von Meske, and finds them to be true *Thymelicus*.—L.]

† *Kopaiodes*—Oar-shaped, having reference to the form of the hairs of the little curl at the base of the antennæ.

unarmed in some species, but with spines in most, which are the stronger upon the middle tibiæ. Body robust, the abdomen as long as the head and thorax united. Wings relatively small, stiff, the anterior ones triangular, the posterior ones short, mostly produced at the inner angle, particularly in the male. The anterior wings generally have a stigma, but no costal fold; and the tuft is absent from the tibiæ.

A. Club of antennæ thick, with a sharp apical hooklet. Vein 2 (i. e., the first branch of the median) of the fore-wings originates much nearer to the base than to the hind margin of the wings, and is almost twice as long as is the trunk of the median vein to its end. Stigma of the male fore-wings in its normal position, or absent (in the European species it is present).

B. The last fifth of the elongated club of the antennæ slender and bent backward, but rounded out at the end. Second vein as in A. Male without the stigma.

C. Antennæ as in A. Vein 2 originates at, or a little before, the middle of the wing, and is not, or only a little, longer than the trunk of the median. Stigma absent, or when present directed more towards the outer margin and reaching only to the first vein.

D. Club of the antennæ more slender and more fusiform, with acute but less sharply defined apical hooklet. The second vein starts in the middle of the wing. Fringe light-colored; at the end of the veins spotted with dark color (in A B and C not spotted). Male without the stigma.

Our two common Central European species (Div. A) are typical of this great world-wide genus, with which agree, in all essential characters, such as structure of the antennæ, neuration of the wings, etc., the greater number (21) of the North American species known to me in nature. The genus is far too comprehensive and varied to be left without analysis, but this desideratum must await a general classification. In the length of the antennæ, the form of the club and its apical hooklet, in the spines of the tibiæ, cut of wings, in the presence or absence of the stigma, and in its structure, manifold differences are displayed; these, however, admit of no arrangement into natural groups, if one would avoid shattering the genus in an unwarrantable manner. The greater number of the species which I have studied (including the American) have spines on the tibiæ—in

some on all the tibiæ, in others on the middle and posterior ones, or on the middle tibiæ alone. Not less are there all degrees of transition apparent, from the feeblest and least perceptible, to those with the long and stout spines. In order to understand that no natural division can be based upon such differences as these, one needs only to place those without the spined tibiæ in comparison with the others. The same value must be placed upon the stigma of the fore wings of the male; it is present in the greater number of the species, at least in the typical (Div. A), but even in a few of these it is wanting, which in other respects do not differ. Perhaps the neuration of the wings supplies better points of support for the division of those species here united into natural genera. The different origin of the first branch of the median vein of the fore wings does not offer available characters because it does not yield sharp limitations. While in some species (*Mathias*, *Zelleri*, *Inachus*) the trunk and first branch of this vein have the same length, the point of departure of the latter in others (*Nostrodamus*, *Osyka* Edw.) is nearer the base, and thus forms a transition to the normal form in about one-third of the length of the wings. Whether the origin of the discoidal vein of the fore wings yields a sufficient characteristic for a true genus *Pamphila*, as Felder supposes (*Wien. Ent. Monatschr.* 1862, p. 483), I have not ascertained.

Scudder (*Syst. Revis. of American Butterflies*) has separated the here included species into numerous genera, but unfortunately has not supplied diagnoses; and from the list of the species alone, the grounds for this separation do not become clearly evident.

The single species of Division B, *Alcides* HS., deviates from all the others here united, in the rounded tip of the antennæ, and should therefore, strictly speaking, be separated, since the acute tip of the apical hooklet of the club is an essential character of the genus. Besides that, it has another peculiarity. According to Herrich-Schæffer's statement (*System. Bearb. d. Schmett. v. Eur.*, vi, 38), the male of this species has only 2 spurs on the hind tibiæ (♀ 4, as usual). Lederer (*Wien. Ent. Monatschr.*, 1857, 79) remarks concerning it: "In the male in my collection (with the female, probably the originals of Herrich-Schæffer's descriptions and figures) I observe distinctly only 3 spurs, the fourth may have been broken off." I have examined 3 males and 1 female. Two flown males (Amasia, Staudgr.) have only end spurs, but of the middle spurs not a vestige is to be seen; in the third male (Magnesia, Led., from Mœschler's collection) both middle spurs are present, but unusually

short. The female belonging to this male has lost one of its hind legs, and on the other there is a single middle spur—the outer one. Among four or five males only one has four spurs, one three, and two or three only apical spurs. *Alcides* must also be distinguished by a very unusual tendency to lose the middle spurs, or to vary in the number of the spurs, as does *Acidalia rusticata*, the latter of which is the more probable.

In Division C., only the male of *Mathias* has a discoidal stigma—a straight oblique streak, which separates *Mathias* directly from all other species similarly marked. The streak arises nearer the margin than usual, a little behind the middle of the dorsal vein, and ends at the first branch of the median. Its color is also different; it is not coal-black, as others, but whitish-gray and glossy. From the two other species of this Division, *Zelleri* offers no particular difference; *Nostrodamus* differs in its unusually short antennae (in this agreeing with the otherwise quite unlike American *Phylæus* Dr.), with their thicker oval club, on which is placed a short conical hooklet, as a point on the thin apical joint.

Herrich-Schaeffer places the species of the Divisions B and C in his genus *Goniloba;* but he is unable to give the difference between it and *Pamphila.*

Inachus has a more slender club than the other species, and is besides separated from them by its spotted fringe (which induced Ménétries to refer it to the genus *Pyrgus);* it has also a peculiarly colored and marked under side of the hind wings. Its place in *Pamphila*, with many other species, can be only provisional.

(To be Concluded in Following Number.)

PAPILIO CRESPHONTES Cram.

BY JACOB BOLL, DALLAS, TEXAS.

The caterpillar of this beautiful butterfly is living here on *Xanthoxylum carolinianum*, or Prickly Ash; at least, till now I did not find it on any other plants. It can be found three times in a year, first in April and May, then in July, and again in September and October. If the cater-

pillars be touched, they stretch forth the reddish-brown fleshy fork from the neck, like all those of the genus *Papilio*. When they do not eat they are sitting rigid regularly on the surface of the leaves. It is most interesting that in this situation their appearance resembles very much the excrements of birds, on account of their color, consisting of white, gray and brown spots. This resemblance is considerably increased in the earlier stage of the larvae, which are particularly found on open places, and are thus very easily seen.

I saw these larvae for the first time in the early stage, and they deluded me in such a manner that I thought them at first to be excrements of birds fallen upon the leaves, and after further examination recognized them as larvae. This resemblance protects them naturally against their enemies, especially the birds. This likeness of the larvae to excrements of birds may seem strange to some readers, but the means and the ways of nature, whereby many insects are protected against the assaults of their enemies, are very numerous and wonderful.

The pupae of the fall brood sometimes develop in autumn when the weather is favorable, but generally not before April of the next year. As a rare occurrence, it should be mentioned that one pupa of the fall brood of 1875 was not hatched before April, 1877. This observation is very peculiar in this southern latitude, and so far as I know, has never been noticed in butterflies. Among Bombycidae this happens occasionally, and it occurred to me in the old country that pupae of the European *Saturnia carpini* hybernated twice before they were developed.

ON MERMIS, A PARASITE OF THE LARVA OF CARPOCAPSA POMONELLA.

BY DR. H. HAGEN, CAMBRIDGE, MASS.

The interesting paper by Mr. J. A. Lintner, Entom. Contributions, No. iv., induces me to give some extracts from the papers by Prof. von Siebold, which the author could not compare himself, the more as they answer some important questions.

Stett. Ent. Zeit., 1850, p. 335 :

"*Carpocapsa pomonana* W. V.

"I examined with much interest, in the Museum in Breslau, Prussia, the specimens of hair worms communicated by different persons. Those worms were found living in the heart of the apple some years ago, very frequently in Silesia (by F. S. Leuckart, Zoolog. Bruchstuecke, Heft I., 1820, p. 5). Four of them belong to *Mermis acuminata*, and others also to *Mermis;* also a specimen in Prof. Otto's collection. The *Filaria* found in an apple by Prof. Waga will probably also be a *Mermis* (Revue Zool., 1844, p. 366)."

As I have given attention to all I found published about Helminthes in insects, I remembered to have seen some other facts stated about their presence in apples. But in comparing my notes I cannot find the work, and the most thorough research in old and new books was without success. So, till now, the above given quotations from Prof. von Siebold are the only ascertained ones.

Stett. Ent. Zeit , 1854, p. 106 :

"I saw in some letters sent to me that it seemed to be inconceivable to several Entomologists to understand how those worms can immigrate into larvae, which from the beginning of their existence live in buds or in fruits, and which never leave these trees or shrubs on which the eggs were laid. Though we have no direct observations how the *Mermis* immigrates into the caterpillar living in the apple or in the pear, I do not at all think that we are obliged to accept a spontaneous generation. We know very well that a number of lower animals leave the egg very far from the place where they shall live, and that they are obliged to make comparatively long journeys to reach the place destined for them. For instance, the Cicada, the larva of which is obliged to go into the earth, though the eggs are laid on high trees. Why should not the brood of *Mermis* generated in the earth migrate in the opposite way on flowers and trees to reach their proper abode? In the spring at certain times the whole superficies of plants is humid and preserves the worms from drying up. This supposition is corroborated by the observation of Prof. Creplin concerning the migration of another worm."

In a later paper, *l. c.* p. 32, it is stated by direct observation in England and Germany that after strong rains the brood of *Mermis* comes out of the earth and travels on flowers and shrubs in such numbers that the

old tale of "a worm-rain" could have been believed. All those worms belonged to *Mermis nigrescens*. Siebold has seen the immigration (boring into) of young *Mermis* into the larvae of *Hyponomeuta cognatella*, and Dr. Meissner into the legs of larvae of *Ephemera*. The "boring into" is done by an armature on the head of the *Mermis* consisting of twelve movable hooks placed in a double series around, and serving later as a means of locomotion into the interior of the body of the host.

It should be remembered that the *Mermis* leaves the host later to go into the earth, and that only there the sexual parts are developed and the brood generated.

The species was first described by Rudolphi as *Filaria acuminata*, and later by Siebold as *Mermis acuminata*.

A NEW SPECIES OF PHIGALIA.

BY G. H. FRENCH, CARBONDALE, ILL.

Phigalia cinctaria, n. sp.

Wingless female.—Length .75 of an inch; exserted oviduct, .25 more. Color light gray with a very slight olive tint, and irregularly mottled all over with black; the spots large above, but smaller on the sides and beneath; the thorax nearly uniform black; the divisions between the segments pea green while alive, but turning darker in drying. Head grayish black, the clypeus black; antennae black, annulated with gray, reaching to about the middle of the body, when turned back. Hind wings reaching to the back part of the first abdominal segment, the fore wings reaching to the middle of the same segment. Feet and legs grayish black, annulated with gray. The oviduct with two joints exserted, the last third of the outer joint hairy, the hairs perpendicular to the joint. Head short, scarcely to be seen from above, rather wide between the eyes; palpi short. From a single ♀.

Chrysalis.—Length, exclusive of bristles, .55 of an inch. Dark brown, coarsely punctured, the punctures between the segments fine, the abdomen ending in a conical segment, which is smooth at the end and tipped with two short, stout, divergent bristles. Subterranean.

The moth from which the above description is taken was bred from a larva taken from an apple tree about fifty miles north of here, May 28th, 1877. It was at that time an inch long, gray, banded transversely with a number of white lines. It moulted June 6th, when all but one of the white lines were replaced by brown, the ground color remaining the same. After feeding a few days longer, it entered the ground and transformed to a chrysalis as above. At this time it was about an inch and a half long. The imago appeared March 27th, 1878.

ON THE EMERGENCE OF LEPIDOPTERA FROM THEIR COCOONS.

BY C. E. WORTHINGTON, IRVING PARK, ILL.

In the years 1856 and 1857 Capt. Thos. Hutton communicated to the London Entomological Society (Trans. v., 85) and to the Journal of the Agri-horticultural Society of India (ix., 167–9) certain observations on the means employed by the imago of *Actias selene* in obtaining exit from its cocoon. In 1857 Messrs Horsfield and Moore in their catalogue of the Lepidoptera in the Indian Museum, quote and endorse Capt. Hutton's observations, and in the course of their remarks indicate indirectly that the same methods are employed by *Antherea paphia*, an Indian Attacian allied to our *T. polyphemus*.

In these articles the hooks on the wings and the drop of acrid liquid on the head are both noticed and the conclusion arrived at that the means employed are both chemical and mechanical. Capt. Hutton, however, states that the moth discharges this liquid from the mouth and applies it with the brush on the forehead—apparently an error, as the structure of the mouth parts would hardly admit of the secretion of such a liquid, and when secreted it could hardly be conveyed to the forehead.

On reading these notes it occurred to me that I had noticed that examples of *polyphemus* emerging from cocoons from which the top had been removed invariably carried a drop of brown liquid on the frontal tuft, and a little investigation convinced me that the liquid, so far from being secreted by the mouth, was contained in a cell underlying the conspicuous greenish spot on the pupa. This cell is ruptured from the top

by the emerging insect and leaves its contents on the forehead. Pupae in which fully formed moths had died without emerging show, on dissection, the empty cell with a sediment adhering to the forehead of the insect not only in *T. polyphemus*, but in *A. yama-mai* and other species of *Antherea* I have been able to examine in this condition.

With a view of determining the question, I prepared a number of *polyphemus* cocoons by removing the outer layers and cutting a narrow slit on opposite sides to near the head, so that when suspended in the light the motions might be watched, and in two instances have been able to see, though rather imperfectly, the whole performance. As before stated, the moth on breaking the pupa-skin carries on its forehead a drop of liquid, which, as the moth lengthens itself in the effort to free the fore legs, is smeared upon the end of the cocoon, and during the twisting and squirming accompanying this effort, well rubbed in. After freeing the legs the moth rests for a moment; then, pushing up one shoulder, turns several times in the cocoon, the shoulder being pressed against the smeared part. The result of this appears to be to loosen some of the fibres, for after two or three repetitions of this movement, the legs are extended upward and the abdomen extended, forcing the shoulders more firmly against the cocoon and a vigorous clawing begun; this is succeeded by a butting movement, the abdominal segments being first retracted and then forcibly extended, followed by more twisting, clawing and butting, until a small hole is made, when the butting movements predominate and the moth finally emerges, pushing the cut ends of the threads outward.

So far as I have been able to observe, the hooks in the wings merely serve to detach the fibres and hold them in place until broken by the powerful legs, the removal of the gum and weakening of the silk by the liquid on the head rendering this comparatively easy—this possibly being aided by the surplus fluids of the pupa being brought up during the retraction and extension I have called "butting," but whether this is really the case or not I am unable to state. A similar cell is observable in all pupae of this family, and it seems probable that they all emerge in the same manner, employing neither wholly chemical nor mechanical means, but both.

NOTE.—It is but fair to add that since these notes were prepared I have seen mention of a paper by Mr. Packard on the same subject, but as it is not in general circulation, have been unable to see the paper in question.

CORRESPONDENCE.

ON THE HONEY TUBES OF SOME BUTTERFLY LARVÆ.

DEAR SIR,—

In my paper in the July No. of the CAN. ENT., p. 136, I stated that I found a reference in "Newman's British Butterflies" to a mention by Zeller of the ants licking a conical tube in *Damon* (I think it was).

Zeller refers to C. E. Pezold in L. G. Scriba, Beitraege zu der Insecten Geschichte, 1793, Heft 3, p. 230, who states that ants often indicate the presence of the caterpillar of *Papilio Biton* = *Lycaena Damon*. "On the 11th (12th counting the head as 1st) segment are two small yellow spots. I saw a caterpillar moving them while feeding, and with the microscope I found them to be two whitish tubes protruded by the caterpillar and again invaginated. When first protruded the tube is similar to a three-cornered pyramid, the three sides of which can be opened and invaginated in the cylinder. When the caterpillar feeds, the tubes are almost incessantly thrust out and withdrawn. I never saw any fluid coming out, nor remarked any smell. I found two similar wart-like parts on the next preceding segment, but without any change of shape. The caterpillars of *Lyc. argus* and *Thecla Rubi* possess the same movable tubes in the same place, but I could not find them in *Theclas Quercus* and *Betulæ*. It is a question what is the use of these organs. Are they for defence as in *P. machaon*? I do not know whether the tubes of *Damon* are excretive organs, but I have some reason to believe they are—the more so as the ants are very busy about the caterpillars and cover them often entirely without harming them. Mr. Esper has observed the same in the caterpillars of *Lyc. Icarus*. Perhaps it is here as with Aphides, where the ants sip up the secretion. That I did not see any fluid is no reason that it does not exist."

W. H. EDWARDS, Coalburgh, W. Va.

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ON THE NEW CARPET BUG.

BY DR. H. HAGEN, CAMBRIDGE, MASS.

Perhaps a few additions to Mr. J. A. Lintner's very interesting article will not be out of place. In 1872 the late Mrs. W. P. L. Garrison came to visit the Museum, and told me about an insect destroying the carpets in Buffalo, N. Y., and named there "the Buffalo pest." I had not then heard anything about the insect, and Mrs. Garrison, after her departure, was kind enough to send me some living specimens from Buffalo. I bred them here in the Museum, and determined them as *Anthrenus scrophulariæ* L. The following years I had numerous inquiries from Cambridge and Boston in relation to this carpet pest, and I traced about three-fourths of all cases to a large carpet store in Washington St. in Boston, where the carpets were bought, and what ought not to have been done, they were directly laid in the rooms, without beating them before strongly and disinfecting them in some way.

Mr. Lintner was unable to find any record of its preying upon carpets or other woolens in the Old World. But there exists enough in the literature. Dr. H. Noerdlinger, in his well-known book, "Die kleinen Feinde der Landwirthschaft," etc., 1855, 8to., p. 90, states as follows:

"The common flower-beetle, *Anthrenus scrophulariæ*, is from April common on many flowers, especially on fruit trees and roses. It is common also in houses, etc., where it can become very obnoxious by the destruction of furs, clothes, animal collections, and even leather and dried plants. The obnoxious larva, which naturalists should take care to avoid, is common in closets and rooms in the attic, where it finds dead flies and from whence it likes to enter the other rooms."

I have taken Noerdlinger's book at random, but it would not be diffi-

cult to find such notices in similar books. To show that this pest is not a new one, I add two older authors taken at random.

F. W. Herbst, Coleoptera, vol. 7, 1797, p. 328, says: "This beetle is everywhere very common in rooms, on buds, and especially common on tulips. It destroys, as well as its relatives, collections of insects and plants. The larva lives in the houses, like the *Dermestes*, and destroys all kinds of collections of natural objects, cloths, furs, leather and victuals." The variety of *A. scrophulariæ—sutura grisea*—is described from Europe by Illiger, 1798, p. 398. F. Wiegmann, Handbook der Zoologie, 1832, p. 308: "The larva lives on animal matters, and is sometimes very injurious to hides."

I have ascertained this summer that the carpet bug eats of a piece of cloth consisting half of worsted, half of cotton, only the worsted threads, and left the cotton threads uninjured.

I may add some words concerning the list of the obnoxious insects introduced from Europe into America. It is, as I believe, overlooked that about three-fourths of the insects enumerated are surely not originally European insects. They were introduced into Europe from the East by the advancement and progress of culture, and in the same way by the advancement of culture from Europe to America. The same is the case with the common weeds, and some years ago, by carefully comparing the list of European weeds in Prof. Ratzeburg's work with the lists of the described American plants, I found out that two-thirds of all European weeds are common in the United States, and perhaps a part of the last third, of which I was not able to make certain. I myself was at first much surprised to find in the middle of the prairie, near the railway to St. Paul, Minn., common European weeds. I should state that I share entirely in the wishes of the inhabitants of N. America to receive and enjoy progress and advancement of culture, without the accompanying drawbacks which nature seems to have so closely united with them.

After all, I should state that it is remarkable that such pests as the Colorado beetles emigrate very exceptionally from the west to the east; so the locust tree is even now entirely free from pests in Europe, though imported a century ago and very common everywhere. There are some American insects imported into Europe which have been overlooked. *Blatta Americana* is common in all sugar refineries to Archangel, and everywhere in large cities in store-houses. *Termes flavipes* is probably also imported from this continent. *Blatta orientalis* was imported

from Asia to the west of Europe, and made from there a well ascertained migration to the east again and through Siberia. All insects finding it easier to live in the company of man, or by articles used and needed by man, will of course follow him as well as dogs and rats.

Mr. Lintner has not mentioned *Phylloxera*, which has in Europe done more injury and has caused more losses than almost all the other pests together.

THE GENERA OF THE HESPERIDÆ OF THE EUROPEAN FAUNAL-REGION.

BY DR. A. SPEYER.

(Translated from the Stettiner Entomologische Zeitung for 1878, pp. 167-193.)

(Concluded from August No., p. 154.)

CATODAULIS.*

♂. Antennæ much longer than half the costal margin of the fore-wings, nearly three-fourths as long as the body, uniform black, at two-thirds of their length expanding into a slender fusiform club, the last third of which is suddenly bent at a right angle; from this point forwards it is rapidly narrowed, but not very acute, nor curved into a hook. Locklet of hair of medium length and of the usual structure. Palpi projecting the full length of the eyes beyond the front, the first joint thickly hair-scaled, the end joint moderately short, cònical, almost horizontal. Tibiæ unarmed, the hind ones with four spurs, the outer one of each pair much shorter than the inner one. The tuft of hair begins on the base of the tibiæ and reaches (on the inside running downwards) to their end. Body not very robust, the head and thorax united equal to the abdomen, the latter not reaching the inner angle of the hind wings, and destitute of the

[* Dr. Speyer writes that this genus must give way to DAIMIA Murray, 1874.—L.]

ventral excavation. Wings large and broad; hind wings undulate, with a deep sinus at the end of vein 5, their basal third of the underside covered with long matted whitish hair between the inner margin and the middle cell; the remaining surface with prostrate scales. No costal fold. (2 ♂ from the Amur, and 1 from Yokohama, Staudinger.)

That *Pyrgus Tethys* Ménétries (*Enum. Corp. anim. Musei Petropolit.*, p. 126, Tab. x. fig. 8) neither belongs to the genus *Pyrgus*, nor to either of the other genera of European Hesperides, nor even shows close relations with them, is apparent upon a very slight examination. For that reason I am also less sure with regard to *Catodaulis*, whether it does not coincide with described exotic genera which are otherwise unknown to me, and consequently if the synonymy be not thereby unnecessarily increased. Herrich-Schæffer's Table of the genera does not indicate to me any genus corresponding with it. Kirby places *Tethys* in his genus *Erynnis* (= *Spilothyris* Bdv.), from which it is certainly to be inferred that he was not acquainted with this butterfly, whose *habitus* decidedly contrasts with that of every other European Hesperian. In *Pyrgus* A. we notice prominently the transparent spots of the fore-wings and the waved border of the hind-wings. With *Sclothrix*, *Tethys* has nothing but the tibial tuft in common.

The latter character is undoubtedly absent from the female, which is unknown to me; and still further I do not know whether the shaggy hairiness of the hind-wings (which was the occasion for the adoption of the name) pertains to this sex. These hairs seem moreover not to adhere very firmly, for not a vestige of them appears in a male example which has been long on the wing, and is besides not everywhere present in equal completeness.

PYRGUS.

Club of the antennæ ovate or elongated, feebly compressed, straight, or not quite regularly falcate, rounded off at the end (except in *Poggei*). Lock of hair long. Palpi projecting more than the length of the eyes beyond the front, the middle joint bristly, the apical joint thick, bluntly conical, horizontal or directed obliquely forwards. Tibiæ unarmed (except in *cribrellum*), destitute of the tuft. Abdomen as long as the head and thorax united, reaching as far as to the posterior angle of the hind-wings. Fringe checkered.

A. ♂ With costal fold.

a. Stoutly built species, with deeply waved-toothed (tief wellenzahnigen) hind-wings, and with transparent spots on the fore-wings.

b. Hind-wings more deeply dentated, or with the margins entire; fore-wings without transparent spots.

B. ♂ Without costal fold. Hind-wings slightly dentated.

a. Club of antennæ longer than in the other species, bent behind the middle, and thence to tip much reduced. Male with a trace of the costal fold.

b. Club of the antennæ straight or only slightly bent, rounded at tip.

This is, after *Pamphila*, the least homogeneous genus, including species either with or without the costal fold, and which show some differences in the form of the club of the antennæ. The Division A. *a.* differs besides somewhat in *habitus*, and has therefore been regarded as a distinct genus. Essential differences I have not been able to find; moreover *Proto*, in its *habitus* and expanse of wings, forms a connecting link between it and the other species. If it should be thought proper to give them generic distinction, the older name *Carcharodus* of Hübner would be confirmed, and under which he had correctly assembled the species and had sufficiently characterized them. Kirby places here (besides *Tethys* Mén.) one other species from America (*Carcharodus mazans* Reak.) which is unknown to me.

Alceæ Esp. differs in the form of the club of the antennæ from the two next related, and in general from the other species of the genus. The last fifth of the very thick club is (nearly as in *Pamph. Alcides*) remarkably reduced and bent backward, and also rounded at the end. *Althaeæ* ♂ has a bunch of hair on the underside of the fore-wings; *Lavateræ* has none of these marks, but instead, particularly large hyaline spots. In the Division A. *b.* stands the only species of *Pyrgus* whose tibiæ (the middle and posterior) are armed with spines, and those moderately short (e. g. *cribrellum*). I have already mentioned this species as illustrating the small value for systematic purposes of the tibial spines in this family. But they offer a convenient mark for separating *cribrellum* and *tessellum*, which are sometimes confounded. *Proto* connects the group A. *a.* to B., especially to *Poggei*, and would, if it had no costal fold, be more naturally placed

next to it. In fact the costal fold is a little shorter and narrower than in the other species. This, and the circumstance that in *Poggei* there is the first intimation of a fold as a narrow seam in the membrane, militates against the generic separation of Divisions A. and B.

Poggei, in the form of its antennæ, recalls *Nisoniades*, but the bending of the club does not really begin in the middle, but a little behind it, and it is not so regularly falcate as in that genus. *Poggei* approaches so near to *phlomidis* and *Proto* in all other respects that a separation from them would only be justified if a number of agreeing species could be united to it.

SCELOTHRIX.

Club of antennæ elongate ovate, somewhat compressed, feebly falcate, rounded on the end. Locklet, palpi and fringe as in *Pyrgus*. Hind tibiæ without spines. Male with much developed costal fold; two membranous, sheath-formed appendages on the metasturnum, and a long hair-tuft on the hind tibæ. The appendages start from the base of the hind legs and project more or less convergingly, occasionally being bent apart (feebly x-shaped) for nearly one-third the length of the abdomen, over the very deep and long ventral cavity. They are a pair of almost linear, rather flat, membranous, apparently hollow structures, at first sight to be compared with a short, broad sabre-sheath, thickly scaled, and on the front edge and particularly at the tip with longer hairs. Their form, clothing and color present some differences, which probably (but which I have not proven) will afford useful specific characters.

The tuft of the tibiæ, composed of long, fine pencil-like hairs, arises close under the knee of the hind tibiæ on the inner side. It is at least as long as the tibiæ, often considerably longer, and appears in captured specimens, generally, spread apart. When drawn in, it is placed under the sheath-like appendages—at least this is so in several specimens in my collection. Its color varies from pale yellow to black in various degrees of mixture.

This genus approaches so near to the preceding one (several of its species agreeing with it fully in *habitus*, color and marking) that the separation requires special justification, because the differences become conspicuous only in the male sex. But in this sex the differences are so highly developed and easy to detect,—the forms united thereby so homogeneous—that it seemed to me more reasonable to establish a new genus

than to add to the subdivisions of *Pyrgus* still another. Should transition forms exist, *Scelothrix* must certainly be absorbed, but no such forms are known to me :—the tibial tuft and the appendages are either completely developed, or entirely absent.

Maculata is characterized by very acute fore-wings, by the particular color and marking of their undersides, and above all by the white fringe being marked with black only on the upper side, and not both above and below as in the other species. Appendages of the pectus and tuft of the tibiæ in the male well developed, the latter extending to the end of the first tarsal joint. The other species stand very close together, and it happens here again, as in other very natural groups, that the genera which are easiest to define, are those in which the species are the most difficult—declaring distinctly that if the genus should be easy to define, the parts of which it consists must be very homogeneous. Here are chiefly those species or varieties nearest to *alveus : fritillum*, *serratulæ*, *cacaliæ*, *andromedæ* (and quite independent of the Ramburian *cersii*, *carlinæ* and *onopordi*, concerning which nobody has accurate knowledge), which difficult in themselves to separate by fixed characters, become in the mass still more difficult to separate from their originals, the more that the number of specimens compared increases, and their localities widen. The reason for this may be that these forms have not begun until recent times (geologically speaking) to separate themselves from their common originals ; and as species (in a systematic sense), have not yet become perfect, the intermediate forms still existing as such in many localities, while in others they have disappeared. The evidence for this last position appears to me to be given in the following observation. The two forms of the *alveus*-group, which occur here in Rhoden, are *fritillum* (H. 464–5, HS.) and *serratulæ* (HS. fig. 18–20) ; the supposed stem-species, *alveus* (H. 461–3) is entirely absent. The first two fly in the same locality (upon the Muschelkalk formation), which I visit diligently every year, and where I find my richest source for Diurnals and many other Lepidoptera. *Fritillum*, and also *serratulæ*, appear here in quite typical form, and I have not yet met with an example which has raised a doubt as to which of the two forms it should be referred, nor which had assumed the characteristics of *alveus*.

I found *fritillum* on this spot during the whole of June, and again at the end of August, and in September ; also, during several years, singly, in the last half of July. In former years this butterfly appeared sometimes in large numbers, but recently it has become much more scarce.

Serratulæ, as well as I remember, for many years, had only once fallen into my hands in this place, where I found it in the evening, sleeping with two specimens of *fritillum* upon a flower. For the past ten years, however, I have annually (possibly as the result of more careful searching) found this species, but only in small numbers, between the end of May and the middle of June; but lately only in single badly weathered specimens. In Midsummer and Autumn I have never seen it here. This cannot be the spring brood of *fritillum*, as the time of flight of *fritillum* begins with the first of June, and only a little later than that of *serratulæ*. The latter flies also in the Alps, at the same time as the other related forms, in July and August.

Were I to base my judgment upon the occurrence of the two species in this vicinity, I would unhesitatingly pronounce them specifically distinct and easy to separate. But I am made very uncertain by specimens which I have found in Wildungen, only a little more than five miles distant from this place. There I found (on clay slates) the typical *alveus* and *serratulæ* moderately common, but *fritillum* only singly. Among the few specimens that I have yet in the collection is at least one *fritillum* ♂ with a strong inclination towards *alveus*, and a *serratulæ* ♀ of uncommon size, which might almost as well be referred to *alveus*. Besides, if I were to endeavor to distribute among the known types the numerous examples found in the different parts of the Alps, multifariously varying in their size, in the cut of wings, in color and markings, the uncertainty would rise to such a degree that it might easily be conceived how Meyer-Dür (*Tagfalter d. Schweiz*, page 218, fig.) draws together as forms of a single species all three of them and *cacaliæ*; yes, and even *carthami*. In the fact that the usually specified separative characters will not throughout stand the test, he is certainly correct.

Local and climatic influences, which are so productive of various modifications, particularly in restricted localities of high mountains, undoubtedly play a great part here; and it is naturally to be expected that, in places where the different forms live in large numbers in close proximity, the close limits among themselves would be obliterated by continual crossings.

At a former time specimens were sent to me under the name *cersii* Ramb., said to be from the vicinity of Paris, which had much white upon the upper side of the hind-wings and brick-red on the under side. They appeared to me at that time not to be specifically distinct from *fritillum*.

As *carlinæ* Ramb., Staudinger has sent a pair of the small *Scelothrix* from the Southern Tyrol, which are nearly related to *alveus* and *serratulæ*, but may be distinguished from them particularly in having narrower and more acute wings and less expanded hind margin (their fore and hind angles the more prominent on that account.) Three males taken upon the Gemmi well accord therewith. I would only regard them as a somewhat degenerated mountain variety of *alveus*.

Nisoniades.

Antennæ half as long as the fore-wings, their club somewhat compressed, slender, gradually dilated and then narrowed and more or less acutely produced, regularly curved, lunate-falcate. Locklet long. Palpi projecting upon the front to nearly twice the length of the eyes, with long and thick hairs, but less coarse than in *Pyrgus* and *Scelothrix;* the apical joint thick, bluntly conical, somewhat bent. Tibiæ unarmed, and without the tuft,* but with long hairs. Fore-wings triangular, outer margin not toothed, fringe unicolored. Male with longer costal fold.

The peculiarly native country of this genus, scarcely more than represented in Europe, is North America. Scudder enumerates sixteen species, based chiefly upon differences in the form of the abdominal appendages, several of which, however, Edwards will not acknowledge to be good species. The characteristic feature is the form of the club of the antennæ, which is fusiform when stretched out, but which takes the form of a narrow crescent when in its regularly curved condition. This fundamental form is constant; the stoutness of the club and its degree of acuteness differs according to the species. In some American species it is very slender and finely pointed; in others, as in our *Tages*, it is thicker and more blunt, but never so suddenly rounded as in the preceding and following genera.

* In a letter received from Dr. Speyer as this is passing through the press, he desires to make the following correction in this diagnostic feature. The tibial tuft (see also foot of page 126) is not reliable for generic separation. A critical examination made by him of some of the species of *Nisoniades*, has shown its presence in *Persius* and *Icelus;* in the latter, quite strong. *Brizo*, although so closely related to *Icelus*, is without the tuft. The detection of this marked difference in these two allied species, establishes their specific value, which has been questioned, and also shows that the presence or absence of the tuft is only of specific importance.—L.

Montanus Brem. is distinguished from the others above, which accord with it pretty well in *habitus*, by the particularly large hind-wings with expanded margin, also by the difference of color and marking; but it has all the essential characters of the genus. Its club is somewhat thicker than in *Tages*, but is otherwise of the same shape.

THANAOS.

Club of antennæ elongated, curved, shorter than in *Nisoniades*, suddenly swollen, and scarcely contracted at the well rounded tip. Forewings more elongate than triangular, the front margin more steeply arched above the base, the hind margin shorter. Male destitute of the costal fold. All the other characters as in *Nisoniades*.

The erection of a separate genus for *Marloyi* is more difficult to justify than even the somewhat artificial separation of the genus *Scelothrix* from *Pyrgus*. For the absence of a costal fold, their principal character, as has already been shown in *Pyrgus*, is insufficient to establish a generic value; the antennal club differs only in its shortness and stoutness, and no importance can be attached to the slight difference in the cut of the wings. All three of these features taken together induce me to consider it more proper, for strict systemization, to set apart this element which disturbs the establishment of a generic character for *Nisoniades*. In order to avoid constructing a new generic name, I have used that which Boisduval selected to include *Tages* and *Marloyi*.

May 20th, 1877.

ANNUAL MEETING OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The Club met pursuant to notice, at 2:30 on Tuesday afternoon, August 20, 1878, at room 17, The Lindell Hotel, St. Louis, Missouri.

The President, Mr. J. A. Lintner, of Albany, in the chair. In the absence of the Secretary, Mr. B. Pickman Mann, Prof. A. G. Wetherby, of Cincinnatti, was appointed Secretary *pro tem.*

The President then delivered his

ANNUAL ADDRESS.

Gentlemen of the Entomological Club:

For the honor which you were pleased to confer upon me, at your last meeting, when I was unable to be with you, in calling me to preside over you, I am fully appreciative, and would return my grateful acknowledgments. While I well know that there are several among you who far better deserved the honor of succeeding to the chair vacated by my illustrious predecessor, yet I would interpret your selection as a tribute to my devotion to our loved science, and to my earnest desire to aid in its progress to the extent of my humble ability.

On these annual gatherings, marking the lapse of a period signalized by progress equaling, even surpassing that of a decade but a few years ago, it would seem fitting and proper that a comprehensive view of that progress should be given. But this has been so ably done by one of our number, and you have had it presented to you in the pages of *Psyche*, that whatever I might say, in this direction, would be but repetition.

Permit me then, instead, to refer to some evidences of progress in American Entomology, shown within the recollection of several of us here present. Going back forty years, very little was known of our abundant insect fauna, except of the Coleoptera, an order which enjoyed the good fortune of being an attractive one, easy to collect in and prepare for the cabinet, and which early enlisted in its study earnest students, who have since lent honored names to the annals of American science. Thus, in 1835, in Harris' List of the Insects of Massachusetts, the names of 994 Coleoptera are given, and but 140 Lepidoptera. Of the latter, 34 are butterflies, four of which are erroneously referred to European species: among these only three species of Hesperidæ are mentioned. Seventeen species of Noctuidæ are recorded, with the additional note of "96 unnamed species." There are also the names of 7 Geometers, 1 Pyralid, 1 Tortrix and 6 Tineids. How great an advance upon this in our knowledge of forms is shown in the Crotch Check List of 7,450 species of Coleoptera, in the Grote Check List of 1,132 species of Noctuids (already quite incomplete from the species subsequently made known), and in the the Edwards Catalogue of 506 species of Butterflies (110 of which are Hesperidæ). I often recall, as I am reminded of past progress, a request

of Dr. Fitch, soon after the commencement of his Reports, for my careful attention to the Catocalas, for the authorities of the British Museum were, he thought unnecessarily, multiplying species. He did not believe that we really had over a half dozen species. To-day we number over 90 accepted species.

At the time to which I have referred, very few—perhaps not over a score (my limited knowledge of the Coleoptera must be my excuse if I err) of the histories of our insects were known; now, we may count by the hundred those of which we know the transformations and the life histories more or less complete. Some of these, thanks to the labors of Edwards, Riley, Scudder, Walsh and others, have been charmingly wrought out, and are honorable contributions to science.

The list of working Entomologists is rapidly enlarging, and with the consequent diffusion of a knowledge of their purposes and their results, we have reason to believe that the day is not far distant when the opprobious prefix of "crazy" will not invariably be associated with "bug-hunter." In the last edition of the Naturalists' Directory, the names of 281 persons are recorded who are making Entomology their study in North America. It is probable that a full list would be increased by at least 25 per cent., extending the number to 350.

With so large a number of working Entomologists, we would be justified in expecting larger annual contributions to our literature. It would seem to me but a moderate estimate that one-third of the number should possess the ability of making such careful observations and of collating them in such a form that they would prove acceptable and valuable contributions to our knowledge. While we know so little of the transformations of our species, the habits of their larvæ and imagines, their geographical distribution—in short, the numerous details entering into and composing their life histories, there is scarcely a new fact relating to these particulars which is not worthy of being placed on record in the pages of our Entomological journals, which will gladly give them place. It has been stated that there are but about thirty Entomologists in the United States and the Dominion of Canada who are in the habit of publishing the results of their observations and studies. The last volume of the CANADIAN ENTOMOLOGIST presents a list of forty-five contributors; and Mr. Scudder, in his review of the work done during the year 1877, to which reference has been made, gives an account of the publications of

forty-one writers, seven of whom have discussed injurious insects only. We wish that this latter number had been much larger.

A marked improvement has been shown in the number, extent and character of Entomological collections, both in public institutions and in private hands. It is most earnestly to be hoped that the growing appreciation of the value of these collections may demand and ensure their proper care and future preservation. To this end it is very important that each individual possessing a valuable private collection (and there are now a respectable number distributed through the several States which contain 5,000 examples) should make such arrangements for its disposition and preservation after his decease as may, within a reasonable extent, ensure its perpetuity. The authoritative statement which has been made, that the extremely valuable collections of Drs. LeConte and Horn will at some future day be added to the collection which the ability and zeal of Dr. Hagen has built up at the Cambridge Museum, is highly gratifying intelligence. And in this connexion, let me endeavor to impress upon each one of you the service which you may render to science by availing yourself of every opportunity to urge upon those who have voice in the erection of buildings devoted to scientific collections, that a primary consideration be that they be made fire-proof.

The literature of our science has already become quite respectable, and its collection on our shelves forms no inconsiderable a library. The eleven volumes of the American Entomological Society represent a large amount of earnest and thorough work. The nine volumes of the CANADIAN ENTOMOLOGIST are replete with interest and instruction. The numerous papers scattered through the pages of the Reports of the Peabody Academy of Science, Proceedings of the Boston Society of Natural History, Annals of the Lyceum of Natural History of New York, Proceedings of the Philadelphia Academy of Natural Science, Bulletin of the Buffalo Society of Natural Sciences, Proceedings of the California Academy of Natural Sciences, and others, fully illustrate the earnestness with which Entomological study is being prosecuted, and give large promise of a brilliant future. The exquisite illustrations of the "Butterflies of North America" are a credit to our country, being fully equal to the best work of the class in Europe. The publications of LeConte have given him high place among the honored names of the fathers of American Entomology, while the writings of Hagen, Grote, Scudder, Packard, Horn, Cresson and Uhler represent no inconsiderable portion of the progress

upon which we are congratulating ourselves. Nor can I omit reference to our European friends — to Loew, Osten Sacken, de Saussure, Speyer, Zeller, Mœschler, Butler and others, who are freely lending us their valued aid in the descriptions of forms too numerous for our few hands, and in the solution of problems which require for their determination the study of the entire insect fauna of the eastern hemisphere in connection with our own.

The most gratifying feature, perhaps, in the report of progress which I am able to present to you, is the aid which the General Government is now extending to Entomological explorations and investigations, in placing scientists in the field and in the publication of their results. Two years ago, the occupant of this chair felt called upon to express to you his sorrow, disappointment, indignation, that Congress had declined to accede to the memorials presented it, asking its recognition and acceptance of the service which applied Entomology was in a condition to render. Now, it is a cause of congratulation that the Department of Agriculture has selected as its Entomologist one whose training in the school of economic Entomology for the past ten years has specially qualified him for the responsible position he occupies ; and we have the additional gratifying assurance that the Secretary of the Department is in full sympathy with our aims.

In conformity with a precedent long since established in Europe, our Government has honored itself while honoring science, in seeking to add to the productive wealth of the country through a control of the insect depredations inflicted upon our people, to the extent of enormous annual losses, and, at times, poverty and starvation. The two special Commissions which have been already appointed, it is understood are, ere long, to be followed by others. The published results of one year's labor of the Locust Commission is in our hands. An inspection of the matter crowding its 772 pages will, I am sure, convince any one competent to judge, of the wisdom of the appropriation made for its support. The Cotton-worm Commission has already actively entered upon its work.

To Government aid we owe the publication of Packard's Monograph of the Phalænidæ—a beautiful quarto of attractive typography and ample and excellent illustration ; Thomas' Acrididæ of North America, with 260 quarto pages and illustrations : the Reports on Hymenoptera, Lepidoptera, Coleoptera, Hemiptera and Orthoptera in Lieut. Wheeler's Surveys West of the 100th Meridian, of 331 quarto pages and several

chromo-lithographic plates; and to Reports on several orders of insects by Chambers, Grote, Hagen, Osten-Sacken, Packard, Scudder, Thomas and Uhler, in the Annual Reports and the Bulletins of the Hayden Survey of the Territories.

The liberality displayed by our Government in the publication and gratuitous distribution to those whose scientific labors render them worthy recipients, of investigations in other departments of Natural Science—in Geology, Palæontology, Mammalogy, Ornithology, Ichthyology, Botany, etc., deserves our most earnest commendation. The facility of publication thus afforded to meritorious work almost evokes the envy of some of our European friends.

In conclusion, permit me to commend to the members of the Club the biological study of our insect forms. It is attractive, it is simple in many of its phases, it is of great practical utility, it is a field where all can find abundant work, and one in which some of those questions which are engaging the attention of zoologists in other departments, may best find their most ready answer. Let no one be satisfied with the simple possession of a large and well arranged cabinet of insects. If to collect and own it be a source of pleasure, often beyond expression, then science may demand at his hands that he should aid in extending its boundaries in return; and in no better way can this be done than in working out the life histories of our species, beginning with those with which we hold the more intimate relationship. Let descriptions of forms remain, except in exceptional cases, for those who have special fitness and opportunity for the work; and systemization for him who, like the poet, *nascitur non fit*, that kaleidoscopic manipulation of genera and the higher groups may cease to bewilder, perplex and dismay.

In illustration of what may be done in the study that I commend to you, I would refer to the labors of Mr. W. H. Edwards in working out the histories of some of those butterflies which appear under different forms at different seasons of the year. Some of the results are known to you, and I am sure that you regard them as among the most valuable recent contributions to Entomology. The untiring zeal with which the work has been prosecuted and is being continued, deserves the commendation which it has received from the most eminent European Entomologists, and the success with which it has been crowned.

Gentlemen, I trust that our assemblage at this time may not only conduce to the interests of our science, but also render its pursuit more

pleasant to us, through the privilege it affords of personal acquaintance, comparison of observations, interchange of opinion, and the strengthening of those bonds of sympathy which should (they do not always) unite those who labor in a common cause.

On the motion of Mr. A. R. Grote, of Buffalo, a resolution was passed requesting THE CANADIAN ENTOMOLOGIST to publish the President's Address and the proceedings of this meeting.

Mr. E. B. Reed, of London, Canada, associate Editor of the CAN. ENT., apologized for the unavoidable absence of the Vice-President, Mr. Wm. Saunders, and stated that the Editor of the CAN. ENT. would be most happy to comply with the wishes of the Club respecting the publication of the proceedings of the meeting.

Mr. A. R. Grote exhibited some insects from Georgia—*Callosamia angulifera*, *Eacles didyma*, *Lagoa pyxidifera*, *Heterocampa obliqua*. In the South he had found that *Actias luna*, *Samia cecropia*, *Telea polyphemus* and *Saturnia io* were double-brooded, while on the contrary, *Citheronia regalis* was only single-brooded.

Prof. Wetherby stated that in his section, and in other parts also of the North-Western States, many of the above-named moths were also double-brooded.

Miss Emily A. Smith, of the Scientific Association of Peoria, Ill., submitted to the meeting a most interesting account of *Lecanium acericorticis* Fitch, a bark-louse that had seriously damaged the Maple trees, both hard and soft, in Illinois and adjoining States. The whole life history of this pest had been most carefully worked out by Miss Smith, who also exhibited a very complete set of microscopical preparations of the insect in its various stages, and also of a parasitic *Chalcid* discovered by her. One important point noted was the migration of the bark-lice on the approach of the fall from the leaves to the trunk of the tree, on which, however numerously they might be found together, their position was always lengthwise with the trunk. In the South the insect was doubtless double-brooded. Dr. Fitch had briefly described the insect many years ago, but Miss Smith had been enabled to work out many hitherto unknown points in its history.

Various experiments had been tried to destroy the lice, but Miss Smith had found the best success in using a Babcock or Chambers Fire

Extinguisher, charged in the usual way, with the addition of a little crude carbolic acid, in the proportion of about one large spoonful to six gallons of water. By means of the Extinguisher she was able to reach even large trees, the cost being about 20 cents per tree. The remedy should be applied before the insects become too old, otherwise a stronger preparation of carbolic acid was necessary, and in consequence the trees might possibly suffer somewhat.

Mr. Thos. Bassnett, of Jacksonville, Florida, had listened to the admirable account with very great interest, inasmuch as in the South the culture of the Orange tree, in which he was largely interested, was seriously threatened with extermination by the ravages of a bark-louse similar to that described by Miss Smith, and he was glad to hear that a remedy could be so successfully applied.

Prof. C. V. Riley, of Washington, D. C., spoke, thanking the lady for bringing this subject before the meeting, and complimenting her on the discoveries she had effected. He fully corroborated the statements made as to the extent of damage caused by bark-lice, especially those affecting the Orange in the South. He strongly advocated the use of the "Extinguisher" in similar cases, but recommended that kerosene should be tried instead of carbolic acid; it would, he thought, be found of less injury to the trees, and would destroy the insect for some time after the formation of the scale, which the carbolic acid would not do. It should not be applied in excess; the ordinary proportion should be about one part kerosene to twenty of water.

The whole topic was very fruitful of discussion, and Miss Smith was much thanked for her paper and for the drawings and microscopical preparations that accompanied it.

On motion of Prof. Riley, seconded by Mr. Reed, a resolution was carried that a committee be appointed to prepare a report and submit to the next session of the Club, in regard to the quorum of members necessary to transact business.

The Chairman appointed the mover and seconder and Prof. A. G. Wetherby as the committee.

Prof. Riley gave a brief abstract of some of the Entomological papers he proposed to read to the Association.

(1) Notes on the life history of the blister beetles, and on the structure and development of the genus *Hornia* Riley.

(2) On the larval growth of *Corydalis* and *Chauliodes*.

(3) On the means by which Silk-worms issue from their cocoons.

Hornia was parasitic on the common humble-bee, and had been successfully identified by careful study, although in several important points it differed from the *Meloidæ* to which it belonged.

The further larval history of *Corydalis cornutus* was given by Mr. Riley, and was most interesting, especially to those members who had listened to Mr. Riley's first descriptions of this curious insect at the Detroit meeting. Mr. Riley had been very successful in elaborating the various points of difference between *Corydalis* and *Chauliodes*.

In discussion it was stated that the somewhat peculiar name of the "Hellgrammite Fly" for the *Corydalis* had been for many years in common use both on the Upper and Lower Mississippi; and that the equally curious name of "Dobson" was given to its larva, which was largely used for bait by the river fishermen.

On the paper relating to Silk-worms reference was made to Dr. Packard's recent theory on certain spines on the wings of Bombycidæ, which he stated were of service in assisting the exit of the insect from the cocoon.

Mr. Riley, in combatting this idea, showed how in almost every case the silk was spun in figures of 8, which would easily yield to pressure, especially as in most cases a fluid (wrongly termed bombyc acid) was emitted, and the silk thus rendered more pliable. His idea was that the peculiar make up of the cocoon rendered it more yielding for the exit, and that though the insect usually emerged at the end of the cocoon, there seemed to be no reason why, if it chose, it could not find an egress equally well at the side of the cocoon.

Several minor matters were discussed, and the Club adjourned at the call of the chairman.

(To be Concluded in October No.)

BOOK NOTICES.

Entomological Contributions, No. iv., by J. A. Lintner.

We tender our sincere thanks to the author for an early copy of this fourth part of his admirable work, which appears in form similar to the previous issues, and occupies 144 pages.

It opens with a chapter on *Mermis acuminata*, a parasite on the larva of *Carpocapsa pomonella;* then an admirable account of the life history of the new Carpet Bug, *Anthrenus scrophulariæ*, with magnified illustrations of the insect in its several stages ; following which are chapters on *Isosoma vitis*, the Lepidoptera of the Adirondack region of New York, Collections of Noctuidæ at sugar at Schenectady, on some Lepidoptera common to the United States and Patagonia, on *Lycæna neglecta*, new species of Californian Butterflies, on some species of *Nisoniades ;* descriptions of new species of *Cerura*, *Xylina*, *Hypocala*, *Acidalia*, *Cidaria*, besides a number of valuable notes on Lepidoptera illustrative of their life history and habits and geographical distribution. Every subject is treated in the author's usual thorough and systematic manner, and the work forms a valuable addition to our constantly increasing Entomological literature.

On the Tongue (Lingua) of some Hymenoptera, by V. T. Chambers. From the Journal of the Cincinnati Society of Natural History, April 1878—8vo., pp. 13.

This paper is very interesting and instructive, and is intended as a reply to the questions—What do bees eat? and How do they eat it? An illustration of a transverse section of a bee's tongue accompanies the text.

Manuscript Notes from My Journal : Cotton and the principal insects, &c., frequenting or injuring the plant in the United States, by Townend Glover.

This excellent contribution to economic Entomology is published uniformly with the previous portions of " Manuscript Notes from My Journal," reviewed in earlier numbers of the CAN. ENT., that is, in quarto form, the text written and etched by the author, and afterwards printed from stone. The admirable plates, 22 in number, constitute in this instance the most considerable portion of the work and illustrate not only the insects which injure the cotton crop, but also certain forms of fungoid disease to which the plant is subject. A work so instructive and useful as this would be to those engaged in this important branch of Southern agriculture should be widely circulated. The small edition published has been got up at the author's own expense, who has distributed the copies with the most liberal hand, free of any charge, among the libraries of the various scientific societies in the country ; they are not, however, access-

ible to the general public. The untiring industry of this talented Entomologist is a marvel to all those who know of his work. It affords us great pleasure to find that he has so far recovered from his late severe illness as to enable him to resume those Entomological studies in which he has so long taken a prominent part.

Butterflies and Moths of North America, by Herman Strecker, Reading, Pa.

We are indebted to the author for a copy of this work, which is in large octavo form, in paper cover, containing 283 pages.

Following the preface, which partakes somewhat of the character of an advertisement relating to the sale and purchase of insects, the reader will find a series of short but very instructive chapters on breeding, collecting, mounting, preserving, transporting and classifying specimens, occupying some 26 pages in all, in which the author's long practical experience and thorough knowledge of the subject is presented in a plain and practical manner. He proceeds on the very admirable plan of explaining everything down to the minutest details, so that a reader who knows nothing of the subject when he takes the work up, has, after a careful perusal, a very fair knowledge of the whole matter. This part is illustrated by one plate: a second plate is devoted to illustrating the structure of butterflies and moths. The author's style is peculiar, but interesting and racy; we sincerely regret that this otherwise highly useful portion of his work is marred somewhat by the occasional treatment in a flippant manner of subjects which others deem sacred.

There is a very complete list of the terms and abbreviations used in works on Lepidoptera, with plain and full explanations, following which is an alphabetical list of localities of which something of the Lepidopterous fauna inhabiting them is known. Next we have a very full synonymical catalogue of American butterflies north of Mexico, with localities in the form of marginal notes, which, with appendix, occupies the larger portion of the work. A Bibliographical chapter of 75 pages closes the volume, in which is found an alphabetical list of authors who have written on Lepidoptera, with full details of their writings.

On the whole, we regard this work as very convenient and useful. The preparation of it must have involved an immense amount of labor, which has been performed in such a manner as to reflect credit on the author.

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No. 10.

THE

Canadian Entomologist.

VOLUME X.

EDITED BY

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The Canadian Entomologist.

VOL. X. LONDON, ONT., OCTOBER, 1878. No. 10

THE ANNUAL ADDRESS OF THE PRESIDENT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

To the Members of the Entomological Society of Ontario:

GENTLEMEN,—Each revolving year brings its duties. To-day it is my privilege and a very pleasing duty to offer again to you a few words of encouragement, to refer briefly to some of the Entomological achievements of the past, and do what I can towards stimulating to further effort. The importance of the study of Entomology is yearly impressing itself more and more upon the public mind, as insect foes hitherto scarce become abundant, or as new ones invade our domain.

At present we are in danger from the approach of a new insect enemy which promises to give us a great deal of trouble. I refer to the new Carpet Bug, *Anthrenus scrophulariæ*. It was during the summer of 1874 that attention was first called by some of the newspapers in the Eastern States to the great damage being done to carpets in some of their cities on the sea-board by the ravages of an insect quite different from the well-known Carpet Moth, *Tinea tapetzella*, and far more destructive; one which would attack new carpets as readily as old ones, and devour their substance with such rapidity and persistence as to raise a doubt in some minds as to whether, in case this insect becomes generally prevalent, the use of carpets could be continued at all. Two years later this pest was found common in Schenectady, N. Y., when they were shortly brought under the notice of one of our most active and thorough workers in the Entomological field, Prof. J. A. Lintner, of Albany, N. Y., who at once proceeded to investigate the life history of the insect. Up to this time little or nothing was known here in reference to it, other than that the destructive creature was a larva of some sort, nearly oval in form and about three-sixteenths of an inch long, with the body clothed with short

hairs which were longer at each extremity. A number of these larvæ were collected and fed upon pieces of carpet, and their transformations carefully watched until the disclosure of the perfect insect, when it proved to be a member of that very destructive family of beetles known to Entomologists as the Dermestidæ. This insect, which proves to be a European species, has probably been imported from Europe with carpets brought to New York and Boston, at which ports its destructive efforts first attracted attention. The beetle, the parent of all this mischief, is a very small one, being not more than one-eighth of an inch long, and one-twelfth of an inch broad; it is nearly oval, black, with faint red and white markings. It does not confine its attention to carpets, but will eat any sort of woolen goods, but does not appear to injure those of cotton. In Europe it is said to destroy furs, clothes, collections of animals, insects and plants, and is sometimes very injurious to leather. A more detailed description of this insect and its workings, as furnished by Prof. Lintner's observations in his recent "Entomological Contributions," will be given in the annual report of our Society. As this insect has for some time past been committing great ravages in Buffalo, N. Y., it is not likely that we shall be long free from it; indeed it is altogether probable that it is already in our midst, although I am not aware that it has yet been brought under the notice of any of our Entomologists. Unfortunately it is a very difficult pest to destroy. The ordinary applications, such as camphor, pepper, tobacco, turpentine and carbolic acid, have, it is asserted, been tried without success, and no effectual means for its destruction has yet been devised.

Strange that so many of our most injurious insects have been brought from Europe, and that when introduced here they multiply to a far greater extent than in their native home. This rapid increase doubtless arises from the fact that they have numerous parasites in the place of their nativity which prey on them, and that these parasites are rarely imported with them, and hence it becomes a question of great practical importance as to whether these parasites might not by special effort be introduced, and thus materially lessen the losses which these scourges inflict on the community. We are indebted to Europe for the Codling Moth of the apple, *Carpocapsa pomonella;* the Currant Worm, *Nematus ventricosus;* the Oyster-shell Bark Louse, *Aspidiotus conchiformis;* the Cabbage Butterfly, *Pieris rapæ;* the Currant Borer, *Ægeria tipuliformis;* the Hessian Fly, *Cecidomyia destructor;* the Wheat Midge, *Diplosis tritici;* the Grain Wee-

vil, *Sitophilus granarius;* the Cheese Maggot, *Piophila casei;* the Cockroach, *Blatta orientalis;* the Meal Worm, *Tenebrio molitor;* the Bee Moth, *Galleria cereana;* the Carpet Moth, *Tinea tapetzella;* the Clothes Moth, *Tinea vestianella;* the Bacon Beetle, *Dermestes lardarius*, and several others of lesser note.

It cannot be denied that there has been some reciprocity in the matter. We have given Europe the noted *Phylloxera vastatrix*, which has inflicted damage to the extent of millions of dollars on the vineyards there; they have also received now from us the much-dreaded Colorado Potato Beetle.

During the past season we have had a fair share of destructive insects. The Forest Tent Caterpillar, *Clisiocampa sylvatica*, has again been numerous in the district about London and in many parts west of it, but not so abundant as last year. The severe frosts in May destroyed myriads of the very young larvæ then newly hatched, and later in the season there prevailed among the nearly full-grown larvæ in some localities a strange disease which carried them off by hundreds. I myself saw large numbers of them still retaining their hold on fences and tree trunks, which, when touched, were found quite dead, and so decayed as to burst with a very gentle handling. Very many have also been destroyed in the larval state by parasites; probably one-half or more will perish from this cause alone. Birds also have devoured many of them. On one occasion the crop of a black-billed cuckoo, *Coccygus erythropthalmus*, was brought to me packed entirely full of these larvæ. Even their clusters of eggs, which they deposit in rings upon the twigs of trees, are not free from attack. Last winter I discovered a species of mite preying upon the eggs and devouring them rapidly; many clusters were found entirely destroyed in this way, others partially so, and as each cluster would contain probably two or three hundred eggs, some idea may be formed of the benefits conferred upon us by these tiny mites.

The Colorado Potato Beetle is still spreading eastward through the Maritime Provinces, and has this year reached St. Johns, New Brunswick, but it is no longer the fearful evil at first anticipated, and our farmers battle with it confidently, knowing that with a little perseverance in the use of Paris green, they can ride victorious over this formidable foe. The use of this poisonous substance has provoked much discussion, and unnecessary alarm has been excited by some writers, who have expressed grave fears that the use of so much Paris green would eventually poison the soil

to such an extent as to render it permanently unfit for the growth of other crops. Several years ago Prof. W. K. Kedzie, of the Michigan Agricultural College, when experimenting in this direction, demonstrated that water charged with carbonic acid or ammonia dissolved a certain portion of the Paris green, but that this was quickly converted into an insoluble and harmless compound by combination with the iron which exists in almost every soil. As rain water always contains more or less of these ingredients, it is more than probable that the small portion of this poison used on potato fields soon loses its poisonous properties in this manner. In any case, one pound of the green spread uniformly over an acre of soil would only amount to less than one-sixth of a grain to the square foot, so that were the poison to remain unchanged, this minute portion might be added to the soil annually for a century without producing any perceptible deleterious effects on plant growth. It is to be regretted that any one should attempt to excite needless alarm in this way. Caution should be urged in handling this powerful poison, and it is often the case that more is used than is needed; these points are important and cannot be too often referred to. Paris green is best and most economically used with water in the proportion of one teaspoonful of the powder to a pailful of water, kept well agitated and sprinkled on the potato plants by means of a hand whisk dipped from time to time into the liquid. If the Paris green is pure this proportion is ample, but too often this useful compound is largely adulterated, a practice which some dealers are tempted to adopt from the eagerness with which a large portion of the public run after cheap goods. Paris green is frequently adulterated to the extent of from twenty-five to fifty per cent., chiefly with sulphate of baryta, a cheap and harmless mineral compound. By resorting to practices of this sort dishonest dealers can supply their customers at a less price than the cost of the pure article, and at the same time make large profits. It is a matter of regret that with an Adulteration Act in force, which if properly carried out would at once put an end to these and all such impositions, the public are not better protected.

The insect enemies of the Potato Beetle are in some localities rapidly increasing in numbers. In the annual report of our Society for the year 1871, our esteemed coadjutor, Mr. E. B. Reed, contributed an excellent article on the Potato Beetle, in which he enumerates a number of insects which prey upon this pest in the various stages of its growth, and among them refers to a species of *Lebia*, one of the active members of that family

of beetles known as Carabidæ, all of whom devour other insects. This species, *Lebia grandis*, is there said to be rare in Ontario. The first examples of this insect which I remember capturing were taken last year at sugar when trapping moths, and I believe it is the only species belonging to that family which I have ever taken in this manner; several of them were found feeding on the sweet liquid on dark nights about 10 o'clock. Early this fall I received a letter from Mr. W. E. Coldwell, of Constance, Ont., announcing the appearance in large numbers of a friendly insect, which was devouring the larvæ of the Potato Beetle, and proving a very effectual check on their increase. This letter was accompanied by specimens of the insect, which, to my gratification, I found on examination were examples of *Lebia grandis*. A few weeks later a farmer in this neighborhood called on me with the information that he had observed large numbers of an insect which he had not seen before, devouring the larvæ of the Potato Beetle. He brought no specimens with him, but from his description of the insect I have every reason to believe that it was the same *Lebia*. Since then I have occasionally met with examples of this friendly visitor hidden amongst the leaves of plants, a common place of resort for it during periods of inactivity.

The Hessian Fly, *Cecidomyia destructor*, which appeared in force in many counties of our Province last year, and which it was feared might again become a serious trouble, has happily almost disappeared. I have not heard of any serious loss from this pest during the past season. Should any of you desire, at any time, information in reference to the life history and habits of this insect, I would refer you to a very practical paper in our last annual report, by the Rev. C. J. S. Bethune; also to a more elaborate paper by the same distinguished Entomologist in our report for 1871.

The Cabbage Butterfly, *Pieris rapæ*, still continues its ravages, but does not seem to be quite so abundant this year as it was last. Water heated to near the boiling point has been used with success in destroying the larva, without injuring the cabbage. Strong decoctions of Cayenne pepper and Smartweed *(Polygonum——?)* have also been spoken highly of; but I look forward with far more confidence to a remedy provided by nature which is gradually making itself felt. I allude to that tiny little friendly parasitic fly, *Pteromalus puparum*, which is rapidly increasing in our midst. A few days since, while watching some of the full-grown larvæ of the Cabbage Butterfly which were feeding on Nasturtium leaves, I was much gratified in witnessing the method of attack which this parasite

adopts. Settling herself quietly down on the back of the caterpillar, near the terminal segments, with her head towards the caterpillar's head, she paused awhile ; then with a sudden movement of her ovipositor, so quickly that the motion almost escaped detection, she thrust an egg under the skin of her victim. The caterpillar seemed startled, and quivering, jerked its head and anterior segments suddenly about, and then quieted again ; the little tormentor meanwhile sitting perfectly composed on the spot where she first settled. Presently another thrust was made, followed by further uneasy movements of the larva, and in this manner, in the course of a very few minutes, quite a number of eggs were deposited. The caterpillar did not seem to be conscious of the cause of its troubles, nor, indeed, of the presence of its enemy, excepting when the thrusts with the ovipositor were made. On drawing a little nearer for the purpose of better observing this interesting operation, the tiny creature took alarm and flew off. Further examination revealed the presence of several more of these little friends, busily searching for further specimens to operate on. The eggs deposited soon hatch into little grubs, which eventually devour the body of their victim, and after it has entered the chrysalis state, eat small holes through the chrysalis, and thus make their escape. It has long been an unsettled point among Entomologists as to whether this parasite operates on her victim in the larval or chrysalis state, the weight of opinion being hitherto in favor of the view that the chrysalis is pierced and the eggs deposited in it ; but from the observations here detailed it would appear that the eggs are usually, if not invariably, placed in the nearly full-grown larva.

At the same time I observed an insect belonging to the true bug family, Hemiptera, with its proboscis thrust into one of the same caterpillars, quietly sucking out its contents, the half-emptied victim vainly endeavoring to escape. As this bug was immature, I was unable to determine the species to which it belonged ; it is pleasing, however, to know that there are several friendly helpers among the insect tribes aiding man in his efforts to subdue this obnoxious insect.

The Codling Moth of the apple is less abundant than usual this year, a scarcity which may be attributed to the early hatching of the moths during the very warm days of spring, and many of them perishing before the blossoms of the apple were sufficiently far advanced for them to operate on. Attention has been called again to the curious fact already noted in Europe many years ago, that the larva of this insect is sometimes

occupied by a strange parasite, a species of *Mermis*, known commonly as a hair-snake, a name probably due to the absurd belief, not yet quite extinct, that horse-hairs placed in water eventually become endued with life, and change to hair-snakes. Several instances have occurred of late in the United States of these remarkable creatures being found in the interior of apples, where they had lived as parasites on the Codling worm, and having destroyed their host, remained in the fruit about the middle, where they were in danger of being eaten.

The Plum Curculio is no longer a stranger in that once famed plum-producing district of which Goderich is the centre. So plentiful has it become there now that some plum-growers are becoming quite discouraged and ready to give up the culture of the fruit entirely. This troublesome insect has not yet been reported from the Owen Sound district, where plum culture is still extensively and profitably carried on.

The importance of the study of Natural History in our schools, especially the branch of Entomology, is beginning to be recognized, and I trust the day is not far distant when every public school will have its museum of Natural History objects, where the children can be taught with the specimens before them the names and habits of the commoner mammals, birds, insects and plants with which they must constantly come in contact. Such studies would, in my opinion, strengthen the intellect and cultivate the memory and other faculties of the mind more thoroughly than many of the more abstract studies now specially designed for that purpose, while the practical value of such knowledge to the fortunate possessor in after life can scarcely be over-estimated. I am glad to state that at the Model Farm in Guelph the important study of insects injurious to agriculture is regularly taught with the aid of a very fair collection of specimens.

The meeting of the Entomological Club of the American Association for the Advancement of Science was held this year at St. Louis, where some very interesting papers on destructive insects were read, and some curious facts in reference to insect life elicited. Our Society was ably represented by a member of our Editing Committee, Mr. E. B. Reed. It will doubtless be a source of gratification to you to learn that your President has again been honored with the Vice-Presidency of that distinguished body of naturalists.

During the year some interesting additions have been made to our Entomological literature, which we can only now partially and briefly

enumerate. Among the most valuable are the "Entomological Contributions," by J. A. Lintner; "Descriptions of Noctuidæ," by A. R. Grote; "Food Plants of the Tineina, with Descriptions of New Species," by V. T. Chambers, both published in the Bulletin of the United States Geological and Geographical Survey; "Manual of the Apiary," by A. J. Cook; on "Sexual Dimorphism in Butterflies," by Samuel H. Scudder; also several papers by the same author on fossil insects found in the Rocky Mountains, and in the Tertiary Beds at Quesnel, in British Columbia; "Insects Injurious to the Cotton Plant," with many plates, by Townend Glover; "On the Butterflies and Moths of North America," by Hermann Strecker. Several additional numbers of Edwards' "Butterflies of North America" have appeared, each one rivaling or surpassing its predecessor in the exquisite beauty of the plates illustrating the species described.

The publications of our own Society have been creditably maintained. Our annual report to the Department of Agriculture for the past year has been very favorably noticed, and our CANADIAN ENTOMOLOGIST has been issued regularly, its pages being well filled, chiefly with the records of original observations. The contributors to our last volume numbered no less than forty-five, and included the names of nearly every Entomologist of note on the continent. During the year we have published two handsome lithographic plates, one on wood-boring beetles, illustrating eight species; the other, which is printed in colors, exhibits the full-grown larva of that rare and interesting moth, *Samia columbia*. Among the most valuable papers I would mention those of W. H. Edwards, on the preparatory stages and dimorphic forms of butterflies; and one by the same author detailing the notable discovery of secretory organs on the hind segments of the larvæ of *Lycaena pseudargiolus*, from which is discharged a sweet fluid which induces the attendance of ants, who in return for the sweets thus provided them, defend these larvæ from their enemies. Our pages have been enriched also by valuable papers on the Noctuidæ and Pyralidæ, by A. R. Grote; on gall insects and other subjects, by Dr. H. Hagen; on Tortricidæ, by C. H. Fernald; on Tineina, by V. T. Chambers, besides many others, which time will not permit me to enumerate. During the past three months we have published in three portions a translation from the German of a very valuable paper by Dr. A. Speyer, on the Genera of the Hesperidæ, which paper, we trust, will be the means of bringing about such a re-arrangement of the species contained in this interesting family of butterflies as will be acceptable to Lepidopterists, and

at the same time, one likely to be permanent. It is through the kindness of Prof. J. A. Lintner, of Albany, that this translation has been supplied to us.

The practice of capturing our night-flying moths by the method of trapping, known to Entomologists as "sugaring," is still persevered in by most of our more active members, and with great practical results. Species which formerly were regarded as the greatest rarities have in many instances been taken in large numbers, while many new discoveries have rewarded the most persistent workers in this interesting field of research. As an example of the results of such work we would refer to a paper published in the CANADIAN ENTOMOLOGIST for November, 1877, on "Catocalæ Taken at Sugar, at Center, New York," by Dr. James M. Bailey.

During the past year that talented and energetic Entomologist, Prof. Townend Glover, of Washington, has, in consequence of ill health, been obliged to resign his position as Entomologist in the Department of Agriculture. While deeply regretting the cause which necessitated the change, I am pleased to be able to record the graceful recognition of the importance of Economic Entomology by the heads of the Department in Washington, in appointing Prof. C. V. Riley to fill this high position, a man who has done so much by his valuable reports as State Entomologist of Missouri to popularize Entomology and to disseminate practical information in reference to our insect pests throughout this continent.

In our last annual report reference was made to the appearance of the first of a series of practical works on Economic Entomology by that renowned Entomologist, Andrew Murray, F. L. S., of South Kensington Museum, London, England. This work treated of some of the lower forms of insect life and their allies, and was to have been followed by seven additional volumes, all having a practical bearing on this subject, so important to the agriculturist. I then expressed the hope that this talented author might be spared to complete the series of useful works proposed, and thus leave behind him a lasting monument of his industry and devotion; but not long after this the sad news reached us that he had ceased from his labors—that he had been called away by death. Thus "man proposes but God disposes." It is commendable to lay our plans for usefulness in life, and to labor as opportunity offers with diligence, knowing that our time is short, and that the most useful life will soon—as far as this world is concerned—be at an end; but I love to think that when our work here is done, our happy lot may be to find in a purer state

new fields of labor, where, free from the impediments which now obstruct our progress, we may study with much greater advantage the wonderful works of the Infinite Creator.

Thanking you for your kind attention,

I remain, yours very sincerely,

WM. SAUNDERS.

ANNUAL MEETING OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

(Concluded from September No.)

August 21st, 1878.

The Club met in the same place at 3 o'clock p. m., the President in the chair.

There was a much larger attendance than yesterday of members and those interested in Entomology.

The first order of business was the reading of the report of the special committee appointed yesterday. Mr. Reed presented the report.

The committee to whom was referred the question of the constitution of a quorum beg to report as follows:

Whereas it is most desirable in the interest of the Club that a definite and permanent character should be given to all its proceedings, and that nothing should be left undone which would tend to establish complete confidence in the manner of transacting the business of the Club,

Your committee therefore recommend that the constitution be amended by providing

(1) That no business of the Club shall be transacted unless there are present a quorum of ten persons, who shall have been enrolled as members of the Club at least one year previous to the then session.

(2) That when motions shall have been carried by the Club, the same shall not be rescinded at any subsequent meeting unless there be present as many members as were present at the date of passing such motions.

Your committee recommend that this report be printed and a copy sent to each member of the Club, and that it be brought up for discussion at the next annual session of the Club.

August 21, 1878.

C. V. RILEY,
A. G. WETHERBY,
E. BAYNES REED.

The report was unanimously adopted.

The Club then proceeded to the election of officers.

On motion, duly carried, the following gentlemen were re-elected officers for the ensuing year:

Mr. J. A. Lintner, Albany, N. Y. -	- President.
Mr. Wm. Saunders, London, Ont. -	Vice-do.
Mr. B. Pickman Mann, Cambridge, Mass.	- Secretary.

The President returned thanks for the honor conferred upon him. He then addressed the Club, giving a most interesting description of the success that had attended his efforts and those of his co-laborers in collecting Noctuidæ during the season of 1877, by the means known as "sugaring." By reference to a list given on page 120 of his "Entomological Contributions," No. 4, it would be seen that there had been captured eighty-six species, not one of which had hitherto been taken in the Albany district. Nearly all of these had been found in the famous Center locality. He most graphically described his manner of working by this method, and strongly recommended its trial to all the members.

Prof. Wetherby made some remarks on this attractive means of capture, which was continually bringing under the notice of Entomologists specimens hitherto unknown or considered as most rare. It was a question if there were any species which are in reality rare, their seeming rarity resulting from our not knowing when, where and how to collect them.

Miss Smith described a collecting bottle of her own device, by which, on touching a spring, the cover flew back and the insects could be readily caught in the receptacle. Its chief recommendation was that it could be managed by one hand, leaving the other at liberty for holding the lantern.

Mr. Reed advocated the fastening of the lantern to the waist by a belt, thus leaving the hands at greater freedom to use the bottles and boxes.

The President said he had found that in using the ordinary bulls-eye lantern the fingers could be thrust through the wire handle in such a manner that their ends and the thumb were free for use in withdrawing, hold-

ing and replacing the stopple of the collecting bottle. The lantern in hand enabled him more readily to adjust the light, and he had found that it was often more desirable to throw the penumbra rather than the full light upon the tree, many insects often fleeing from a strong light.

Miss Smith gave an account of the damage done to the oaks in Wisconsin and Illinois by the larvæ of a little Tortrix, *Argyrolepia quercifoliana* Fitch.

A very interesting discussion took place on the question of instinct or reason displayed by insects, and many curious instances were cited proving that instinct and reason differ in degree and not in kind.

The meeting then adjourned.

LECANIUM TULIPIFERÆ.

BY A. J. COOK, LANSING, MICH.

On page 218 of the "Revised Manual," in speaking of other sources than flowers from which bees collect sweets, I remark that I have seen the bees thick about a large bark-louse, which attacks and often destroys one of our best honey-trees. This is an undescribed species of the genus *Lecanium*.

In the summer of 1870, this louse, which, as far as I know, has never yet been described, and for which I propose the above very appropriate name, *tulipiferæ*—the *Lecanium* of the tulip tree—was very common on the tulip trees about the College lawns. So destructive were they that some of the trees were killed outright, others were much injured, and had not the lice for some unknown reason ceased to thrive, we should soon have missed from our grounds one of our most attractive trees.

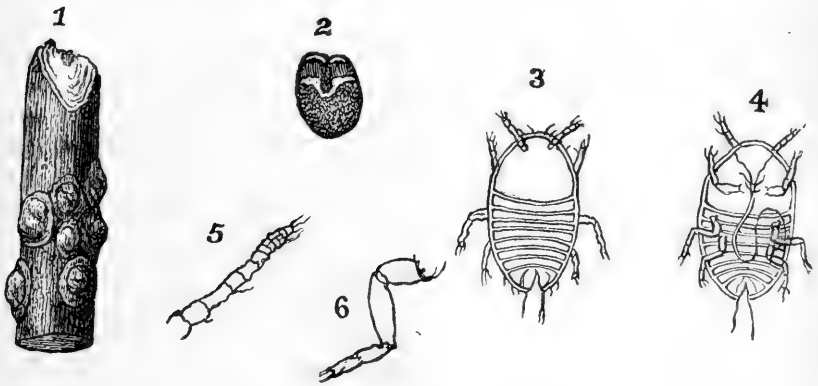
Since the date above given I have received these insects, through the several editors of our excellent bee papers, from many of the States, especially those bordering the Ohio River. In Tennessee they seem very common, as they are often noticed in abundance on the fine stately tulip trees of that goodly State. In the South this tulip tree is called the pop-

lar, which is very incorrect, as it is in no way related to the latter. The poplar belongs to the willow family; the tulip to the magnolia, which families are wide apart.

Wherever the tulip-tree lice have been observed, sucking the sap and vitality from the trees—there the bees have also been seen, lapping up a sweet juicy exudation, which is secreted by the lice. In 1870 I observed that our tulip trees were alive with bees and wasps, even as late as August, though the trees are in blossom only in June. Examination showed that the exuding sweets from these lice were what attracted the bees. This was observed with some anxiety, as the secretion gives off a very nauseating odor.

The oozing secretions from this and other lice, not only of the bark-louse family (Coccidæ), but of the plant-louse family (Aphidæ), are often referred to as honey-dew. Would it not be better to speak of these as insect secretions, and reserve the name honey-dew for sweet secretions from plants, other than those which come from the flowers?

The fact that this insect is yet undescribed—that it attacks one of our best honey trees, and is the source of a so-called honey-dew, leads me to append the following description, with illustrations.



NATURAL HISTORY OF THE LECANIUM TULIPIPERÆ.

The fully developed insect, like all bark-lice, is in the form of a scale (fig. 1), closely applied to the limb or twig on which it works. This insect, like most of its genus, is brown, very convex above (fig. 1), and concave beneath (fig. 2). On the under side is a cotton-like secretion,

common to all of the genus *Lecanium*, which serves to enfold the eggs. Underneath the species in question are two transverse parallel lines of this white down (fig. 2) ; one of them, probably the anterior, is nearly marginal, and is interrupted in the middle ; while the other is nearly central, and in place of the interruption at the middle it has a V-shaped projection back or away from the other line. The form of the scale is quadrangular, and not unlike that of a turtle (fig. 1). When fully developed it is a little more than 3-16 of an inch long, and a little more than ⅔ as wide.

Here at Lansing, the small, yellow, oval eggs appear late in August. In Tennessee they would be found under the scales in their cotton wrappings many days earlier. The eggs are 1-40 of an inch long, and 1-65 of an inch wide. These eggs, which are very numerous, hatch in the locality of their development, and the young or larval lice, quite in contrast with their dried, inert, motionless parents, are spry and active. They are oval (figs. 3 and 4), yellow, and 1-23 of an inch long and 1-40 of an inch wide. The eyes, antennæ (fig. 5) and legs (fig. 6) are plainly visible when magnified 30 or 40 diameters. The 9-jointed abdomen is deeply emarginate, or cut into posteriorly (fig. 3), and on each side of this slit is a projecting stylet or hair (figs. 3 and 4), while from between the eyes, on the under side of the head, extends the long recurved beak (fig. 4). The larvæ soon leave the scales, crawl about the tree, and finally fasten by inserting their long slender beaks, when they so pump up the sap that they grow with surprising rapidity. In a few weeks their legs and antennæ disappear and the scale-like form is assumed. In the following summer the scale is full-formed and the eggs are developed. Soon the scale, which is but the carcass of the once active louse, drops from the tree, and the work of destruction is left to the young lice, a responsibility which they seem quite ready to assume.

In my observations I have detected no males. Judging from others of the bark-lice, these probably possess wings, and will never assume the scale form, though Prof. P. R. Uhler writes me that some of the males are apterous. He says that it is very important to know and record the males, and that the genera are hardly determined without them.

REMEDIES.

If valued shade or honey trees are attacked by these insatiate destroyers, they could probably be saved by discrete pruning—cutting off

the infected branches before serious injury was done, or by syringing the trees with a solution of whale oil soap,—or even common soft soap would do—just as the young lice are leaving the scales. It would be still better to have the solution hot. Whitman's Fountain Pump is admirable for making such applications.

Fig. 1 is slightly magnified; the others are largely magnified. The drawings were made from the objects by W. S. Holdsworth, a senior of the Michigan Agricultural College.

DESCRIPTION OF TWO NEW SPECIES OF CATOCALA.

BY A. R. GROTE, BUFFALO, N. Y.

Catocala Beaniana, n. s.

Intermediate between *Briseis* and *Meskei*. Fore wings paler than *Briseis*, with the t. p. line more dentate, and the brown subterminal shade paler; sub-reniform open. Hind wings red like *Meskei*, the middle black band broader, interrupted, transverse and not like *Briseis*, where it is still broader, continued and rounded, not so straight across the wing. Beneath much like *Briseis*, with the black bands broader and the white interspaces narrower than in *Meskei*. The subterminal white dentate shade on the primaries above more dentate than in *Briseis*. This species is similarly sized with *Briseis*, and is best described comparatively with that species and *Meskei*. Sent me by Mr. Thomas E. Bean, under the number 574, from Illinois.

Catocala Westcottii, n. s.

♂ ♀. Allied to *anna*, but smaller, with pale yellow hind wings and continuous bands, the median band angulated inferiorly and not so constricted superiorly as in that species. The primaries closely resemble *anna* in markings; the black outer shade of the t. a. line is quite similar and approaches *anna* and *Westcottii* to the group of *nuptialis*, *abbreviatella* and *Whitneyi*. Beneath the pale yellow outer interspace is narrower in *Westcottii*, and there is no basal black ray on secondaries, which show the

black reniform mark on the disc as in *anna*. The mesial black band is subcontinuous and proportionately broader in *Westcottii*. Above the markings of fore wings are very similar in the two species; the tone is a little darker in *Westcottii*. The female expands 50, the male 43 mil. I have the male from Illinois, Mr. Bean, number 577; the female from Wisconsin, Mr. O. S. Westcott, for whom I name the species.

DESCRIPTION OF TWO NEW CALIFORNIAN BUTTERFLIES.

BY THEODORE L. MEAD, NEW YORK.

Chionobas Ivallda, n. sp.

MALE—Expanse $1\frac{1}{16}$ to $2\frac{1}{16}$ inches, average $2\frac{1}{16}$ inches. Upper side of primaries fuscous, with velvety discal bar and a submarginal row of gray-ochraceous spots between the nervures. These spots are usually six in number, situated in the consecutive interspaces between the nervules, beginning with the last but one subcostal interspace, counting from the apex of the wing. The second of these spots always contains a black ocellus, pupilled with white. On the fifth interspace (last median) are usually faint indications of a fuscous dot in about one-third of the specimens examined; in one instance this dot is distinct and pupilled with white.

The ochraceous spots are not sharply defined unless very well developed; their length is not more than one-third that of the inner margin of the wing; in breadth they sometimes occupy the whole interspace, leaving only a narrow border of fuscous on the nervule, while sometimes they are almost obsolete. The spots are always truncated on a line nearly parallel to the outer margin of the fore wing, thus leaving a fuscous border.

Costa mottled with gray and fuscous.

Secondaries gray-ochraceous with a fuscous border, usually with a pupilled ocellus in the second median interspace; this is occasionally obsolete. Nervures more or less distinctly fuscous.

Under side—Primaries gray-ochraceous, the pupilled spot or spots of the upper side shown more distinctly; the costa and apex mottled pale

gray and black. A distinct fuscous band as in *Chryxus* crosses the wing; it has a sharp tooth extending out on the upper branch of median nervule and occasionally one also in the last median interspace. Within this band is another, less distinct and often partly obsolete, but corresponding with the inner crenate band of secondaries. Near the outer margin is a border of sprinkled fuscous scales, condensed inwardly to a line which is nearer the margin than the similar one in *Chryxus*. The cell is closed by a bar of dark fuscous.

Ground color of secondaries gray with a tint of ochraceous, mottled with black; the ocellus of the upper side is always more distinct, even when absent above it is indicated below. The usual band of secondaries is as a rule distinct, though sometimes hardly distinguishable from the other mottling of the surface; as in *Uhleri*, the border is crenulate, quite variable as to the depth of the crenulations; the inner border with a sinus where it crosses the median nervure, in these respects much like *Chryxus*.

FEMALE—Expanse $2\frac{1}{10}$ to $2\frac{4}{10}$ inches. Primaries ochraceous above; the band of under side shown distinctly in fuscous, its tooth on upper branch of median nervure very noticeable; the nervures fuscous. Costa and outer margin rather broadly bordered with grayish fuscous; this border usually becomes obsolete near the angle of the wing, except a narrow line at the margin, which is always dark fuscous.

The two ocelli mentioned in the description of the male are always present in the female; usually also another on either side of the lower ocellus—in that case four in all.

Secondaries as in the male.

Margins of the fore wings entire, of the hind wings slightly crenulate in the male, decidedly so in the female; fringes fuscous cut with white.

C. Ivallda is distinguished immediately from *Chryxus* by the pale color; there is no trace of the fulvous tint shown by most of our Western species of *Chionobas*. The color, in fact, is almost exactly that of the curious *Hipparchia Ridingsii*, which has not only the appearance, but the habits of a *Chionobas*.

C. Ivallda is here described from 39 ♂ 8 ♀, one pair of which were taken by Mr. Morrison at Summit, and the rest by myself on Freel's Peak and Tallac Mountain, all three localities being within a few miles of Lake Tahoe, near the boundary line between California and Nevada. They

were taken during the latter part of July and early in August, at an elevation of nine to ten thousand feet above the sea.

This species is local and I believe extremely rare in most parts of its habitat. In a very thorough exploration of the mountain crests about Summit I found none ; I camped for two days on Freel's Peak for the express purpose of hunting this species, my father assisting me in the search ; although it seemed a favorable locality, but five specimens were taken, all males. On the grassy northern slope of Tallac Mountain, however, we were more successful, and by returning thither and again camping, a good series of specimens was obtained.

Chrysophanus Editha, n. sp.

Group of *Xanthoides* and *Dione*. Expands 1¼ to 1⅓ inches.

Male fuscous above, narrowly edged with black along the outer margin, and with black discal bar ; the usual spots show through very faintly on the upper side. Hind wings fuscous, with similar black edge, and within this a row of four or five black spots near the anal angle. The two nearest this angle are surrounded by an irregular ochraceous line. Under side of fore wings gray inclining to fuscous, cinereous on the disc, with the black spots as in allied species. Hind wings below gray-fuscous clouded with white. A rather broad band of gray-fuscous occupies the outer margin ; this band is crenated inwardly and cut by a fulvous line which begins on the abdominal margin, extends out on the submedian and last branch of median nervules, thus leaving a white, black-pupilled half-ocellus at anal angle, a large gray-fuscous crescent in the next interspace, and next to this a white, black-pupilled ocellus ; in this respect the present species resembles *Xanthoides* and differs from *Dione*, which has much more fulvous. At the inner edge of the gray-fuscous band the white clouding is condensed into a continuous line of broad lunules, and at the inner border of this is the row of spots always found in this genus ; these spots are quite large, pale gray-fuscous, edged with black and surrounded by white ; the discal bar is usually confluent with the dot within the cell, so as to form an irregular horse-shoe mark.

Fringes of all the wings composed of scales of two lengths, the upper and shorter set being nearly black, the lower ones white ; sometimes the black scales are a little longer in certain places, thus making the fringe seem white cut with black.

The last branch of median nervule of hind wings prolonged into a very slight tooth ; this is more distinct in the female, being there about as in *Xanthoides* ♂.

The female differs from the male in always having at least a small fulvous or ochraceous cloud upon the disc of fore wing, and a similarly colored streak at the outer angle. The cloud upon the disc is sometimes so extended as to cover half the surface of the wing. The spots of lower surface are rather distinctly shown above. In the middle of secondaries there is often an irroration of fulvous scales and a distinct scalloped fulvous line along the outer margin, enclosing a black crescent, or double dot near anal angle and smaller dots above.

Under side like the male, but brighter, and with markings more distinct ; a fulvous tint is also seen at outer angle of primaries.

This pretty little species may be distinguished from *Xanthoides*, its nearest ally, by its smaller size, the much more convex outer margins and more rounded outer angle of primaries, the blunter tooth of secondaries, the white clouding below and the large size of all the spots.

Described from thirty-three specimens, ♂ and ♀ in about equal numbers, taken on the borders of Lake Tahoe, near Carnelian Bay, on the 26th of July. In a stay of some weeks around Lake Tahoe, during which I was constantly collecting, this species was only once met with, then appearing in considerable numbers and easily taken on the flowers of Yarrow *(Achillea millefolium)*, which is already a common weed in many parts of California.

ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The eighth annual meeting of the above Society was held at the residence of Mr. Wm. Saunders, on the evening of the 20th Sept., 1878. The President, W. Saunders, in the chair. Letters of apology for non-attendance were read from the following members of the Council : Jas. Fletcher, Ottawa ; J. G. Bowles, Montreal, and J. Pettit, Grimsby. The President also reported that in consequence of removal to Montreal, Mr. J. Williams had been obliged to resign the office of Secretary-Treasurer.

The report of the Montreal Branch was read by the Secretary, showing that organization to be in a prosperous condition, and the members active in the work of promoting Entomology in Canada. On behalf of the Council of the parent Society, Mr. Saunders reported a number of valuable acquisitions to the Library.

The President then read his Annual Address, after which a vote of thanks was tendered, coupled with the request that a copy be furnished for publication in the ENTOMOLOGIST.

The election of officers next took place, with the following results:—President, Wm. Saunders, London; Vice-President, Rev. C. J. S. Bethune, Port Hope; Secretary-Treasurer, Jas. H. Bowman, London. Council—E. B. Reed, London; Wm. Couper, Montreal; J. Pettit, Grimsby; J. M. Denton, London; Rev. R. Burnet, London; G. J. Bowles, Montreal; Jas. Fletcher, Ottawa, and R. V. Rogers, Kingston. Editor, W. Saunders, London. Editing Committee—Rev. C. J. S. Bethune, Port Hope; E. B. Reed, London; G. J. Bowles, Montreal, and Rev. R. Burnet, London. Librarian, W. E. Saunders, London. Library Committee—E. B. Reed, J. M. Denton, H. B. Bock, with the President, Librarian and Secretary-Treasurer. Auditors, Messrs. Chas. Chapman and A. Puddicombe.

Succeeding the business portion of the meeting, an interesting and instructive hour was spent in the microscopic examination of insects and plants with the aid of three excellent microscopes belonging to Messrs. Puddicombe, Denton and Saunders. Among the objects of special interest were egg clusters of *Clisiocampa sylvatica*, with mites at work destroying the eggs; mounted specimens of the new Carpet Bug, *Anthrenus scrophulariæ*, and of the parasite on the Cabbage Butterfly, *Pteromalus puparum*.

IMPORTANT ANNOUNCEMENT.

In consequence of removal, our late Secretary-Treasurer, Mr. J. Williams, was obliged to resign his office. Our correspondents will please bear in mind that in future all business communications should be addressed to his successor, Mr. Jas. H. Bowman, London, Ont.

Canadian Entomologist.

VOLUME X.

WM. SAUNDERS.

THE CANADIAN ENTOMOLOGIST.

Devoted to the Entomology of North America

General Editor:—W. SAUNDERS, London, Ont.

Editing Committee:—REV. C. J. S. BETHUNE, M. A., Port Hope, and Messrs. E. BAYNES REED, London; and G. J. BOWLES, Montreal.

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The Canadian Entomologist.

VOL. X. LONDON, ONT., NOVEMBER, 1878. No. 11

A NEW GALL MOTH, AND NOTES ON LARVÆ OF OTHER GALL MOTHS.

BY D. S. KELLICOTT, BUFFALO, N. Y.

There have been described, thus far, three N. American moths whose larvæ produce galls, or more or less decided enlargements of the stems of their food-plant. They are, first, *Gelechia gallæsolidaginis*, described by Riley, with cuts, in the First Mo. Rept. at page 173 ; accompanying the description is an account of six parasites. Second, *Walshia amorphilla*, described by Clemens in Proc. Ent. Soc. Phil., vol. ii., page 419 ; also an account of larva habits, etc., with cuts, is given in the Second Mo. Rept. at page 132. Third, *Paedisca (Eurypłychia) saligneana*, described by Clemens in Proc. Ent. Soc. Phil., vol. v., page 141 ; an account of it also occurs in the Second Mo. Rept., page 134.

I have found *G. gallæsolidaginis* common at different places in Michigan and about Buffalo, N. Y. However, its enemies are so numerous of late at Buffalo that not above one-half of the galls escape, so the insect is much less common than it was a few years since. I have but few facts to add to those given in the excellent monogragh of Prof. Riley cited. I find that the galls are *not* always on dwarfed specimens of the plant, and, further, the larva does *not* bore entirely through the stem and then make the plug, but cuts away the walls and inner bark, leaving the epidermis which dries and falls away after the plug is completed. These galls are of frequent occurrence on plants much branched and of full altitude ; they are lower on the stem than those of the fly *Trypeta solidaginis*, or of the moth *Paedisca saligneana*, and are therefore less conspicuous. On the other hand, they are more readily found than the large, oblong gall made near the ground on the golden-rod by a fly whose name is unknown to me.

Paedisca saligneana, the mis-named gall moth, is a very common insect in the vicinity of Buffalo. The habits of the larva have not, I believe, been published. Riley in the Second Mo. Report gives reasons for concluding that it is an intruder on *G. gallæsolidaginis*. It certainly is not.

The moth begins to appear about June 20th. In a few days the minute larvae may be found penetrating the stem just above the axil of a leaf near the top of the plant; sometimes they occur in a branch. The larva cuts right across the stem and soon clears out everything but the bark. The point attacked is soon surrounded by an enlarged ring, which is an effort of the plant to strengthen its weakened stem by adding new material to the outside layers; the ring continues to increase in diameter and in length upwards. The average mature gall is two and one-half times the diameter of the stem in thickness, and four times as long as broad. During the growth of the gall there is a "window," usually near the bottom, consisting of a tubercle pierced with a round orifice which is temporarily closed by a web membrane. The tubercle is probably at the point where the larva entered the stem. The purpose of this gateway seems to be for ventilation and for ejection from time to time of the castings which accumulate at the bottom of the cavity.

The larva during the summer is dusky, during the winter dull white; it attains a length of .56 to .6 of an inch; head and cervical shield dark brown or black; on the segments are large piliferous spots arranged as follows: on first segment one in front and below the spiracle, the second has a transverse row of six, the third to twelfth each has the transverse row of six and two on the dorsum behind the row.

In the autumn, when full fed, it spins a thin lining to its house and remains all winter at the lower extremity; when spring quickens it ascends, bores near the top a round passage-way, leaving, however, an external scale of bark after the manner of *T. solidaginis*. It then spins a close white cocoon reaching up to the point of final exit. It remains a pupa about three weeks. When the time has come for the final change, the pupa, assisted by the spines on the abdominal rings, ascends the silken-lined gallery, and with the prow on its front, breaks up the door, protrudes two-thirds its length, where it remains until the moth escapes, leaving the pupa-skin to tell the tale.

The pupa is rather slender, curved like a *Cossus* chrysalis, brown, teeth on abdominal rings prominent; there is on the front a strong beak, which serves a good turn when the insect escapes.

I have met only one parasite, an ichneumon fly. It is not abundant.*

There is still another moth known to me whose habits are very similar to those of *Gelechia gallæsolidaginis* Riley. I present its history and description, and propose to call it *Gelechia gallæasterella.*

Larva—Length .4 of an inch. Color tawny, head black, cervical and anal shield composed of ragged brown patches, true legs dark, terminal joint light. Piliferous spots mostly small and round, arranged thus : first segment has one below and one in front of the spiracle, second and third one above the foot and a triangle above it, fourth to eleventh two below the spiracle and a triangle above, the bases of which make a row on the sides of the dorsum.

Pupa—Length .33 of an inch. Brown, head and thorax quite dark. The head and eyes are rather more prominent than the pupa of *gallæsolidaginis ;* it is also stouter.

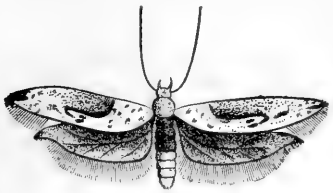

Fig. 1. (x2)

Imago—Length .32, expanse .8 of an inch (average of five). Fore wings white, speckled with brown and black ; there is a brown patch occupying the costal half of the middle third ; it is darkest towards the base ; bordering the hind margin of the patch is a distinct (under a lens) dark brown line which terminates in a hook ; just behind the middle of the patch are two short, parallel, black dashes ; beyond these, in line with the apex, is a short, black, irregular mark. Cilia touched with brown, the tips quite dark. Hind wings gray ; cilia light with a tinge of yellow ; tips dark. Palpi white with brown scales on outside of second joint ; terminal joint black nearly half its length, extreme tip white. Antennae annulated with brown and white. Head white, thorax white more or less streaked with brown. Abdomen gray peppered with dark scales below, the first three segments yellow above.

Described from several bred specimens.

* There is a fourth moth which I have found at different places in Ont. and New York, whose larva produces a gall on the Willow. Its habits are almost identical with those of *saligneana.* I had its history in manuscript to accompany this paper, but when about to send it to the publisher, Prof. C. H. Fernald informed me that Prof. C. V. Riley also has it in manuscript. It will finally be published as *Grapholitha gallæsaliciana.*

Food plant, *Aster corymbosus*, on the stems of which it makes an elliptical, hollow gall, 1.25 inches in length, .48 of an inch in diameter, the diameter of the plug (fig. 2) being .08 of an inch.

The galls are found a few inches above the ground, the terminal bud developing very little after the larva begins operations. May 22nd I found full-sized galls, the inhabiting larva at the time being quite small. July 1st I discovered the first pupa which disclosed a moth, August 1st. The larva just previous to its change makes a perfectly round hole (leaving a thin scale of the epidermis) through the thin walls near the top of its house, which it fills with a closely-fitting plug of silk; on the outer border of this plug is a flange which prevents its displacement inwards, but allows the escaping moth to readily push it outwards. It then lines the interior with silk and soon changes to a chrysalis.

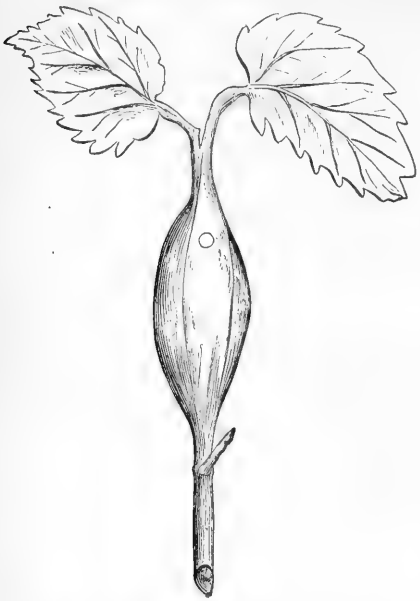

Fig. 2. Nat. Size.

Tweive galls collected August 3rd contained four without parasites, while eight had an elliptical, dark cocoon suspended in the centre.

NOTES ON PAPILIO CRESPHONTES AND CATOCALÆ.

BY G. H. FRENCH, CARBONDALE, ILL.

This season I have seen some peculiarities in rearing *Papilio cresphontes* that seem worth noting. I had at one time four of the larvæ in a cage of three different broods. The two older ones changed to chrysalids June 29th; one from the top of the box with the head down, number two

on the side with head up. Number three pupated July 11th, on the side of the box, head up; number four changed July 14th, suspended from the top the same as number one, all of them at an angle with the object to which they were attached, as is usual with *Papilios*. Numbers one and three produced imagines July 15th and 29th, or after a pupal period of fifteen and sixteen days respectively. August 4th, numbers two and three remained unhatched, having remained in this state thirty-six and twenty-four days, and they presented no indications of hatching. At this time I turned the box on its side, so that the heads were suspended downward instead of pointing upward. August 7th both produced perfect imagines.

Among my captures of Catocalæ this season in this vicinity, are *C. marmorata* Edw., *C. sappho* Streck., and *C. delilah* Streck., on white oak trees, the last June 29th, the second July 18th and 19th, and the first September 7th.

DESCRIPTIONS OF NEW ICHNEUMONIDÆ.

BY E. T. CRESSON, PHILADELPHIA, PA.

Genus MESOSTENUS Grav.

MESOSTENUS NUBILIPENNIS.— ♀. Black; anterior orbits, lower part of cheeks, spot on middle of face, most of clypeus and labrum, spot on mandibles, annulus on antennæ, line on sides of collar, spot on each side of prothorax above, spot on disk of mesothorax, most of scutellum, dot on post-scutellum, tegulæ, spot beneath, spot on sides of pleura, spot on each side behind posterior wing, two elongate marks on metathorax behind covering the prominent, obtuse and transversely compressed tubercles, the four anterior coxæ, spot on posterior pair above, annulus at base of posterior tibiæ, extreme base and apex of the first joint of posterior tarsi, the second, third and fourth joints entirely, and the apical margin of segments 1–6 of abdomen, all white; front unarmed; thorax opaque; mesothorax confluently punctured; metathorax reticulated; wings hyaline, with a fuliginous cloud beneath stigma, areolet quadrate, closed; legs fulvous, extreme tips of posterior femora, their tibiæ except white annulus near

base, most of basal joint of their tarsi, and the apical joint, black ; abdomen fusiform, rather shining, punctured, first segment considerably dilated at apex ; ovipositor shorter than abdomen. Length .30 inch.

Hab.—Georgia (Morrison). Very much like *albomaculatus* Cress., but readily distinguished by the fuliginous cloud on anterior wings.

MESOSTENUS CANDIDUS.—♂. Black ; orbits, face, clypeus, labrum, palpi, line on collar, spots on each side of prothorax above, two lines on mesothorax, scutellum, spot on post-scutellum, tegulæ, spot beneath, transverse line on sides of pleura, short line or spot beneath, curved spot behind each posterior wing, four spots on metathorax posteriorly, arranged in a transverse line, those on posterior face covering the short obtuse tubercles, four anterior coxæ and trochanters, base above and apex beneath of posterior coxæ, their tarsi except base and extreme tips, base and apex of first abdominal segment, and apical margin of second and following segments, all white ; front unarmed ; antennæ entirely black ; mesothorax confluently punctured, without distinct impressed lines ; metathorax reticulated ; wings hyaline, with an æneous gloss, areolet open ; legs fulvous, base beneath and apex above of posterior coxæ, extreme tips of their femora, their tibiæ except base, and extreme base and apex of their tarsi, black ; abdomen slender, smooth and polished, first segment slightly dilated at tip, the second much narrowed to base. Length .30 inch.

Hab.—New York (Comstock).

MESOSTENUS FORTIS.—♀. Black ; orbits, face except two spots above clypeus, clypeus, labrum, spot on mandibles, palpi, broad annulus on antennæ, line on collar, spot on each side of prothorax above, two lines on mesothorax, scutellum, spot on each side before on basal ridge, post-scutellum, tegulæ, dot beneath, longitudinal line on sides of pleura nearly confluent with a short curved line posteriorly and beneath, a line before each intermediate coxa, spot behind posterior wing, two spots on posterior face of metathorax covering the short blunt tubercles, a round spot on each flank, all the coxæ except tips of posterior pair above, four anterior trochanters, base of first abdominal segment, and narrow apical margin of all the segments above, all white ; front unarmed ; antennæ thickened beyond the middle ; mesothorax without distinct impressed lines, sparsely punctured, longitudinally striated on disk ; wings hyaline,

slightly dusky at tips, areolet open ; legs pale fulvous, tarsi paler, apex of posterior coxæ above black ; abdomen fusiform, shining, impunctured, first segment gradually dilated at tip ; ovipositor as long as the abdomen. Length .45 inch.

Hab.—New York (Comstock). This may prove to be the ♀ of *candidus.*

MESOSTENUS DILIGENS.—♀. Black ; orbits, very broad on cheeks beneath, face except medial spot, clypeus, base of mandibles, palpi, broad annulus on antennæ, collar, large spot on each side of prothorax above, two lines on mesothorax, scutellum, short oblique line on each side anteriorly, spot on post-scutellum, tegulæ, spot beneath, large spot behind each posterior wing, small one beneath, large oblique line on sides of pleura confluent with mark in front of intermediate coxæ, flanks of metathorax, two large sub-cuneiform marks on posterior face covering the short blunt tubercles, four anterior coxæ, first abdominal segment except black spot above near tip, spot on each basal corner of second segment, and broad apical margin of segments 2–6, all white ; front unarmed ; mesothorax with indistinct impressed lines ; wings hyaline, areolet open ; legs pale fulvous, tarsi paler, extreme tips dusky, posterior coxæ with white spot above ; abdomen fusiform, impunctured, first segment rather broadly dilated at tip ; ovipositor shorter than abdomen. Length .32 inch.

Hab.—Illinois (Lewis).

MESOSTENUS AUDAX.—♀. Black ; orbits, broad on cheeks beneath, sides and middle of face, most of clypeus, spot on mandibles, palpi, broad annulus on antennæ, line on collar, spot on each side of prothorax above, two short lines on disk of mesothorax, scutellum, spot on post-scutellum, tegulæ, spot beneath, oblique line on sides of pleura, smaller one immediately beneath, spot behind posterior wing, round spot on flanks of metathorax and two spots on posterior face covering the short blunt tubercles, all white or yellowish-white ; front unarmed ; mesothorax confluently punctured, with indistinct impressed lines ; metathorax rather coarsely reticulated ; wings hyaline, faintly yellowish, areolet open ; legs fulvous-yellow ; coxæ dull whitish, posterior pair tinged with fulvous, tarsi pale yellow, extreme tips dusky ; abdomen fusiform, impunctured, first segment and apical and lateral margins of remaining segments, dull whitish, sometimes more or less tinged with fulvous, especially the disk of post-petiole,

which is rather broadly dilated ; ovipositor shorter than the abdomen. Length .55 inch.

Hab.—Georgia (Ridings).

MESOSTENUS EXAPTUS.—♀. Black ; head and thorax marked exactly as in *audax ;* front unarmed ; mesothorax rather sparsely punctured, the two impressed lines distinct only in front ; metathorax reticulated, broad and flat on posterior face, sub-pubescent ; the tubercles short and obtuse ; antennæ robust toward tips ; wings hyaline, slightly dusky at tips, areolet open ; legs fulvous-yellow, anterior coxæ and trochanters whitish, tarsi yellowish ; abdomen fusiform, shining, impunctured, apical margin of the segments narrowly whitish, the first segment, and anterior margin of the yellowish band on second segment, fulvous, post-petiole rather broadly dilated ; ovipositor a little longer than the abdomen. Length .32 inch.

Hab.—Massachusetts (Ridings).

MESOSTENUS SAUNDERSI.—♀. Black, shining ; anterior orbits interrupted on sides of face, short line on posterior orbits, spot on clypeus, palpi, annulus on antennæ, spot on scutellum, dot behind, the short blunt tubercles on metathorax, tegulæ, and dot beneath, all yellowish-white ; mesothorax sparsely punctured, without impressed lines ; metathorax broad, reticulated, flat on posterior face ; sides of pleura longitudinally excavated, polished ; wings hyaline, faintly dusky at tips ; areolet open ; legs fulvous, posterior tibiæ dusky at tips, tarsi pale yellowish, fuscous at extreme tips ; abdomen fusiform, shining, impunctured ; the first segment entirely, and broad apical margin of second segment, fulvo-ferruginous, apical margin of remaining segments narrowly whitish, interrupted on disk of third segment ; post-petiole rather broadly dilated ; ovipositor as long as the abdomen. Length .40 inch.

Hab.—Canada West (Mr. Wm. Saunders). In this species the head and thorax are almost entirely black.

MESOSTENUS LATICINCTUS.—♀. Black, opaque ; broad orbits, face, clypeus, mandibles except tips, palpi, broad annulus on antennæ, collar, broad line on each side of prothorax above, spot on disk of mesothorax, scutellum, large mark on each side behind posterior wings, spot beneath them, flanks of metathorax, two elongate marks on posterior face covering the prominent transversely compressed obtuse tubercles, tegulæ, dot

beneath, broad oblique mark on sides of pleura, confluent behind with a large mark covering almost entirely the under surface, four anterior coxæ and trochanters, and broad band at tip of abdominal segments, all white ; front unarmed ; antennæ long, sub-robust at tip ; mesothorax very finely and densely punctured, metathorax more coarsely so ; wings sub-hyaline areolet open ; legs fulvous-yellow, posterior coxae with base beneath and apex above black, posterior tarsi yellow, fuscous at extreme tips ; abdomen sub-fusiform, the base and apex shining, post-petiole gradually dilated ; ovipositor about half the length of the abdomen. Length .35 inch.

Hab.—Louisiana (Lewis).

MESOSTENUS PROMPTUS.—♂. Black ; anterior orbits broad on sides of face, clypeus, mandibles except tips, palpi, spot on each side of prothorax above, lateral carinae at base of scutellum, tegulae, four anterior coxae and trochanters beneath, and posterior tarsi except base and apex, white ; sometimes the middle of the face is more or less white ; antennae entirely black, slender at tips ; front unarmed ; mesothorax shining, sparsely punctured, the two longitudinal lines deeply impressed, the middle lobe prominent ; metathorax with lateral carinae of posterior face sharply defined, but without prominent tubercles or spines ; wings sub-hyaline, areolet sub-quadrate, closed ; femora fulvo-ferruginous, four anterior tibiae and tarsi yellow ; abdomen slender, sub-compressed at tip, fulvo-ferruginous, the three or four apical segments black. Length .35 inch.

Hab.—Canada (Pettit) ; Illinois (Lewis).

MESOSTENUS AMERICANUS.—♀. Black, shining ; short line on upper anterior orbits, palpi obscurely, annulus on antennae, interrupted beneath, obscure line on each side of scutellum at base, and dot on tegulae, whitish ; front unarmed ; mesothorax with well impressed lines ; metathorax rather coarsely sculptured, with a smooth polished space on each side at base, sides of posterior face with sharply defined carina, but without prominent tubercles or spines ; wings sub-hyaline, areolet longitudinally subquadrate, closed ; four anterior legs, except coxae and trochanters, and posterior femora ferruginous, posterior tibiae and tarsi fuscous, joints 2–4 of the latter occasionally more or less pale ; abdomen narrow fusiform, shining, impunctured, ferruginous, apical segments sometimes dusky, first segment long, slender, apical third rather suddenly dilated and subquadrate ; ovipositor as long as the abdomen. Length .30–.33 inch.

Hab.—Maine (Fernald); Virginia (Ridings). This has much the appearance of a small specimen of *Cryptus americanus* Cress.

MESOSTENUS MACILENTUS.—♂. Black; orbits broad on cheeks, clypeus, base of mandibles, palpi, line on collar, upper margin of prothorax interrupted medially, spot on disk of mesothorax, scutellum, spot behind each posterior wing, line on flanks of metathorax, two spots at tip above, tegulae, spot beneath, two spots on sides of pleura, the anterior one the largest (both sometimes wanting), and spot at base of all the coxae, all white; front unarmed; antennae entirely black; mesothorax prominently trilobed; metathorax unarmed, pubescent; wings more or less dusky, areolet minutely quadrate, closed; legs long and slender, fulvo-ferruginous, black line at base of posterior femora within, their tibiae and tarsi more or less dusky, the second and third joints of the latter more or less pale; abdomen long, slender, ferruginous, apical segments sometimes obfuscated; first segment long, linear, stigmata prominent. Length .40 inch.

Hab.—Illinois, Louisiana (Lewis); Texas (Heiligbrodt).

NOTES ON SEVERAL SPECIES OF COLEOPTERA, WITH SOME ACCOUNT OF HABITS, ETC.

BY CHARLES DURY, AVONDALE, HAM. CO., OHIO.

Meglodacne Ulkei Crotch.

This pretty and interesting species, described by Mr. G. R. Crotch from a single specimen in the collection of Prof. Ulke, of Washington, D. C., who received it from Kentucky ten years ago, has remained unique in his collection until I found it, together with its larvæ and pupa.

Its food is fungus *(Polypora)* growing on logs. Its full-fed larvæ are ⅞ inch long, rather slender, of light color, with the head brown; it eats out a cavity in the fungus, and there transforms to a pupa, which is of a pale flesh color. When the beetle first hatches from the pupa it is of a very light pinkish color, without any markings whatever. When it hardens it

acquires the black spots and the deep red color, with which its elytra are ornamented. A species of brown ant appears to prey on it, as I saw several larvæ and soft imagines being dragged away by these ants. The habits of the adult differ somewhat from *M. heros* and *fasciata*, in that *Meg. Ulkei* lives more inside the fungus and is less inclined to drop to the ground when the fungus is jarred.

Habitat—Campbell Co., Ky. ; July, 1878.

Bothrideres (Machlotes) exavatus Mels., and *gemminatus* Say.

These two species were found under and in the bark of an old elm tree, and were from the ground up 26 feet. They vary much in size. The larva constructs a very curious semi-transparent cocoon, flat on one side and convex on the other, and generally several joined together in a cluster. On emerging the imago is very light, but soon hardens and gets quite dark-brown colored.

Campbell Co., Ky.; July, 1878.

Omophron robustum Horn.

This species is described by Dr. Horn from specimens from Nova Scotia, and I believe Mr. Shwartz took a specimen or specimens on Lake Superior. In company with *Om. americanum* Dej. and *tessellatum* Say *robustum* was secured. While these species preferred sloping sandy banks near the water, many were taken on mud banks. On deluging the bank with water, it was amusing to see them rush out and up the bank.

Ham Co., Ohio ; July, 1878.

A FEW HINTS ON COLLECTING LARVÆ OF DARAPSA VERSICOLOR.

BY ROBERT BUNKER, ROCHESTER, N. Y.

For several years past I have searched carefully for larvæ of this species, only to be rewarded with damaged wardrobe and wet feet. This season I determined to try the plan of breaking off the button-bush branches and shaking them over paper spread on the ground. On my

first trial I secured one nearly full-grown larva of *versicolor*, and six half-grown larvæ of *promethea*. Unfortunately I was unable to visit the bushes again until it was too late. The advantages this method has over that of examining the bushes while standing are manifold. In the first place, four times as many branches can be examined in the same length of time. Secondly, not a larva, great or small, can escape observation. Last, and not least, eggs may be detected, because, as is well known, insects generally lay their eggs on the under side of the leaf or on the stem. Another advantage to the collector is that the wood of this shrub is very brittle, and fifty branches can be broken off in a few minutes.

I observed one characteristic not mentioned by Geo. D. Hulst in his description of *D. versicolor*. In moving from one branch to another it feels its way step by step, stretching out the thoracic part of its body three times its ordinary length, and then suddenly drawing back, repeating the same several times before venturing forward, reminding me strongly of the manœuvring of a large tropical basket-worm I once had the pleasure of rearing. As many of the branches of the button-bush hang directly over the water, the larva seems to know by instinct that a fall would be fatal, and no doubt (as Mr. H. Strecker has suggested) many of them are lost in this way.

A Remarkable Entomological Collection.—Some details have reached us concerning a large collection in Entomology made by Henry Edwards, of San Francisco, during the last 25 years. Professor Davidson, President of the Academy of Sciences, states that this collection of insects is one of the largest ever made in the United States, and by far the most complete ever made on the Pacific coast. It consists of about 60,000 species, comprising more than 200,000 specimens. These include not only all the orders on the Pacific coast, but nearly or quite all in the United States, with a large representation of orders from all parts of the world. The collection is said to be really one of the most complete known in any country. It is valued at $12,000, or rather, that is about the sum expended in freights, cabinets and the purchase of rare specimens. The labor of 25 years is not estimated.—*Times (London, Eng.)*

INSECTS OF THE NORTHERN PARTS OF BRITISH AMERICA.

COMPILED BY REV. C. J. S. BETHUNE, M. A.

From Kirby's Fauna Boreali-Americana : Insecta.

(Continued from Vol. x., p. 139.)

FAMILY ACANTHIADÆ.

389. ARADUS TUBERCULIFER *Kirby.*—Plate vi., fig. 5. Length of body 3¾ lines. A single specimen taken with preceding.

[279.] Body dull black, very flat. Head with the nose prominent and obtuse, and the front armed with a sharp tooth on each side; antennae black with the second joint rufous all but the tip; the last joint white at the tip; prothorax with a short anterior truncated lobe, widest in the middle where the sides form a rounded angle; emarginate posteriorly; edge very minutely serrulate; six longitudinal ridges occupy the disk of the thorax, the two external ones are abbreviated and rather obtuse; scutellum with a reflexed margin, and bearing on its disk a large subhemispherical tubercle; hemelytra reticulated with cinereous, especially the membrane; abdomen with a broad margin, and the last segment bilobed with incurved lobes.

This species appears to be related to *A. depressus* and *elevatus* Fabr., and to *A. quadrilineatus* of Say.

390. ARADUS AFFINIS *Kirby.*—Length of body 2½ lines. Several taken with preceding.

Extremely similar to *A. tuberculifer*, but much smaller. Antennæ entirely black; prothorax not extended anteriorly, so as to form a lobe; lateral abbreviated ridge more obtuse, resembling a tubercle; margin of the abdomen with a white point at the apex of each segment; anus not lobed.

FAMILY REDUVIADÆ.

[280.] 391. REDUVIOLUS INSCRIPTUS *Kirby.*—Plate vi., fig. 7.—Length of body 3 lines. A single specimen taken with preceding.

Body of a pale or yellowish white, linear-oblong, widest posteriorly. Antennae shorter than the body, rufous, three last joints very slender;

head and prothorax streaked and dotted with black; with the anterior lobe of the latter constricted next the head, separated from the posterior by an impressed sinuated black line; scutellum black with two pale longitudinal elevations, thickest anteriorly; hemelytra with the nervures whiter than the rest of their substance; with three blackish discoidal dots arranged longitudinally from the middle to the membrane; thighs dotted with black, the anterior pair being incrassated and thicker than the intermediate, and these than the posterior, which are not incrassated; back of the abdomen black, with a white lateral margin, underneath with three longitudinal black stripes.

[281.] 392. CHIROLEPTES RAPTOR *Kirby*.—Length of body nearly 4 lines. Two specimens taken in the road from New York to Cumberland-House.

Body black and shining. Head subrhomboidal, connected with the prothorax by a long cylindrical and transversely wrinkled neck, which altogether gives the animal a serpentine aspect; legs pale; shoulders much incrassated, blackish at the tip, armed below with several strong spines; cubits with a single intermediate one; prothorax bell-shaped, black, dull from inconspicuous pubescence; scutellum dull, white at the tip; hemelytra dull from pubescence, blackish-brown, with paler lines which extend into the membrane; lateral margin white; abdomen black, with the ventral lateral margin white.

This species approaches very near to Say's *Reduvius raptorius*, but it is distinct.

[282.] 393. NABICULA SUBCOLEOPTRATA *Kirby*.—Length of body 4 lines. Taken with the preceding.

Body apterous, black, without any gloss. Head subtriangular, antennæ rufous; thorax bilobed, first lobe thrice as long as the last, bell-shaped; last a little wider than the first, flattish; hemelytra a little shorter than the abdomen, brownish-black, punctured; lateral margin obscurely rufous; membrane scarcely differing in substance or colour from the rest of the hemelytrum; legs rufous? abdomen obtusangular underneath.

FAMILY HYDROMETRIDÆ.

394. GERRIS RUFO-SCUTELLATA *Latr*.—Length of body 6⅓ lines One specimen taken in Lat. 65°.

Body underneath black, covered with silver pile. Head brown-black, subpilose; two first joints of the promuscis black and robust, the remainder rufous and more slender; antennae rufous with the last joint black; eyes large, subhemispherical, brown; prothorax dull-ferruginous, with the lateral margin, a dorsal subelevated line, and the scutellum, paler; legs rufous, pale at the base; hemelytra dull-ferruginous, with the lateral margin and nervures black; the bead that forms the lateral margin of the abdomen, and the two last segments, are rufous; the anal spines are very little shorter than the tail.

[283.] 395. GERRIS LACUSTRIS *Linn.*—There were three pupæ of this species taken, which do not appear to differ from the European specimens.

FAMILY CORIXIDÆ.

396. CORIXA STRIATA *Linn.*—Length of body 3—3¼ lines. Many specimens taken with the preceding.

Body yellowish, depressed, naked, smooth. Head inflexed, obtuse; eyes brownish, triangular; antennae inserted before the eyes under the lateral margin; scape incrassated; remaining joints together are setiform; prothorax subtriangular, with the hemelytra, brown, streaked transversely, with irregular yellow streaks; epipleura not streaked, pale-yellow; breast black, spotted with yellow on the sides; legs yellow; anterior and posterior tarsi natatory; the latter longer than the tibiae; abdomen with the first ventral segment, and an abbreviated basilar band of the second, black.

VARIETY B. With the first joint of the posterior tarsi black at the tip. This may be a distinct species; there were seven specimens distinguished by a black annulet surrounding the terminal half of the first dilated joint of the tarsus in question.

[284.] 397. CORIXA CARINATA *Kirby.*—Length of body 4 lines. Two specimens taken with preceding species.

Body yellow underneath, embrowned at the insertion of the legs. Head yellow; front broad and flat; labrum transversely tricarinate; occiput obtusangular; vertex with an obsolete longitudinal ridge issuing from the

angle of the occiput; prothorax with a longitudinal intermediate ridge, transversely streaked with yellow and brownish black; hemelytra sprinkled, and towards the base almost streaked, with black and yellow. In other respects this species resembles *C. striata*.

398. CORIXA PLANIFRONS *Kirby*.—Length of body 4 lines. Two specimens taken with the preceding.

This species differs from the preceding in having the under side of the body black, with two pale spots on each side of the breast, and the anal half of the abdomen pale-yellow. The head is yellow, the vertex is ridged longitudinally and separated from the front by a transverse curvilinear ridge; and from which the anterior part of the face is inflexed, plane or slightly concave; in other respects this species exhibits exactly the same characters with *C. carinata*. They may perhaps be sexual varieties.

[285.] FAMILY NOTONECTIDÆ.

399. NOTONECTA INSULATA *Kirby*.—Length of body 6⅔ lines. A single specimen taken.

Body underneath black, above yellowish. Head yellowish, with a brownish longitudinal stripe between the eyes, which are reddish; scutellum very black, velvetty; hemelytra with the lateral margin brown spotted with yellow; the posterior half of the hemelytra is brown anteriorly, black-brown in the middle, fuliginous at the apex; in this darkened portion anteriorly is a yellowish triangle connected with the last marginal spot, and posteriorly is a white kidney-shaped spot followed by the sooty apex; breast very hairy with longish fuliginous hairs; legs yellowish.

VII. HOMOPTERA.

FAMILY CERCOPIDÆ.

400. CERCOPIS MARGINELLA *Fabr*.—Length of body 3¼ lines. Taken with the preceding, and at Carlton-house in April.

Body black, dotted and inscribed with white. Hemelytra embrowned; nervures black; lateral margin sanguine; margin of the abdomen edged with white.

[286.] VIII. LEPIDOPTERA.

FAMILY PAPILIONIDAE.

401. PAPILIO TURNUS *Linn.*—Taken in Canada by Dr. Bigsby. [It is, of course, quite unnecessary to repeat Kirby's description of this very familiar butterfly.]

[287.] 402. COLIAS EDUSA *Fabr*,—Several specimens from North America. [This species is, no doubt, *C. eurytheme* Boisd., which is quite common at Sault Ste. Marie and other localities in the North-west. For description and admirable figures see Edwards' "Butterflies of North America," vol. i., part iv.]

PERSONAL.—Our esteemed friend, J. Pettit, Esq., has removed from Grimsby, Ontario, to Buffalo, New York. Correspondents when writing him will please bear in mind this change of address.

CORRESPONDENCE.

A CHEAP ENTOMOLOGICAL CABINET.

DEAR SIR,—

I have recently been looking over the back volumes of the ENTOMOLOGIST, and have found them, as I do the later numbers, very interesting and instructive reading. Among other valuable items, I have noticed suggestions regarding the construction of cheap cases for holding specimens, and as the question of expense is always an important one, especially to young collectors, I will, if you can spare me space, briefly describe the style of cabinet I am now using, and which has been adopted by one of my friends.

Among the substitutes for cork mentioned by Packard (in his Guide to the Study of Insects) are thin frames covered on each side with paper

and fitted into the bottom of drawers in a cabinet. Now I have gone a step farther, and discarding the drawers entirely, have adopted the frames and adapted them to a cabinet without drawers. This cabinet can be made of any size and be divided by upright partitions to suit the taste of the owner, and the frames can run in grooves made in the sides and partitions before it is put together, or between movable strips tacked or screwed in afterward at suitable distances, say two inches. The one I now use (a small one made as an experiment) is three feet two inches wide inside, with two partitions, so that there are three spaces each one foot in width. It is fifteen inches deep and two feet high. Placing the frames two inches apart gives me twelve in each section, or thirty-six in all, and as each has a surface of twelve by fifteen inches, I have an aggregate expanse of thirty-six square feet. The advantages claimed for this cabinet are its lesser weight and expense. It is easily handled and can stand pretty rough usage without fear of damaging specimens, as the pins are firmly held, and the frames, running in grooves or between strips, cannot stir when the door shuts close against them. It does away with the expense of drawers, the cork alone for which (thirty-six feet at 18 cents per foot) would be $6.48. The frames constructed of thin stuff (say quarter-inch) cost at the most five cents each, and suitable stiff cartridge paper is very cheap. If the frames are made slightly smaller than those mentioned, one sheet will cover both sides of two frames. The paper is put on when damp, but should not be too wet. The frames can be easily re-papered if needful, and if the sections are made of equal width, they will all be interchangeable, which will be found a great convenience.

This manner of keeping specimens will, I think, be particularly useful to collectors of Coleoptera. I send this, feeling that each member of the Society should contribute his mite of experience and knowledge for the benefit of his fellow-workers.

W. H. Harrington, Ottawa, Ont.

THE TOMATO-WORM *(Sphinx quinque-maculata).*

Dear Sir,—

This insect has been extraordinarily abundant this year in the neighborhood of Port Hope, so much so that many persons had to take vigorous

measures for the preservation of their crop. On the few plants in my own garden scores of the larvæ were found. A market-gardener who lives close by me—Mr. Wm. Eddie—informs me that on one day during the summer he and his assistants together gathered *four bushels* of the "worms" off an acre and a quarter of tomatoes! During many days following they seemed almost as numerous as ever, in spite of continuous hand-picking. Yesterday (Oct. 18) Mr. Eddie brought me a newly escaped imago. Is not this autumnal appearance most unusual? I suppose that it may be attributed to the long continuance of warm weather; up to to-day nothing has yet been touched by frost in my garden.

C. J. S. BETHUNE, Port Hope, Ont.

ON L. LUCIA AND PSEUDARGIOLUS.

DEAR SIR,—

In the absence of all knowledge of the preparatory stages of *Lycaena Lucia*, the date of the first appearance of this species and *L. pseudargiolus* var. *neglecta*, at this place the present season, are not favorable to Mr. Edwards' view of their being one and the same thing. One male example of *Lucia* was found on April 4th. On the 8th several appeared, two males taken. On the 12th males common, one female taken. On the 19th several pairs taken copulating; many observed. A male *neglecta* taken, apparently just emerged. On 22nd both sexes of *Lucia* common; males worn; several male *neglectas* abroad. On April 30th and May 4th females of *Lucia* observed depositing eggs on flower buds of *Cornus Florida*. May 9th, female *neglectas* abroad, both sexes of which have been observed up to July 10th. The last *Lucia* was observed May 9th. The above observations were carefully and conscientiously made. If, in the end, it shall be proved that *Lucia* is an early spring form of *pseudargiolus*, the above is almost couclusive evidence that deep coloration is not wholly the result of frigid weather.

NOTE.—It is with trepid hand that I pen the fact that two species of *Rhopalocera*, believed by some of our boreal friends to exist no where in this State outside of famous Center—*N. canthus* and *A. vialis*—are frequently met with in this section.

E. C. HOWE, M. D., Yonkers, N. Y.

DEAR SIR,—

The cutting sound heard by Dr. Packard, and discovered to be two black points used by the insect to cut its way out of prison, is not confined to *Luna*. I have heard the same sound when *Polyphemus* was about to leave its wintry mansion, but supposed it was done by the moth working its feet against the softened part of the cocoon. The feet and legs seem as strong when the insect first emerges as they do any time afterwards; indeed it is surprising, after the exhaustive effort the insect must have made to get through the tough cocoon, to see how readily it crawls up to a convenient place for its ample wings to spread into shape and beauty. As all breeders of moths are aware, the wings, when the moth first comes out, are soft and weak, and are the last parts we should suppose would assist in the arduous task.

On two occasions I have heard a sharp report when *Cecropia* was about to make its exit from the cocoon. The sound was similar to that produced by toy torpedoes such as boys amuse themselves with. I have thought perhaps the corrosive liquid used by the moth to soften the silk might be of an explosive nature, and on coming in contact with the oxygen of the air, might produce the sound. I should like to know if any of the readers of the CAN. ENT. have heard this remarkable sound, and what their opinions are. ROBERT BUNKER, Rochester, N. Y.

DEAR SIR,—

Saperda candida Fab. made their appearance this year about twenty days earlier than usual. Trees leafed out in this vicinity about thirty days earlier than in ordinary seasons. Took June 2nd, 3 ♂ and 1 ♀.

June 6th, I took one pair of *Saperda puncticollis* Say on poison ivy (*Rhus toxicodendron* L.)—the first of these handsome *Saperdas* taken in this locality.

June 12th, took the first *Saperda Fayi* Bland. This borer attacks the limbs and stem (½ to 1½ inches in diameter) of our wild thorn (*Crataegus crus-galli* L. and *C. tomentosa* L.), creating a gall-like, gnarly swelling, weakening the branch so that it sometimes breaks off by the wind, and often killing it. The beetle cuts its way out from one to three inches above or below the swelling. In 1876 I took a ♀ *S. Fayi* Aug. 15th.

CHAS. D. ZIMMERMAN, Buffalo, N. Y.

TORTRICIDÆ WANTED.

CHECK LIST OF NORTH AMERICAN NOCTUIDÆ.

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NOTES ON A WINTER HOLIDAY.

BY THE EDITOR.

During a recent holiday, while on a trip South, we spent a day among the Entomologists at Albany, N. Y. To say that it was a pleasant day, an *exceedingly enjoyable* day, would convey but a faint idea of the pleasures there in store for us. Arriving early in the morning, we made our way to the State Museum of Natural History, where we found three veteran Entomologists conspiring to make our brief stay a memorable one. Under the guidance of Messrs. Lintner, Meske and Hill, we were soon enraptured by the sight of the countless rarities contained in the collections of Lepidoptera made by those gentlemen in this vicinity. We have seen many collections in the course of our wanderings, but for multiplicity of species, full series of rarities and matchless perfection of individual specimens, it had never before been our pleasure to witness anything that would compare with the valued stores contained in the cabinets of these enthusiastic collectors at Albany; and without fear of contradiction, it may be said that the Entomologists resident there have contributed more towards our knowledge of the Lepidoptera native to the northern portions of America than any other equal number of collectors in the country. The enthusiasm they have long maintained and their indomitable perseverance have enabled them to overcome almost every obstacle and accumulate such wonderful series of specimens, especially by night captures at sugar, as no less favored Entomologist could look over without feelings almost akin to envy. After one had seen scores upon scores of individuals of some rare Noctuid, which in one's own collection had perhaps long been represented by a treasured fragment, the question would frequently rise as to whether *anything* in this line be rare in the neighborhood of Albany.

During the day we were also privileged to see the magnificent series of Catocalas in the collection of Dr. Jas. H. Bailey, and one could only regret that the day was too short to do any sort of justice to the mass of material to be inspected. After laboring busily from early morn until late at night, we parted at the railway station, carrying with us the most pleasant recollections of a day happily spent amidst old and newly-found Entomological friends.

On reaching Washington, Nov'r 23, we paid a brief visit to the Entomological rooms in the Department of Agriculture, where we had expected to find our esteemed friend, Prof. C. V. Riley, but unfortunately business had called him away from home. Through the kindness of Messrs. Pergande and Howard we were shown very many things of interest, especially in the way of insects in their earlier stages, both living in breeding cages and preserved as blown larvæ, and in this way a very pleasant and instructive hour or two was spent. We were sorry to learn from our good friend, Chas. R. Dodge, that "Field and Forest" was about to be discontinued for want of sufficient support. This valued periodical has done good service in the cause of Natural Science, awakening an interest in this direction in many minds, and we feel that in its decease we have lost a valuable aid. It gave us much pleasure to find that veteran Entomologist, Prof. T. Glover, with health almost restored, busily engaged in his Entomological work. Through the affable kindness of Dr. T. V. Hayden, we were shown through the Department of the Interior, that great national laboratory from whence has issued so many works invaluable to the naturalist in every field of labor. After lingering long among the many interesting objects which claimed our attention, we returned laden with useful works and pamphlets on subjects relating to Entomology, deeply impressed with the important work here carried on by a great and progressive nation in the interests of science; and with very pleasant recollections of the great personal kindness shown us by the worthy and distinguished head of this most useful branch of the national service.

The Smithsonian Institution was also visited, with its immense collections and innumerable objects of interest, and through the kindness and liberality of the Secretary, some recent and valuable works on Entomology and kindred subjects were secured for our Society's library.

Passing through Virginia, the Carolinas and Georgia, we landed in Fernandina, Florida, with its historic surroundings, on the 30th day of November, where we found everything assuming a tropical aspect—the

landscape dotted with Palms, Orange trees, Magnolias, Live-oaks and other evergreen trees, and the air so balmy as to at once suggest thoughts of butterfly nets and collecting bottles. Of the latter we had with us a supply, but not expecting to meet with anything on the wing, our insect nets were left folded away in their wintry home. We turned over logs and chips in search of insect life, but found very little to reward our energies. Subsequently, while wandering about in Jacksonville, we saw several butterflies on the wing, most of them new to us; we recognised that charming yellow, *Callidryas eubule* as it floated about among the beautiful roses, jessamines, poinsettas and other flowers in the gardens, and we longed for a net that we might cultivate a closer acquaintance with this and some of the other species which we were unable to determine in their flight. Our old friend, *Danais archippus*, was frequently met with, and reminded us of summer at home. Florida, however, is very poor in insects at this season of the year, but as summer approaches it is in many parts a paradise for the collector. During a week spent in this land of flowers we travelled over 800 miles along its rivers and railways, seeing much of its characteristic scenery, the most southerly point touched being Leesburgh, on Lake Griffin, a little south of the 29th degree of latitude and 300 miles south of Jacksonville by tortuous river travel. Here butterflies were more abundant, and having landed with a very pleasant party in an orange grove, amidst half a million of oranges on 2,500 large bearing trees, one was puzzled what to do first. The oranges were tempting, but the sight of beautiful specimens of *Agraulis vanillæ*, *D. berenice*, with charming *Heliconias*, *Theclas*, etc., was still more overpowering, and with hat in hand, the butterflies were vigorously pursued until several specimens had been secured, but with such imperfect means of capture at hand, the beautiful insects were battered and torn, and our clothing having become covered with malignant burs collected in the chase, we thought it best under the circumstances—the first burst of enthusiasm being over—to devote our attention more particularly to the orange question.

While vigorously consuming oranges, enquiries were made as to whether the trees or fruit were subject to insect enemies. Beyond occasional specimens of the larva of *Papilio cresphontes*, we could not learn of any caterpillar which consumed the leaves, and the only insect which seemed to trouble the orange growers at all was a species of Coccus—*Aspidiotus citricola*—which attacks the bark and foliage of both the orange

and lemon trees, and occasionally, if very numerous, gives the tree a sickly appearance. But such an effect was rare, and one could not help feeling astonished at the luxuriant and vigorous growth of the average orange grove and the symmetry and beauty of the trees laden with their golden fruit, in soil, in most instances, so poor that one wondered where the nourishment came from. In our course up and down the Ocklawaha River, where the trees are everywhere clothed with the beautiful Florida moss, *Tillandsia usneoides*, and the swampy margins decked with brilliant asters and other composite flowers, we observed many Neuropterous insects on the wing, but did not succeed in capturing any; indeed, the catching of an insect seemed insignificant work in the midst of the excitement attendant on the shooting of alligators, herons, ducks and other large game, and at the close of the week there were very few spoils wherewith to grace the Entomological cabinet. Now, a few days later, amidst frosts and snow, the novel recollection of the recent heated butterfly chase, the cooling off under the shade of orange trees, imbibing the sweet rich juice of the fully-ripened fruit, and the additional novelty of a sunburnt brow, all in the midst of the month of December, are things not soon to be forgotten.

ON THE PUPATION OF THE NYMPHALIDÆ.

BY W. H. EDWARDS, COALBURGH, W. VA.

In Ent. Mo. Magazine for August, 1878, is a paper by Dr. J. A. Osborne, respecting a discovery made by him of the mode by which the larvæ of the Nymphalidæ attach the chrysalis to the button of silk, and which is "altogether at variance with the account given in Kirby and Spence and other works." Dr. Osborne relates: "In watching the transformation of *V. Urticæ*, I found that the chrysalis was attached to the old skin of the caterpillar by a membrane sufficiently strong and permanent to support the insect during the critical last moments of pupation, and fully explaining why it does not fall down when the tail of the chrysalis is withdrawn from the old skin and thrust up to be attached to the silk." The

author then refers to a communication made by him to *Nature*, vol. xv., p. 7, 1877, on the same subject, and quotes from Figuier's Insect World the following account of the pupation of *Urticæ*: "The chrysalis, which is shorter than the caterpillar, is at some distance from the silky net-work to which it must fix itself; it is only supported by that extremity of the caterpillar's skin which has not been split open. It has neither legs nor arms, and yet it must free itself from this remaining part of the skin and reach the threads to which it is to suspend itself. The supple and contractile segments of the chrysalis serve for the limbs which are wanting to it. Between two of these segments, as with a pair of pincers, the insect seizes a portion of the folded skin, and with such a firm hold that it is able to support the whole of its body on it. It now curves the hinder part slightly and draws its tail entirely out of the sheath in which it was enclosed," &c. Dr. Osborne then says: "How this can be conceived possible, considering the utterly soft condition of the newly-excluded pupa, and that the caterpillar skin is now reduced to a packet so small that it covers only the end of the tail of the chrysalis (loc. cit.), in which moreover there are no longer any free segments, I cannot understand. On the other hand, it is very easy to show that the last and sufficient bond of connection between the chrysalis and the old larva skin is a membrane extending from the lining of the latter to the anterior horns of the two lateral ridges bounding the anal area of the chrysalis. . . . . I have tested its strength to sustain the weight of the chrysalis and the time during which it resists desiccation and the writhings of the insect, the obvious object of which is, not to get rid of the old caterpillar skin, but to rupture this membrane after the chrysalis has made good its tail attachment to the silk." The communication in *Nature* called out no reply or remark from lepidopterists, and hence Dr. Osborne again recited the facts in the Ent. Mo. Mag. The Editors thereof say: "We will be very glad to know if the very reasonable explanation advanced in support of the theory of our correspondent has been elsewhere referred to, and also to have the results of direct experiment by others. So far as we can discover, most of the published accounts are simply copied, or extracted from Réaumur."

As soon as I read this communication, I sought for butterflies of this family, and soon took females of *Grapta interrogationis* and *D. archippus*. The former laid many eggs in a bag, tied over a stem of hop, and the other a few on Asclepias. The larvæ from both lots have finished their pupation, and I have carefully watched the process. Dr. Osborne's statement

is correct. The chrysalis of *Grapta* is supported by a narrow, white membrane or ligament, about one-tenth inch long, one end of which is pointed and fastened to the inner side of the larval skin near the extremity thereof, and the other is forked and fastened to the ends of two curved, slightly raised, longitudinal ridges, which are to be found on the ventral side of the last segment. These ends are at the anterior edge of the segment. They project sufficiently to form hooks, as it were, which hold the membrane firmly. In *archippus* the ligament is much larger and stronger than in *Grapta*. It is broad, black, and deeply forked where it attaches to the segment. In this species, instead of low ridges, there are two rows of shining black processes, three in each row, and the outer pair are knobbed, and a little pointed anteriorly. On these outer knobs the ligament is fastened. I do not believe that the chrysalis of *Grapta* ever seizes the loosened skin *for a support*—at any rate any support that such a hold could furnish is not essential, for I have repeatedly raised the skin with forceps entirely off the abdominal segments on the ventral side, so as to discover the distended membrane, and in several cases have cut the skin off just below the membrane at the instant the effort was beginning for freeing the tail. In these last cases the chrysalids were seen to be connected with the skin by the membrane only, and the membrane is the lever by which the chrysalis climbs to the silk. There could not possibly have been any other support.

Réaumur's account of the pupation of the *Suspensi* was drawn up after very extended observations on larvæ of several species of *Vanessa* principally (he says, several hundred caterpillars), and is given at great length. Similar statements are given by subsequent authors, often based on direct observation, but so far as I can discover, one and all describe the process as it would appear to a looker on. I notice in Westwood and Humphrey's British Butterflies, p. 54, what is doubtless an inadvertent error: "The chrysalis carefully withdraws its tail from the skin, *seizing hold of the outside* of the latter by pressing two of the rings of its body together, and enclosing between part of the old skin. *By repeating this process*, it at length pushes its tail upwards, till it reaches the silken button," &c. For *outside*, read *inside*.

Dr. Harris, Ins., 2nd ed., p. 282, gives an account of the transformation of *archippus* with much detail.

"By bending together two of these rings near the middle of the body, the chrysalis seizes, in the crevice between them, *a portion of the empty*

skin and clings to it so as to support itself while it withdraws its tail from the remainder of the skin. It is now wholly out of the skin, *to which it hangs suspended by nipping together the rings of its body;* but as the chrysalis is much shorter than the caterpillar, *it is yet at some distance from the tuft of silk, to which it must climb. To do this, it extends the rings of its body as far apart as possible, then, bending together two of them above those by which it is suspended, it catches hold of the skin higher up, at the same time letting go below, and by repeating this process with different rings in succession, it at length reaches the tuft, &c.*" "We may see the whole process in the caterpillars of *archippus*," &c. Dr. Harris drew his description from nature, and was too careful an observer to commit himself in a case like this beyond what he thought he clearly saw.

In Butterflies of N. America, vol. I., I gave an account of the transformation of *Grapta comma*, taken strictly from my own observations. In this I find no mention of the climbing by the aid of the successive pairs of segments, described by Dr. Harris as taking place in *archippus*, but otherwise my statement agrees substantially with his. I had previously read of the transformations of butterflies in various works, and so was doubtless prepared to receive the common version of the mode, but I described precisely what I thought I saw. I have heretofore repeatedly witnessed this process in various genera, but I find by recent experience that it is impossible with a single observation, or by half a dozen, to determine all the details, and only by watching one point in one example and another in the next, and verifying each again and again, could I feel sure that I had made myself acquainted with this part of the history of a single species. I have watched sixteen transformations of *interrogationis* and two of *archippus*, during the last few days, and will describe at length what I have seen. It may serve to show how the error spoken of originated and has been perpetuated by so many observers, and for more than a century, with no suspicion of wrong till Dr. Osborne made his discovery. In *interrogationis* the period of suspension varies from 6 to 24 hours, according to the state of the weather and degree of warmth. My first observations were made under a clear sky, and mercury about 80° Far., in the middle of the day; the later ones in cool and rainy weather, with cold nights. The larva of this species is suspended from a button of pink silk. At first it holds itself in a circular shape, its head turned in against segments 11 and 12, the lowest part of the curve being at 7th. After two hours, more or less (in warm weather), the curve is relaxed, and the atti-

tude resembles figure 6, the dorsum on last segments being convex, the head turned in opposite 8 and 9, the lowest part of the curve being at 6th. Two or three hours later the body hangs straight, and the four anterior segments are bent almost at a right angle to the others. The head continues to droop, and by this it is made certain that the final change approaches. Presently there is a twitching of the spines, first confined to one segment, but extending soon over the whole body, and changing into a waving motion. This is accompanied by a twisting of the segments beneath the skin, which increases in strength and continues some minutes. Two or three times a spasm of contraction comes on by which the body is lifted up into the last one or two segments and let fall again. Then a creeping movement under the skin commences, extending from the posterior segments forward, and seems to break the skin loose from the body, and one wave after another runs along till the distended skin on the anterior segments bursts. This always takes place on the middle of the dorsum, on the 3rd segment, and the mesonotum of the chrysalis is forced through, splitting the skin up to the head (or first segment), and sometimes splitting the skin of the head also. By the continued creeping movement the body is slowly forced through the rent. As this is oblique, the ventral side of the chrysalis is fully three segments behind the dorsal in the divesting, the skin on the anterior segments fitting tight as a glove, although it is loosening and packing in a mass about the anal feet. In about 90 seconds from the time of the rupture the skin on dorsal side has been pushed back to 10, and the effort begins for the extrication of the tail of the chrysalis from the caterpillar skin. This tail must be withdrawn and fastened outside the skin to the same button of silk which the caterpillar clung to. At this instant the skin covers the ventral side of the chrysalis to 8th segment, but is moving up constantly, and as the chrysalis bends the posterior half of the abdomen sharply back to force the tail out of the sheath, the segments are pinched together and there is at the same time a pinching in of the skin. But there is no seizing of the *outside* of the skin; if there were no other reason, the spines would make this impossible. The tail now free, the chrysalis straightens itself up, and swinging on the ligament, lifts itself towards the silk, the last segment describing an arc of a circle of which the ligament is the radius, and the tail, which at the same instant is curved forward, is brought round and over the considerable packet of the old skin and with precision strikes the silk. An observer, knowing nothing of the

ligament, seeing only the violent contortions, the abdominal segments expanding and contracting to the utmost, while at the same time the chrysalis steadily rises toward the silk, naturally concludes that the one movement is the direct result of the other. When I lifted the flap of skin entirely clear of the struggling segments and cut it off a little below the tail, the bendings and contortions were not interrupted by my interference, nor was the effort to reach the silk in the least abated. Held firm by the stretched ligament, which was in plain view, the body rose, and the tail, which had got well outside the padded skin, and was before complete extrication bent backward, now bent forward, and by the upward swing was brought exactly to the silk. Several times as I was lifting, the skin and chrysalis together were dislodged, and fell into my hand. Then by drawing the skin back the ligament was exposed and it was distinctly seen that it was attached to the chrysalis by the pointed ends of the ridges before mentioned, and that there was no other connection between skin and chrysalis.

After the hooklets of the tail are caught in the silk, the chrysalis whirls one way and then the other, the last segments actively twisting and screwing in order to fasten the hooklets more securely. This movement does not seem to be made for the purpose of rupturing the membrane or for getting rid of the old skin especially, for I noticed that whenever the skin parted and fell just as the silk was grasped, as did sometimes happen, the same whirling and all the movements usually seen followed. It is a wonderful exhibition, and the last act is beyond my comprehension,—namely, the rising of the chrysalis with no external aid save what comes from the ligament. I can only state the fact.

When the rupture of the skin of the caterpillar of *interrogationis* first takes place, and the mesonotum is made to appear, this organ is pressed down and flattened, but in a short time, and before the transformation is completed, it swells out, and becomes nearly as large and as prominent as it ever will be ; the head case is pushed forward on the thorax and jammed in, so that on first issuing, the chrysalis is truncated at the anterior side of the mesonotum. When the skin is thrown off, the chrysalis hangs limp and distended, like a long cone, with no prominences except the mesonotum. Presently the segments shorten and become broader, the ends of the wing cases creep nearer the tail, the tuberculated points on the abdomen swell out, the head case pushes up, with its palpi cases, and in course of half an hour the final and characteristic shape is assumed.

The change in these respects is nothing like so striking in *Grapta* as in *Limenitis*, where the chrysalis is greatly hunched and displays a prodigious mesonotum. In this case the chrysalis is at first as limp and shapeless as in *Grapta*, but reaches its proper form in the same way; the segments contracting and the processes growing and maturing as one looks at them.

The transformation of *archippus* presented a close resemblance, but some differences. When first suspended, which it did from a pad of white silk, the larva took the attitude of an oval, the head brought near 12th segment; a few hours later that of figure 6; and finally of a right angle, the head continuing to droop. During the last two hours there was a constant movement of the head, which seemed to rub itself on the anterior legs, and several times and up to within one-half hour of the change, the larva doubled itself up and brought its head to the button of silk, as if greatly annoyed at something there. This I noticed in both the larvæ observed. Finally the body was contracted and lifted up as in *Grapta*, and a slight creeping movement was seen, but there were no twitchings or twistings as in *Grapta*. The creeping became stronger, advancing in waves, and the strain on the anterior segments became severe, till the skin burst on the dorsal line of 2, 3 and 4, and the top of the head also was rent. The slit was oblique, and the ventral side was covered three segments beyond the dorsal. When the body was exposed on dorsum at 10 and 11, the ventral side was covered at 8 and 9, and the skin fitted tight, so that as the body bent back in the movement to free the tail the skin was pinched between the segments. The struggle became violent, the segments all along the abdomen stretching to the utmost, and then contracting forcibly, *one telescoping into the next;* and *in this the skin followed the segment, and was drawn in and held for an instant.* As this movement ran through the segments successively the skin was pinched at one joint after another, and the chrysalis was evidently rising towards the silk as described by Dr. Harris. Unfortunately I was able to see the transformation in but two examples of *archippus*. In the first one, I set myself to see how the whole change must have appeared to Dr. Harris, as he had described it minutely. In the next one I lifted the flap of skin till I saw the ligament. In so doing the whole thing unhooked from the silk, and as it lay in my hand I pulled back the skin and was able to look at the ligament with a lens. I also lifted the chrysalis by the skin, and the ligament did not part. It did so afterwards only by a strenuous effort

of the chrysalis, and then remained distended, with its forks in shape. The nature of this organ must be determined by further observations. I had sent to a friend, who is an experienced microscopist as well as entomologist, a chrysalis of *interrogationis* which had been dropped in glycerine at the crisis of pupation, and he writes me thus: "I have examined the preparation, which was in good condition except the separation of the chrysalis from the skin. I see what you call the two ridges, which exist also in the caterpillar and have between them the anus in both caterpillar and chrysalis. Further, I find connected with the skin the whole rectum, and a little more of the intestinal canal, drawn out in pupation. A little below I see a substance which I suppose to be your membrane, about as long as the rectum and structureless. I would suppose that the membrane belonged to the rectum and perhaps the external cover of it, if you had not written that the membrane in *archippus* is black. I took a caterpillar (in spirits) of this species, and opening it, found that the rectum was white, or at least light colored. One should make a section of the caterpillar of *archippus* just after suspension to discover where this black membrane comes from. The use and purpose of the knobs and bars in the chrysalids is doubtless this: in these organs are built up and developed the anal appendages of the imago."

September, 1878.

NEW N. AMERICAN LEPIDOPTERA, WITH NOTES ON A FEW LITTLE KNOWN.

BY A. R. GROTE, A. M.,

Director of the Museum, Buffalo Society Natural Sciences.

Daremma catalpae.

Sphinx catalpae Boisd., pl. 2, figs. 1, 2 (1874).

This species is represented in the Collection of Mr. E. L. Graef by an example from Florida. It is smaller and darker than *D. undulosa* or *D. Hageni*, of a uniform butternut or olive brown tint.

Emydia ampla, n. s.

♀. Wings large, body linear, slight. Eyes naked; palpi exceeding the front; maxillæ weak. Antennæ (♀) with converging setose pectinations. Head white; thorax white, black dotted. Fore wings white, silky, with a black dot on the cell and two superposed at the extremity of the cell; one below median vein at basal third and others at base suggesting a basal transverse line. A narrow blackish costal stripe and a terminal distinct interrupted line; fringes white. Hind wings smoky gray with whitish fringes. Beneath entirely blackish or smoky gray with a dark discal dot on hind wings. Abdomen smoky gray. *Expanse* 43 mil. *Habitat*, Colorado (Coll. E. L. Graef).

Lygranthoecia acutilinea, n. s.

♂. Eyes naked, body slender, tibiæ armed. Form of *marginata*, *Thoreaui* and *saturata*. Ochrey or olive fuscous with snow white or silvery white lines. Transverse anterior greatly medially and outwardly exserted, preceded by a black marginal line, irregular, raggedly toothed. Cell shaded with whitish or pale ochrey. Reniform marked by black dots. Outer line denticulate, followed by a black line, crossed by white streaks on the median nervules. Subterminal line white, bent inwardly opposite the cell and again before internal margin. Fringes fuscous cut with white. Hind wings whitish with diffuse blackish discal spot and terminal band, the latter interrupted with white above anal angle. Fringes whitish, faintly interlineate. Beneath whitish, powdered with black; primaries blackish to exterior line with double black discal spots, the reniform open, fringes checkered; secondaries mostly whitish with black discal dot and whitish fringes; body pale fuscous. *Expanse* 27 mil. *Habitat* Colorado, Coll. E. L. Graef.

Heliothis nuchalis Grote.

This species is very near the European *H. scutosa*, as I find from a specimen of the latter in Mr. Graef's collection. As is the case with *armiger* and *dipsacea*, the American representatives of which I have described as *umbrosus* and *phlogophagus*, we have now a third species nearly related to the European. At the same time extended and careful comparisons of the American and European forms have not been entered into as yet with any of these species of *Heliothis*.

Melicleptria oregonensis Hy. Edw.

This species has been sent me by Dr. Bailey from Nevada (No. 19).

Chytoryza tecta Grote.

This genus is characterized by a pellucid impression on the fore wings of the male on the cell before the transverse posterior line. In the shape of the wings it differs from *Pteraetholix bullula* and in the thinner labial palpi. These two genera from Alabama and Texas seem to be our nearest allies to the genera *Anomis* and *Aletia.*

Catocala cœlebs Grote.

Another specimen of this rare species has been taken by Mr. Hill this season in the Adirondacks. This species has the fore wings black and gray. What is probably a variety of *C. badia,* with brown primaries, but with the lines better marked than in the type, has passed erroneously as *C. cœlebs* in several collections I have recently seen. Probably this mistake has led to the belief that *cœlebs* was only a form of *badia.*

Asopia cohortalis, n. s.

♂. Allied to *squamealis* and with blackish fringes and distinct black terminal line. Head and thorax, basal and terminal fields of primaries ochre brown. Median space shaded with black. Inner line dentate as in *squamealis,* black, preceded by a paler ochre shade. The pale shades are well marked on costa, but do not spread or form blotches as in *squamealis.* Outer line upright, a little bent in on costal region, denticulate, black; it is further removed from external margin than in *squamealis;* between the lines are three costal marks; the two median lines are parallel, the distance between them remaining the same. Hind wings fuscous with double blackish lines; fringes interlined with black; a terminal black line; fringes fuscous. Beneath the primaries show a series of costal marks to the common outer line, which is black; beyond the line the terminal field is shaded with ochre. A dotted terminal black line; fringes fuscous, interlined. *Expanse* 25 mil.; Colorado, Mr. E. L. Graef. The color and position of the outer line are different from *squamealis.*

Agrotis piscipellis, n. s.

♂ ♀. A species with simple antennæ, armed tibiæ, naked eyes and untufted thorax, and somewhat flattened abdomen, which resembles *Ufeus*

plicatus or some of the species of *Homohadena*,* such as *induta* and *incomitata*. Thorax and fore wings dark but bright brown, veins more or less marked with black, stigmata obsolete, median lines sometimes obsolete, when present black, narrow, single; t. a. line upright, rivulous; t. p. line denticulate, exserted superiorly, marking venular points, followed by a faint pale shade; s. t. line pale. Hind wings pale at base, smoky outwardly, sub-pellucid, veins darker, no discal dot above or below. Front and tips of palpi very deep brown. Beneath pale, washed with reddish, a common black even line, veins indicated. Thorax and appendages and abdomen beneath rosy brown. Collar unlined. *Expanse* ♂ 34 mil. (Colorado); ♀ 40 (Nevada); from Dr. James S. Bailey. May be placed with the *albalis* group, but resembles no species very nearly. Body not hairy as in *U. plicatus*.

Agrotis cupida.

This species seems to be subject to unusual variation. What may be taken as the typical form, or that which is best marked, expands 33–35 mil., the wings are of a brick brown with the stigmata filled with black, a black mark on costa at inception of s. t. line, the s. t. space a little darker than the rest of the wing, the lines well defined. A larger form from Texas expands 40 mil.; it has been reared from the larva by Belfrage (No. 674). It is more red, more unicolorous, the markings less obtrusive. A specimen taken by Dr. Bailey is the size of the typical form, but has the sub-basal and subterminal spaces entirely filled in with *black*. Then come three specimens in which the fore wings seem a little narrower and the expanse smaller. One is bright orange red, all the markings obsolete. Another is more of the typical shade, but both stigmata are ringed with bright yellow. The third I have described as distinct, under the name *brunneipennis*. This one, from Mr. Thaxter, is a little smaller than the others, expanding hardly over 30 mil. It is dark red-brown, almost immaculate. Whether these three belong to a different species from *cupida* remains doubtful.

Agrotis cupidissima.

It seems to me now probable that *lactula* is not sufficiently distinct from this Californian form. In the type of the latter the ground color is

* I can find no character to separate *Metahadena* from this genus, to which I would accordingly refer *H. atrifasciata* (Morr.)

darker, more purplish brown, while *cupidissima* is pale reddish clay color. But the powdery markings are the same in shape, and, bearing in mind the variation in *cupida*, it seems easy to include *lactula* as a form of *cupidissima*. At the same time the body seems slenderer in the type specimen I have, and the form more compact. These forms all have the collar unlined.

Agrotis placida.

A dark form with pale terminal space, but much smaller than *alternata*, which Mr. Hill has taken in the Adirondacks. Four specimens sent me from Nevada may be forms of this species. They all come from Dr. Bailey. One has the fore wings shaded with brown, median and terminal space both paler, markings quite distinct. Another is almost unicolorous blackish with the shadings and markings powdery. Again, another has a reddish cast reminding one of *cupida*, but with pale terminal space. It does not seem possible that these Nevada specimens belong to distinct species, but for some time to come it is evident that our determinations in this group will be provisional unless we can find other characters than coloration and size to distinguish the "species."

Agrotis alternata.

A heavier form than *cupida*, the terminal space contrasting and paler. Varies much in tone; some specimens shaded with orange or reddish brown. Generally it seems of a clay color. One specimen from Nevada (Dr. Bailey) may be a distinct species. The median lines are more propinquitous and shaded with pale scales; the terminal space strongly contrasts. It is more likely, however, to be an extreme variety. *Agrotis orbis* from California may only be a form of *alternata*. I have a specimen from Colorado which seems intermediate, but which I refer to *alternata* provisionally. I have recently identified *Glaea anchocelioides* of Guenée, which resembles some varieties of *alternata*, but has unarmed tibiæ.

Hadena senescens, n. s.

♂ ♀. Male antennæ simple, ciliate; eyes naked, lashed. A tuft behind the collar and on the thorax behind. Tibiæ unarmed. Primaries straight along costal margin; wings rather broad. Pale dust color with the costal region to s. t. line of primaries shaded with brown. Lines double. Orbicular oblique, narrow above, rounded below. Reniform large, pale with internal black annulus. Disc between the spots black.

Subterminal space shaded with brown, showing the pale ante-apical dots distinctly. S. t. line marked with black before internal margin as in *vigilans*. A scalloped pale terminal line, interrupting the brown fringes. Hind wings blackish with pale terminal border and discal lunule. Beneath shaded with reddish; dark discal lunules, double common shade lines, pale terminal border on both pair. Head and collar shaded with brown; pectus and legs blackish beneath; abdomen purplish-brown. Front and palpi blackish. *Expanse* 36 mil. Taken by Mr. Hill in September in Lewis Co., N. Y. Allied to *Hadena vigilans*.

Hadena algens, n. s.

♀. Eyes naked, with lashes. Head not prominent but, as in *vigilans* and *senescens*, rather closely applied. Stone gray with inconspicuous markings. Collar pale with narrow black edging. A slight black basal dash. Lines and spots inconspicuous. Orbicular bordered on inside with black, edged with pale, subquadrate; reniform narrow, kidney-shape, both spots upright, incompletely edged with black and pale scales. S. t. line pale, irregular, marked with black on submedian fold. A terminal even dotted black line. Hind wings dark gray, reflecting the double lines and discal lunule of under surface. Beneath gray; discal spot of primaries open and nearly obsolete, on hind wings dark shade. The terminal space on both wings paler than rest of wing. *Expanse* 30 mil.; Maine, Prof. Fernald.

The three species here alluded to will be separated eventually from *Hadena*, but at the moment I refer them to the typical genus of the subgroup to which they belong.

Mamestra noverca, n. s.

♂ ♀. Eyes hairy. Male antennæ simple. Fore wings of a mossy brownish olivaceous. Orbicular margined with black, open to costa, rounded, moderate. Reniform pale, elongate, subquadrate, erect. T. p. line double, pale centered, followed by points on the veins, outwardly oblique to vein 4, thence inwardly oblique, nearly straight, below reniform to internal margin. Subterminal line pale, irregular, preceded and followed by black marks over the middle of the wing. Fringes concolorous, preceded by small black points and cut with pale. A black median basal dash or shading. Thorax concolorous; tegulæ shaded with blackish. Hind wings whitish at base with discal mark and broad smoky border.

Beneath dusty gray with traces of double common lines and discal marks. *Expanse* 34 mil. Nebraska, Colorado, Dr. James S. Bailey. This species is allied to *Goodellii*, but it more closely resembles the following species, which, owing to the naked eyes, must be separated generically.

Hadena genitrix, n. s.

♀. Eyes naked. This species is of a mossy blackish olivaceous with the ornamentation effaced. From the shape of the t. p. line, the position of the reniform and the excavation of hind wings, it is allied to *curvata*. Claviform outlined in part with black. Orbicular spherical, complete, somewhat widely separate from the pale, half-erect, rounded reniform, which is contiguous to the t. p. line. T. p. line pale-centered, double, lunulate, followed by pale points. S. t. line pale; fringes concolorous, cut with pale, preceded by black terminal dots. Hind wings entirely smoky with line and discal mark. Beneath pale, shaded with blackish on disc of fore wings; black discal points, distinct on secondaries and common lines; with sprinkled black scales on both wings. Thorax and head like primaries. *Expanse* 36 mil. Nebraska, Colorado, Nevada, Dr. James S. Bailey. The median lines are further apart than in *M. noverca*, the claviform is indicated, the reniform is somewhat oblique and lies against the t. p. line, which is more uneven than in *M. noverca*. The two species are liable to be confounded unless care is taken.

Apatela theodori, n. s.

♂. Eyes naked; tibiæ unarmed. Gray shaded with pale brick red. Head and thorax above grayish, metathoracic tuft reddish: abdomen reddish gray. Fore wings gray with pale reddish shadings. Lines fine, black, single. Basal line arcuate. A fine black streak from base along submedian vein. The nervules also scantily marked with black scales. Sub-basal space shaded anteriorly with reddish. T. a. line slightly outwardly oblique, irregularly lunulate. Median shade marked in black on costa, commencing midway between the lines, greatly exserted medially, irregularly dentate, becoming reddish below costa. Median space before the shade gray, behind it reddish. Orbicular and claviform obsolete. Reniform reddish, large, undefined. T. p. line interspaceally dentate, rounded superiorly, thence inwardly oblique. Submedian space gray, except at costa, much invaded by the acutely and deeply dentate s. t. line which is preceded by black V-shaped shades, the one on submedian fold

crossing the space and forming a dash. Terminal space reddish ; fringes interrupted. Hind wings white with faint mesial line, fringes white. Beneath white with reddish cast and faint reddish common line. Front with a black line. *Expanse* 43 mil. Colorado, Dr. Theodore S. Bailey, for whom I name the singularly colored species.

MICRO-LEPIDOPTERA.

BY V. T. CHAMBERS, COVINGTON, KY.

PHILONOME.

Philonome Clemensella Chamb., *ante v. 6, p. 97.*

I have usually taken this species at the same place, about one or two specimens a year, and always within ten yards of the place where I first took it six years ago. The trees in the immediate vicinity were *Gleditschia triacanthos*, *Ulmus americana*, *Prunus serotina* and *Celtis occidentalis*, but it may have fed as larva upon some weeds or shrubs growing near. All of my specimens were taken about the 8th or 10th of July. This year, however, I have captured (June 14th) two specimens (perfectly fresh) on *Gleditschia triacanthos* at another place, where the nearest tree was *Celtis occidentalis*, growing some thirty yards away. Its larva and food plant, however, are not yet by any means certainly ascertained.

The labial palpi are divergent and ascending, and not quite so long as the maxillary pair. I have stated *loc. cit.* that the antennæ are about two-thirds as long as the wing and pale reddish orange ; perhaps it would be more correct to say that they are a little more than half as long as the wings, with the base reddish orange, and the stalk white tinged with pale orange or yellow. I have also stated that there is a reddish orange transverse stripe across the top of the thorax before its apex, and this is most

often the case; though sometimes the portion of the thorax behind this streak is reddish orange to the tip, and in perfectly fresh specimens the transverse stripe is made up of raised scales; the oblique white costal streak has its tip produced a little towards the apex, and is margined behind the tip with brown scales. There are two dark brown hinder marginal lines, one at the base of the ciliæ and the other at their tips and running out into the hooks. The abdomen and legs are silvery yellowish and the upper surface of the abdomen is stained with fuscous.

LAVERNA.

L. circumscriptella Zell.

I have not seen Prof. Zeller's specimens, but I have received from Miss Murtfeldt specimens which, with the aid of Prof. Zeller's figure and description, I recognise without difficulty as belonging to this species. The thorax, head and palpi are white, except that the basal part of the second joint of the palpi is stained with brownish. The fore wings are of a pale grayish ochreous, with the dorsal margin from the base nearly to the middle snowy white, the white crossing the fold at the base, and further back again crossing the fold and reaching almost to the costal margin; it is margined behind by two small tufts of raised brown scales, as represented in Zeller's figure, and there is another one on the costa not represented in the figure, which again has a minute brown spot in the white at about the basal fourth, which I do not find in my specimens. The figure also gives a very distinct white streak which leaves the white of the dorsal margin at the fold and curves to the costal margin before the ciliæ; this streak is absent in one of my specimens and much less distinct in the other than it is in the figure. There is a black speck at the hinder angle (indistinct in my specimens) and the apex is dusted indistinctly with brown. *Al. ex.* 5½ lines.

Miss Murtfeldt informs me that "The larva is a pale, glossy, green, cylindrical worm, which feeds upon the immature seeds of *Œnothera* and pupates within the capsules."

A single ♂ from Texas, and one bred ♀ also from there, lack the curved white line on the fore wings figured by Prof. Zeller, and in some of the other females it is indistinct.

MEMORANDA.

Tropical residents continue to visit us. I have in my cabinet two examples of *Sphinx (Argeus) labruscæ* Linn. One of these was taken at Chicago, the other on a vessel near Mackinaw Straits. Several examples of *Erebus odora* Linn. have been taken here this fall, two very fresh examples having flown into one of our school-rooms during the night.

My setting-pliers, bought several years ago from S. E. Cassino, at Salem, and in constant use since, show decided magnetic polaritis. One point attracts, while the other repels steel pins, etc. The upper end has attractive power. The pliers have never been in contact with a magnet, and have probably never lain in the same position for a week. Is the magnetism due to some mechanical action to which the pliers were subjected in the process of manufacture?

O. S. Westcott, Racine, Wis.

OBITUARY.

It becomes our painful duty to announce the death of one of our correspondents, Mr. W. V. Andrews, of Brooklyn, N. Y., who died on the 20th of October, 1878, after a brief illness, resulting from a sudden attack of paralysis.

William Valentine Andrews was born on the 11th of February, 1811, in Pilton, Somerset, England. At an early age he entered the British service, and served as a private in the Coldstream Guards, rising eventually to the rank of Captain. Subsequently he resigned his commission and removed to Canada, where he resided for several years in London, Ont., engaged in the book and periodical business. From thence he removed to the United States and settled in Brooklyn, where he spent the last few years of his life in the same branch of business, devoting his leisure time chiefly to the study of Entomology, in which he made rapid progress. He had a well arranged collection of Coleoptera and Lepidoptera, and a small but well selected library of Entomological works. His remains were interred at Rosedale Cemetery, New Jersey.

Since his decease his collections and library have been purchased by Mr. John Akhurst, of Brooklyn, N. Y.

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