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October 7, 1863.

Mr. C. K. Dillaway in the chair.

The following paper was presented: —

ON CERTAIN REMARKABLE OR EXCEPTIONAL LARVÆ, COLEOPTEROUS, LEPIDOPTEROUS AND DIPTEROUS, WITH DESCRIPTIONS OF SEVERAL NEW GENERA AND SPECIES, AND OF SEVERAL SPECIES INJURIOUS TO VEGETATION, WHICH HAVE BEEN ALREADY PUBLISHED IN AGRICULTURAL JOURNALS. BY BENJ. D. WALSH, M. A.

COLEOPTERA.

CICINDELA SEX-GUTTATA, Fabr. On eight or ten occasions, from the beginning to the end of May, 1861, I noticed bright and perfect specimens of the imago of this insect under the bark of oak logs in the woods. The species, as is well known, occurs exclusively in tim-

ber-land, and usually on foot-paths leading through the woods. Does its larva burrow in decayed wood and prey upon timber-borers? All known Cicindelidous larvæ burrow in the earth, but the imagos of certain foreign species, found in tropical America, are said by Westwood to haunt the leaves of trees, instead of the ground. (Westw. Intr. Classif. I. p. 49.)

Cotalpa (areoda) lanigera, Linn. On five separate occasions I have known the imago of this insect to be dug up in garden ground early in May, whence I infer that its larva feeds upon living roots, like that of the well-known May-beetle, (*Lachnosterna quercina*) and the European cockchafer (*Melolontha vulgaris.*) The closely-allied *Pelidnota punctata* Linn., on the contrary, lives in the larva state in rotten wood, whence I have myself bred it, and where it is recorded to breed by Dr. Harris. (Inj. Ins. p. 26.) Similarly the great majority of Elateridæ breed in rotten wood; but the larvæ of certain European species, and, as I believe from having bred the imago from garden-soil, that of the American *Cratonychus incertus* Lec., feed on the roots of living plants. An elaterid larva (species unknown) has been observed by me to be very destructive to young corn plants in the West on newly-broken prairie, devouring the portion of the stem which lies under ground.

Xyloryctes Satyrus, Fabr. The larva of this species does not feed on decayed wood, as the generic name (Anglicè *timber-digger*) would lead us to suppose, and as do the allied genera Dynastes and Phileurus, but on the roots of living grass. It is very large, white, and remarkable for the head being coal-black and coarsely punctate, and in its general appearance it closely resembles the larva of Lachnosterna. In the spring of 1861 I bred the imago from a larva found late in the preceding autumn under a flat stone in a grassy place in the woods. In the latter part of September, 1861, having found another larva similarly situated, I carefully replaced the stone, and, on revisiting it some weeks afterwards, found, a few inches under the surface, the track by which the larva had travelled off, consuming the roots of the grass as it went. I am informed by my ornithological friend, Dr. Velie, of Rock Island, that he has found larvæ, which from his description must be those of this insect, two or three feet below the surface, in the spring of the year, on digging out the nests of bank-swallows in a grassy spot several hundred feet from the nearest timber. Hence we may conclude that it burrows deeply into the earth to pass the winter.

N. B. — In estimating the alar expanse of my Lepidoptera, it should be observed that I set my specimens with the wings well drawn forward, which of course slightly diminishes the expanse. The more accurate method is to give the length of the fore-wing; but as Lepidopterists generally have not yet adopted this rule, I have, for the sake of uniformity, followed the usual practice.

Halesidota (lophocampa) Antiphola, n. sp. The imago of this species is utterly undistinguishable from that of *H. tessellaris*, Sm. Abb. & Harr. though the larva is very different, and occurs on oak, basswood, etc., but never on hickory; while that of *H. tessellaris* is peculiar to the buttonwood or sycamore. I have now before me four specimens of *tessellaris* (3 ♂, 1 ♀) and two of *Antiphola* (1 ♂, 1 ♀), both species carefully bred by myself in separate cages in 1862–3, for the express purpose of testing their identity. The former came out June 22 and 28 and July 8 and 21, and the latter, July 6 and 10. I have also before me six specimens of *Antiphola* (3 ♂, 3 ♀) bred by myself from the oak in 1858–61, when I had never attempted to breed *tessellaris*. There is some considerable variation, especially in the shape of the wing-bands, in individuals of both species; but on the closest scrutiny I can detect no variation in one which does not also occur in the other species. For example, in the front wing, — 1st. The terminal wing-band is confluent in its middle, in a single point, with the subterminal wing-band, (1 *tessellaris* and one wing only of another specimen, and 2 *Antiphola*.) 2d. The subterminal wing-band is widely interrupted in its middle, with or without an isolated roundish spot of the same color as the wing-band in the interruption, (1 *tessellaris*, 4 *Antiphola*.) 3d. The short band, or semifascia, on the middle of the costa, which is normally composed of one roundish or squarish costal spot, and two long and narrow sub-costal spots, all three contiguous, has all these three spots separated by a distinct interval, (1 *tessellaris*, 1 *Antiphola*) or has only two of these spots separated by a distinct interval, (1 *tessellaris*, 2 *Antiphola*.) 4th. The fourth band, counting from the tip of the wing, instead of having its sides sub-parallel, is resolved into a costal roundish or squarish spot, which touches at a single point the remaining part of the band, (3 *tessellaris*, 1 *Antiphola*.) 5th. The fifth or basal band, which is normally composed of two roundish or squarish costal spots, separated from each other by a wide interval, and touching at a single point, or widely confluent with, a much larger postcostal or anal spot, has one or both of the costal spots separated distinctly from the large postcostal spot, (1 *tessellaris*, 4 *Antiphola*.) 6th. The shortest space between the fourth and fifth bands varies in *tessellaris* from .07 to .12 inch, and in *Antiphola* from .02 in a very small ♂ to .12 inch.

In the body there is scarcely any variation, except that the hind edge of the collar, which is bluish-green in *tessellaris*, either for its whole width or only in the middle, is immaculate in all my *Antiphola* but two, and even in those two less obviously bluish-green. In both species the inner edges of the shoulder-covers are bluish-green, and there is in addition a narrow bluish-green vitta between the shoulder-covers which has been overlooked by Dr. Harris. As regards the legs, there is a small black or fuscous spot on the inside tip of the anterior femora in three *tessellaris*, and three or four *Antiphola*. The head, palpi, and antennæ are exactly alike. In describing *tessellaris*, Dr. Harris omitted to say that each of the five wing-bands bordered by minute dusky spots is either pale ochrey-brown, or several shades darker than the ground-color of the four wings, which, as he correctly states, is a faint tinge of ochre-yellow. The omission has not been supplied in Dr. Morris's Synopsis. (See p. 348.)

The *larva* of *H. Antiphola* may be described as follows, from the living specimens: — Body covered with dense hairs, varying in color in different specimens from dirty-whitish to fuscous-cinereous, and from ochre-yellowish to pale yellowish-brown. On the first segment behind the head a lateral black pencil of hairs, beneath which are two white pencils, all directed obliquely forwards; on the second segment a lateral black pencil, beneath which is one white pencil, both directed obliquely forwards; on the eleventh segment, the same as on the second, except that the pencils are directed obliquely backwards, and that the white pencil is less obvious. When disturbed, this larva rolls itself up like an Arctian. Food-plants, oak, basswood, &c. Very common near Rock Island, Illinois.

The larva of *tessellaris* has its pencils located on the second and third segments instead of the first and second, and they are yellow or orange-colored instead of being some of them black and some of them white. The larva of *Caryæ* Harris, which I do not know, is said to have a pair of black pencils on the fourth and on the tenth segment, and the imago is quite different from *Antiphola*. The larva mentioned by Dr. Harris (*Inj. Ins.* p. 362) as occurring on various trees, but with the imago of which he was unacquainted, is described by him as having no pencils on the first segment, and cannot, therefore, unless the Harrisian description is faulty, be identical with *Antiphola*. The larva of *maculata* Harris has a pair of black pencils on the fourth and on the tenth segments, instead of the first, second and eleventh, and besides, the imago is said to resemble *caryæ*, not *tessellaris*. It is observable that Dr. Harris says that the caterpillar of *tessellaris* "is not correctly represented in Smith & Abbott's Insects of Georgia." Possibly the caterpillar of *Antiphola* may be there represented.

The difference between describing the individual and describing the species, and the consequent importance of describing, whenever practicable, from numerous specimens, is well exemplified in the case of these two insects. A writer who had only one or two specimens of each imago before him, might have been easily led to suppose that any one of the six or eight variations which I have enumerated as common to both species was a good and valid specific character, whereas, as I have shown, they are all individual aberrations. Length of body of *H. Antiphola* ♂ .57–.65 inch, ♀ .57–.72 inch. Expanse ♂ 1.65–1.97 inch, ♀ 1.73–2.00 inch. Four ♂, four ♀. Those who recollect Shakspeare's *Comedy of Errors* will understand the allusion conveyed by the trivial name.

SPHINGICAMPA, n. g.

Differs from Dryocampa, to which it is otherwise very closely allied, only as follows: — The larva is sphingiform and always assumes in repose the true sphingide attitude. In the imago the ♀ antennæ, as well as those of ♂, are bipectinate for their basal two-thirds, and minutely serrate for the remaining one-third. The ♀ pectinations, however, are only three-fifths as long as in ♂, and do not merge into the serrations so abruptly as in ♂. As in Dryocampa, the hind wings are much curved forwards on the basal half of their costal edge, so as to project far beyond the front wings in repose.*

SPHINGICAMPA DISTIGMA, n. sp. ♂ *Body* pale ochre-yellow, sides of the abdomen paler; venter tinged with brown. *Legs* fuscous-gray, tarsal claws and tips of tarsi beneath, fuscous. *Wings, above*, ochre-yellow, sometimes tinged with ochrey-brown. Front wings irregularly and thickly sprinkled with dusky dots; two-fifths of the distance from the base, along the costa, are placed two roundish white dots, equi-distant from each other, from the central point of the disk,

* Ceratocampadæ was first established as a distinct and exclusively American family by Dr Harris, but has been somewhat unnaturally united with Saturniadæ by succeeding authors, (Harris *Inj. Ins.*, p. 398; Morris *Synopsis*, pp. XXIV and 219.) Dr. Clemens has beautifully shown that it differs from Saturniadæ, not only in the characters laid down by Dr. Harris, but also in having "the subcosto-inferior nervule of the front wing *simple* and not *furcate*," (*Proc. Ent. Soc. Philad.*, I., p. 177.) In other words, in Ceratocampadæ the subcostal vein sends off towards its tip three branches or sectors which are all simple; in Saturniadæ the middle one of these three sectors, instead of rising directly from the subcostal vein, rises from the basal sector or branch, thus making that basal sector appear "furcate." (Compare Harris *Inj. Ins.*, figs. 187 and 194.) Sphingicampa, it may be added, follows strictly the Ceratocampade type in this respect, and it agrees with Dryocampa and differs from Ceratocampa in the palpi being very small and indistinct. The Harrisian family character, "♀ antennæ thread-like, and neither feathered nor toothed," must be modified so as to include Sphingicampa. It is remarkable that the typical forms in Ceratocampadæ all, so far as known, feed on the oak, and the aberrant forms upon other forest trees.

and from the costal edge, a line connecting them being at right angles to the costal edge, or sloping slightly towards the basal hind edge of the wing. These two dots are sometimes of equal size, sometimes the one nearest the costa has twice the diameter of the other, and occasionally *vice versa;* and in two or three specimens, there is a dusky cloud on their terminal side. At about one-seventh of the distance from the apex to the base commences a narrow and obscurely-defined fuscous band, slowly and gradually diverging from the terminal margin for three-fourths its length, when it suddenly converges with the terminal margin for the remaining one-fourth of its length, forming an angle of about 140° with its former course, and attains the interior margin. On the terminal side of this band, the ground-color of the wing is of a paler yellow, and generally with a faint, purplish tinge. Hind wings lake-red, except the sub-costa and the terminal one-third or one-fourth, or occasionally the terminal one-fifth. *Beneath*, the front wings have the same sub-terminal narrow band as above, but less distinctly angulated, and except towards its costal extremity, not fuscous, but dull lake-red. On the basal side of this band the sub-costa is bright ochre-yellow, with a few dusky dots, and the other part lake-red, shading off gradually to a pale, dull yellow with a tint of purple as the band is approached, which last color is continued beyond the band, where there are also a few scattering dusky dots. In a single ♂ the lake-red color extends nearly to the terminal edge. The hind wings are ochrey-whitish, sprinkled with dusky dots, especially along the costa; two-thirds of the way along their costa from the base there is a very obscure, narrow band, dusky towards the costa, elsewhere brown, gradually and slowly diverging from the terminal edge for three-fourths its length, and then angulated as in the front wing till it attains the interior or anal edge.

The ♀ differs only as follows: — In one specimen, the front wing above is almost ochrey-brown. In two, the white dots of the front wing are entirely absent; and in another, only the one next the costa is present, and is smaller than usual. The ground-color of the front wing is always the same on both sides the band. In one specimen, the lake-red color of the hind wing extends to its terminal margin. Beneath, the band on the hind wings is always very distinct, and wider than in ♂.

Length ♂ .91–1.00 inch, ♀ 1.00–1.15 inch. Expanse ♂ 2.12–2.44 inch, ♀ 2.50–2.93 inch. Six ♂, seven ♀, all bred from the larva. That there may be no possible doubt as to the ♀ antennæ being bipectinate, it may be as well to state that on June 22 a ♂ and ♀ copulated in the cage, and remained in copulation for half an hour after they had been pinned. The first imago, a ♀, appeared June 13, and the last, also a ♀, July 28, all without exception coming out about dusk.

The *larva*, which is described from the living specimens, is one of the most beautiful natural objects known to me. It is about 1.80 inch long and .45 inch in diameter, of a bright grass-green color, with scattered whitish tubercles, or short, robust thorns, very thickly set towards the anus, and a regular row of them at the anterior dorsal edge of the three or four first segments. Laterally, immediately beneath the line of spiracles, which are normal, from the third thoracic to the penultimate abdominal segment inclusive, there is a narrow, whitish vitta, bordered above by purple. On each side of the dorsum of thoracic segments 2 and 3 are two slender transversely arranged recurved horns, one-fourth inch long, tubercled, and either bluish or purplish at tip. On each side of joints 5, 7 and 9, or occasionally only on 7 and 9, and in three specimens on 5, 7, 9 and 10, are a pair of slightly recurved, highly-polished, silvery or nacreous thorns, the outer one short and robust, the inner one slenderish and .15 inch long. In one of the three specimens having a lateral pair of nacreous thorns both on 5, 7, 9 and 10, there are, in addition, single rudimental nacreous thorns on 6 and 8, in range with the longer nacreous thorns on 5, 7, 9 and 10; and in another one of the three there are such rudimental thorns both on 4, 6 and 8. In still another specimen, which has the normal pair of thorns on 5, 7 and 9, there is only a single lateral thorn on 10. On the dorsum of 11 is a horn similar to those on 2 and 3. Anus horizontal. Body, beneath, green, with smaller and denser tubercles. Legs rufous, tipped with brown-black; prolegs brown-black beneath as well as their hooks. Head rufous, rugose, with a longitudinal stria divaricating at an angle of 45° two-thirds of the way to the mouth, which is obfuscated. In two out of three alcoholic specimens, there is, on the middle of segments 2–11 or 4–10, just below the lateral white vitta, a short, robust black thorn, which I did not notice in the living insect, and several of the ventral tubercles are also brown-black. Described from twelve to twenty specimens. *Food-plant*, honey-locust. The first larva met with, which was full-grown and shortly after went under ground, occurred July 10. Most of my larvæ buried themselves three or four inches in the earth, but one of them only buried one-half of its body under the earth, the remaining part being covered by some dry leaves.

The *pupa*, which is not contained in any cocoon, is of the usual dark chestnut color, with deep, coarse punctures towards the anus, and has its anterior end armed with fifteen to twenty short, robust, hooked thorns, pointing in various directions. The piece covering the antennæ distinctly exhibits their bipectinations. The pronotum is obsemicircular, placed immediately behind the origin of the antennæ, and bears on its hinder suture, near the lateral apex of the semicircle a spiracle, in the form of a semi-circular opening .02 inch long.

The mesonotum is three times as long as the pronotum, and bears the front wing-cases, but no spiracle. Then follow two short pieces, each half as long as the pronotum, and neither of them bearing any spiracle, the anterior one bearing the hind wing-cases.* Then eight abdominal segments, all but the last of which bear a conspicuous lateral spiracle. At each end of abdominal joints 4 and 5, and at the anterior end of 6, is a close-set row of robust thorns, and a sub-obsolete row on the hind end of 3, 6 and 7; and the three grooves between 3–6 are very deep and wide. On the eighth or anal joint are about a dozen irregular thorns, and the anal thorn is .19 inch long, rugose beneath, tubercled above, and acutely bifid at its terminal one-fifth. Total length, 1.34 inch; greatest diameter, .39 inch. One specimen.

Dryocampa bicolor (?) Harris. ♂ Three specimens, one of which I bred in 1861–2, and two on June 30 and July 30, 1863, from a normal Dryocampade larva feeding on oak-leaves in 1862, are utterly undistinguishable from *Sphingicampa distigma* ♂ Walsh, except by the front wings being slightly more tinged with brown. In one specimen the two white dots of the front wing are of equal size; in the other two the dot next the costa has twice the diameter of the other one. They scarcely differ from Harris's description of *bicolor* except as follows: — *First*, There are *two* obvious white dots on the front wing above, but, as we saw, a variety of ♀ *S. distigma* occurs with only *one* dot, as Harris describes *bicolor*. *Second*, The hind wings are lake-red above only on their basal two-thirds or three-fourths; but, as we have seen, a variety of ♀ *S. distigma* occurs with the hind wings entirely lake-red, as Harris describes *bicolor*. — Length ♂ .90–1.10 inch. Expanse ♂ 2.17–2.30 inch. Three ♂, ♀ unknown. As only the ♂ of *bicolor* was known to Dr. Harris, and as ♂ *bicolor* and ♂ *distigma* are undistinguishable, though the larvæ are entirely different, it is possible that *bicolor* Harris is identical with *distigma* Walsh, and distinct from *bicolor* Harris Walsh. Since, however, Dr. Harris's species has been currently referred to Dryocampa, I have thought it best to leave it in the genus where I found it.

What I suppose to have been the *larva* of *bicolor* resembled pretty closely that of *Dryocampa pellucida*, as described by Dr. Fitch (N. Y. Rep. II. § 324), so that imagining it to belong to that species, I failed to note the points of difference. As, however, I bred in the same cage specimens of *D. stigma*, and as Dr. Harris describes the larva both of *stigma* and *pellucida* very differently from Dr. Fitch, it may possibly have been the case that what I took for the larva of *stigma* was in reality the larva of *bicolor*. Both *S. distigma* Walsh and *D. bicolor* Harris Walsh differ from *D. senatoria*, *stigma* and *rubicunda*,

* I consider both these two pieces to be metanotal.

but scarcely from *pellucida*, in the angle formed by the costal with the terminal edge of the front wing being much less acute, or, in other words, by the interior margin being proportionally longer and the terminal margin proportionally shorter.

It is quite impossible that I should have bred both *distigma* and *bicolor* from the *same* larva, thus manufacturing *two* species out of *one*, because not only were the two species bred in distinct cages in 1862–3, but I bred, as already stated, a *bicolor* in 1861–2, which was a year before I became acquainted with the very remarkable larva of *distigma*.* I am familiar with the larva of *D. senatoria*, and never saw any of them assume the peculiar sphingide attitude, which the larva of *S. distigma* invariably assumes in repose, clasping at the same time the under surface of the main rib of the honey-locust leaf with its prolegs, so as to be overshadowed and concealed by the leaflets. The young larva of the allied *Ceratocampa regalis* is said by Dr. Harris "when at rest to bend the fore part of the body sideways, so that the head nearly touches the middle of the side." (Inj. Ins. p. 400.) *Sphingicampa* seems to be a beautiful connecting link between *Ceratocampa* and the sphingide genus *Ceratomia*, the larva of which last has, like the two former genera, horns on the meso- and meta-thorax. Indeed, until I noticed the antennæ of the pupa of *Sphingicampa*, I was fully persuaded that I had got hold of a new species of *Ceratomia*. The generic distinction between the imagos of *Sphingicampa* and *Dryocampa* is precisely similar to that between the imagos of *Attacus* and *Saturnia*.

It being thus shown that in Halesidota, Walker (= Lophocampa, Harris), two species which are quite distinct in the larva, are undistinguishable in the ♂ ♀ imago, and that in Dryocampadæ two species, belonging to distinct genera, and the larvæ of which are totally

* There is one possible source of error as to the distinctness of *Dryocampa bicolor* and *Sphingicampa distigma* which had escaped my attention. These two supposed species were, it is true, bred in separate cages and kept separate when buried for the winter, but in the spring the separate cages into which they were put were filled with fresh earth taken from my door-yard. In this door-yard stand two honey-locusts, from which I had obtained most of my larvæ of *distigma* in 1862. It is barely possible, therefore, that some of the fresh earth placed in the cage in the spring might have contained, unobserved by myself, a pupa of *distigma*; but on the supposition that my three specimens of *bicolor* were bred from such pupæ, it is necessary that this improbable thing should have happened, not only once in the spring of 1862, but twice in the spring of 1863. I am the less inclined to believe that this could have been the case, because Dr. Fitch has remarked that *D. stigma* (imago) "can sometimes scarcely be distinguished" from *D. senatoria* imago, and so far as regards the coloration I can confirm this fact from my own experience. Yet the larvæ of these two species are very different. (See Fitch, *N. Y. Rep.*, Vol. II., § 323.) Mr. Edwards writes me word that "he thinks in *D. pellucida* and *D. stigma* there is a great resemblance between either the ♂♂ or the ♀♀, he is not certain which."

unlike each other, are also undistinguishable in ♂ imago, the importance of carefully studying the larva state of every insect becomes at once apparent. Have these two pairs of species been apparently identical in the imago, either ♂ ♀ or ♂ only, and actually distinct in the larva, for all time since their supposed original creation? or were they identical both in larva and imago, perhaps some millions of years ago, and did an individual Halesidota then acquire a taste for buttonwood leaves instead of oak and basswood leaves, and an individual Dryocampa acquire a taste for honey-locust leaves instead of oak leaves, and propagate the same taste in its descendants through all time? Is it possible that in the course of millions of years a permanent change in food should have then produced external structural differences in the larva such as those we see between the larvæ of *H. tessellaris* and *Antiphola*, and between the larvæ of *S. distigma* and *D. bicolor*, and internal structural differences in the imago such as would prevent the sexual intermixture of the two races? I am acquainted with some cases where change of food produces a constant and very remarkable change in coloration in the larva, though none of any consequence in the imago. One of these cases, which is fortified by the authority of Abbott, (*Datana ministra*) I have recorded in the *Proc. Ent. Soc.* of Philadelphia (Vol. I. p. 296); and Dr. Fitch has recorded the very instructive fact that the mere shifting of their quarters, from the leaf to the ear of one and the same plant, produces in the descendants of *Aphis avenæ* (the grain plant-louse) a constant change of color from green to yellow or reddish-yellow. Again, that even structural differences may be propagated by hereditary descent in Mollusca to a whole local race, we learn on the authority of Dr. P. P. Carpenter. "It is a curious fact," says that author, "that whatever be the form of the operculum in the different tribes of predaceous mollusks, whenever it has been broken, and has to be repaired by the animal, it always takes a simple oval shape, with concentric layers, the nucleus being in the middle. In one place on the English coast there is found a race of *Buccinum undatum* (the common whelk of the English and American coasts), which perpetuates a very abnormal condition. They have two small opercula of more or less irregular shapes, but each of concentric elements. Probably their remote ancestor met with an accident, and has transmitted her mode of repairing the fracture to her descendants." (*Lectures on Mollusca*, Smithson. Rep. 1860, p. 176.) The phenomena of what are known as "self-tailed dogs" are familiar to many Englishmen. In the great grazing counties in the north of England a peculiar breed of dogs, known as the "Cur-dog," has been used for ages for driving cattle, as the Colley-dog is used for driving sheep, and so common has been the practice of cropping their tails that Bewick actually

figures the animal with a short tail. "Many of these cur-dogs," says that writer, "are whelped with short tails, which seem as if they had been cut; and these are called self-tailed dogs." (*Hist. Quadrupeds*, 5th ed. p. 329.) More than thirty years ago, the gardener of one of my relatives at Thetford, in England, had, by continually cropping the tails of the kittens, originated, as I was credibly informed, a breed of *self-tailed* or short-tailed cats. It is singular that although Darwin mentions a race of stags "with an antler only on one side," which can only be supposed to have originated from accidental mutilation propagated by hereditary descent, yet that he should assert that "there is not sufficient evidence to induce us to believe that mutilations are ever inherited." (*Origin of Species*, pp. 123 and 130, Am. ed.) The very frequent and sometimes almost universal absence of the anterior tarsi in certain species of dung-feeding beetles can scarcely be explained, as he proposes, by the effects of disuse; for on that hypothesis we should surely find the anterior tarsi, when present in these species, abnormally short, as in the Lepidopterous Nymphalidæ; whereas, of more than twenty recent *Chœridium capistratum* examined by myself in 1860, only one had any anterior tarsi, but that one had them fully developed. I suspect that he is mistaken in saying (p. 123) that "in some genera [of dung-feeding beetles] the [anterior] tarsi are present, but in a rudimentary condition." Dr. LeConte, indeed, says that "in one genus, Dendropœmon, from Brazil, the tarsi have only two joints," (*Introd. Class. Coleopt.*, p. 125), but this is a very different thing from a true rudimentary tarsus, such as is found in the anterior legs of Nymphalidæ, where all the joints are present, but greatly reduced in length and functionally impotent (Argynnis ♀), or soldered together with no appearance of any sutures, (other Nymphalidæ.) Latreille says of the European genus Onitis, "antici pedes, in fœminis saltem, tarsis nullis." (*Gen. Crust. et Ins.*, II. p. 80.)

Nearly a hundred years ago, the borer that infests the locust (*Clytus pictus* Drury) was known by Forster "to inhabit the locust in the province of New York." (Quoted by Fitch, *N. Y. Rep.*, II., § 329.) Twenty-five and probably up to fifteen years ago, it was unknown in Illinois on the locust, although, according to our best Illinois botanists, the locust is indigenous in the southern part of the State. For many years back, it has been gradually working its way into the State westward and southward, destroying the locust-trees as it advances, and has now reached two points (Geneseo and Coal Valley) within twenty and twelve miles respectively of the Mississippi River at Rock Island. In northeastern and central Illinois, the locust-trees were pretty much destroyed several years ago, e. g. near Chicago, La-Salle, Bloomington, and Jacksonville. In Rock Island they are as yet untouched. Yet as much as six years ago I split a ♂ imago of

Clytus pictus, which I still preserve, out of a stick of hickory wood in Rock Island, and in the course of the next two or three years I took two specimens in the same neighborhood, which proves that the species has been all the time in existence there, feeding in all probability on our hickories and walnuts. * Is this hickory-feeding insect a distinct species, differing in the larva state, but apparently identical in the imago, or was there a brood of *Clytus pictus* one hundred years ago in the Eastern States, which acquired a taste for locust wood, and, by the laws of hereditary descent, handed over the taste to their descendants, which have gradually, in the course of a century, spread westward to the Mississippi River? We are bound, I think, to accept the latter hypothesis until the former one can be proved to be true. Will this locust-feeding race of *Clytus pictus*, in the course of an indefinitely long period of time ever acquire structural differences in the larva, similar to those which distinguish the larva of the oak and basswood-feeding *Halesidota Antiphola* from that of the buttonwood-feeding *H. tessellaris?* and is it probable that in the course of a still longer period of time the imagos may become distinct either in coloration, or in structure, or in both? To believe in the present existence of distinct species is one thing — nobody doubts that; to believe that they have always been distinct, and will always remain distinct, throughout all time from their supposed original creation, is another and a very different thing.

* After the above was placed in the hands of the Society (Sep. 2), a numerous swarm of the imagos of *Clytus pictus* has burst forth from the locusts in Rock Island. The locusts in our Court-House Square, which were planted twenty to twenty-two years ago, are now (Sep. 14, 1863) full of the borings of this insect, and two or three imagos may be found on the trunk of almost every one of them. Three years ago I carefully examined these same trees, and could not discover a single hole. Yet there are plenty of hickory trees growing within a mile of the Court House. I may add here that Prof. Sheldon, of Davenport, Iowa, has informed me that he has repeatedly, for many years back, split *Clytus pictus* out of hickory wood, and that, so far as he is aware, the locusts in Davenport are not yet attacked by this insect.

It is well known that the locust-feeding type of this insect occurs in the imago state exclusively *in the autumn*. The hickory-feeding type, on the contrary, is said by Mr. Bland to be abundant on that tree *in the spring*, (*Proc. Entom. Soc. Phila.*, I. p. 95.) Again, Dr. Harris describes the young larvæ of the locust-feeding type as "boring in the spring through the sapwood more or less deeply into the trunk, the general course of their winding and irregular passages being in an upward direction." (*Inj. Ins.*, p. 104.) Speaking of the hickory-feeding type, Dr. Horn describes the excavations of the larva as being "immediately subcortical not in a line, but in every direction," and says that it is not till "it is about to become pupa that it bores for a slight depth into the wood and for a distance of about three inches." (*Proc. Ent. Soc. Philad.*, I., p. 30, and compare p. 122.) Hence it would appear that the habits of the two types of this insect differ, especially as to the time of their assuming the imago state. The larva of the hickory-feeding type is fully described and figured by Baron Osten Sacken. (*Proc. Ent. Soc. Philad.*, I. pp. 105 and 121.) I am not aware that there is any full description extant of the larva of the locust-feeding type.

The following gradations in a regular series are, I think, established from the above-mentioned facts: — *First*, Races exist having distinct food-plants peculiar to each of them, but not, so far as known, differing either in the larva or imago, (*Clytus pictus.*) *Second*, Races exist having distinct food-plants, the larvæ of which differ most remarkably in coloration, but not in structure, and the imagos are almost and perhaps quite identical, (*Datana ministra.*) *Third*, There exist what, according to the accepted laws of classification, we must consider as distinct species, the larvæ of which are structurally distinct, and the ♂ imagos, to all appearance, identical, though there is every reason to believe that the ♀ imagos, one of which is unknown, are structurally distinct in the form of their antennæ, (*Sphingicampa distigma*, n. sp. and *Dryocampa bicolor* Harris Walsh.) *Fourth*, There exist what, according to the accepted laws of classification, we must consider as distinct species, the larvæ of which are structurally distinct, and the imagos, ♂ ♀, to all appearance, identical, (*Halesidota tessellaris* and *Antiphola*, n. sp.) *Fifth*, The great bulk of what we call distinct species are distinct either in coloration, or in structure, or in both, in both the ♂ ♀ imago and the larva states. — It is impossible, in my mind, to avoid arriving at the conclusion that these are but different stages in one and the same process, viz., the formation of a new species.

It is not necessary that those who believe in the origin of species by hereditary descent should believe in any one exclusive method by which those species are originated. Some, perhaps the great majority of species, may have been formed upon the Darwinian theory of Natural Selection, some by changes in the conditions of life, and especially by change of food, as in the above-recited cases, some by what Prof. Owen rather obscurely terms "the ordained potentiality of second causes, from single-celled organisms, with innate capacities of variation and development," (quoted in *Silliman's Journal*, Vol. XXXVI., p. 298), and some by other yet unexplained processes. No one cause appears to be sufficient to account for all the phenomena. Natural Selection does not explain the origin of many structures, both in the animal and vegetable kingdoms, which cannot be conceived to subserve any utilitarian purpose, and "innate capacities of variation" does not satisfactorily account for the many wonderful coädaptations of structure met with in almost every organized being.

LIMACODES SCAPHA Harris. Imago undescribed. ♀ Body robust, very pale chestnut-brown. Antennæ more than attaining the middle of the costa. Legs but moderately hairy, and of a very pale chestnut-brown color. Wings very pale chestnut-brown, above and beneath, the entire length of the costa of the front wing with a large, velvety, chestnut-brown patch, beautifully regular in its shape, and

edged behind with silvery-white, which shades off gradually into the ground color. The shape of this patch may be thus defined: — With one leg of the compass on the middle of the costa, and with a radius equal to one-fourth of the costa, commence next the base of the wing, and proceed to describe a semi-circle; as soon as three-fourths of the semi-circular arc is described, draw from that point to the apex of the wing a circular arc of 45°, with its convexity towards the terminal margin, and connect the sub-costal vein, at the point of commencement, with the base of the wing by a line diverging from the costal edge, so as to double its distance by the time it attains the base of the wing. The whole spot thus constructed has somewhat the shape of the half of a very sharp-pointed acorn, the narrow stripe next the base representing the stalk, the three-fourths of the semi-circular arc the cup, and the arc of 45° the acorn itself. Length ♀ .43 inch. Expanse ♀ 1.19 inch. Length of cocoon .42 inch; breadth, .31 inch. One ♀; ♂ unknown. The larva fed on hickory leaves, but I have met with two specimens on the buttonwood or sycamore. The imago did not appear till the following summer. It is possible, but extremely improbable, that I may be mistaken in referring the above imago and cocoon to *scapha* Harris, as I had some other larvæ in the same jar with that of *scapha*.

Limacodes? hyalinus, n. sp. ♂ *Body* robust, covered with long, shining, brown-black hairs. Antennæ reaching one-third of the way along the costa, pale-brown, widely pectinate at base, the pectinations at base as long as the diameter of the eye, and gradually tapering to nothing at the tip; palpi concealed by yellowish hairs. Tip of *abdomen* with a brush of rufous hairs. *Legs* dull rufous, mostly covered by long, black hairs, hind femora covered with long, yellowish hairs, and the hind tarsi with rufous ones. Front *wings* narrow, three times as long as wide; hind wings triangular, the costal edge convex, the anal edge straight, the terminal edge very slightly concave, and the apex of the apical and anal angles acute and not rounded off. Disk of all four wings hyaline to the naked eye, but under the lens sparsely covered with fine, appressed, short, dusky hairs. Front wings with the veins, a narrow costal and terminal margin, a much wider interior margin, and a small spot at the tip of the discoidal cellule, all opaquely mottled with brown-black and ochre-yellow hair. Hind wings with the veins, a wide costal and interior margin, and a very narrow but definite terminal margin, all opaquely covered with brown-black hair. Length .36 inch. Expanse .70 inch. One ♂, which hybernated in the cocoon; ♀ unknown.

The *larva* is flattish, elongate-oval, of a palish brown color, with about nine pairs of laterally-projecting, flattened appendages, covered with short, dense, velvety hair, arranged along the entire length of

its dorsum. Of these appendages, the third, fifth and seventh pairs project greatly beyond the others, the third and fifth nearly straight, but with the tips hooked backwards, the seventh regularly curved forwards. Each appendage has the hair parted down the middle of its upper, and so far as visible, of its lower surface, so as to point in contrary directions, and they are very slightly attached to the body, and are shaken off by the insect before proceeding to spin its cocoon. Beneath, above each spiracle, is a divergent bunch of pale-brown hair. Length (not quite full grown) .38 inch. Width, including appendages, .38 inch; without appendages .20 inch. Length of cocoon .35 inch; breadth .25 inch. *Food-plant*, wild cherry. One specimen. Comes very near to the larva of *L. pithecium* Sm. Abb. in the structure of its appendages, and seems to differ chiefly in the seventh appendage curving forwards and not backwards, and in the insect being much smaller. And yet the imago differs from Limacodes in the antennæ being pectinate, and in the remarkable shape of the hind wings, and will, probably, when the ♀ is known, form a new genus. Two larvæ, which occurred on the oak in the autumn of 1862, apparently belong to another species allied to *pithecium*, though I failed to breed them, one having died after spinning, and the other having produced from its cocoon, August 4th of the following year, a common species of Conops (Diptera) with the middle third of its abdomen sanguineous, perhaps *C. analis* Fabr. These latter larvæ were much larger than that of *hyalinus*, measuring, when recent, .70 inch; they agreed with it in having apparently nine pairs of appendages, the last pair very short, but they had only the third and sixth pairs projecting beyond the others, and both these pairs were curved backwards, with the extreme tips of each slightly hooked forwards. We may call this larva *Limacodes? tetradactylus*.

Hipparchiscus, n. gen.

(Belongs to the family Geometridæ.) *Palpi* long, projecting beyond the head about one diameter of the eye, the basal joints hairy, moderately long, and gently curved upwards, the terminal joint not hairy, short and porrect. *Antennæ* long, extending nearly two-thirds of the way to the apex of the expanded front wing, bipectinate three-fourths of the way to the tip in ♂ and subserrate on the other one-fourth, simple or scarcely subserrate in ♀. *Maxillæ* nearly as long as the antennæ. *Abdomen* ♂ with a terminal brush. *Legs* with the hind tibiæ ♂ furnished with a large fan-like brush of hairs; front tibiæ ♂ with a small brush of hairs; tibial spurs normal, but minute on the anterior legs; first tarsal joints fully as long as the four following put together. *Wings* simple; front wings subtrigonate, the interior margin perfectly straight, and the costal, interior and terminal

margins about in the proportion of twenty-seven, nineteen and sixteen to each other, the apex of the apical and anal angles but slightly rounded off. Hind wings nearly as large and as wide as the front wings, and nearly in the form of half a quadrant, the costal and interior margins straight, and equal to each other, the terminal margin strongly curved in its middle, so as to foreshadow a tail, and more gently elsewhere ; the apex of the apical angle much rounded off, that of the anal angle scarcely rounded off. Fringes unicolored. *Larva* ten-footed, its dorsum with curved lateral appendages covered with short, velvety hair, and similar to those of *Limacodes? hyalinus* Walsh, except that they are much shorter and none of them abruptly longer than the others.

Hipparchiscus venustus, n. sp. ♂ ♀ Milk-white. *Head* with a large, squarish, ferruginous spot extending from eye to eye before the base of the antennæ ; occiput grass-green ; antennæ of ♂, with a pair of the longest bipectinations, which lie about one-fourth of the way from the base, expanding two-thirds the diameter of the eye. *Thorax* grass-green above. *Abdomen*, with the dorsum of segments 1–3 grass-green, segment 1 with a milk-white, squarish dorsal spot covering its whole length, and 3 with a similar spot, generally confluent with the white surface of 4, but occasionally, when 4 and 5 are also marked with green above, as distinct as the other spot. *Wings* grass-green, white on the basal three-fourths of their costal edge, their fringe white, and each wing with two narrow, linear whitish fasciæ, the *locus* of which may be thus defined : — Let the interior margin of the front wing and the costal margin of the hind wing touch as near as may be ; then trisect the interior margin of the front wing, and, with one leg of the compasses on the extreme base of either wing and the other leg on the point of trisection nearest to the base, describe a circular arc on either wing. From the other point of trisection draw upon either wing a line parallel with the terminal margin ; and let each one of these four lines be slightly sinuate, and let that next the base of the front wing be almost serrate. Length ♂ .40 inch, ♀ .35–.39 inch. Expanse, ♂ 1.06 inch, ♀ 1.00–1.18 inch. One ♂, two ♀, one of which was bred May 11th from the *larva*, which hybernated, without spinning any cocoon, at the bottom of a glass jar. *Food-plant*, oak. The grass-green color in this insect is nearly the same shade found in *Attacus luna*, but scarcely so yellow. The *larva* was a true "looper," of the usual cylindrical shape, and of a dingy-brown color, and including the appendages measured about one-fourth of an inch across. The *pupa* is of a pale ochrey-brown color, varied with reddish-brown, with many fuscous dots, especially along the nervures of the wing-cases, and with the caudal thorn simple. It measures .43 inch, including the thorn ; (from the pupal integument.)

This species cannot be referred with propriety to any one of the eighty-five British genera of Geometridæ. *Hipparchus* Leach, *Hemithea* Duponchel, and *Chlorissa* Stephens, all agree with it in the wings being green, but it differs from the first in the hind wings not being denticulate, from the second in the palpi not being short, and from the third in the ♂ antennæ being distinctly bipectinate. I am not aware, either, that any described genus of Geometridæ has the larva furnished with the remarkable lateral appendages met with in this insect, or the *hind* tibiæ of the ♂ imago furnished, as in this insect, with large fan-like brushes. Such brushes, indeed, occur in the *front* tibiæ of many Pyralide genera, e. g. Macrochila, Pechipogon, and Paracolax, commonly called "fan-footed moths," and I notice them in five or six U. States Pyralide species in my collection. In another green Geometride species in my collection, which manifestly belongs to a distinct genus, there is no such fan-like brush on the ♂ hind tibiæ, though, as in several other genera in this family, there is a small one on the ♂ front tibiæ.

DIPTERA.

The only known Tabanide larva, as I am informed by Baron Osten Sacken, has been described by De Geer, and was terrestrial. (See *Westw. Intr.*, II., p. 541 and fig. 128, 9.) The following is aquatic, and the imago obtained from it belongs to the genus Tabanus, but is in too bad condition to be specifically determined, having remained many weeks unattended to in the breeding-jar. I have, on many different occasions, found this larva amongst floating rejectamenta. On one occasion I found six or seven specimens in the interior of a floating log, so soft and rotten that it could be cut like cheese. Once I discovered a single specimen under a flat, submerged stone, in a little, running brook. And finally, I once met with one alive, under a log, on a piece of dry land which had been submerged two or three weeks before, whence it appears that it can exist a long time out of the water. I had, on several previous occasions, failed to breed this larva to maturity, and the only imago I have was obtained in 1861, from larvæ, which, suspecting them to be carnivorous from the very varied stations in which they had occurred, I had supplied with a number of fresh-water mollusks, but the habits of which, in consequence of having been away from home, I was unable to watch. On Sept. 2d, 1863, I found a nearly full-grown larva amongst floating rejectamenta, and between that date and Sept. 23d, he has devoured the mollusks of eleven univalves (*Gen. Planorbis*) from one-half to three-fourths of an inch in diameter; and on three separate occasions I have seen him work his way into the mouth of the shell. In this operation his pseudopods were energetically employed, and I found, on cracking the shells

after he had withdrawn, that a small portion of the tail end of the animal was left untouched — no doubt in consequence of his being unable to penetrate to the small end of the whorl of the shell — and also the skin of the remaining part and the horny tongue-membrane.

Several species of Tabanus are so prodigiously abundant in Illinois, in districts remote from any large streams or ponds, that they must evidently breed in the earth, like DeGeer's species, not in the water, like mine. There are prairies in Central Illinois, as I am credibly informed by numerous witnesses, across which it is impossible to ride or drive a horse in the heat of a summer's day on account of the Tabanus. The most troublesome species is rather larger than *T. lineola* Fabr., and when alive, its eyes are of a brilliant emerald-green, whence it is popularly known as the "greenhead." This species is pretty common every year in the adjoining county of Henry, yet I have never met with it in Rock Island County, Ill., which lies immediately north-west of Henry, though we have eight other species of Tabanus, all rare but *lineola;* and I believe it does not generally occur in Northern Illinois. Baron Osten Sacken has commented to me on the singular fact, that, although Tabanidæ are so numerous in individuals, we scarcely ever meet with their larvæ. But this will not appear so remarkable when we reflect, that of the only two species known in the larva state, one hides itself in the earth and the other in the water.

If, therefore, as appears from the above considerations, the larvæ of many, perhaps most, of our Tabanidæ live in the ground, and if, as there is every reason to suppose, the larvæ of the terrestrial species are as carnivorous as I have shown those of the aquatic species to be, there can be little doubt, considering how numerous in individuals many of the species are, that they must destroy, during their larva life, innumerable noxious subterranean larvæ, *Melolonthadæ*, *Lyttadæ*, *Tipuladæ*, etc. They certainly cannot, at least in Illinois, feed habitually upon land-snails, for land-snails are quite scarce in that State. The scheme of the Creation is perfect, and Nature is never at fault. It is only when Nature's system is but half understood that we heedlessly complain of its imperfections. We blame the house-flies for annoying us, and fail to see that in the larva state they have cleared away impurities around our dwellings, which might otherwise have bred cholera and typhus fever. We execrate the blood-thirsty mosquito, and forget that in the larva state she has purified the water, which would otherwise, by its malarial effluvia, have generated agues and fevers. In all probability, when we rail at the Tabani, that torment our horses in the summer, we are railing at insects which, in the larva state, have added millions of dollars to the national wealth, by

preying upon those most insidious and unmanageable of all the insect-foes of the farmer — subterraneous root-feeding larvæ.

TABANUS ——? Imago ♂. Blackish. Legs blackish; wings brownish-fuscous. Length .70 inch. Expanse 1.30 inch. One decayed specimen came out between June 14 and July 14, 1861, from a larva found early in June.

Larva (from two living specimens, obtained August 14th, 1860, and September 2d, 1863). Length 2.25 inch when extended, 1.75 inch when contracted; diameter .25–.30 inch. The specimen found in 1863, .25 inch shorter. Body cylindrical, twelve-jointed, the three or four terminal joints much tapered at each end of the body, but more so anteriorly than posteriorly, and joints one and eleven, each with a retractile membranous prolongation at tip. Joints one to ten are subequal; eleven is about two-thirds as long as ten, and twelve about one-fourth as long, and .05 inch in diameter. Color a transparent greenish-white, paler beneath; an irregular dark-green or greenish-black annulus, paler beneath, on the anterior and posterior margins of joints two to eleven, the anterior annulus laterally connected with the posterior by two to four dark-green lines. On the dorsum of four to nine, and more obscurely on ten, a dark-green basal triangle, extending half-way to the tip; joint one with paler markings, and with no dark annulus behind; joint twelve entirely fuscous. Head small, apparently fleshy, pale, truncate-conical, .03 inch wide, and about .04 inch long in repose, inserted in joint one without any shoulder The trophi occupy two-thirds of its length, but it has a long cylindrical internal prolongation, extending to the middle of joint two, which is sometimes partially exserted, so that the head becomes twice as long as before. All the trophi are pale and apparently fleshy, except the mandibles, which are dark-colored and evidently horny, and they have no perceptible motion in the living insect. The labrum is slender, a little tapered, and three times as long as wide, on each side of and beneath which is a slender, thorn-like, decurved, brown-black mandible. The labium resembles the labrum, but is shorter, and on each side of it is a slender palpiform, but exarticulate maxilla, extending beyond the rest of the mouth in an oblique direction. No palpi. On the vertex are a pair of short, fleshy, exarticulate, filiform antennæ, and there are no distinct eyes or ocelli. In the cast larval integument the entire head, .25 inch long, is exserted, and is dark-colored and evidently horny, all the parts retaining their shape except the antennæ, labrum and labium. The whole head has here the appearance of the basal part of the leaf of a grass-plant, clasping the origin of the maxillæ on its posterior half, and bifurcating into the somewhat tapered cylindrical mandibles on its anterior half. The maxillæ are traceable to two-thirds of the distance from the tip to the base of the

head, scarcely tapering, bent obliquely downwards at two-thirds of the way to their tip, and obliquely truncate at tip. On the anterior margin of ventral segments four to ten, in the living insect, is a row of six large, fleshy, roundish, tubercular, retractile pseudopods, the outside ones projecting laterally, and each at tip transversely striate and armed with short, bristly pubescence; on the anterior half of ventral joint eleven is a very large, transversely-oval, fleshy, whitish, retractile proleg, with a deeply-impressed, longitudinal stria. On the anterior margin of dorsal joints four to ten, is a pair of smaller, transversely-elongate, retractile, fleshy tubercles, covering nearly their entire width, armed like the pseudopods, but not so much elevated as they are. No appearance of any spiracles. Anus terminal, vertically slit, with a slender, retractile thorn .05 inch long, visible in 1860, but not in 1863. Head, and first segment or two, retractile.

When handled, this larva is very vigorous and restless, and burrows with great strength between the fingers, and even on a smooth table walks as fast as any ordinary caterpillar, either backwards or forwards; when placed on its back it progresses with difficulty by the aid of the dorsal tubercles. The external integument is very transparent, and as the insect progresses, slides backwards and forwards over its internal organs, like the finger of a glove. When placed in a vessel of simple water it swims vigorously, twice the length of its own body at every stroke, by curving its tail round laterally, sometimes to the right, sometimes to the left, so as to touch the side of the fourth or fifth joint, and then suddenly lashing out with it. In such a vessel it keeps all the time close to the surface, and at the end of every stroke, and also when in repose, elevates the anal slit out of the water, on which occasion I once saw a bubble of air attached to it. In the breeding-jar it scarcely ever comes to the surface, but burrows among the decayed wood, aquatic plants, &c.

This larva differs remarkably from the one described by DeGeer, in having ventral pseudopods as well as dorsal ones. It might be supposed that the dorsal tubercles were branchiæ, but for the fact that they are found in the earth-inhabiting species described by DeGeer, and that their structure resembles that of the pseudopods. I conjecture that, like the aquatic larva of *Prionocyphon discoideus* Say (Coleoptera), of whose habits I have given an account in Baron Osten Sacken's Paper on Coleopterous larvæ (*Trans. Ent. Soc. Philad.*, I., p.117), it has a branchial apparatus issuing from its anus, and that the short, retractile anal thorn, which I saw in 1860, was the form assumed by this apparatus when out of the water. But for a lucky accident, I should have been ignorant of the true form of the expanded anal branchiæ, in *Prionocyphon*. Occurs from the beginning of June to

the beginning of September, at which last time I have also met with a specimen only half the length of the full-grown specimen.

The *pupa* (from the pupal integument) is cylindrical, suddenly rounded at the head, and tapering a little in the two last abdominal joints; the color is a very pale, semi-transparent, yellowish brown. The mouth is represented by six tubercles, hexagonally arranged, above which, upon each side, is a trigonate, three or four-jointed antenna, pointing outwards. The pronotum commences immediately behind the antennæ, and bears on its anterior dorsal submargin a pair of reniform, tubercular spiracles. The mesonotum, to which the wing-cases are attached, is twice as long as the pronotum, and bears on its anterior dorsal margin a pair of obliquely-placed, reniform, tubercular spiracles, three times as long as the prothoracic ones. Then follows a very short metanotal piece, about one-seventh as long as the pronotum, bearing no spiracle, which is succeeded by eight subequal segments, all but the last bearing on their lateral dorsal surface a subbasal, round, tubercular spiracle. The first of these eight segments is simple, and extends to the tip of the wing-cases;* the others are all furnished two-thirds of the way to their tips with an annulus of appressed bristles directed backwards. The anal thorn is very robust, having a diameter of one-half the last abdominal segment, and is squarely truncate as soon as its length is half its width, and terminates in six small, robust thorns, arranged in a regular hexagon. Length .97 inch; greatest diameter .21 inch. One specimen.

Midas fulvipes, n. sp. ? ♂ Black. Epistoma (rhomboidal piece beneath the origin of the antennæ), dark rufous with dense fulvous hairs; antennæ dark rufous. Thorax opaque, a little rugose, with scattering erect hairs. Abdomen and venter polished, glabrous, with fine short appressed hairs. Legs with the knees, tibiæ and tarsi fulvous. Wings black on the costa, shading into palish fuscous on the terminal and interior margin; no metallic or colored reflections. Length ♂ .89 inch. Expanse ♂ 1.70 inch. One ♂; ♀ unknown. Easily distinguishable from *clavatus* Drury, of which I took numerous specimens in South Illinois, but which does not occur near Rock Island in North Illinois, by the particolored legs and the immaculate abdomen. Baron Osten Sacken informed me that this insect "seems to be new, and is certainly new to him."

The *larva* of what I suppose to be the ♀ of the above is, when nearly full grown, from 1.50–1.75 inch long, and .31 inch in its greatest diameter. The head is of a polished mahogany-brown color, pointed and thorn-like, being about .10 or .11 inch long, and .03 or .04 inch in

* I believe this first spiracle-bearing segment to be metanotal, as also the corresponding piece in the pupa of *Midas fulvipes*, *u. v.*

diameter at its base. It has a few hairs on its surface, and is almost entirely retractile. The body is cylindrical, somewhat depressed, or rather laterally expanded, whey-colored, with the appearance, even to the naked eye, of irregular patches of small, round, white eggs over nearly one-half its surface, except on the first, second, and partially on the third, segment. The external integument, between most of the middle segments, is retractile, and furnished below with tubercles (pseudopods), which entirely disappear at the will of the animal. Segments three to one are tapered gradually, so as to leave no shoulder at the head, and segment twelve is tapered suddenly to an obtuse point when viewed from above, but when viewed in profile there is a large, triangular prominence on its entire inferior edge. On each side of segment eleven above there is a large brown spiracle — on the other segments none. The larva of the ♂ was much smaller, and varied only in entirely wanting the appearance of masses of eggs on its surface. Described from the living specimens. One ♂; one (supposed) ♀.

The pupa of the supposed ♀ (described from the pupal integument) is cylindrical, a little stouter on the thorax, suddenly rounded off before, and gradually and slightly tapered on the last two or three segments. The general color is a dark chestnut-brown. On each side of the head and above the mouth, which is inferior, is a very large, obliquely-elongate tubercle, sloping towards the occiput, and representing, perhaps, the antennæ. On the extreme occipital end of this tubercle, and also near the other end, is a long, slenderish, acute thorn tipped with black. The pronotum, which bears a dorsal pair of flattish, round, and not very obvious spiracles a little behind the anterior margin, is armed on the middle of its lateral dorsum with a still longer slenderish, acute thorn, about .08 inch long, directed outwards and upwards, curved slightly backwards, and tipped with black. The mesonotum is two and one-half times as long as the pronotum, has a small, robust thorn on the middle of the origin of the wing-case, and on its humerus, close to the suture, bears a spiracle in the form of a round tubercle, terminating in a nipple-like, obliquely-arranged double tubercle. Behind the mesonotum is a short metanotal piece, scarcely half as wide as the pronotum, which is succeeded by eight subequal segments, all but the last bearing a lateral dorsal spiracle, similar to that of the mesonotum, except that the crowning double tubercle is transversely arranged. The first of these segments* is armed on the anterior edge of the whole

* I believe this first spiracle-bearing segment to be metanotal, and to be homologous with the non-spiracle-bearing piece, which follows the piece bearing the hind wings and precedes the spiracle-bearing abdominal joints, in the pupa of Sphingicampa and all other Lepidopterous pupæ known to me. In the Lepidopterous pupa, as in the larva, neither meso- nor meta-thorax bears any spiracle; in these tw dipterous pupæ both of them, as I believe, bear spiracles.

of its dorsal surface with a close-set row of long, slender, flattish thorns, like teeth cut out of a saw-plate, curving upwards, but directed obliquely forwards, and about .05 inch long; on its sternal surface the hind edge, except where it is covered by the wing-cases, which extend slightly beyond it, is armed with a close-set row of similar straight thorns, directed obliquely backwards; and the entire hind edge of two to eight is armed in a similar manner, except that the thorns are somewhat shorter, the suture between one and two being simple on the dorsum. The anal thorn is composed of two thorns, each .15 inch long, laterally divaricate at an angle of about 60°, but confluent at base, their basal half robust and wrinkled, their terminal half slenderish, glabrous, black, and terminating in a very slender claw curved obliquely downwards; and the basal part of this double anal thorn is almost as long and as wide as the eighth segment, but somewhat tapered at tip. The pupa of the ♂ differs only in being a little shorter, very much slenderer, and of a pale yellowish-brown color. (From the pupal integument.) Total length ♂ 1.18 inch; ♀ 1.30 inch. Total abd. diameter ♂ .23 inch; ♀ .37 inch. One ♂; one (supposed) ♀.

On March 28th, 1860, I found the above-described two larvæ near Rock Island, Illinois, in some fibrous *débris* contained in a hollow sycamore. I placed them in a vessel containing about a gallon of the *débris*, intermixed with which I noticed several common larvæ, elateridous, &c.; and in the following July, what I have little doubt, from the comparative largeness and robustness of the pupal integument, was the ♀ imago, came out, but by some means or other made its escape. No other species of Midas exists near Rock Island, so far as I am aware, to which it might be referred. The smaller larva, which proved to be ♂, lived from the summer of 1860 till the following spring, healthy, but without perceptibly growing, when I supplied him with twelve to twenty large, vigorous, lepidopterous pupæ, all of which were either killed by him or else died a natural death, and between the middle of June and the middle of July, 1861, the ♂ imago made its appearance. From these facts I conclude that the larva of Midas is insectivorous, and I suspect that all dipterous larvæ with pointed beaks are so, e. g. that of Xylophagus, which occurs sparingly near Rock Island, Illinois, under decaying bark. The beaked larva of Tabanus I have already referred to. If I am right in supposing the large larva to have been ♀, and if, as I believe, those were the eggs of the insect itself that exhibited themselves on its surface, but of which no traces were visible in the ♂ larva, we have here the only example known to me of sexual characters being discoverable, without dissection, in the larva state of an insect belonging to an Order where the Pupa is quiescent and the metamorphosis complete.

REFERENCES TO SUCH ARTICLES, FURNISHED BY THE WRITER TO VARIOUS AGRICULTURAL JOURNALS, AS CONTAIN NEW FACTS IN ECONOMIC ENTOMOLOGY.

COLEOPTERA.

IPS QUADRISIGNATA Say, attacks the growing ears of sweet corn. (Illinois *Prairie Farmer*, about Sept. 1, 1860.)

CHRYSOBOTHRIS FEMORATA Fabr., and SAPERDA VITTATA Say, the two apple-tree borers. (*Journal of the Illinois State Agric. Soc.*, June, 1862, pp. 21–3.)

AMPHICERUS (BOSTRICHUS) BICAUDATUS Say, bores apple-tree twigs. (*Prairie Farmer*, about May 10, 1860, pp. 308–9, with figures.)

BRACHYTARSUS VARIEGATUS Say, parasitic (?) on a large orange-colored cecidomyiade (?) larva in the stems of wheat. (*Jour. Ill. State Agr. Soc.*, March, 1862, pp. 8–12, with figures.)

ITHYCERUS NOVEBORACENSIS Forster, attacks the twigs of fruit-trees in the nursery. (*St. Louis Valley Farmer*, March, 1862, pp. 82–5, with figures.)

ANTHONOMUS PRUNICIDA Walsh, has the same habits as *Conotrachelus Nenuphar* Hbst. (the "curculio"), and equally common in the valley of the Mississippi. (*Prairie Farmer*, June 13, 1863, and July 11, 1863, p. 21, with figures.)

"ANTHONOMUS (?) PRUNICIDA n. sp. Black, with dense and long whitish pubescence. Head dark rufous, with whitish pubescence; rostrum dark rufous impubescent, confluently punctate, and with a longitudinal carina above and a longitudinal stria beneath, the sculptures in one sex (♀?) ceasing at the insertion of the antennæ. Prothorax dark rufous, above with dense and long golden pubescence, beneath with short whitish pubescence; a wide, flattish, black, naked, dorsal carina, lanceolate at tip and striate longitudinally, extending two-thirds of the distance to its tip. Elytra black, with fine, dense, short, whitish pubescence, punctate-striate with large oblong punctures, the interstices finely punctured and with irregular alternate tufts of white and black hairs, chiefly along the suture and submargin and at the tip; scutel generally with dense white or yellowish hair, and generally on each side of it two conspicuous tufts of black hair, the inner one the larger of the two. Legs dark rufous with whitish pubescence. Wings blackish. Length to tip of rostrum, .30–.35 inch. Pronounced by Dr. J. L. LeConte, in 1861, to be 'unknown to him.'

"This species differs from *Anthonomus* in the third joint of the antennæ being three-fifths as long as joint two, whereas in *A. quadrigibbus*

Say and *A. scutellatus* Schonh. it is only one-third as long as joint two. It differs, also, in the four posterior tibiæ not being dilated in the middle. Joint two of the antennæ is long, three, as before stated, is three-fifths as long as two, four is half as long as three, and five to eight are quite short. The antennæ are inserted three-fifths of the distance from the eyes to the tip of the rostrum. The rostrum is half as long as the body, porrect and not received in a groove between the legs. The femora are all incrassated with a large postmedial tooth. The anterior tibiæ are slightly dilated in the middle, and have a small terminal hook; the other tibiæ are simple. The body is elongate-oval, the thorax a little narrower at its base than the elytra.

"I annex the above generic particulars, because even Dr. LeConte did not venture to determine the genus of this insect. It may, perhaps, form a new genus; but it comes nearer to *Anthonomus* than any other with which I am acquainted. From *Erirhinus*, *Centrinus*, and *Baridius*, it is separated at once by the femora being toothed, from *Balaninus* by joints two to eight of the antennæ not diminishing in length gradually and but very slightly, and from *Magdalinus* by the antennæ being distinctly elbowed." (From the *Prairie Farmer*, June 13, 1863.)

"CONOTRACHELUS PUNCTICOLLIS, n. sp. Head black, with a coppery lustre, finely pubescent, with very fine confluent punctures; rostrum suddenly bent inwards at two-thirds the distance to its tip, as in *C. anaglypticus* Say. Thorax black, sparsely pubescent, much narrower than elytra, as wide as long, scarcely contracted at its base, but much contracted at its tip, with very large, deep punctures, confluent above, so as to form towards its tip three or four irregular, longitudinal carinæ. Elytra regularly punctate-striate, without any carinæ, the striæ shallow and wide, the punctures moderate; the insterstices flattish, very finely punctured, and with a row of short, cinereous bristles upon each directed obliquely backwards; the whole elytrum irregularly mottled with whitish and brown, so as to appear gray with three or four indistinct, brown fasciæ, except on the base of the third interstice, where there is a conspicuous, short, whitish vitta. Legs blackish, with fine, short, whitish pubescence. The second tooth of the femora obsolete.

"Length .15 inch. One specimen. Near *C. cribricollis* Say, but that species has the elytra black, without any bristles. Except in the comparative shortness of the thorax, it resembles in its shape *C. anaglypticus* Say, and is much broader than *C. nenuphar*—the 'curculio.' Beaten off tame plum-trees, at Springfield, Illinois." (From the *Prairie Farmer*, July 11, 1863, p. 21.)

CONOTRACHELUS POSTICATUS (?) Schönh., bred in the spring of

1863, from haws infested by its larva in the autumn of 1862. (*Prairie Farmer*, July 18, 1863, p. 37.)

"CONOTRACHELUS CRATÆGI, n. sp., has the size, shape and sculpture of *anaglypticus* Say, but differs in the elytra being of a uniform color, mottled with ochre-yellow and white, and in the upper surface of the thorax being whitish, except a large and conspicuous triangular spot at its base and the anterior margin, which, as well as the inferior surface, are brown. The second tooth on the femora is obsolete. Abundant near Rock Island, Ill., on the hawthorn. I found it very plentiful, also, near Chicago, on the same tree." (*Ibid.*)

EPICÆRUS IMBRICATUS Say, infests apple and cherry trees and gooseberry bushes, in Iowa. (*Prairie Farmer*, July 18, 1863, p. 37, with a figure.)

"There are four described N. A. species of *Epicærus*, — *imbricatus*, *vadosus*, *formidolosus*, and *fallax*. Dr. LeConte informs me that he believes all four to be mere varieties of one and the same species, in which I entirely agree with him, so far as my knowledge of the genus extends.

"Of the six specimens received from Iowa, two agree pretty closely with Say's description; two are of a nearly-uniform whitish color, with scarcely any appearance of darker bands on the elytra, and two have indistinct dark bands. My three Rock Island specimens have the dark bands very distinct, — much more so than in the Iowa specimens, — and were referred to *fallax* by Le Conte, with the remark above quoted.

"From the nine specimens, it would be easy to construct a regular series, from the almost immaculate variety to the distinctly trifasciate. The slightly-impressed, punctured, dorsal line on the thorax, mentioned by Say, is obsolete in one of the pale Iowa specimens, and in all my Illinois dark ones." (*Ibid.*)

SITOPHILUS REMOTEPUNCTATUS Gyllenh., in Patent Office wheat. (*Journ. Ill. State Agr. Soc.*, Jan., 1862, with a figure.)

DORYPHORA DECEM-LINEATA Say, infests potato and tomato vines, egg-plants, &c., in Kansas and Iowa. (*Valley Farmer*, July, 1862, pp. 209–10, and *Prairie Farmer*, June 6, 1863, p. 356, with figures.)

LYTTA ATRATA, infests flowers of cultivated Asters, and *L. atrata*, *vittata* Fabr., (= *lemniscata* Fabr.,) and *cinerea* attack potato vines. (*Prairie Farmer*, Aug. 29, 1863, with a figure.)

CHILOCORUS BIVULNERUS Muls., attacks unknown enemies of the apple-tree. (*Prairie Farmer*, Aug. 22, 1863, with figures.)

ORTHOPTERA.

Grasshoppers and locusts; LOCUSTADÆ and CICADADÆ. (*Journ. Ill. State Agr. Soc.*, Nov. 1862, pp. 1–3.)

Catydid eggs, on apple-tree twigs. (*Prairie Farmer*, Feb. 28, 1863, p. 132, with a figure.)

LEPIDOPTERA.

LEUCANIA UNIPUNCTA Haw. (army-worm moth), its four primary parasites *Exorista militaris* Walsh, (Diptera) *Mesochorus vitreus* Walsh, *Pezomachus minimus* Walsh, and *Microgaster militaris* Walsh, and its two secondary parasites, *Chalcis albifrons* Walsh, and *Glyphe viridescens* Walsh, (Hymenoptera.) (*Trans. Ill. State Agr. Soc.*, IV., pp. 349–72. *Prairie Farmer*, about Sept. 24, 1861; both articles reprinted *Trans. Ill. Nat. History Soc.*, Vol. I.; *Prairie Farmer*, Dec. 6, 1861, pp. 370–1.)

SOLENOBIA (?) ——— (larva,) under bark of apple-trees. (*Prairie Farmer*, Aug. 29, 1863.)

PHYCITA NEBULO Walsh, or the Rascal Leaf-crumpler, infests apple, crab, and plum trees. (*Prairie Farmer*, about May 10, 1860, p. 308, with figures.)

"PHYCITA NEBULO, n. sp. Expansion of wings .70 inch. Length of body .30 inch. General color, light cinereous, varied with dusky. A row of about seven subsemilunar or linear dark spots on outer margin of front wing. Then, one-fourth of the distance to the body, a waving light, cinereous band, parallel to the exterior margin, marked on each side with dusky black. Nearly at the centre, a much abbreviated black band. Beyond the centre, on the costal margin, a subtriangular dusky black spot, the apex of which connects with the apex of a much larger subobsolete triangular brick-red spot, which extends to the interior margin, and is bounded on the outside by a wavy, light cinereous band, which is bounded outside by a wavy dusky black band, proceeding from the apex of the costal triangle. Base of wing dusky black, enclosing a small, round, light cinereous spot. Hind wings and all beneath, light cinereous shaded with dusky, the front wings darker. Tarsi dusky, with a narrow, light cinereous fascia at the apex of each joint. Hind tibia fasciate with dusky at the apex, sometimes obscurely bifasciate. Intermediate tibia fasciate with dusky at the centre, the fascia generally extending to the base, but becoming lighter. Anterior tibia dusky, with a narrow, apical, light cinereous fascia. Palpi, both labial and maxillary, dusky." (*Ibid.*)

The *larva* lives in a little crooked horn or case, and ties together with silken threads the terminal leaves of young twigs. Frequently, in travelling from twig to twig, it anchors its case by strong silken cables to the naked side of a limb, and in this situation it has exactly the appearance of a piece of dry bird's dung. It may be thus described

from the recent specimen : — Length .50 inch. Color greenish-brown, lighter beneath. Head and body both with long, sparse hairs. Head dull black, with fine, confluent punctures, and a slightly-impressed, longitudinal line divaricating in front. The first segment horny above, and an elevated, shining, black spot on each side of the second segment. Legs 16, normal.

With regard to the generic determination of this insect, Dr. Clemens, to whom I had sent specimens, wrote to me as follows: —

"*Phycita nebulo* Walsh is new to me and doubtless to science; it belongs to the family *Pyralidæ*, Group *Phycites*. The typical species, which Westwood describes under the genus Phycita, is now included in the genus Homalosoma, but the generic diagnosis of the latter does not corroborate that of Westwood. I do not understand why it is that the characters in Westwood correspond very well to those of this species, while the new group, as it now exists, is certainly quite different. I do not find any genus that corresponds entirely with *nebulo* Walsh. Acrobasis appears to come closer to it than any other; but I do not think it is identical. The next volume by Guenée will treat of this group, and in it we may find a genus which will contain *nebulo*." (Aug. 12, 1860.)

HETEROPTERA.

Phytocoris linearis Beauv. (= *Capsus oblineatus* Say,) infests apple, quince, and pear trees. (*Prairie Farmer*, about May 10, 1860, p. 308, and May 2, 1863, with figures.)

Micropus leucopterus Say (Chinch-bug,) and its supposed four coccinellade enemies. (*Trans. Ill. State Agr. Soc.*, IV., pp. 346–9.)

Reduvius raptatorius Say, insectivorous. (*Prairie Farmer*, July 11, 1863, p. 21, with figure.)

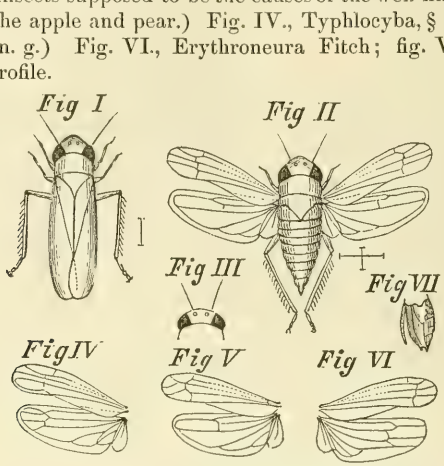
HOMOPTERA.

Proconia undata Fabr. and its eggslits, on grape-vines. (*Prairie Farmer*, July 25, 1863, p. 53.)

Erythroneura tricincta Fitch, on grape-vines. (*Valley Farmer*, Oct., 1862, pp. 305–6; with figures.)

Tettigoniadæ. Twelve new species. (*Prairie Farmer*, Sept. 6, 1862, with figures.) Eggslits of *chloroneura maleficа* (?) Walsh, on apple twigs; (*Prairie Farmer*, April 4, 1863, p. 212, with figure.)

Fig. I., *Chloroneura* (n. g.) *malefica* Walsh; fig. II., the same with expanded wings. Fig. III., head of *Chloroneura maligna* Walsh. (These two insects supposed to be the causes of the well-known "Fire-blight" on the apple and pear.) Fig. IV., Typhlocyba, § B. Fig. V., Empoasca (n. g.) Fig. VI., Erythroneura Fitch; fig. VII., its ovipositor, in profile.



N. B. The lines annexed to the figures show the length unmagnified.

All the insects hereinafter referred to belong to the extensive genus *Typhlocyba* of Germar, which comprised, in 1838, no less than thirty British species. Dr. Fitch reckons up fifty-eight species found in the State of New York; my private cabinet contains over forty-five *Illinois* species belonging to this genus, and it is not at all improbable that there are as many as two hundred and fifty in the whole United States.

Dr. Fitch remarks that "the number and arrangement of the veins in their wing-covers and wings present such differences as would probably have induced authors to separate them into distinct genera, had they been of larger size and better known." He then proposes the following subdivision into genera, or subgenera, and observes that each of them "admits of further division," and that, "as a matter of convenience, a separation is required."

"*Typhlocyba.* Wing-covers bordered on the hind part of their inner side by a submarginal vein, running parallel with the exterior edge, and commonly having a closed discoidal cell also. [See fig. IV.]

"*Empoa.* Wing-covers not bordered, their outer apical cell three-sided, or with a single acute angle at its forward [*i. e.* basal] end. [See fig. V.]

"*Erythroneura.* Wing-covers not bordered; their outer apical cell

tour-sided, or with two right angles at its forward [*i. e.* basal] end." (See fig. VI.) *N. Y. Reports Inj. Ins.*, Vol II., § 104.

This division, as will be noticed, is founded exclusively on the neuration of the elytra. On examining the wings as well, it will be found that two distinct types of neuration exist in each of the last two genera, the terminal cells being bordered in some and not bordered in others, and the median vein being in some unconnected with the submedian by any cross-vein, and in others being distinctly so connected. (Comp. figs. V. and VI.) These differences appear to be of higher generic value than that which separates *Empoa* from *Erythroneura*, and will necessitate the establishment of two new genera. The following synoptical table will exhibit the arrangement at a glance.

Ocelli equidistant from the eyes and from each other, placed near the anterior margin of the head, which margin is rounded, not angulated; elytra indistinctly veined, with four distinct terminal cells; posterior tibiæ with a double row of spines.	Elytra bordered by a vein on the inner terminal margin.	a discoidal cell,		*Typhlocyba*, § *A*.
		no discoidal cell,		*Typhlocyba*, § *B*.
	Elytra not bordered.	Outer apical cell of elytra triangular.	Term'l cells of w'gs bordered, . . .	*Empoasca*, n. g.
			Term'l cells of wings not bordered, . .	*Empoa*.
		Outer apical cell of elytra quadrangular.	Term'l cells of w'gs bordered, . . .	*Chloroneura*, n. g.
			Term'l cells of wings not bordered, . .	*Erythroneura*.

Of these six divisions, the five last all comprise species of about an eighth of an inch in length, and of a uniform pale greenish or yellowish color, with scarcely any markings. These I propose to describe, as they are liable to be confounded with the two foes of the apple and pear. Where specific characters are almost entirely wanting, descriptions of species must necessarily be brief.

Typhlocyba. § B. (Fig. IV.)

Typhlocyba aurea (n. sp.) Golden-yellow, beneath pale, front of head forming the quadrant of a circle. Eyes, ovipositor, and tips of tarsi, brown. Elytra golden-yellow to the cross-veins, paler on the costal half; two middle cross-veins not dislocated, as they are in *Chloroneura* and *Erythroneura;* tips hyaline, extreme tips cloudy; wings hyaline. Length to tip of wings, a little over one-eighth of an inch. Occurs at Rock Island, Ill.

Typhlocyba pallidula (n. sp.) Differs from the preceding as follows: Body whitish above, yellowish beneath; ovipositor yellowish, elytra whitish-subhyaline, sometimes with a faint yellow vitta on the costal and interior margins. Occurs in Southern Illinois.

Typhlocyba binotata (n. sp.) Differs from *aurea* as follows: Body

whitish, with a glaucous tinge. Thorax with two transverse dark dots on its anterior submargin. Sternum varied with fuscous. Dorsum of abdomen, except the extreme tip of each joint, fuscous; ovipositor unknown; elytra whitish-subopaque, except at tip. Occurs at Rock Island, Ill.

EMPOASCA. (n. g.) (Fig. V.)

Empoasca viridescens (n. sp.) Pale greenish. Front of head forming a right angle with the apex rounded off. Eyes and tips of tarsi fuscous; elytra subhyaline, with a faint greenish tinge, the triangular cell not peduncled as it is in fig. V.; wings hyaline. I met with both sexes in Southern Illinois. A single female, which occurred at Rock Island, Ill., varies in being more yellowish than greenish, and in the tip of the ovipositor being fuscous. Length to tip of wings, not quite one-eighth of an inch.

Empoasca consobrina (n. sp.) Differs from the preceding only in being sometimes yellowish, and in the triangular cell of the elytra being always peduncled. Seven specimens, taken at one time near Rock Island, Ill., all agree in this particular. Length slightly over one-eighth of an inch. [This is a mere variety of the preceding; I have now all the intermediate grades. B. D. W., 1863.]

Empoasca obtusa (n. sp.) Pale grass-green. Front of head forming a very obtuse angle, with the apex rounded off. Each ocellus surrounded by a fuscous spot. Eyes, and tips of the tarsal joints, fuscous; elytra greenish-subhyaline; tips hyaline. Triangular cell peduncled. Wings hyaline. Length to tip of wings, three-sixteenths of an inch.

EMPOA. (Elytra, fig. V.; wings, fig. VI.)

Two species, one found on pine, the other on oak, are described by Dr. Fitch, in his Catalogue of New York Homoptera, and referred to this genus. As he says nothing of the neuration of the wings, they may possibly belong to *Empoasca*. *Empoa rosæ* and *E. fabæ* Harris, are in the same predicament.

Empoa albicans (n. sp.) Whitish. Eyes fuscous. Two or three of the basal and of the terminal joints of abdomen, fuscous at tip; ovipositor black; elytra subhyaline, at tip a little cloudy; triangular cell peduncled; apex of vein which forms the inner cell not attaining half the distance to the apex of elytrum; wings hyaline. Length to tip of wings, nearly one-fifth of an inch.

CHLORONEURA. (n. g.) (Elytra, fig. VI.; wings, fig. V.)

Chloroneura abnormis (n. sp.) Pale dull-green. Front of head forming an angle of about eighty degrees, with the apex rounded; an-

tennæ and eyes fuscous; vertex and thorax, with two sanguineous vittæ, more or less obsolete. Abdomen black, except the tips of the joints; the last joint almost entirely greenish. Tips of tarsal joints dusky. Elytra, toward the base, subopaque, dull-greenish; at tip subhyaline; an obscure sanguineous vitta on the anal vein, amd another parallel to it, half-way to the costa, both sometimes obsolete. Wings whitish-subopaque, with the tips of the costal veins fuscous; the cross-vein forming a salient angle, and emitting from its apex an additional vein, as in *Typhlocyba* (fig. IV.) Length to tip of wings, three-twentieths of an inch.

Chloroneura malefica (The culprit leaf-hopper.) (n. sp., figs. I. and II.) Greenish or yellowish. Front of head forming a right angle with the apex rounded. Eyes and tips of tarsi fuscous. Elytra subhyaline, with a greenish tinge; at their extreme tip, cloudy. Wings hyaline, cross-vein simple. Length to tip of wings, one-eighth of an inch. Occurs on apple and pear leaves. Took a pair *in coitu* under bark, early in the spring, in the woods.

Chloroneura maligna. (The malignant leaf-hopper, fig. III.) Differs from the above as follows: — The color is deeper; the head is almost transverse, its anterior edge forming about half a quadrant; the elytra are subopaque, and deeply tinged with green, and their anal vein attains the cross-vein nearly.

Erythroneura. (Fig. VI.)

To this extensive genus belong *Tettigonia obliqua* Say, *T. basillaris* Say, *E. vitis* Harris, *E. vulnerata* Fitch, *E. vitifex* Fitch, and *E. tricincta* Fitch, all of which occur near Rock Island, Ill. Also, nineteen undescribed species, most of them elegantly marked with blood-red or blood-brown, which I have met with in the same locality. I describe only the three following, one on account of its liability to be confused with the two species which infest the apple and pear, and two on account of their infesting the grape-vine.

Erythroneura australis (n. sp.) Pale yellowish. Head forming a right angle with the apex rounded. Eyes and tips of tarsi fuscous. Elytra subhyaline, with a pale, fuscous dot on the basal side of each of the three inside terminal cells, the two outer dots sometimes obsolete. Wings hyaline. Length to tip of wings, one-eighth inch. Very near *Empoa quercius* Fitch, but generically distinct. Occurred in Southern Illinois; a single specimen near Rock Island, Ill.

Erythroneura ziczac (the zigzag leaf-hopper.) (n. sp.) Pale yellowish. Front of head in a right angle with the apex rounded. Eyes dusky; ocelli pale; vertex, with two pale sanguineous vittæ, generally subobsolete. Thorax blood-brown, yellowish in front, often with a yellowish vitta; scutel blood-brown, with a yellowish vitta, occasionally

entirely yellowish. Abdomen often blood-brown, except at base and tip. Tip of ovipositor and of tarsi dusky. Elytra pale yellowish; on the middle of the costa an oblique rhomboidal black spot; on the costal tip a black dot, and on the interior margin, forming a triangle with the other two spots, a black spot; a blood-brown, irregular, broad stripe, covering the humerus, thence running to the interior margin; thence, in a zigzag direction, to the rhomboidal spot; thence to the spot on the interior margin; thence not quite attaining the terminal dot. Wings hyaline; tips of costal veins often dusky. Length to tip of wings, a little over one-tenth inch. Occurs abundantly on the grape-vine.

Erythroneura octo-notata (the eight-spotted leaf-hopper.) Whitish. Head as in the preceding. Thorax a little clouded with fuscous. Abdominal and ventral joints, in mature specimens, dusky, except at tip. Tips of tarsi dusky. Elytra whitish-subhyaline, with the same three spots as the preceding, and, in addition, one on the inner margin not far from the base; on the cross-veins, an irregular fuscous band, and on the disk a small brown cloud, often obsolete. Length a little over one-tenth inch. Occurred sparingly on the grape-vine, along with a few *E. vulnerata* Fitch, and numerous specimens of the preceding, and of *E. vitis* Harris, and *tricincta* Fitch. Dr. Fitch has suggested that these last two species may be mere varieties. I have examined some dozen specimens of each, and find that there are no intermediate grades.

It may, perhaps, be worth while to add, that on the grape-vine where these *Erythroneuræ* were swarming, I noticed a small and rather rare dipterous fly, the *Hemerodromia superstitiosa* of Say, very busily engaged. I caught him and put him in my collecting bottle, along with a number of the leaf-hoppers, and shortly afterwards saw him approach one slyly, stick his beak into it and suck it to death, without previously using his long raptorial front legs." (*Prairie Farmer*, Sept. 6, 1862, with the figures given above.)

Aphis Maidis? Fitch, infests the roots of young Indian corn, as well as the stems of the roasting ears. (*Jour. Ill. State Agr. Soc.*, Sept., 1862, pp. 8–13, with figures.)

Coccus Harrisii Harris. (*Prairie Farmer*, May 10, 1860, p. 308, with figure.)

Rock Island, Sept. 2, 1863.

Capt. N. E. Atwood, of Provincetown, gave some interesting statements relative to the Cod Fishery of our coast. In response to a question of Mr. Putnam, he said he thought the Cod of the Newfoundland Banks to be distinct from that of Massachusetts Bay, and remarked, that upon the Banks