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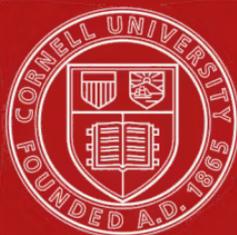
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1st report of Dr. Fitch on the noxious.



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# FIRST REPORT

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## NOXIOUS, BENEFICIAL AND OTHER INSECTS,

OF THE

STATE OF NEW YORK,

MADE TO THE STATE AGRICULTURAL SOCIETY, PURSUANT TO AN  
APPROPRIATION FOR THIS PURPOSE FROM THE  
LEGISLATURE OF THE STATE.

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BY ASA FITCH, M. D.,

ENTOMOLOGIST OF THE N. Y. STATE AGRICULTURAL SOCIETY; MEMBER OF THE  
ENTOMOLOGICAL SOCIETY OF FRANCE, OF PENNSYLVANIA, ETC.

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ALBANY:

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No. 407 Broadway.

1855.



No. 151.

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IN ASSEMBLY, APRIL 3, 1855.

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## REPORT

**Of Asa Fitch, M. D., on the Noxious, Beneficial, and other  
Insects of the State of New-York.**

*Executive Committee of the New-York State Agricultural Society:*

I herewith submit a Report upon the Noxious and other Insects of the State of New-York, particularly such as are injurious to fruit trees, pursuant to your instructions, delivered to me in May last. I also present specimens of the several insects herein described, and of the vegetation as depredated upon by them, from which drawings may be taken for illustrating this report, and which are thereafter to be deposited in the Entomological department of the Museum of the Society.

It has been common in treatises upon economical entomology, to arrange the several species in their scientific order. Although this mode of arrangement has its advantages, it presupposes such an acquaintance with scientific entomology as but very few individuals in our country possess. A person who meets with a worm, say, mining a cavity in the leaves of the apple tree, and consuming their parenchyma, knows not whether that worm is the larva of a Coleopterous, a Lepidopterous, or some other Order of insects, and consequently is at a loss in what part of a work upon noxious insects, arranged in the usual manner, to look for an account of it. Even an experienced entomologist would be equally embarrassed in the case we have supposed, and would be

unable to decide whether such worm was a leaf-mining moth of the Order Lepidoptera, or a Prickly beetle (*Hispa*) of the Order Coleoptera—so closely, according to accounts, do the larvæ of these widely separated groups resemble each other. I have therefore pursued a different mode of arrangement. As the insects which infest our fruit trees occupy the chief part of this report, they are first considered. Commencing with those which occur upon the Apple tree, I speak in succession of those which affect the root, the trunk, the twigs, the leaves, the flowers, and the fruit. In the same order, insects which occur upon the Pear, the Peach, the Plum, and the Cherry, are successively taken up. From our Fruit trees I pass to some species of much interest which have been examined, infesting our Forest trees, our Field crops, and our Garden vegetables. This mode of arrangement of the several topics will be perfectly intelligible to every reader; and, aided by the brief heading which precedes the account of each species, will enable him to turn at once to any insect which he wishes to find, which is here described.

In a field of such extent, and comprising such a multitude of objects, it will not be expected that the researches of a single season can suffice to bring this subject to anything approaching to completeness. I think it is Saint Pierre who remarks that he had made it a point to examine the several insects which made their appearance upon a particular rose bush in his garden, and at the end of thirty years he continued to find new kinds which he had never seen upon the bush before. And however assiduously one may investigate the history of a particular species during the period of its appearance one season, if he returns to the same insect another year, additional traits in its habits commonly continue to be discovered, equal in importance frequently to those which were first noticed. Those species which I have been able to investigate since I received your instructions, including several which have never been noticed in our country before, will be found fully reported in the following pages. The history of some important depredators upon our American fruit trees, the Plum weevil, for instance, and the Canker worm, which I have not as yet had time and favorable opportunities for examining, I hope to present on a future occasion.

As it is the primary object of this report to diffuse information upon an important topic with which very few are at present conversant, I have throughout endeavored to treat the subject in a plain, familiar manner, avoiding any unnecessary resort to technical language, and using no terms but such as will be found clearly defined in dictionaries which are in every school district in our State. A few words, such as antennæ, thorax, abdomen, and elytra, which are so common in works upon insects that no one can expect to obtain the slightest acquaintance with this science without becoming familiar with them, I have employed, as it would savor of fastidiousness to substitute in their stead the corresponding English terms of horns or feelers, chest, body, and wing-covers, which applied to insects are modified from their common meaning, and the general reader will encounter much the same task in familiarizing himself to this modified signification that he will have in learning the more definite and convenient technical terms and their signification.

Those portions of the report which are designed for perusal only when one has specimens before him of which he is desirous to ascertain the names, are inserted in a type of a smaller size. The dimensions of the several insects, larvæ, &c., are expressed in inches and the fractional parts of an inch, 1.25 thus implying an inch and a quarter, 0.75 seventy-five hundredths, or three-fourths of an inch, &c.

With these explanations I submit to you this report, with the hope that it may aid in rendering this branch of science more known to our citizens and available in adding to their comfort and welfare.

ASA FITCH.

*Fitch's Point, (East Greenwich P. O.) March 14, 1855.*

P. S. The Legislature having made provisions for a continuance of this work, as another report will be presented the coming year, a number of species which are in a state of forwardness for publication, and which we had contemplated inserting in the present document, are withheld in the crowded state of the Society's volume of Transactions the present year, with the hope that we

shall be able to obtain additional facts to render our account of these species more complete and exact, and also with the anticipation that we shall be able to accompany them with suitable illustrations, which could not be got ready for insertion in the present volume.

A. F.

*August 7, 1855.*

[NOTE.—This report is also published in the “Transactions of the New-York State Agricultural Society,” vol. xiv, pp. 705-880.]

# INSECTS INFESTING FRUIT TREES.

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## 1. THE APPLE.

### AFFECTING THE ROOT.

Wart-like excrescences growing upon the roots, sometimes of an enormous size; containing in their crevices exceedingly minute lice, often accompanied with larger winged ones having their bodies covered with a white cotton-like matter.

The APPLE-ROOT BLIGHT, *Pemphigus Pyri*. Synonyms, *Eriosoma Pyri*, FITCH, Fourth Report of the N. Y. State Cabinet of Nat. Hist., A. D. 1851, (Senate Document, No. 30) p. 68. *Pemphigus Americanus?* WALKER, List of Homopterous Insects in the British Museum, 1852, p. 1057.

Upon the 29th day of October, 1849, I was occupied in setting out a number of young Apple trees which had been brought me from the nursery at Glens Falls, Warren county, when, on the roots of one of these trees, I observed some very singular excrescences. I was conjecturing as to the cause of this remarkable disease, which appeared to be sufficient to destroy the tree, when, nearly concealed in one of the largest excrescences, a woolly Plant-louse was perceived, and on further inspection, a second one was found, similarly secreted—one of these being dead, the other alive. And on examining the crevices of this excrescence with a magnifying glass, they were discovered to be occupied by numerous lice, so minute as to be wholly imperceptible to the naked eye. These, there can scarcely be a doubt, were the young of the larger winged lice, first noticed.

Upon the wing, in groves, late in the autumn, I have captured numerous individuals of this same species, where no apple trees were growing within a half mile. These were probably bred upon the roots of the Thorn or the Shad-bush (*Amelanchier*

*Canadensis*), and it may possibly prove to be the fact, that this insect is not limited to the *Pomeæ* family, but infests the roots of other deciduous forest and fruit trees.

This affection of the roots of Apple trees has occasionally been noticed in our agricultural periodicals, and various enquiries have been made respecting the insect which occasions them, which enquiries have received no satisfactory answers, for the reason that the insect is a new species, different from any hitherto described in books or known to our nurserymen and fruit growers. A communication from J. Fulton, jr., of Chester county, Pa., in *Downing's Horticulturist*, vol. iii, p. 394, gives additional evidence of this being a common disease over a large extent of our country, and causing great losses to our nurserymen. He says: "The main purpose of my writing is to call attention to an important matter, and to ask for light upon the subject. In taking up trees this fall (1848), I notice that some of the roots will be full of excrescences, or warts, and covered with a minute white, woolly insect; and that some of them find lodgment on the trunks of the trees, in the partly closed wounds made by pruning. As the trees seemed vigorous, I paid little attention to the subject, until another nurseryman called my attention to the subject, and stated, that not being able to supply the demand for Apple trees, he had been at several nurseries in this State to purchase, and was hard set to get a supply, because so many proved diseased in this way, and that thousands had to be thrown away. Since this, a young friend of mine has returned from Virginia, where he had sold and delivered several thousand trees; and he informs me that his trees were very generally so, and that he was not aware that the appearance was at all prejudicial to the health or value of the trees, nor did the propagator of them seem to be aware of their hurtful nature. Can this insect be the 'woolly aphid?' And if so, what can nurserymen do to get rid of a pest which, unfortunately, is by no means rarely seen? I have detected the presence of the insect much the most frequently on trees which grow in a gravelly or slaty soil, and seldom on trees growing in a mellow loam."

A short description of this species was published in my catalogue of the Homopterous Insects, in the State Cabinet of Natural

History, under the name of *Eriosoma Pyri*. All those Plant lice which were formerly included in Dr. Leach's genus *Eriosoma*, which have all the veins of the wings simple, and those in the disk of the hind pair two in number, now form the genus *Pemphigus* of Hartig (Germar's Zeitsch. vol. iii. p. 366), to which genus it is therefore necessary to refer this insect.\* Several of the other species of this genus, as well as the present one, are known to infest the roots of plants. I entertain scarcely a doubt that this is the same species which Mr. Walker soon afterwards described, from specimens obtained in Nova Scotia, under the name of *Pemphigu Americanus*; though the length which he assigns to it (four lines) is rather greater than any individuals I have met with.

To our nurserymen it obviously belongs, to fully elucidate the history of this species, and the disease which it occasions, as they enjoy opportunities for observing it such as belong to no other profession. The knots, or excrescences, occur both upon the large

\* Mr. Westwood, in his *Arcana Entomologia*, vol. ii. p. 63, observes that the name *Brysocrypta* (*Byrsocrypta*) of Haliday must be retained for Hartig's genus *Pemphigus*. And on the next page we are told: "The generic name of *Eriosoma* (Leach) must take place of that of *Pemphigus*, and be restricted to such species as differ from *Aphis bursarius*." There is a contradiction here, which I can only account for by supposing the distinguished author, who is so accurate a nomenclator, has inadvertently placed the name *Pemphigus* in the latter quotation, where he intended to insert *Schizoneura*. The first division of the old Linnæan genus *Aphis* appears to have been made in 1819, when Samouelle (in his *Entomologist's Companion*, p. 232) published the genus *Eriosoma* from Dr. Leach's MSS., with the "*E. Mali*, the *Aphis lanigera* of authors," or the well-known Apple tree blight, as its type. Samouelle's little work, truly a "Useful Companion" in its day, probably was not circulated upon the Continent, and entomologists there seem to have been uninformed of its contents. Several synonyms, in consequence, have unfortunately been introduced into the science. Five years afterwards, Blot (in the *Memoirs of the Linnæan Society of Calvados*, vol. i. p. 114) named the same insect *Myzoxylus Mali*, which name has been extensively circulated by French writers. Still more recently, Hartig (in Germar's *Zeitschrift*, vol. iii. p. 367) has proposed the name *Schizoneura* for this same genus; whilst Macquart has bestowed the name *Eriosoma* upon a genus of flies, in the Order *Diptera*. Mr. Westwood is clearly right in retaining Dr. Leach's name for the genus having *Aphis lanigera* as its type.

With regard to the statement first made above, I would observe, Mr. Haliday first proposed the genus *Byrsocrypta*, if I mistake not, in the *Annals of Nat. Hist.* for the year 1839, page 189, placing under this genus the *Aphis Ulmi* of Geoffroy, and a new species which he names *pallida*. We hence regard the *Ulmi* and not the *bursarius* as the type of Mr. Haliday's genus. Consequently the name *Byrsocrypta* must be retained for the genus which has *Ulmi* for its type, namely, the *Tetraneura* of Hartig; whilst his genus *Pemphigus*, with *bursarius* as its type, is entitled to stand. I therefore give our American species under this name.

roots of the Apple tree and their more slender, fibrous, and capillary branches. In the single instance in which they have come under my notice, the main root of the young tree was half an inch in diameter, half a span below the surface, at which point it was two-thirds surrounded by an excrescence two inches in length and three inches in diameter and height, and connected to the root by a neck much smaller than its base. (The accompanying



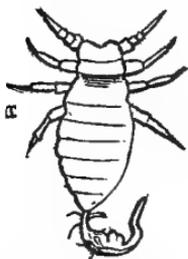
figure is a view of the back of this excrescence, reduced to one fourth its actual size, and one of the small fibrous roots, with an excrescence thereon. The original specimen is preserved in the Entomological department of the Museum of the State Agricultural Society.) It is of an irregular, knobbed form. Its surface is

of the same yellowish-brown color as the bark of the root, and is everywhere crowded with little round elevations, from the size of a mustard seed to that of a buck shot or a small pea. On cutting one of the projecting knobs, it is found to be of a very hard, woody texture, and without any cavities in its center. Upon the main root, between this and the surface of the earth, was a second similar excrescence, but smaller; whilst upon several of the small capillary fibres were similar tubers, from the size of a pea to that of a bullet.

These excrescences are doubtless formed in much the same way that galls and other morbid enlargements in the structure of vegetables are produced. The parent insect insinuates herself downwards along the side of the root, as it would appear, at the close of autumn, and there deposits her stock of eggs, and perishes. These eggs hatch when the ground becomes warm the following spring, and the young lice insert their beaks into the bark of the root to extract their nourishment therefrom. Their punctures produce a kind of irritation, which causes an increased flow of fluids to the spot where they are located. This excessive amount of sap thus diverted to this part occasions an increased growth of the wood, and results in the enormous development which we have witnessed. As in other cases in this family, these lice probably continue to multiply without any intercourse of the sexes

until autumn, when winged individuals are developed, which leave their retreat, and coming abroad into the open air, copulate, and search out new situations in which to plant their species. Others, as I infer from the lateness of the season when I found young lice upon the excrescences, remain in their abode through the winter, to continue their operations upon the same roots the following year.

The *young larvæ*, as appears from the hasty notes and sketch which I was able to take whilst they were still alive, were scarcely four hundredths of an inch in length, of an oval form and a pale dull yellow color. Their legs were shortish, robust, and nearly equal in length. The antennæ appeared much like a fourth pair of legs, being robust, and about the same length as the legs; they seemed to be five-jointed, the joints successively diminishing in diameter, the one next to the last being longest. From the tip of the abdomen of each of these young lice protruded a white filament, or short thread of flocculent cotton-like matter, variously curled and crinkled in different individuals. The whiteness of this filament rendered



it perceptible to the naked eye, and served to show the situation of the insect as it moved about upon the surface of the excrescence, when otherwise it would have been wholly invisible.

The *mature winged individuals* are nearly or quite a quarter of an inch in length to the tips of the closed wings, and these, when spread, measure thirty-eight hundredths of an inch across. The body, legs and antennæ are coal black; the antennæ are about half the length of the body, and the head and abdomen on its back are covered with a dense mass of snow white or bluish white flocculent down. The upper wings are transparent and slightly smoky, as though fine dust had settled upon them. This cloudiness is rather more dense at their tips. The veins are black, faintly margined with dusky brown. The rib vein is robust, and from its base to the stigma very slightly approaches the margin, it then gradually diverges from it to the base of the fourth vein, where it is more distant from the margin than in any other part of its course; it thence curves slightly towards the margin, and joins it at a very acute angle, the margin being commonly slightly contracted, or obtusely notched, at the point of junction. The first vein curves slightly towards the tip on its basal part, and then runs straight, or near its apex curves almost imperceptibly towards the inner margin. The second vein is rather more robust than the first, is thickest in its middle, at its base curved towards the tip, middle portion straight, apical third curving towards the inner margin; its base is nearer to the base of the first vein than to the outer margin, and it is about seven times as far from the first vein at the apex as it is at the base. The third vein is rather more slender than the first, nearly straight, sub-parallel with the second vein two-thirds of its length, its basal third abortive and imperceptible except in a particular reflection of the light, base about the same distance from the base of the second vein that this is from the first, apex nearer the apex of the second vein than this is to the first. The fourth vein is more

robust than the first and third, thickest at base and gradually more slender thence to the tip, basal portion gently curved, the remaining part straight, its apex nearer that of the third than that of the rib vein, about the same distance from the apex of the rib vein that the apex of the third vein is from that of the second. Marginal vein robust and black from the base to the stigma, very slender and black along the outer margin of the stigma, slender and brown from the stigma around the tip of the wing and along its inner margin to the apex of the first vein, thence robust and black, gradually becoming brown towards the base, stigma dark smoky brown, oblong, its opposite sides nearly parallel, abruptly converging to an acute point at each end, the basal end more acute than the apical, and slightly attenuated. Lower wings more clear and hyaline, marginal vein and outer filament of the rib vein pale brown, inner filament black and very gradually diverging from the outer, both filaments undulated beyond the base of the second vein; the two discoidal veins blackish, the first slightly undulated, its apex the same distance from the apex of the second that this is from that of the inner filament of the rib vein.

An abnormal variety has fallen under my notice in one instance, in which the apex of the fourth vein of the right wing was slightly forked.

When a tree ceases to grow with its usual vigor, and its leaves are of a paler and more yellow hue than usual, and no borers in the trunk, or other obvious cause of disease can be discovered, the presence of this blight upon its roots may be suspected, and the earth should be removed from them sufficiently to ascertain whether excrescences such as have been above described are formed upon them, and if discovered, it will be well to clear away the earth from around them as much as can conveniently be done, and pour strong soapsuds upon them, that it may saturate the crevices in the excrescences, for there is little doubt that every insect that is reached and wetted by this solution will immediately perish. And ashes should be freely mingled with the soil with which the roots are covered. It is probable that by a resort to these measures an affected tree can in most instances be cured.

It is chiefly in nurseries, upon the roots of young trees taken up to be transplanted, that the blight will be detected. In consequence of it thousands of trees in our country have undoubtedly been thrown away. But there is probably no necessity for rejecting such trees. If the root be dipped in soap suds, unless the lice upon it are a much hardier race than their kindred which dwell upon the leaves and twigs of trees, they will at once be de-

stroyed, and such trees may then be set out with as much safety as though they had never been affected. This, at all events, is a point which any nurseryman can easily ascertain by experiment. Mr. Downing recommends the mixing of a shovelfull of ashes with the earth in which such trees are set, which may be equally as effectual as an immersion of the roots in soap suds.

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#### AFFECTING THE TRUNK.

Excavating a round flat cavity under the bark near the root, and then boring a cylindrical hole upward in the solid wood: a yellowish or white, footless, cylindrical grub, broadest anteriorly, with a brown head and black jaws.

**THE APPLE TREE BORER.** *Saperda bivittata*, SAY. Synonym, *Saperda can dida*? FABRICIUS.

This is one of the worst enemies against which our apple trees have to contend. It is much more common everywhere in our country than is generally supposed. The editor of the Ohio Cultivator (vol. x, page 212,) speaks of it as a New England insect, which has never been seen as yet, to his knowledge, in Ohio. There can be no doubt, however, that it is common in that State, for I met with it last autumn in the orchards of Michigan and Illinois, and am informed by the editor of the Prairie Farmer that it has for many years been found in the neighborhood of Chicago. Specimens of the beetle have also been sent me from Arkansas; and as this is a native insect, which breeds in the different species of thorn, in the mountain ash, and the shad-bush, there is a strong probability that it is as widely spread over our country as these trees are. And notwithstanding it has been so often noticed in our agricultural and other papers, many of our citizens are yet wholly unaware of its existence, and others who are familiar with the published accounts, suppose it occurs only in some distant localities, and are wholly unsuspecting that their own neighborhoods and their own trees are suffering from it. We have reason to believe that in many instances where orchards are dwindling and dying from the attacks of this insect, their proprietors suppose there is something in the soil or local situation which prevents their fruit trees from being more vigorous and

flourishing. In many sections of our country, it is the current opinion that particular localities are unfavorable to the growth of fruit trees, and this opinion has almost invariably arisen from the fact that orchards planted in these situations have not been thrifty and productive. Now there is a strong probability that, at least in many cases, those failures have been caused by the attacks of insects, and that these localities which are in such bad repute are in reality as well adapted for fruit culture as any others in their vicinity. The justness of these remarks will be evident from the following case: A lot at East Greenwich, Washington county, recently purchased by Dr. Henry K. McLean, had ten young apple trees standing upon it, which are about ten feet high. The bad condition of these trees was noticed by the doctor, when bargaining for the land, and he was told by the former owner that he must not expect fruit trees to do well there, the soil and situation (a terraced flat of gravel, bordering upon Batten kill,) being unadapted to them. Other residents in the neighborhood reiterated the same statement. The doctor, on inspecting the trees more closely, soon afterwards, discovered that they were badly infested with the borer, and going to work with his knife, he last spring dug out and destroyed from these ten trees, over sixty worms, as he assures me, although the statement is almost incredible. Several of the trees were almost girdled, and would have been quite so in a short time. These trees now show for themselves that during the past summer they have scarcely been equalled in the rapidity of their growth and their thrifty condition, by any others in the country. And it is thus rendered evident that the gardens and yards of that neighborhood are well adapted for the cultivation at least of the apple tree, and that the bad repute in which they have heretofore been held has been wholly unmerited.

Elmer Baldwin, Esq., of Farm Ridge, La Salle county, Illinois, an intelligent fruit culturist who has had much experience with some of the insects infesting our fruit trees, and to whom I am indebted for several interesting facts relating to this and other species, informs me, that he sat out fifty apple trees in the year 1838, and in 1843 when they had grown to about three inches in

diameter, a neighbor enquired if the borer was among his trees, saying it had killed nearly half the trees in his orchard. This was the first time his attention was directed to this insect, and on examination he found that almost every one of his trees had from one to five worms in them; and several were destroyed, beyond all possibility of saving them. In one instance he has found twenty of these worms in one tree. For a few years past they have not been so numerous in his vicinity as they previously were. He has kept a pretty accurate account of his fruit trees, and finds that of all the apple trees he has planted, he has lost one in every eight from the borer. The insect is more fond of the quince, even, than it is of the apple, insomuch that he has found it impossible to grow this fruit, the stalks, notwithstanding all the care he has given them, being almost invariably riddled by the borer. Though he has set out very many quince trees during the past sixteen years, he has never been able to get but a dozen quinces, and these were gathered in the fall of 1853, when all kinds of fruit were so abundant in his section of country.

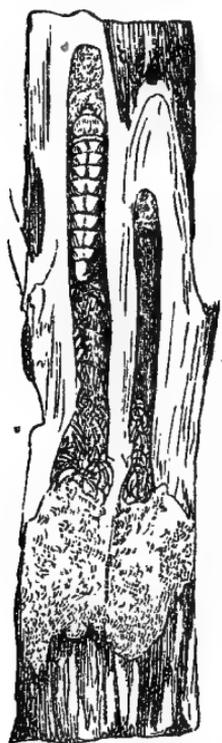
The accounts which have been given, and the ideas that are prevalent respecting the burrow which this worm excavates in the trees which it attacks are very imperfect, and in part erroneous. It is the common opinion that it simply bores a cylindrical passage upwards in the solid wood of the tree, which passage it keeps clean and empty. If this were the case, a constant effort, I think, would be required to prevent this footless worm from falling to the bottom of its burrow. As we shall see, that part of its operations whereby it does the most injury to the tree, has been hitherto overlooked.

The winged beetle makes its appearance every year early in June. Like other species of the family of long horned beetles (*Cerambycidae*) to which it pertains, it flies only by night. In the course of this and the following month the female deposits her eggs, one in a place, upon the bark, low down, at or very near the surface of the earth; but when these beetles are numerous, some of their eggs are placed higher up, particularly in the axils where the lower limbs proceed from the trunk. From each of these eggs is hatched a minute grub, or more properly a maggot,

for it has no feet. It is of a white color, with a yellowish tinge to its head. This maggot eats its way directly downwards in the bark, producing a discoloration where it is situated. If the outer dark colored surface of the bark be scraped off with a knife the last of August or fore part of September, so as to expose the clean white bark beneath, as can easily be done without any injury to the tree, wherever there is a young worm it can readily be detected. A little blackish spot, rather larger than a kernel of wheat, will be discovered wherever an egg has been deposited, and by cutting slightly into the bark the worm will be found. It gradually works its way onwards through the bark, increasing in size as it advances, until it reaches the sap-wood; here it takes up its abode, feeding upon and consuming the soft wood, hereby forming a smooth round flat cavity, the size of a dollar or larger, immediately under the bark. It keeps its burrow clean by pushing its excrement out of a small crevice or opening through the bark, which it makes at the lower part of its burrow, and if this orifice becomes clogged up it opens another. This excrement resembles new fine saw dust, and enables us readily to detect the presence of the worm by the little heap of this substance which is accumulated on the ground, commonly covering the hole out of which it is extruded, and by particles of it which adhere around the orifice where it is higher up, or in the fork of the tree; the outer surface of the bark also often becomes slightly depressed, or flattened, over this cavity.

When the worm is half grown, or more, as if conscious it would now form a dainty tid bit for a woodpecker or any other insectivorous bird, and that it was daily becoming less secure in its present situation, by reason of its burrow being so large, and forming so much of a cavity as to be liable to be detected by any scrutiny made on the outside of the tree, it seeks to place itself in a less exposed situation, by gnawing a cylindrical retreat for itself upwards in the solid heart-wood of the tree. Some of its habits are now reversed. The flat cavity which it was so careful to keep clean it is now intent upon filling up and obliterating, as far as it is able, that it may not be discovered. It ceases to eject its castings, and now crowds and packs them in the lower part of its

burrow, as it bores a round hole, upward, in the solid wood. This hole runs slightly inwards, towards the centre of the tree, and then outwards, so that when it is completed its upper end is perforated through the sap-wood, and is only covered by the bark.



The lower flat portion of its burrow is by this time stuffed in every part with its castings, whilst the long cylindrical passage above is still empty. As if fearful that these castings, being so fine and dry, might sift out, and thus leave an open passage for some marauding insect or other enemy to crawl in and destroy it during its defenceless pupa state, and that it may, during this period of its life, be securely held in the middle of its cylindrical hole, the worm now turns itself around, (as I think, for it is impossible to conjecture how otherwise this long round cavity becomes filled in the manner in which we usually find it,) and with its jaws strips a quantity of woody fibres from the inner walls of the middle part of its burrow, thus enlarging this part sufficiently to give it ample room to repose here in its pupa state, when its body becomes more short and broad than it has previously been. With these fibres

of wood, which are from a half to three-fourths of an inch in length, it firmly plugs up all the lower part of its burrow above the flat excavation in the sap-wood, placing the fibres frequently in as regular order as the hairs of a mustache. And the castings which it voids when in this inverted position are crowded, and firmly packed together in the upper end of its burrow. Thus the long cylindrical hole which it has bored becomes filled up, and securely plugged with woody debris at each extremity, leaving only a vacant space in its middle, where it is deepest sunk in the wood of the tree, for the insect to lie during its pupa state. The annexed cut will give an idea of these burrows and their contents, as they appear when the bark is removed and the wood cut away sufficiently to expose their whole length to view. Having now finished its labors and attained its growth it again

turns itself around to its former posture, with its head upwards, becomes inactive, and lies dormant during the winter season, and the following spring is transformed to a pupa. From this pupa the perfect insect soon after hatches, and tearing away the saw-dust like powder which has been packed in the upper end of its burrow, it has only to break through the bark here, which it easily does with its sharp, powerful jaws, to come out of the tree.

It will thus be seen that the burrow of this worm consists of two distinct parts—a round flat excavation in the sap-wood, immediately under the bark, and a long round hole in the solid wood, running upwards from the upper part of the flat cavity, first inwards towards the centre of the trunk, and then outwards to the bark. This upper portion of the burrow is variable in its length, being sometimes no more than an inch and three quarters, and at other times, as I am informed, a foot or more. The lower flat portion, as already stated, is about the size of a dollar, but is frequently much larger than this; and when the worm comes to knots or other obstructions when excavating it, instead of making it round it is cut out in an irregular form. But in all cases the worm passes the first periods of its life in consuming the sap-wood, its jaws probably being too weak as yet to enable it to work in the harder wood of the interior of the tree, and it is by thus mining in the sap-wood, and cutting off so many of its vessels, that this worm does the chief injury to the tree, stinting it in its growth, and causing the leaves to assume a yellowish, sickly hue. And where four or five worms are at work in one young tree, as is often the case, these flat cavities in the sap-wood are liable to come in contact with each other, and thus completely girdle and destroy the tree.

Numerous variations in the form and direction of the burrows of these borers may be met with. Some of the worms seem to be very wild and erratic in their proceedings. It is sometimes the case that as soon as it reaches the sap-wood it works directly upwards, under the bark, and then turns, it may be, obliquely downwards before entering the heart-wood. A most singular deviation from the usual habit was related to me by Esquire Bald-

win, as follows: "The borer first made a flexuous channel upwards, under the bark, a distance of two feet, the channel becoming gradually larger as the worm had increased in size. Having traced its burrow thus far by means of a pointed twig, for (said my informant) whenever I find one of these fellows in my trees I am after him immediately 'with a sharp stick,' I found he had bored directly through the centre or heart of the tree, which was four inches in diameter, taking a course slightly upwards, so that after loosening and removing some of the stuffing in the hole, I discovered my rod had pricked through the bark on the opposite side of the tree, and yet did not encounter the worm; but on examining upon this side of the tree I found, having not quite completed his feast, he had gone upwards in the sap-wood three inches further, where I finally discovered 'the gentleman.' He evidently had finished his travels, for he was an inch and a half in length, was sluggish and inactive, and to all appearances was about changing to a pupa." According to Dr. Harris (Treatise on New England Insects, page 95,) the larva state of this insect continues from two to three years.

Mr. T. B. Ashton, of Whitecreek, New-York, informs me that he has in different years captured about one hundred and fifty of these beetles in their perfect state, and that only one-third of these have been females. According to his observations the time of their appearance varies somewhat, as the season is more forward or backward, but commonly, here in Washington county, forty miles north of Albany, they begin to be found upon the trees about the 20th of June, from which time until the close of the month they appear to be more numerous than they are afterwards.

The mature worm varies considerably in its size, but is most commonly rather less than an inch long, and over a quarter of an inch in diameter anteriorly at its broadest part. It is of a cylindrical form, the second segment being bulged and rather broader than the others. It is soft and fleshy, and of a very pale yellow or a white color. The head is chestnut-brown, polished and horny, with scattered hairs; the upper jaws (mandibles) are deep black, sloped at their tips, which are obtusely rounded; between them appears the labrum or upper lip, of a tawny yellow color, and densely clothed with short hairs; the throat is also pale tawny yellow. The feelers (palpi) consist of a conical, three-jointed process, on the under side of each mandible, and inserted upon the lower jaw (maxilla), the tip of which slightly projects in the

form of a short roundish process at the inner base of the feelers. The feelers of the lower lip (labial palpi), are also perceptible, forming a conical two-jointed process of a chestnut color, inside of each lower jaw. The antennæ are also represented by a small, jointed, projecting point, near the outer angles of the head, so minute that we should little suspect it would become developed into the long horn which we find in the winged beetle. Scattered over the remainder of the body, more densely in particular places, are numerous short brown hairs. The second segment is larger than any of the others, as shown in the following cut; its upper side slopes obliquely downwards and forwards, and is occupied by a large smooth spot of a pale tawny yellow color, the posterior part of which is covered with brown points; beneath is a smaller transverse space, occupied by similar points, but with a band destitute of them running across its middle, and on each side is a pale tawny yellow spot destitute of these brown points. The third and fourth segments are shorter than the following ones. On the top of the fourth and each of the succeeding segments, to the tenth, is a transverse wart-like elevation, divided into two parts by a strongly impressed longitudinal line. Along each side the spiracles or breathing pores form a row of nine chestnut brown dots, situated upon the second, the fifth and each of the following segments; and immediately below these is an elevated longitudinal ridge, which is interrupted at the joints. Beneath, as above, is a transverse wart-like hump on the middle of each segment from the fourth to the tenth, with a faint longitudinal impression across its middle. There are thirteen segments in all, separated from each other by strong constrictions. The last one of these is double, or appears like two segments, its posterior portion being but half as broad as the anterior, into which it is deeply sunk.



The perfect insect or beetle measures from slightly over one-half to plump three-fourths of an inch in length, and from 0.17 to 0.25 in width, the males being smaller and much more slender than the females. It is covered with dense appressed milk-white pubescence, and above are three broad stripes, formed by short appressed hairs, of an amber or butternut brown color, not a fuscous brown, as is stated in some of the descriptions. These stripes commence upon the base of the head and extend the whole length of the body. Both upon the thorax and the elytra they are coarsely punctured, each puncture yielding a short black nearly erect bristle. The middle stripe embraces the suture of the elytra, is gradually narrowed to a point posteriorly, and does not reach the apex of the suture. The outer stripes are narrower on the thorax, and occupy the outer half of each elytrum, and are edged exteriorly at their tips with white. The white portions of the surface are clothed with fine white hairs, which on the face are interspersed with black bristles arising from fine black punctures. The head has an impressed black line in its middle, upon which in the center of the face is a brown spot, which is round, kidney-shaped, or like the letter V. In the females this spot is sometimes wanting, or is replaced by two faint dots. The mouth is black, with the labrum or upper lip and the bases of the mandibles clothed with white appressed hairs. The eyes are coal black. The antennæ are inserted upon a short broad prominence which arises in the notch of the eyes. They are slightly longer than the body in the males, and shorter in the females. They are composed of eleven joints, whereof the second one is quite short and all the others long and cylindrical, the basal one being much

thicker than the others. They are covered with appressed white hairs upon a black ground, causing them to appear gray in the males and white in the females. The basal joint has several scattered black bristles, and upon the under side is a row of similar bristles to the end of the fifth joint, and three at the tips of each of the three following joints. The thorax presents a slender line in its middle, which line is impressed posteriorly and elevated anteriorly, its anterior end being often of a white color. The legs are of the same color as the antennæ, the soles of the feet being pale brown or yellowish, and the hooks at their tips are reddish-brown.

This insect was regarded as a new species by Mr. Say, and he accordingly described it in the year 1824, in the Journal of the Academy of Natural Sciences, (vol. iii. p. 409,) under the name of *Saperda bivittata* or the Two-striped Saperda, which name is also adopted by Dr. Harris, and is currently known throughout our country as the scientific name of this insect. Fabricius long since very briefly noticed a species (*Entomologia Systematica*, vol. i. b. p. 307,) which he found in the museum of Dr. Hunter, the native country of which was unknown, under the name of *Saperda candida*, or the White Saperda. He merely says of this insect that it is white, above fuscous with two white stripes, and with obtuse, smooth elytra. As Dr. Hunter's museum contained many insects from this country, Prof. Haldeman and Dr. Le Conte regard our Apple tree borer as being without doubt the *S. candida* of Fabricius. In this they are probably correct; but as our insect is clearly of an umber and not a fuscous brown color, and has punctured elytra, marks which are at variance with the Fabrician account, I deem it more safe to retain the name given by Mr. Say, connected with which there is no query, until our insect has been compared with the specimen, which is probably still in existence, from which Fabricius drew his description.

Among the means provided by the Author of Nature for destroying this borer and keeping it from becoming unduly multiplied, the woodpeckers of our country, and particularly the Downy woodpecker (*Picus pubescens*, Lin.), which is so frequently seen in our orchards, stands conspicuous. This gay bird seems to have been endowed with the habits and furnished with the organs which it possesses, for the express purpose of enabling it to discover and prey upon the Apple-tree borer and similar larvæ. As these worms place themselves under the bark, down

at the very surface of the ground, their lurking place can only be found by a bird which makes its examinations with its head downwards; and the slender, extensile, flexible, barbed tongue of this bird was evidently constructed to enable it to probe the holes and explore the crevices and cavities of the bark, and transfix and drag from its cell any worm which is found reposing there. Esquire Baldwin tells me that in numerous instances he has found the flat cavity excavated by the borer under the bark, without any vestiges of a worm in it, and has been wholly at a loss to account for its disappearance at this time, when its burrow is not half completed. My neighbor, Peter Reid, who has devoted much attention to our birds and their habits, informs me he has repeatedly noticed the woodpecker remaining some considerable time down at the very root of the Apple tree, busily occupied in some operation at that particular part. These facts we think clearly elucidate each other, and render it evident that the woodpecker is the most formidable natural enemy to the Apple-tree borer which exists. And whether such a war of extermination should be waged against this bird, as has been declared by high authority (Kirtland's Zool. Ohio, p. 179), we leave to be considered hereafter.

It is probable, from what is said of the next species, that this also is subject to the attacks of Hymenopterous or Bee-like parasites, which feed upon and destroy the worm, although I am not aware that any of these have as yet been actually discovered preying upon it.

On glancing over the various remedies which have been proposed, and which may be met with in our agricultural papers, for the destruction of this borer, we are forcibly impressed with the fact, that, although these publications are doing great good in our community, they still unwittingly circulate many things that are foolish, and some that are pernicious. As an instance, we may cite the following: "One of the surest means to destroy the borers in Apple trees, is to make a solution of potash, two pounds to a gallon of water, which must be injected into the hole where the borer has entered, by means of a syringe holding half a pint." Now, we are not without suspicions that so strong a solution of caustic potash would destroy not only the borer, but the tree

also, especially if a half pint of it could be injected into each of the holes which are frequently made by four or five worms in one young tree. But as these holes are commonly already stuffed full of sawdust-like matter and woody fibres, we see not how anything can possibly be injected until these are removed. And this solution, we are further told, must be injected "into the hole where the borer has entered." Now this hole is at first no larger than a pin, and often becomes wholly closed up in the course of a few weeks, so that, as Hood says, "there a'n't no Billy there"—the worm having opened another orifice through which to eject its castings. Yet the terms of the prescription are explicit and peremptory. Through the hole where the worm has entered the solution "must be" injected.

In the treatment of the Apple-tree borer, to use a medical term, there are two "indications." The first is, to protect the tree from attack; the second, to destroy the worm. And as we have simple, direct, and effectual modes for accomplishing both these purposes, there is no occasion for dwelling upon those which are of doubtful efficacy or inconvenient to be applied.

Experiments amply show that alkaline preparations of suitable strength are most repulsive, nay, directly poisonous to most insects and their larvæ, whilst upon vegetation they have an opposite effect, promoting the health and accelerating the growth of plants. Of these preparations, one of the least expensive, one which is everywhere at hand, and of suitable strength for being applied freely to the outer bark of trees without danger of eroding or otherwise injuring its texture, is common soft soap. Many citizens from all parts of our State, who were present at the last annual meeting of the State Agricultural Society, will recollect the high encomiums passed upon this article, by the Hon. A. B. Dickinson, and his statement that a handful of it placed in the axils of the lower limbs was a sovereign prophylactic, repelling all insects from the tree. Although we cannot deem the application of this substance in this simple manner such a panacea as was intimated—indeed, we are confident it could have no effect to prevent a moth or a plant-louse from alighting and depositing its eggs upon the distant leaves and twigs—yet against all those in-

sects which infest the trunk or which are obliged to crawl up the trunk to gain access to the tree, we have little doubt it will prove an effectual safeguard. Washed downwards as it will be by the rains so as to impregnate the bark over the chief part of the trunk and to the very root, there is little probability that the beetle of the Apple-tree borer will venture to deposit its eggs in a situation where those eggs, or the young worms which proceed from them, will be exposed to destruction from encountering this alkaline matter. The late Mr. Downing (*Horticulturist*, vol. ii. p. 531) recommended a mixture of soap, sulphur, and tobacco water, with which to paint the bark of the tree immediately above the surface of the ground, and in the axils of the lower limbs; subsequently (vol. iv. p. 536) he recommends soap merely thinned with tobacco water, to the consistence of thick cream, to be applied to the same places. According to his observations, the borer entirely forsook the trees which were thus washed, even though the mixture had been applied some weeks previous to the appearance of the winged beetle. There can be little doubt that the efficacy of these prescriptions of Mr. Downing depend chiefly, if not entirely, upon the soap they contain. It will be as well, therefore, to apply this alone, in the manner in which it is used by Senator Dickinson, or by rubbing it in the axils of the lower limbs and around the base of the tree, these being the parts which are liable to be attacked by this insect. In all orchards where the borer is present or where a visit from it is apprehended, this measure should invariably be resorted to the latter part of May, or, in more northern localities, where the beetle will be somewhat later in appearing, early in June. Young thrifty trees, especially, should be attended to, as this insect appears to be particularly inclined to infest them.

With regard, in the next place, to destroying the worm, where the trees have been neglected and the beetle has been permitted to invade them and deposit its eggs. If time permits, the orchard should be examined the last of August, and the outer surface of the bark at the root scraped, to detect any black spots therein; for at this time, the minute worms in the bark can be more readily destroyed than at any subsequent period, and before they have

done any injury to the tree. It is the practice of Esquire Baldwin to wash the butts of his trees with strong lye, the last of August. The newly hatched grubs are now but slightly sunk in the bark. The lye penetrates the small orifices which they have formed and destroys them. He makes it an invariable rule thus to wash his trees every year, and since he commenced this treatment it is very rare that he has found a borer in them.

But if, through the pressure of other avocations during the busy summer months, the orchard has been neglected and these borers have penetrated the wood, they should still be carefully searched out and destroyed, for they continue to cause irritation and injury to the tree so long as they remain in it. Before the fall of the leaf, trees which are badly infested may be known by their sickly, chlorotic appearance. Mr. Ashton informs me, an experienced person can easily determine when young trees are suffering from the borer, by taking hold of them and swaying them to and fro. Infested trees, when thus handled, feel as though they were loose at the root, in consequence, no doubt, of having so many of their fibers cut off by the worm; whilst unaffected trees feel more stiff, and as though they were firmly bound by the soil. But at all seasons of the year the presence of this worm can be most readily and certainly ascertained by examining the surface of the ground where it is in contact with the tree. The small heap of sawdust-like castings remains piled up against the bark, covering the orifice from whence they were extruded, for months afterwards. Therefore, in warm days in winter and early spring, when almost every one is most at leisure and has the strongest relish for some out-door work of this kind, the snow being off the ground, these borers may be hunted with success.

Various expedients for killing the worm, such as injecting different solutions, plugging up the hole, thrusting a wire into it, &c, have been proposed, many of them, I must think, by persons who had very little practical acquaintance with the subject on which they were writing—the opening into the burrow being at the surface of the earth in most cases, so low down and difficult of access by grass and often by suckers or young shoots growing in front of it, as to render a resort to many of these remedies very

difficult if not absolutely impracticable. On the whole, I think the best resort of any now in use, is that which is most commonly practised, namely, opening the burrow with a chisel or a stout bladed knife, to where the worm lies, and destroying "the villain." Experience shows that the wound thus made in the tree is of little account, as it readily heals, and injures the tree far less than does a continuance of the worm therein. Even where three, four, or five worms are cut out of one small tree, the vigor with which it starts forward immediately afterwards sufficiently attests the benefit which has been rendered it.

But when I came to examine the situation of this worm and the construction of its burrow, a remedy suggested itself to me so perfectly simple and sure, and so easy of application, as I have found on trial, that I am surprised it has never before been proposed. It consists in scalding the worm by pouring hot water into the top of its burrow. The upper end of the burrow can easily be found by puncturing the bark with an awl, or even with a stiff pin directly above the orifice where the castings have been ejected. It is commonly about three inches above this orifice, but may be an inch less or a few inches more. It is discovered by the point of the awl readily sinking in much deeper here than it will elsewhere. Then, with the point of a pen-knife cut away the bark, which is already dead, which covers the upper end of the burrow, and scrape out the saw-dust like castings which are packed into this part of the cavity, loosening and removing them as far down as can conveniently be done. Then from a tea pot or other vessel having a small spout, pour hot water into the hole, at intervals as it soaks downwards, for a few moments, until you are certain, from its oozing out at the lower orifice, or otherwise, that it has reached the worm sufficiently to kill it. By cutting downwards into the wood, and extracting the worm, a few minutes after this operation, any one can satisfy himself that the culprit is, as Patrick says, "killed dead," and that

" A kettle of scalding hot water injected  
Infallibly cures the timber affected,  
The worm it will die and the tree will recover."

Indeed it is quite probable that merely opening the upper end of the burrow, in the manner above described, so as to permit the

rain to enter and soak downwards, will destroy the worm. And it may be that by introducing soap or some other substance into the hole, the tree will be aided in its recovery, and the bad scar be prevented which commonly results from the wound made by this worm. These are points which can only be determined by experiments which I have not yet had opportunities for carrying into operation.

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Boring under the bark and in the solid wood; a pale yellow, footless grub, its anterior end enormously large, round, and flattened.

Running up and down the trunk and limbs in June and the fore part of July; an oblong, brassy-blackish snapping beetle, nearly half an inch long, its back under its wings brilliant bluish-green.

THE THICK-LEGGED BUPRESTIS, OR SNAPPING-BEETLE, *Chrysobothris femorata*, FABRICIUS.

Another insect, which has not heretofore been noticed in our country as a borer in the Apple tree, pertains to the Family BUPRESTIDÆ, or the brilliant snapping beetles. Mr. P. Barry, of the Mount Hope nurseries, Rochester, has forwarded to us sections of the body of some young Apple trees, which were sent to him from a correspondent in Hillsboro, in southern Ohio, who states that in that vicinity the borer, which is contained in the specimens sent, is doing great damage to the Apple trees, and that he has had Peach trees also killed by this same worm. From an examination of these specimens, it appears that this insect is quite similar to the common Apple tree borer in its habits. The parent insect deposits its eggs on the bark, from which a worm hatches, which passes through the bark and during the first periods of its life consumes the soft sap wood immediately under the bark. But when the worm approaches maturity and has become more strong and robust, it gnaws into the more solid heart-wood, forming a flattish, and not a cylindrical hole such as is formed by most other borers—the burrow which it excavates being twice as broad as it is high, the height measuring the tenth of an inch or slightly over. It is the latter part of summer when these worms thus sink themselves into the solid heartwood of the tree, their burrow extending upwards from the spot under the bark where they had

previously dwelt. On laying open one of these burrows I find it is more than an inch in length and all its lower part is filled



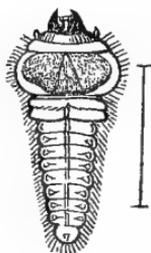
and blocked up with the fine sawdust-like castings of the worm. Thus when the worm is destined to lay torpid and inactive during the long months of winter, it has the forethought, so to speak, to place itself in a safe and secure retreat, within the solid wood of the tree, with the hole leading to its cell plugged up, so as effectually to prevent any enemy from gaining admission to it.

Still, this worm is not able to secure itself entirely from those parasitic insects which are the destroyers of so many other species of its race, and which, as is currently remarked, appear to have been created for the express purpose of preying upon those species, in order to prevent their becoming excessively multiplied. We should expect that this and other borers, lying as they do beneath the bark or within the wood of trees, were so securely shielded, that it would be impossible for any insect enemy to discover and gain access to them, to molest or destroy them. But among the specimens sent me by Mr. Barry, is one, where the worm has been entirely devoured, nothing but its shrivelled skin remaining, within and upon which are several minute maggots or footless little grubs, soft, dull white, shining, of a long egg-shaped form, pointed at the tip and blunt in front, their bodies divided into segments by very fine transverse impressed lines or sutures. They are about one-tenth of an inch long and 0.035 broad at the widest part. These are evidently the larvæ of some small Hymenopterous or Bee-like insect, pertaining, there can be little doubt, to the family CHALCIDIDÆ—the female of which has the instinct to discover these borers, probably in the earlier periods of their life when they are lying directly beneath the bark, and piercing through the bark with her ovipositor, and puncturing the skin of the borer, drops her eggs therein, which subsequently hatch and subsist upon the borer, eventually destroying it. These minute larvæ were forwarded to me under the supposition that they were injurious to the Apple tree, whereas, by destroying these pernicious borers, it is evident they must be regarded as our best friends. This fact illustrates

how important it is for us to be acquainted with our insects in the different stages of their lives, that we may be able to discriminate friends from foes, and know which to destroy and which to cherish.

The preparatory states of but a very few species of the extensive family of insects to which the borer now under consideration belongs, appear to have been hitherto noticed; and, so far as I am able to ascertain, the only figure of a larva like this which infests our Apple trees, which has yet been published, is that of *Agilus Fagi*, in Dr. Ratzeburg's work on the Forest Insects of Europe, (plate ii, fig. 8 c.)

The form of this borer is quite singular, and bears some resemblance to that of a tadpole, or a battledoor. It consists of a very large, round, flattened portion, anteriorly, which is suddenly tapered into a long cylindrical tail or handle-like portion. The broad anterior part of this worm is about two-tenths of an inch in diameter and the narrow posterior part is but half as wide. Its length is about 0.65. It is soft,



flesh-like, and of a pale yellow color. In front two short robust jaws of a deep black color and highly polished are slightly protruded. When these are spread apart the tips of the feelers and between them the lips are perceptible. The head is blackish brown and polished, and is deeply sunk into the second segment. Near each outer angle of the head is a small, pale yellow, bead-like protuberance, which is probably the antenna. In Dr. Ratzeburg's figure, above alluded to, this slight protuberance is represented, probably incorrectly, as arising from the second segment.

The second segment is deeply sunk into the third, and like all the remaining segments is pale yellow, and clothed with short minute hairs. The third or large segment is rather more broad than long, and is round and flattened above and beneath. Its upper side is occupied by a large, callous-like, transverse-oval elevation, the surface of which is flat and covered with numerous brown raised points, and in the middle are two smooth impressed lines, which diverge from the anterior to the posterior margin. Between these, on the middle of the basal edge, is a more faintly impressed line, running forward, but becoming effaced before it reaches the centre. On the under side is also a callous-like elevation, similar in all respects to that on the upper side, except that in place of the impressed lines it has in its middle a single channel or furrow, which does not extend to the posterior nor quite to the anterior margin. The fourth segment is a third narrower than the preceding, and has an impressed transverse line in its middle. In the deeply impressed suture which divides this from the third segment, on each side, is a smooth, crescent shaped, elevated spot of a chestnut brown color, resembling a little tick adhering in the fold of the skin. The nine remaining segments are of nearly equal length and diameter, except the two last, which are successively narrower. They are separated from each other by sutures which are strongly constricted. Along the middle of the back

is a smoothish faintly-marked line, and on each side of each segment is an irregular triangular indentation, from the inner angle of which a faint impressed line extends inwards. On each side, beneath, is an impressed, longitudinal line. There are no conical projecting points at the apex of the last segment.

These borers, sent to me as above stated, have not yet completed their transformations; but they will in all probability remain in their present cells in the wood, and be changed to pupæ the coming spring, from which the perfect insects will issue the latter part of May and during the month of June. And there can be little doubt that they will prove to be the species named by Fabricius *Buprestis femorata*, which species pertains to the modern genus *Chrysobothris*. This insect may be met with in all parts of our country. The natural place for its larva is in the White oak, and it is probable that being deprived of a sufficient supply of this wood, in which to deposit its eggs, in consequence of our forests being so rapidly and extensively cut down, this insect has been obliged to resort to the Apple and Peach trees. Dr. Harris speaks of meeting with it upon and under the bark of Peach trees, and I have captured it upon the Apple tree. Professor Kirtland, of Cleveland, Ohio, doubtless alludes to this species, (Downing's Horticulturist, vol. ii. p. 544,) when he says, "Our Apple trees are often injured by the larvæ of the *Buprestis*, which will girdle out extensive portions of the bark and young wood." This, moreover, is in all probability the beetle of which a wood cut illustration is given in the Ohio Cultivator, vol. x, page 242. Although no description of the insect or its larvæ is given, the figure presents more points of resemblance to *C. femorata* than to any other common American species. The following interesting particulars, there stated, sufficiently indicate that this beetle will be liable to do great damage in our orchards. The editor says, "The late Dr. Barker, of McConnellsville, (Morgan county, Ohio,) called our attention to the injury done to his Apple trees, by the beetle represented above, several years ago. It was in the month of July, and large numbers of these beetles were seen running up and down the trunks and branches of the trees, while beneath the bark extensive ravages of the larvæ were found. We observed, however, that these injuries seemed in nearly or quite all cases to have commenced where the bark had previously been

killed from some other cause, and were almost invariably on the south side of the trees. We have since found occasional marks of these insects in other orchards, but never where the trees appeared to have been in perfect health previous to their attacks." This beetle, however, is by no means limited to old and decaying trees, as the observations of the editor of the Ohio Cultivator leads him to infer. The sections of wood sent me by Mr. Barry are from young and thrifty Apple trees; and it occurs in Oaks, also, of this character, as well as those which are aged and perishing.

Like other species of its family, the Thick-legged Buprestis is variable in size, measuring from four to five tenths of an inch in length, and about two-tenths in width. It is of a black or greenish black color, polished and shining, with the surface rough and uneven. The head, and sometimes the thorax, and the depressed portions of the elytra, are of a dull coppery color. The head is sunk into the thorax to the eyes, is densely punctured, and is clothed in front with fine white hairs, which are directed downwards. Upon the middle of the top of the head is a smooth, raised, black line, with a narrow impressed line through its middle, a mark which serves to distinguish this from some of the other species which are closely related to it. The thorax is much more broad than long, and is widest forward of the middle. Its surface is covered with dense, coarsish punctures, which run into each other in a somewhat transverse direction. It is also somewhat uneven, with slight elevations and hollows, but has not two smooth raised lines on its middle and anterior part, which are met with in another species very similar to this, the Tooth-legged Snapping-beetle, (*Chrysobothris dentipes*, Germar.) The elytra or wing-covers present a much more rough and unequal surface than any other part of the insect. Three smooth and polished raised lines extend lengthwise of each wing-cover, and the intervals between them are in places occupied by smaller raised lines, which form a kind of net-work; and two impressed transverse spots may also be discerned more or less distinctly, dividing each wing-cover into three nearly equal portions. These spots reach from the inner one of the three raised lines nearly to the outer margin, crossing the two other raised lines, and interrupting them more or less. They are commonly of a cupreous tinge, and densely punctured, but are more smooth than the other portions of the surface. A smaller and more deeply impressed spot may commonly be found in the space next to the suture, and forward of the anterior spot, of which it is, as it were, a continuation. The wing covers are rounded at their tips, so as to present a slight notch at the suture when they are closed; and the outer margin, towards the tip, has several very minute, projecting teeth. When the wing-covers are parted the back is discovered to be of a brilliant bluish-green color, and thickly punctured, with a row of large impressed spots along the middle, one on each segment, and half way between these and the outer margin is another row of smaller impressed dots, having their centres black. The under side of the body and the legs are brilliant coppery, the feet being deep shining green, their last joint and the hooks at its end black. Here also the surface is everywhere

thickly punctured, the punctures on the venter or hind part of the body opening backwards. The last segment has an elevated line in the middle at its base, and its apex is cut off by a straight line, in the middle of which is commonly a small projecting tooth. The anterior thighs are remarkably large, from which circumstance this species has received its name, and they have an angular projection on their inner sides, beyond the middle. The tibiæ or shanks of these legs are slightly curved.

The remedies for destroying this borer must necessarily be much the same with those already stated for the common borer or Striped Saperda. They consist essentially of three measures: 1st, coating or impregnating the bark with some substance repulsive to the insect; 2d, destroying the beetle by hand picking; and 3d, destroying the larva by cutting into and extracting it from its burrow.

As it is during the month of June and fore part of July that the beetle frequents the trees for the purpose of depositing its eggs in the bark, it is probable that whitewashing the trunk and large limbs, or rubbing them over with soft soap, early in June, will secure them from molestation from this enemy. And in districts where this borer is known to infest the Apple trees, the trees should be repeatedly inspected during this part of the year, and any of these beetles that are found upon them should be captured and destroyed. It is at midday of warm sunshiny days that the search for them will be most successful, as they are then most active, and show themselves abroad. The larvæ, when young, appear to have the same habit with most other borers, of keeping their burrow clean by throwing their castings out of it through a small orifice in the bark. They can therefore be discovered, probably, by the new sawdust-like powder which will be found adhering to the outer surface of the bark. In August or September, whilst the worms are yet young, and before they have penetrated the heart-wood, the trees should be carefully examined for these worms. Wherever from any particles of the sawdust-like powder appearing externally upon the bark, one of these worms is suspected, it will be easy, at least in young trees, where the bark is thin and smooth, to ascertain by puncturing it with a stiff pin, whether there is any hollow cavity beneath, and if one is discovered, the bark should be cut away with a knife, until the worm is found and destroyed. After it has penetrated the solid

wood, it ceases to eject its castings, and consequently we are then left without any clue by which to discover it. Hence the importance of searching for it seasonably.

A small, oblong, flattish, brown scale, shaped like an oyster shell, fixed to the smooth bark; often in prodigious numbers; in winter and spring covering a number of minute, round, whitish eggs.

THE APPLE BARK-LOUSE, *Aspidiotus conchiformis*, GMELIN; *Coccus arborum linearis*, MODEER, and others; *Diaspis linearis*, COSTA.

The Bark-louse is, on the whole, the most pernicious and destructive to the apple tree, at the present time, of any insect in our country. Every where through the northern States it is infesting the orchards to a grievous extent, causing the death of many trees, and impairing the health and vigor of many more.



It appears in the form of minute scales, resembling the shell of a muscle or an oyster in their shape, adhering to the surface of the bark, as shown in the annexed cut. It is no rare occurrence to meet with young trees, the bark of which is literally covered and crowded with these scales from the root to the end of the twigs, and some individuals finding no vacant spot upon the bark where they can fix themselves, are driven to the leaves and the fruit, for upon these one or more of these scales may sometimes be found. And where a tree continues to be thus infested, year after year, it dwindles away and finally dies. I have observed this to be the case especially with young trees standing alone in fields, where, when the vigor of the tree becomes impaired, the insect has no other tree to which it can migrate, better adapted for its sustenance. Other trees have been noticed as overrun by this insect for a year or two, when, probably from the tree becoming so exhausted as no longer to be capable of suitably sustaining the insects, they cease to affect it, and it, after a few years, recovers. Whether in such instances the insects perish for want of due nourishment, or whether they migrate to other trees, I am unable to say, though I incline to the opinion that the former is the case with the chief part of them.

Badly as this insect is infesting our orchards in the State of New-York, it is scourging our western neighbors far more severely. In those districts bordering upon Lake Michigan, in particular, it is at the present time making the most appalling havoc, surpassing anything which has hitherto been recorded of this species. Scarcely a tree is free from them, and unless measures for destroying the insect are resorted to, the tree is sure to perish within a few years after it is invaded.

George Kimball, Esq., of Kenosha, Wisconsin, gave me the following interesting account of the introduction and spreading of this insect among his trees: "The bark-louse appears to have been introduced here in the year 1840 by four young sweet apple trees which my son brought from Cleveland, Ohio. These trees dwindled, their limbs had a black appearance, and the bark was everywhere covered with these lice, crowded upon and overlapping each other, so that they would peel off in large scales, and be washed off by rains, clusters of them adhering together in sheets, till finally, in the year 1848, these trees died, having grown not more than an inch annually for the three last years. And the same lice had now spread upon and were covering my other trees more or less. All my trees became badly infested, the sweet ones being overrun more than the others. Some of them took up their abode upon my pear trees also, particularly upon a small tree which I happened to have, bearing hard worthless fruit; this was covered with them as badly as some of my apple trees. We could find nothing in books, or in agricultural or horticultural papers which seemed to apply to this louse, and hence were thrown upon our own ingenuity to combat it. Efforts were made in this village to organize a society, with an admission fee of ten dollars, to raise a fund with which to encourage experiments, and handsomely reward the person who discovered the best remedy. A secret remedy, which proved to be worthless, was extensively sold all over this section of country for one dollar to each person. Hoping that my younger and more vigorous trees would outlive the pest, I dug up and threw away all my old trees, upwards of thirty in number. I have now about one hundred and fifty trees, none of them over twelve years old, and

have strong confidence that the remedy to which I now resort will keep them freed from the bark-louse. But through all this district of country the trees are overrun and dying from these insects, a tree not living but about three years after it becomes badly infested, and on almost every farm several dead trees may be seen, and many more which are so far gone that they can never recover."

This insect does not appear to have penetrated west, as yet, beyond the districts bordering upon Lake Michigan. I found the orchards upon the Mississippi river free from it, and on a most particular inspection of the trees of Esquire Baldwin, of Farm Ridge, less than a hundred miles west of Chicago, they were found to be wholly uninfested. But that it will gradually extend itself onwards over the entire west, there can be no doubt. And it is to be feared that for some years after its first arrival in each place, it will run much the same career it is now doing on the borders of Lake Michigan, it being common for a noxious insect when newly introduced, to multiply and thrive to a much greater extent than it does subsequently, after it has become fully naturalized.

At the west it is generally supposed that this insect is a new species, peculiar to that section of country, as no distinct description and account of it is given in works accessible to the mass of readers. And, entertaining this view, my friend Robert W. Kennicott, of West Northfield, Illinois, in a communication read in June last, before the Cleveland Academy of Natural Sciences, and published, with a figure of the young larva, in the newspaper report of their proceedings, names it the *Coccus Pyrus Malus*, under which name I observe it is since spoken of in some of the western agricultural periodicals. But this insect is certainly identical with the one which we have here at the east, which has all along been regarded as the same which has long been known upon the apple and some other trees and shrubs in Europe. It was first described by Reaumur, in 1738, who found it upon an elm in France; and it appears to have been named *Coccus arborum linearis*, (which literally means the Linear Bark-louse of

trees,) first by Modeer, (Act. Gothenb. i. 22,) by which name it has been noticed by Geoffroy, and authors generally since. Gmelin refers to the same insect, at least as it has been generally supposed, under the name *Coccus conchiformis*, or the Shell-form or Oyster-shaped Bark-louse. The specific name, *arborum linearis*, if really designed for the Bark-louse upon the Apple-tree, is a very unfortunate one, as this species is not linear in its form, but tapering, and nearly all the other species of Bark-lice infest trees as well as this. Costa has recently reformed this name, by omitting from it the redundant word *arborum*. But if the original name is to be rejected, in consequence of its non-conformity to the present rules of scientific nomenclature, Gmelin's name *conchiformis* must assuredly take its place, in consequence both of its priority and its appropriateness. Some of the latest authorities, however, regard the *conchiformis* and *linearis* as being two distinct species. This threw such doubts upon the question which of these names should be adopted for our Apple Bark-louse, provided it was identical with the European insect, as I felt myself scarcely competent to resolve, with the few authorities upon these insects which I have at hand. As Mr. Curtis, the distinguished British entomologist, now president of the Entomological Society of London, had communicated a series of articles upon several of the species of this genus, to the third volume of the Gardener's Chronicle—a volume to which I have not access—and as I had heretofore had some correspondence with him, I recently enclosed to him for his opinion, specimens of our Apple Bark-louse, and also a seemingly identical species found upon our Red osier, (*Cornus sericea*.) The following is an extract from his reply: "I have carefully examined your specimens. They are identical, and are the *Coccus arborum linearis*, Geoff., and I believe the *C. conchiformis* of Gmelin, which is in that case a synonym. You are right in placing them in the genus *Aspidiotus*." I trust this information will satisfy some of my western friends who have been reluctant to credit my statement that their insect is not new, but is common here at the east, and also in Europe.

Mr. Rennie speaks of having found this species in great plenty upon currant bushes. I have never met with it upon the culti-

vated currant, but have found it upon our wild currant (*Ribes floridum*,) pretty numerous. Scales very similar to those of the Apple bark-louse, but of a smaller size, of a pale brownish color, and not curved, may be met with also upon the twigs of the butternut. Some of these are so small as to be imperceptible to the naked eye. As they are evidently a distinct species, I propose to name them the Butternut Bark-louse, *Aspidiotus Juglandis*. My friend Dr. A. S. Todd, of Wheeling, Virginia, has sent me specimens of another species of this same genus, occurring upon Rose bushes. He says: "My finest roses are cursed with these vermin. They kill 'for certain' every Rose bush they get upon. It dies to the ground." This is a round, flattish, white scale, about five hundredths of an inch in diameter, often with a light yellow spot or cloud in its center. This is probably the *Aspidiotus Rosæ* of Bouché, (Schadl. Gart. Ins , p. 53,) which is briefly noticed in Kollar's Treatise, English edition, page 179.

The Apple Bark-louse is about one-eighth of an inch long, of an irregular ovoid form, often bent in its middle, and more or less curved at its smaller end, which is pointed, the opposite end being rounded. It is of a brown color, of much the same tint



with the bark, its smaller end being paler and yellow. It closely resembles an exceedingly minute oyster-shell pressed against the bark—a similitude so striking as to be readily perceived by every one, and is frequently designated in common conversation, under the name of the Oyster-shaped Bark-louse. These shells or scales are situated irregularly, though the most of them are placed lengthwise of the limb or twig, with the smaller end upwards. These scales are the relics of the bodies of the gravid females, covering and protecting their eggs. During the winter and spring, these eggs may be found, on elevating the scales. The number of eggs under each scale is very variable. Several which I have counted, have shown the following numbers—13, 22, 36, 54, 58, 71, 86, 102. I have uniformly found a greater number of eggs where the scales were upon a thrifty tree. When a tree becomes overrun, so as to dwindle and not afford a copious supply of nourishment, the number of eggs is reduced.

Under these scales I have also repeatedly met with a small maggot, three hundredths of an inch long, or frequently much smaller, of a broad oval form, rounded at one end and tapering to an acute point at the other, soft, of a honey-yellow color, slightly translucent and shining; with an opaque brownish cloud in the middle, produced by alimentary matter in the viscera, and divided into segments by faintly impressed transverse lines. This is probably the larva of some minute Hymenopterous insect, specially designed by Providence for destroying the eggs of the bark louse. That these eggs are its food is shown by the fact that when the maggot is small a number of eggs are found under the scale with it, when it is larger the eggs are fewer. The individual from which the above measurement and description was drawn had but two eggs remaining for it to consume. Whether the maggot be larger or smaller it, with the eggs, appears to completely fill the cavity beneath the scale, and I have only met with this parasite upon thrifty trees, where each scale had a large number of eggs beneath it. It doubtless remains beneath the scale during its pupa state, and then makes its exit by perforating a small round hole through the scale. Scales which are thus perforated may frequently be met with. Our cut represents a scale magnified and perforated for the escape of a parasite, the short line on the right hand side of the figure indicating the natural length of the scale.

The eggs are somewhat less than the hundredth part of an inch in length; they are of a regular oval shape, about twice as long as broad, smooth but not shining, opaque, most of them of a white color, others dull pale yellow.

As early as the 12th of May I have found individual larvæ hatched, and running about with much activity among the eggs, but remaining under the scale for protection. It is not till about a fortnight later that the eggs mostly become hatched, and the young crawl out from under the scale and scatter themselves over the bark. To the naked eye they appear like minute white dots, uniformly diffused over the smooth bark of the twigs, and appearing like natural white points or glands of the bark. A person to whom I once pointed out these white specks was reluctant

to believe they were anything else than white dots natural to the smooth young bark, until by careful watching some of them could be perceived to be moving about upon the bark.

When first hatched from the egg the larva is but about half the size of the egg, of an oval form and a pale dull yellow color. Three pairs of legs are perceptible, two placed anteriorly, the other posteriorly and distant. It walks about with much life and agility. I have not traced this insect through the subsequent stages of its life with sufficient accuracy of observation to give its history.

A number of remedies for the bark-louse will be found reported in late volumes of the *Prairie Farmer* and other western agricultural papers. The secret remedy which was hawked through that section, as perfectly sure of destroying these lice, was simply an infusion of quassia, with which the trees were to be wet from a syringe or watering pot. This of course was soon discovered to be worthless, or effectual only when applied to the young newly hatched lice, at which time infusion of tobacco or soap suds would be a more economical and still more effectual remedy. These, and also strong lye, potash water, whitewash, dry ashes, sulphur, and I know not how many more articles have been recommended by different writers. In a late number of the *Michigan Farmer* (vol. 13. p. 82,) A. G. Hanford gives a very favorable account of the effects of tar and linseed oil, beat together and applied warm with a paint brush thoroughly, before the buds begin to expand in the spring. This, when dry, cracks and peels off, bringing off the dead scales with it. Trees which were thus treated grew from two to two and a half feet last summer, which had advanced only a few inches in previous years. The remedy to which Esq. Kimball, of Kenosha, resorts is probably one of the most efficacious, and as convenient as any; he boils leaf tobacco in strong lye till it is reduced to an impalpable pulp, which it will be in a short time, and mixes with it soft soap, (which has been made cold; not the jelly-like boiled soap,) to make the mass about the consistence of thin paint, the object being to obtain a preparation that will not be entirely washed from the tree by the first rains which occur, as lye, tobacco water, and most other

washes are sure to be. The fibres of the tobacco, diffused through this preparation, cause a portion of its strength to remain wherever it is applied, longer than any application which is wholly soluble in rain water can do. He first trims the trees well, so that every twig can be reached with the paint brush, and applies this preparation before the buds have much swelled in the spring. Two men, strictly charged to take their time, and be sure that they painted the whole of the bark to the end of every twig, were occupied a fortnight last spring in going over his hundred and fifty young trees. When I saw his trees, the latter part of September, this composition was still plainly to be seen upon the rough bark of their trunks and upon the under sides of their limbs, resembling a whitish mouldiness of the bark. The trees had grown very thriftily, and yielded well, whilst only a single scale could here and there be found upon the twigs of the present year's growth, all the older parts being entirely free from them. Although trees perishing with lice were standing in the adjacent yards and gardens, it seemed these insects preferred starvation at home rather than being poisoned by invading these trees, hence it appears that one thorough application of this preparation is sufficient to destroy all the insects upon the trees, and to protect them from invasion from neighboring trees for a period of two years; for free as the trees were from these insects in September, there can be no call for a renewal of this composition upon them the coming spring.

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Wounding the twigs and causing them to wither and fall; a very large black fly with four glassy wings, with orange-colored ribs and red eyes.

THE SEVENTEEN-YEAR LOCUST, *Cicada septendecim*, LINNÆUS.

On some accounts the Seventeen-year Locust is the most remarkable insect of which we have any knowledge. The unusual length of time which it requires for completing its growth, and the perfect regularity with which every generation, numbering many millions of individuals, attains maturity, so as to come forth at the end of seventeen years, the entire brood hatching within a few days' time, has caused this more than any other American

insect to be noted throughout the world. And it was, doubtless, from its suddenly appearing in such vast numbers, at long intervals of time, like the Migratory Locust of the East, that the early settlers of this continent gave it the name of "Locust," by which it is now universally designated; although it is wholly unlike those insects which are properly termed locusts, both in its form and habits.

Another remarkable fact with respect to this species is, that in different districts of our country broods appear in different years; yet the brood of each district invariably preserves the interval of seventeen years for coming out in its winged state. We have three of these broods partly within the bounds of the State of New-York, and there appear to be at least six others in other parts of the United States.

One of these inhabits the valley of the Hudson River. Its northern limit is the vicinity of Schuylerville and Fort Miller, and this appears to be the most northern point to which this species anywhere extends. From thence it reaches south along both sides of the Hudson to its mouth, where it extends east, at least to New-Haven in Connecticut, and west across the north part of New-Jersey and into Pennsylvania. Its last appearance was in the year 1843, and it will consequently make its next appearance in 1860.

The second brood occurs in Western New-York, Western Pennsylvania, and Eastern Ohio. The last year of its appearance was 1849; it will consequently reappear in 1866.

The third brood appears to have the most extensive geographical range. From the southeastern part of Massachusetts it extends across Long Island and along the Atlantic coast to Chesapeake Bay, and up the Susquehanna at least as far as to Carlisle in Pennsylvania. And it probably reaches continuously west to the Ohio, for it occupies the valley of that river at Kanhawa in Virginia, and onwards to its mouth, and down the valley of the Mississippi probably to its mouth, and up its tributaries, west, into the Indian territory. This brood has appeared the present year, 1855, and I have received specimens from Long Island, from

Southern Illinois, and the Creek Indian country west of Arkansas, these last having been gathered by my friends, Robert W. Kennicott and William S. Robertson. They show that from one end of this vast stretch of territory to the other, the species is quite uniform in its size and marks. Mr. Robertson, writing from Tullehassie, under date of May 24th, says: "I have heard the Seventeen-year Locusts for ten days past, but they are not plenty here. At Park Hill, however, twenty-five miles south of this, in the Cherokee country, they are very numerous, and in these hungry times, occasioned by the severe drouth of last year and this spring, the people are glad to gather and eat them."

A fourth brood, and which has been the oftenest and most fully noticed of any, reaches from Pennsylvania and Maryland to South Carolina and Georgia, and, what appears to be a detached branch of it, occurs also in the southeastern part of Massachusetts. It was observed as long ago as 1715, and its reappearance has been recorded seven times since, the last one of which was in the year 1851. It will consequently reappear in 1868.

A fifth brood extends from Western Pennsylvania, through the valley of the Ohio river, and down that of the Mississippi to Louisiana. This appeared last in 1846, and will therefore reappear in 1863.

A sixth appeared the past year around the head of Lake Michigan, and as far east as to the middle of the State of Michigan, and extended west across Northern Illinois and onwards, an unknown distance, into Iowa. It reached south at least as far as Peoria, and north to the line of Wisconsin. Mr. M. P. Weter, of Tirade, Walworth county, Wisconsin, informed me that a narrow strip, but about a mile in width, extended through his neighborhood, and onwards, north, for a distance of at least twenty miles.

A seventh is recorded as having appeared in the western part of North Carolina in the year 1847.

An eighth was noticed at Martha's Vineyard, Mass., in 1833.

A ninth was noticed in the valley of the Connecticut river, in Massachusetts, in the years 1818 and 1835.

• It is possible that in some of these last cases other species may have been mistaken for the seventeen-year locust, and that in those instances where straggling individuals of this locust are reported to have occurred during the intervals between the appearance of the main swarm, other species have been confounded with this, particularly the Creviced cicada, (*C. rimosa*, Say,) which comes out in the same month, and in its colors, &c., closely resembles the *C. septemdecim*.\*

I have personally met with this species in two instances; the first was upon the forenoon of the tenth of June, 1826, upon the oaks and other trees and shrubs between West Troy and Cohoes, which were covered with these insects at that date, making the neighborhood ring with the discordant din of their shrill song. After the long interval of seventeen years, in a grove in the town of Stillwater, the same note was heard again, and was instantly

\* We have in our country several species of the large interesting insects which pertain to this family. The most common one in our State is the Dog-day cicada, (*C. canicularis*—Harris,) which probably is not distinct from the Frosted cicada (*C. pruinosa*) of Say. It appears annually in most parts of the State in autumn. The Creviced cicada, (*C. rimosa*—Say,) and also the Bordered cicada, (*C. marginata*—Say,) occur also within our bounds. Farther south the species become more numerous. Among a number of those sent me by Mr. Robertson from the Creek Indian territory, the following do not appear to have been hitherto described.

The SUPERB CICADA (*C. superba*) is of a rich olive green color, having a black band between the eyes, and six black spots upon the anterior margin of the middle segment of the thorax. The abdomen above is olive-yellow, with two mealy-white spots at the base. The under side is whitish-yellow, coated over with a mealy-white powder. The wings are clear and glassy, the apical row of cells of the fore wings and the hind margin slightly smoky; the veins are bright green, except those surrounding the apical row of cells, which are dark brown, and the two short anastomosing outer veinlets are margined with smoky-brown, forming the usual dusky W-shaped mark. This species measures an inch and three-fourths to the tips of the closed wings. It occurred in August upon two small elm trees growing two rods apart, beside a brook in the middle of a prairie, with no other trees near, and no elms within some miles of these. On climbing one of these trees the cicadas, of which there were a number of individuals, all flew to the other tree; on climbing this last they all flew back; so that on climbing one tree three times and the other twice, but a single specimen could be captured, so shy were they.

ROBERTSON'S CICADA, (*C. Robertsonii*.)—Green, variegated with brown and black; upper side of the abdomen black and shining, with two yellowish spots near the base; middle segment of the thorax yellowish brown, the elevated  $x$  green, and a large green spot at the end of each of its anterior horns; wings glassy-hyaline, their veins slender, green, becoming light yellow at their apices; rib of the anterior wings edged with black on its inner side; length to the tip of the closed wings, in the female, two inches and fifteen hundredths.

recognized, though at a distance of some twenty rods. As it was repeated at short intervals, I was able to draw near and capture the songster, who had come out some days in advance of the main swarm. The note, which is uttered only by the males, is peculiar, and may be represented by the letters *tsh-e-e-E E-E-e-ou*, uttered continuously, and prolonged to a quarter or a half minute in length, the middle of the note being deafeningly shrill, loud and piercing to the ear, and its termination gradually lowered till the sound expires. In a wood in the vicinity of Ottawa, Illinois, on the 22d of September last, I heard the note of a cicada identical with the above, except that the syllables were short, and uttered at regular brief intervals, thus, *tsheeu, tsheeu, tsheeu*, much resembling the creaking of a grindstone when in want of grease. This was probably some autumnal species, a native of that vicinity; but it might possibly have been a straggling individual of the seventeen-year locust, which had not completed his transformation until three months after his due time, and which uttered his notes in this hurried, impatient manner, upon finding himself "solitary and alone."

Circumstances may cause this insect to appear and disappear somewhat earlier at some of its visits than at others. Mr. Wight, editor of the *Prairie Farmer*, informs me that the Illinois brood last year had mostly disappeared upon the fourth of July, whilst the preceding visit of this same brood was in vigorous life and activity at that date, as was recollected from the fact that a particular neighborhood had met together to commemorate the day, in a barn, which was the most spacious edifice in the vicinity, and the company were much annoyed in their festivities by the incessant din which these locusts kept up in and around the building.

This insect dwells entirely in timber land, never inhabiting fields which have been cleared seventeen years, or the prairie lands of the west. It was noticed the past year as being more wide-spread in many places in Illinois than it was on its previous visit. Fruit or forest trees, wherever they had been planted upon the prairies, were seventeen years ago destitute of these in-

sects, but the past year they came from the ground among such trees as abundantly as in the original timber lands. It has been commonly supposed heretofore that the larvæ derive their nourishment from the roots of the trees upon which the eggs were deposited, puncturing the bark with their beaks and extracting the juices, and in this way it has been supposed that much greater injury was done to the trees than by the wounds made upon the twigs by the perfect insects. This view has been sustained by Miss Margaretta H. Morris, in an interesting communication to the Philadelphia Academy of Natural Sciences, and published also in Downing's *Horticulturist* (vol. ii. p. 16), in which she attributes the failure of pear and other fruit trees, in many cases, to the exhaustion of the sap, produced by these larvæ fixing themselves upon the roots. On examining a pear tree which had ceased to thrive, she found that all those roots which were six inches or more beneath the surface were thronged with countless numbers of the larvæ, clinging to them by means of their beaks inserted in the bark. From one root, a yard in length and about an inch in diameter, she gathered twenty-three larvæ, varying in length from a quarter of an inch to an inch—a much greater disparity in size than could have been anticipated in larvæ which were all of the same age.

The habits and nourishment of these larvæ is a topic which needs further investigation. Mr. R. W. Kennicott, of West Northfield, Illinois, writes me that in the month of November in following down the roots of several trees and shrubs, the twigs of which were badly cut to pieces by the locusts last year, to the distance of a foot or more, he was unable to find a single one of these grubs, a strong indication that when young they descend deeper than Miss Morris supposes. And a more important fact is, that they subsist upon the roots of grass and herbs as well as those of trees. I learn from Dr. J. W. Moody that at Spring Arbor, Jackson county, Michigan, in fields which had been cleared of their timber some sixteen years, and which have been under cultivation most of the time since, the locusts came forth last June as plentifully as in the timber land; and these seemed to have been equally as well nourished, for they were of the same

size, and came out of the ground upon the same day, with those which appeared in the timber lands; nor were they any more plenty beneath two or three shade trees standing in the cleared grounds than in other parts of the fields. In other places I was also informed of their coming from the earth plentifully in fields which had been cleared several years. Indeed, the pupæ emerge in all situations, except where the ground has been wholly destitute of trees and shrubs for seventeen years or more. They even work their way out in the middle of the most solid and hard-trodden roads. This fact is noticed by Rev. Andrew Sandel in the first recorded notice which we possess of this insect, in 1715, (*Medical Repository*, vol. iv., p. 71,) and was also stated to me by different persons in Illinois. It serves to show the remarkable strength which the anterior legs of the pupa must possess to enable it to dig through ground so compacted.

It is in the night time that the pupa (of which the accompanying figures, taken from specimens of *C. rimosa*, give a view,) emerges from the ground. The warmth and dryness of the air by day would doubtless cause its exterior shell-like case to become stiff and crack open prematurely.



Some of the pupa hatch upon the ground, near the holes from which they have emerged; others crawl up the sides of fences and upon bushes and trees, sometimes to a height of twenty feet. The pupa fixes itself securely by its feet, its thin shell-like covering cracks open anteriorly upon the back, and the inclosed insect withdraws itself therefrom, leaving the empty case adhering to the place where it was fixed.

The oak is the tree which the seventeen-year locust appears most to infest, for the purpose of depositing its eggs, and next to this is probably the apple tree. So numerous were these insects in several orchards in Illinois last June, and such injury did they threaten the trees by their wounds, that the proprietors were induced with poles and goads to whip and drive them from the trees. And B. S. Rollin, of Wyoming, Wisconsin, in the Wisconsin and Iowa Farmer of November last, (vol. vi. p. 254,) reports that in

his vicinity the oak and apple tree limbs were breaking off with every wind, at the point where they had been operated upon by the locusts, and that some of the trees were badly injured hereby. The editor of the *Farmer*, in commenting upon this communication, thinks that the damage will prove to be but slight, and will in reality be that "heading in" which is often serviceable to fruit trees. But it must be rare that our apple trees can be benefited by any heading in, all experience showing that the perfection of the fruit requires that this tree should be kept well trimmed, so as to permit a free circulation of air and light among its branches; and the same condition of the tree is one of its best safeguards against tree-hoppers, plant-lice, and many other insect enemies which particularly prefer situations where the foliage is dense.

In addition to the trees already mentioned, this insect deposits its eggs in the poplar, the locust, the hazlenut, and probably in all our deciduous trees and shrubs. The different species of walnut and hickory, however, are said to be exempt from its attack. It will probably prefer those trees having the twigs thick and robust, to those in which they are slender and flexible; it has even been known, according to Dr. Harris, to commit its eggs to the white cedar, but it is probable that pines and the evergreens generally will be avoided by it.

Dr. Harris, (*New England Insects*, p. 184,) gives the following description of the manner in which the female locust wounds the twigs and deposits her eggs. They select those branches and twigs which are of a moderate size. These they clasp on both sides with their legs, and bending their ovipositor downwards at an angle of about forty-five degrees, they repeatedly thrust it obliquely into the bark and wood in a longitudinal direction, at the same time putting in motion the lateral saws of the ovipositor, and in this way detach small splinters of the wood at one end, and turn them upwards, so as to form a kind of lid or cover to the perforation. The hole is bored in a slanting direction, to the pith, and by a repetition of the same operation, is gradually enlarged, forming a longitudinal fissure of sufficient extent to receive from ten to twenty eggs. The lateral pieces of the ovi-

positor serve as a groove to convey the eggs into this nest. They are placed in pairs side by side, but separated from each other by a portion of woody fibre, and they are fixed into the limb somewhat obliquely, so that one end points upwards. When two eggs have been thus placed, the ovipositor is withdrawn for a moment, and is then inserted again, dropping two more eggs in a line with the first; and this operation is repeated until the fissure is filled from one end to the other. The insect then removes a short distance, and commences making another nest, to contain two more rows of eggs. She is occupied about fifteen minutes in making one of these slits and filling it with eggs; and frequently fifteen or twenty of these nests are formed upon one limb. Fifty nests have been counted in one instance, upon a single limb, extending along in a line, each containing from fifteen to twenty eggs in two rows—the whole appearing to be the work of one insect. After one limb is sufficiently stocked, the insect passes to another. She thus goes from limb to limb and from tree to tree, until her supply of eggs, consisting of four or five hundred, is exhausted. And by her assiduous labors in thus providing for a succession of her kind, she becomes so wearied and weak as to fall to the ground, in attempting to fly, and soon dies.

From the wounds which are thus made in the limbs, the sap exudes, often profusely. This attracts numerous ants to the spot, to regale themselves upon this sweet fluid. The naturalist, Pontedera, who gave some attention to the operations of the insects of this family, says that when the eggs have been deposited, the insect closes the mouth of the hole with a gum, capable of protecting them from the weather. M. Reaumur thinks this is only a fancy, as he could discover nothing of the kind. But to us it appears quite probable that what Pontedera supposed was a gum which had been deposited by the parent insect, was the dried juice of the twig.

The fissures which the female makes, in which to deposit her eggs, are not the only wounds which this insect occasions upon the trees. It inserts its sharp beak into the bark for the purpose of sucking the sap, this being the nourishment on which the locust subsists. Although some of my correspondents express doubts

whether this insect takes any nourishment after it arrives at its perfect state, Mr. Weter informs me that an orchard of young trees upon his farm had the smooth bark of the trunk and limbs punctured profusely, and that the sap exuded copiously from these punctures; and Mr. Robertson makes the same observation.

It however is only those twigs and limbs which are badly wounded by the female in depositing her eggs, which perish and fall to the ground. But in this way extensive injury is often done. Mr. Thomas W. Morris speaks of having seen the tops of the forest trees in Pennsylvania and Ohio, for upwards of a hundred miles, appearing as if scorched by fire, a month after this locust had left them. (*Horticulturist*, vol. ii, p. 17.) Many of the wounded limbs, however, survive the injury which they receive.

The EGGS of the locust are 0.08 long and 0.06 in diameter. They are of an oval form, rounded at each end, and of a white color. Statements are very conflicting as to the length of time that elapses after the eggs are deposited before they hatch, some saying it is but a fortnight, others that it is six or seven weeks.

The young LARVA, when it hatches from the egg is but 0.06 in length, and of a yellowish-white color, clothed with fine hairs, its eyes and the claws of its fore legs being tinged with red. It has six legs, of which the anterior pair is much the largest, resembling the claws of the lobster, and armed on the under side with strong spines. It is quite active and lively in its motions, and drops itself from the limb to the ground, in which it immediately buries itself by means of its fore legs, which are admirably adapted for digging.

The PERFECT INSECT varies from an inch and a half to nearly an inch and three-quarters in length, to the tips of its closed wings, and when these are spread, they measure from two inches and a half to three and a quarter across. It is of a coal black color, marked with bright orange yellow as follows—upon the transverse and oblique raised lines at the base of the thorax, a large spot on each side of the thorax forward of the wings, the whole under side of the abdomen in the males, but only the posterior margins of the segments in the females, the veins of the wings, the beak and the legs. Varieties occur having the feet black, the shanks marked with black towards their bases, this color either occupying the whole outer side, or merely forming a stripe on their anterior side. The anterior thighs are also black along their inner edge, including the spines which arise from this edge. The four hind thighs often have a black stripe along their posterior sides. The angular edges of the anterior hips are also black. There is commonly a small dull white spot in the groove on the middle of the head, behind the small simple eyes. The veins of the wings are margined each side by a slender black line; they become dusky at their tips, and the oblique vein, parallel with the apical margin, is black, and is margined with smoky.

The two outer anastomosing veinlets of the fore wings are black, with only a slender orange line along their middle, and are margined with smoky, forming a W-shaped mark, which superstition to this day, continues to a slight extent, to regard as portending "war." The small opaque orange basal cell is black on its inner side, and the elevated vein running from the outer side of this cell to the base of the wing is also deep black, with a large black spot behind and a small one before its basal extremity, as seen when the wings are spread. The folded inner part of the hind wings is margined with smoky, and on its apical side with black.

Characters drawn from the veins of the wings, by which to discriminate the species, would appear from this insect to be of little value. Thus, the first or outermost veinlet, or cross-vein as it is termed by Mr. Walker, is separated from the second veinlet about the distance of its length in the male, but often by double this distance in the female. The second veinlet is slightly curved in the male, whilst in the female it is straight, with a slight curve towards its inner end, and in one specimen before me it is abruptly bent, forming an angle of less than 135 degrees. It is of the same length with the first veinlet commonly, but is sometimes much longer.

It would be interesting to carefully study over a large collection of specimens of the seventeen-year locust, belonging to separate broods of this insect, and gathered from different localities, to ascertain if some marks cannot be detected by which the individuals belonging to each brood can be discriminated from the others.

When newly hatched from the pupa, the locust is soft, heavy, and sluggish in its motions. At this time, as I am informed by Mr. Kennicott, it is preyed upon by our large species of dragonflies or darning-needles (*Libellulidae*), which seize and devour numbers of them.

Mr. W. S. Robertson informs me, that the Indians make the different species of Cicada an article of diet, every year gathering quantities of them, and preparing them for the table by roasting them in a hot oven, stirring them until they are well browned.

Accounts of persons having been stung by the seventeen-year locust, and dying in consequence of the wound, are current in different sections of our country, every time this insect makes its appearance. The past summer, a newspaper article gave the name, residence, and particulars of the death of a young lady in Illinois, who was thus stung, stating the attending circumstances so definitely as to leave no doubt that the story was authentic. And it is possible that the sharp beak of this insect, or the ovipositor of the female, may inflict a puncture so extremely painful

as to cause death in a delicate person of irritable habits. But such instances must be extremely rare. The insect has been freely handled, times without number, by different persons, without its manifesting any malevolence or disposition to injure, and to secure a concert of their shrill notes, boys have been known sportively to imprison numbers of them in the crowns of their hats, without harm. Upon this subject, R. W. Kennicott writes me as follows: "I consider the common idea that Cicadas can produce death by stinging, to be highly preposterous. If it were so, I fancy I ought myself to be about a dozen corpses at this time, for I have handled hundreds of them in such a manner as gave them a fair chance to try their stinging powers on me, had they been possessed of such. I observed that when I pulled them off from a branch, while in the act of depositing eggs therein, they would often continue instinctively to work the ovipositing apparatus for some time; and should any one's hand or finger happen to be in the way at this time, it would be very apt to get severely pricked, such is the sharpness of the instrument."

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#### AFFECTING THE LEAVES.

Small green lice without wings, accompanied by a few black and green ones having wings, all crowded together in vast numbers upon the green tips of the twigs and under sides of the leaves, sucking their juices.

THE APPLE PLANT-LOUSE. *Aphis Mali*, FABRICIUS.

THE APPLE LEAF-LOUSE. *Aphis Malifoliae*.

These insects pertain to the Order HOMOPTERA and the Family APHIDÆ. The Genus *Aphis* is at once distinguished from all other insects by having its fore wings with one longitudinal vein, the rib-vein, from which branches three oblique veins, the last or outermost one of which is twice forked. The insects of this family, and of the closely allied family COCCIDÆ or Bark-lice are among the greatest pests which the fruit grower and the gardener have to encounter. They are astonishingly prolific; and every kind of tree, shrub and herb, it is probable, has a species of louse infesting it, whilst many have two, three or more, each part of

the tree having its peculiar species. Thus upon the apple tree, we have already noticed the Apple root blight, a species of woolly louse producing excrescences upon the roots, and the Apple Bark louse. There is also the tree blight, (*Eriosoma lanigera*), which infests the trunk and limbs. We come now to consider this species, which affects the young succulent ends of the twigs and the leaves, and another species which we have observed upon the leaves, which appears to be distinct from the *Mali*, though probably possessing the same habits. We thus have five kinds of these vermin infesting our apple trees.

In many instances it is extremely difficult to determine whether the lice upon our American trees and plants are identical with those which occur upon the same or similar vegetation in Europe, the descriptions given of them by the old authors being so very brief, and often drawn up from a superficial examination of the species. And I have heretofore been in much doubt whether this common *Aphis* of our apple trees was the same insect which similarly infests the orchards of Europe, named *Aphis Mali* by Fabricius; that species being described by him, by Kollar and others, as being of a green color, whereas, our insect in its winged state is almost invariably black, its abdomen only being green. But having recently been favored with specimens of the European insect, from my esteemed friend Dr. Signoret, of Paris, and also on comparing our *Aphis* with the description given of the European by M. Amyot, (*Annals Entom. Soc. France*, 2d series, vol. v. page 478,) and the detailed account of the veins of its wings, furnished by Mr. Walker, (*List of British Museum*, page 985,) not the slightest doubt remains in my mind, but that the insects of the two continents are identical, and that upon this side of the Atlantic it has been introduced by the trees brought hither from Europe.

The history of this species and its annual career is as follows: Early in the spring, sunk deep in the cracks and crevices in the bark of the apple trees, may be seen numbers of small, oval, black, shining eggs, from which these insects are produced. Scraping off the dead bark of old trees, and coating the trunks of all the trees with whitewash at that period of the year is a practice of much utility, since thereby most of the eggs of this and some other

insect depredators will be destroyed and the health of the tree promoted. These eggs hatch quite early, as soon as the buds begin to expand, and the young lice locate themselves upon the small, tender leaves, inserting their beaks therein and pumping out their juices. All of the lice thus hatched are females, and reach maturity in ten or twelve days. Without any intercourse of the sexes, these females that were produced from eggs, now commence giving birth to living young, bringing forth about two daily, for a period of two or three weeks, when, having become decrepid with age, they perish. The young mostly locate immediately around the parent, as closely as they can stow themselves. Upon a young leaf, in a space less than half an inch long and the tenth of an inch wide, I counted thirty-six young lice and four winged females, which had recently alighted there to begin a new colony. The young reaching maturity after a similar length of time, in their turn become parents. Thus these vermin continue to breed, and as fast as new leaves expand they are in readiness to occupy them. When favorable circumstances attend them, their multiplication surpasses all power of computation. In the warmth of summer they attain maturity in less than half the time they do early in the spring. And like most of the species of the *Aphidés* they at this period of the year produce winged as well as wingless females, the former dispersing themselves to found new colonies upon other trees. It is reported of the insects of this family, that there are from sixteen to twenty generations in the course of the season, from twenty to forty young being produced from each parent. Thus, from one egg, as stated by Mr. Curtis, in seven generations, 729 millions of lice will be bred. And if they all lived their allotted length of time, by autumn everything upon the surface of the earth would be covered with them. When cold weather begins to approach, males as well as females are produced, and their operations for the season close with the deposit of a stock of eggs for continuing their species another year. On the last day of last October, it being a warm sunny day, after many nights of frost, I observed myriads of winged and apterous lice wandering about upon the trunks, the limbs and the fading leaves of all my apple trees, many of them occupied in laying their eggs. These were scattered along in

every crevice of the bark, in many places piled up and filling the cracks, and others were irregularly dropped among the lichens and moss growing upon the bark—every unevenness of the surface, or wherever a roughness afforded a support for them, being stocked with as many as could be made to cling to it. The eggs were then of a light yellow or green color, and were so slightly glued in their places that it was evident by far the largest part of them would be washed away by rains or brushed off by the driving snows of winter. But I by no means anticipated such a great diminution in their numbers as actually occurred. I should judge that in the spring several hundreds had disappeared for every one that then remained.

The present year (1855) the apple plant-louse, as well as species infesting willows and some other trees, appears to be unusually prolific, and has excited much alarm among many owners of young orchards, for it is young thrifty-growing trees which are most infested by it. In one instance a gentleman came to me a distance of twenty five miles, bringing specimens of this insect, to learn its name and what measures he could resort to for destroying it, and in the *Country Gentleman* of July 19, (vol. vi. p. 48,) is a letter from William Gilchrist, of Hebron, Washington county, giving an account of its depredations upon his trees, many of which were in danger of perishing unless they were relieved from these vermin. Norman Briggs, Esq., of Schaghticoke Point, informs me that particular varieties of the apple appear to be much more infested by this insect than other varieties; thus the Sour Bough, wherever it was growing in his grounds, was overrun with lice, whilst among the kinds least affected were the Northern Spy and Red Astrachan.

As already stated, this insect locates itself upon the green succulent shoots at the end of the twigs, upon the under surface of the leaves, and upon the leaf-stalks. The leaves being of a comparatively stiff, leathery texture, do not become wrinkled and plaited like those of the peach, the snowball, and many other shrubs and trees; they, however, curve backwards, often to such an extent that the point of the leaf touches the stalk on which it grows, thus furnishing to the insect a comparatively secure covert

from rains and the night dews. The leaf-stalks also become bent, so that all the leaves growing upon a twig are, in badly-infested trees, turned backwards, pressing against the twig, and thus shielding that part of the colony which is located thereon. An infested tree may be distinguished at a distance of several rods by the leaves on the ends of its twigs being thus turned backwards, instead of standing freely out in their natural position. The bark of the limbs, and the surface of the leaves also, becomes blackened as if it had been smoked by the flame of a candle or other burning substance. This blackness does not rub off upon white paper, but Mr. Briggs informs me that washing the bark with a solution of sal soda removes it entirely. He had observed this black appearance of his trees before he noticed the lice which caused it, and seeing a newspaper-recommendation of this wash for cleansing trees, he applied it to four of those in his orchard. The next day he was astonished at finding myriads of these lice crawling down and up the trunks of these four trees, and upon the ground they were heaped together in a ring around their bases. The alkaline matter in this wash had evidently tinctured the sap of the tree, and made it unpalatable to these insects, and they endeavored to emigrate to some place free from it, but on reaching the ground they knew not where to go, and many, therefore, travelled up the trunk again in search of some other avenue of escape.

A strong disagreeable smell is also emitted from trees that are badly infested with the apple plant-louse, and when a person has been examining infested twigs this smell remains upon his hands. The odor is peculiar and very loathsome, and reminds me of the smell of stale fish more than anything else with which I am able to compare it.

All the insects of this family secrete copiously a sweetish fluid, called honey dew. This is ejected from the two little horns, or nectaries, which project one on each side of the hind part of their bodies. Often a clear drop of this fluid may be seen at the tip of one or both of these horns. This fluid, falling upon the leaves and evaporating, gives the leaves, under a colony of these lice, a shining

appearance, as though they were coated with varnish. For the purpose of regaling themselves upon this honey dew, or to destroy the aphides, different species of ants, flies, and quite a number of other insects are always found in company with them. Several of these, and their habits, will be more particularly considered at the close of our account of this species.

Grouped together, and covering the surface of the twigs and leaves which they infest, these lice are found in all stages of their growth. When newly born they are almost white, but soon become pale dull greenish yellow, which is their prevailing color during the larva period of their lives, the antennæ, the nectaries, the knees and feet being dusky, and sometimes black. The mature females are generally without wings, and their bodies are much broader than in the larva state, being shaped like an egg, the smaller end forward. These, as well as the winged individuals, vary greatly in their colors and marks, as will be seen from the description of this species and its varieties which we here give.

The WINGLESS FEMALES are somewhat less than the tenth of an inch long, and are of a pale yellowish green color, with the head frequently more yellow than the body. Stripes of a deep green color are commonly present upon the back, or sometimes there is a single stripe in the middle, and transverse ones at each of the sutures or impressed lines between the segments, but these transverse stripes do not extend to the margin upon either side. The eyes are black. The beak, by which it pierces and sucks the juices of the twigs and leaves, the antennæ, and the legs, are whitish, their tips black or dusky, and the knees also are commonly dusky. The nectaries are equal in length to the distance from their bases to the tip of the abdomen, and are dusky or white, with their outer ends black. Protruding from the extremity of the abdomen is a short tail-like appendage, nearly half as long as the nectaries, and of a black color. But in females examined in autumn, at the time of depositing their eggs, this appendage was not observed. I hence infer it pertains only to those which bear living young.

The MALES and the WINGED FEMALES appear to be alike in their colors. They measure about 0.12 to the tips of the wings, this being double the length to the tip of the abdomen, or more. The head and thorax are of a coal black color, with the neck commonly green. The antennæ are inserted upon the front part of the head, between the eyes. They are black, slightly tapering towards their tips, scarcely as long as the body, and slightly covered with very fine short hairs. They are seven-jointed, the two basal joints short and thick, almost as broad as long; the third joint is longest of all, and often shows several slight equidistant constrictions, dividing it seemingly into several short joints; the fourth and fifth joints are equal, and each

but little shorter and more slender than the third, whilst the sixth is but half as long, and the seventh is double the length of the sixth, and quite slender and thread-like. The abdomen is short and thick, of an oval form, and obtusely rounded at its apex, of a bright grass-green color, with a row of black dots along each side forward of the nectaries, one dot upon each segment. On its under side at the tip, are two square brown spots, more or less separated from each other as the abdomen is distended with aliment in a greater or less degree, and above the apex are often three short blackish transverse stripes. The tail-like appendage in the female is black, and about a third as long as the nectaries, which are also black, and if pressed against the abdomen, would reach its tip in the females, but are shorter in the other sex. The legs are pale dull yellow or whitish, with numerous even hairs; the feet, tips of the shanks, and of the thighs, black or dusky; the hind thighs black, except upon their basal third. The wings are transparent, but not perfectly pellucid, the stigma or opaque spot towards the end on the outer margin, is dull white, and the veins are dark tawny brown, the longitudinal rib-vein being paler and becoming whitish towards its base, the third or forked vein is abortive and colorless at its base, and, as in many other species, the first vein has a dusky mark from its tip, running upon the margin, towards the base. The first and second veins are more than twice as far apart at their tips as they are at their bases; the third vein is slightly farther from the second at its tip than at its base, and is a third farther, or more, from the second at base than this is from the first; the tip of the first fork is much nearer the tip of the second fork than that of the third vein, and is about the same distance from the tip of the third vein that this is from the second; the tip of the second fork is equidistant between the tips of the first fork and the fourth vein; the tip of this last is commonly twice as near the tip of the second fork as it is to that of the rib-vein.

Individuals have been observed, in which the wing-veins varied from their normal state as follows:

1. Tip of the third vein nearer that of the first fork than that of the second.  
Common.
2. The second and third veins parallel with each other.
3. The second fork very short, its tip only half as far from the tip of the first fork as from that of the fourth vein.
4. Left wing with but one fork to the third vein, the second wanting.
5. Right wing with three forks to the third vein.
6. Left wing with the second vein slightly forked at its tip.

The following VARIETIES in the colors and marks of this species may be specified. The greatest diversity in these respects occurs after the coming on of frosty nights in autumn, it being then difficult to find two individuals with precisely the same hue and marks. This diversity is undoubtedly produced by the cold to which the insects have been exposed, and the unhealthy juices of the faded and decaying leaves which now furnish the only nourishment which is accessible to them. It might hence be deemed that the whole race was now in a diseased state, if it were not that sexual intercourse takes place freely, and the females are all industriously occupied in depositing their eggs.

Variety *a*, *pallidicornis*. The antennæ brownish yellow instead of black. Young individuals.

Variety *b*, *nigricollis*. The neck not green, but of the same black color as the head and thorax. Common among aged individuals.

*c*, *thoracica*. The thorax dull green, with a black band forward of its middle. Young.

*d*, *fulviventris*. The abdomen pale dull yellow instead of green.

*e*, *nigriventris*. The abdomen greenish black, with the row of black dots along each side, indistinct.

*f*, *immaculata*. The abdomen without any dots or darker colored marks.

*g*, *obsoleta*. The lateral row of black dots faint and scarcely perceptible.

*h*, *triseriata*. A row of black dots along the middle of the back, as well as upon each side of the abdomen.

*i*, *bivincta*. Two black bands towards the apex of the abdomen, on its upper side.

*j*, *tergata*. Abdomen above, with two black bands towards its tip, and three rows of black dots anteriorly.

Several specimens of Plant-lice which I gathered from the leaves of Apple trees, in Mercer county, Illinois, upon the 4th day of October last, and which at the time of capturing them I supposed were varieties merely of the common species which we have been considering, prove on examination to pertain to a different species. They are a size larger and of a shining black color throughout. In the common species the legs are uniformly pale with black feet and knees, the preserved specimen showing this character almost as distinctly as living individuals; in these specimens on the contrary the legs are entirely black, or at most brownish yellow at their bases in some instances. The wing-veins moreover differ notably from those of *Aphis Mali* in several points. They are more slender, and the fourth vein is relatively shorter and more strongly curved through its whole length. In consequence of this curvature it is nearer to the second fork at its base than at its tip. Two-thirds of the specimens which were captured at that locality coincide with each other in these differences. This fact would indicate this to be a more common species upon the Apple trees in Illinois than the *Aphis Mali*; but its darker color and larger size rendering it more conspicuous than that species may have occasioned a disproportionately large number of this species to be gathered. It may appropriately be named the Apple-leaf louse (*Aphis Malifolia*). The specimens show the following marks in addition to what has already been stated :

The APPLE-LEAF LOUSE measures 0.15 to the tips of its wings. The third vein of the fore wings is but slightly abortive at its base. The second and third veins are

parallel with each other, or in some instances are nearer at their tips than at their bases. In *Aphis Mali* the first fork branches from the third vein beyond its middle. Here it is given off much lower down, at about a third the distance from the base to the tip. Commonly the second fork is here half as long as the first fork; in *Aphis Mali* it is much shorter. The tip of the fourth vein is as near that of the rib-vein as it is to that of the second fork. The callous point on the outer margin of the hind wings is much more distinct in this species, and here the two oblique veins branch from the rib-vein at a much less acute angle than in *Aphis Mali*.

We come next to speak of the remedies for destroying these vermin.

Drenching the vegetation infested with any of the species of *Aphis* with strong soap-suds or weak lye is a measure which has been much recommended, and is certainly one of the most efficacious within our knowledge. But it is those insects only which are wetted by the solution that are destroyed. These are creatures which "sprinkling" will not cleanse from the tree; "immersion" must be resorted to. As it is the green succulent ends of the twigs of young thrifty trees, and the leaves growing from these parts that are most infested and liable to be seriously injured, they may be rid of these vermin to a great extent by preparing a solution of soft soap in a tin pan or other convenient vessel, and whilst one person holds this under the infested twigs, let another person bend them one after another down into it, holding them there for several seconds. This will, in most cases, destroy all of the lice upon the twigs and leaves which are thus immersed, and will cleanse and impart new vigor to them. But this is by no means so infallible a remedy as some writers have represented it to be. Some of the lice, perhaps from being more hardy than the generality of their race, will survive. It, however, will reduce their numbers so far as to allay all fears of immediate injury to the trees from this pest.

Instead of a solution of soft soap, a writer in a late number of the *American Agriculturist* (vol. xiii. p. 295) recommends thoroughly rubbing this substance about the trunks and limbs two or three times a year. It is very probable that thus applied, a sufficient amount of the alkaline matter would be absorbed and taken into the circulating fluids of the tree to render these fluids distasteful, and perhaps poisonous to the Aphides. We have al-

readily seen how repulsive to these insects the trees of Mr. Briggs, immediately became upon being washed with a solution of soda.

Tobacco water, prepared by pouring a gallon of boiling water upon a quarter of a pound of tobacco, and used in the same manner as above directed in the case of soap suds, has been reported as a certain remedy. Moses L. Colton, of West Bolton, Vermont, says (*Country Gentleman*, vol. vi. p. 78), a nursery of about twelve hundred Apple trees became so infested with lice that most of the trees turned black and the leaves withered and died, until he tried tobacco water, prepared, however, much stronger than above recommended. This completely destroyed the insects, and the leaves they had killed having fallen off, new ones started out. For six years past he has been obliged to resort to this more or less every year, in his nursery and orchard, and he finds it an effectual remedy when made strong enough. He prepares a decoction, made by boiling four or five pounds of tobacco in water sufficient to nearly fill a tin pan.

The remedy which is admitted on all hands to be the most effectual, and sure of ridding infested vegetation of every aphid upon it, is the smoke of tobacco. But unfortunately this can only be resorted to in the case of rose bushes and other low shrubs or small trees. For enclosing a shrub to be operated upon, gardeners abroad use a large box, a hogshead, or a kind of small tent humorously described some time since by Prof. Lindley (*Gardener's Chronicle*, July 11, 1846,) under the name of a "parapetticoat," made by sewing the upper end of a wornout but entire petticoat to the outer edge of an opened parasol that has been thrown aside, any holes in its cover being first mended, and a staff six feet long securely tied to its handle. The petticoat being then raised up in folds to the parasol, the staff is inserted into the ground under the centre of the infested shrub, and the petticoat is drawn down to surround and inclose all of the foliage of the shrub. The interior is then filled densely with tobacco smoke for the space of five or ten minutes, or long enough to insure the fumes penetrating every curl, plait and crevice of the foliage. The apparatus is hereupon removed, and the foliage immediately washed with lukewarm water from a large syringe,

else it too would be liable to be destroyed. This utterly exterminates the aphid from the shrub, every insect being suffocated and dropping from the plant, so that

“unnumbered corpses strew the fatal plain.”

One measure more, and this the most important of all, whereby to subdue these insects, remains to be stated. A person who is acquainted with the aphides, and the several kinds of other insects which prey upon and destroy them in different ways, will never permit a valuable tree or plant to suffer injury from them. He will at once repair to the hedges and borders of the forests in his vicinity, and with a beating net, such as is used by entomologists for gathering insects, or an opened inverted umbrella, or some other implement convenient for this purpose, he will soon collect from the foliage a few scores of these natural enemies of the plant-lice, and conveying them alive in small boxes and vials, will set them free upon the tree or shrub that is infested. Most of these being in their larva state, and without wings, will not leave their new situation so long as any food for them remains there. This is said to be the remedy to which all the more intelligent French and German gardeners are accustomed to resort in an emergency of this kind. The rapidity with which these natural enemies of the aphides not only suppress but utterly exterminate them, in instances where they are so multiplied and excessively numerous as to seem unconquerable, is truly surprising. At one time the present season (1855) the cherry trees in my grounds became overrun with the Cherry plant-louse—to be considered hereafter—to such an extent that the under surface of the more young and tender leaves, and the succulent ends of the limbs and twigs, were all covered and black with them. If not checked it was evident that every tree would soon perish. I was about to import from the neighboring fields and forests a stock of the natural destroyers of these pests, when I found on examination that nature had already scattered numbers of these every where among the aphides. All apprehensions as to the result were hereupon at once allayed. A week afterwards, upon a careful inspection, not a single aphid could anywhere be found upon these trees. Of the teeming millions which were revelling there so recently, a

few of the empty, shrivelled skins, adhering to the leaves, was all that remained.

We have seen the prodigious increase of these creatures which would take place if they were allowed to multiply to the extent they are susceptible of doing. Such is their fecundity, that if no check was given them, it is evident that from the cedars of Lebanon to the hyssop upon the wall, every leaf and spear of vegetation springing from the bosom of mother earth, would be thronged and blighted by the countless myriads which would be produced in the space of a few months. Fortunate indeed is it for man that in this, as in so many other instances, Providence has furnished remedies for an evil which would otherwise be so calamitous—remedies which are far more effective than any which human skill has been able to devise. As this family of insects appears to outstrip every other in the rapidity with which it is liable to multiply, to keep it restrained within its appropriate bounds means more efficient are here requisite than elsewhere, and we accordingly find that the aphides have enemies more numerous, more active and inveterate, than any other group in this department of the works of nature. Whole families of other insects, some of them numerous in species, appear to have been called into existence chiefly for the purpose of feeding upon and destroying these vermin, and an acquaintance with the several kinds of insects which, in our country, occur in company with these pests of vegetation is quite important, that we may know which to destroy or pass by in indifference, and which to cherish and protect, and call to our aid in instances where nature herself does not furnish them in sufficient numbers.

By far the most constant comrade of the aphis is the ant. One species or another of this family of insects (FORMICIDÆ) is almost invariably found wherever a colony of plant-lice have established themselves. By this means we frequently discover colonies of these insects which would escape our search if our attention was not attracted by these larger sized sable colored attendants. The fondness of the ant for sweet substances is well known, as it is always prowling about cupboards and other places where saccha-

rine matters are kept, and it is for the purpose of feeding upon the honey-dew that the aphides secrete so copiously that they are such constant attendants upon these insects. The mode in which they obtain this from the plant-lice is quite interesting; with their long flail-shaped antennæ they gently touch the backs of the plant-lice, whereupon these eject this sweet fluid, which stands in the form of a small clear drop at the tip of one or both of the nectaries or little horns towards the end of their bodies. This the ant immediately sips, and by passing from one aphid to another he obtains his fill of this delicious sweet. A family of ants is thus supplied with an important part of its nourishment by discovering a tree on which the aphides have located themselves, and thereafter one after another of the ants may always be seen passing up and down the trunk of the tree. Plant-lice have hence been styled the kine or cattle of the ants, as they come to them regularly to milk them as it were, and in return for this savory food which they furnish the ants, some of the latter remain constantly by them night and day to protect these small weak creatures from being molested by their insect or other enemies. Thus before we are able to inspect a colony of plant-lice we are first obliged to brush off or destroy the ants which are guarding them, and I have frequently noticed that when a colony of aphides is newly established, and before it has been found by these insects, it remains small and does not thrive and increase so rapidly as when nursed and guarded by these industrious heroic creatures. Thus a colony of the Cone-flower plant-louse (*Aphis Rudbeckiæ*) a species which I described in the Fourth Report of the State Cabinet, page 66, which has been established more than a fortnight upon a stalk of golden rod (*Solidago*) near my door, although it has not been molested by any destroyer, numbers only twenty-five individuals, and these are scattered about upon the stalk and leaves, seemingly pining in want of their accustomed attendants to herd and nurse them.

The species of ant which I have most frequently met with, associated with plant-lice upon the apple tree, is a large black ant, with a dark red thorax, and is very similar in its size and colors to the wood-eating ant, (*Formica herculeana*, Linn. *F. lignivora*,

Latr.) which excavates its burrows in the trunks of old and decaying trees, in which it is sometimes met with in countless numbers. And I am not without suspicions this may be a variety of that species rendered darker in its colors by being more exposed to the light and air. It is much darker colored than the species alluded to, its thorax being deep chestnut red, and its legs black, with the thighs tinged with chestnut red, but always darker than the thorax, instead of being of the same color as we generally find them in *F. herculeana*. These and other differences to be specified appear to be constant, occurring in all the specimens which I find attending the aphides of the apple and other trees, and induce me to regard it as a distinct species, which I propose to distinguish under the name of

The NEW-YORK ANT (*Formica Novaboracensis*). The neuters are uniformly about 0.30 long. The body and legs, as in *F. herculeana* are covered with very short fine appressed hairs, which on the head and body are interspersed with a few longer erect bristles, whereof several are clustered upon the elevated posterior part of the thorax, others stand out from the edge of the wedge like scale at the base of the abdomen like eye-lashes, and others are arranged in transverse rows upon the abdomen, of which there is one upon each side of each suture. The scale at the base of the abdomen, instead of being the same red or yellow color as the thorax, or only somewhat dusky at its summit, is here black, with its base only sometimes dark red. The posterior face of this scale in *F. herculeana* has a broad shallow concavity, like the hollow of the hand, whilst here it is merely flattened, or in some instances has a small concavity in its middle. In the preserved specimen, the edges of the abdominal segments, especially the basal one, are often membranous and of a pale dull yellow color; and a variety occurs in which the anterior suture is impressed or constricted.

In addition to ants, different kinds of wasps are common, hovering about the foliage of trees infested with plant-lice. Most of these appear to be attracted to them on the same errand with the ants, namely, to regale themselves upon the honey-dew, without molesting them further than to obtain this fluid. Thus I have observed our common Blue wasp, (*Pelopæus cæruleus*, Linnaeus) the base of whose abdomen is contracted into a long slender penduncle, standing beside a colony of lice, and turning its head from side to side, gently touching their backs with its antennæ, hereby tickling and causing them to eject their honey dew, and their mouths following in the track of the antennæ, sipping up this fluid. Our common hornet or "yellow jacket" (*Vespa*

*maculata*, Linnæus) is also frequently noticed in the same situations. These insects are so much larger and more powerful than the ants that the latter make no attempts to drive them away as they do most other intruders. They quietly stand aside and permit the large wasp to pilfer from them what would serve as a meal for a dozen of their own family.

Other wasp-like insects, of a smaller size, pertaining to the family CRABRONIDÆ, seize and carry off the plant-lice. These excavate holes in decaying posts, rails and similar situations, and collect young spiders for food for their young, several of the species gathering plant-lice for the same purpose. These they enclose in the same cells in which they drop their eggs, the egg being in the bottom of the cell, often attached to the end of the abdomen of an aphis, that the young worm when it hatches may find its food placed directly in contact with its mouth; and the exact quantity of food is put into each cell before it is sealed up, which the worm will require for bringing it to maturity. But the most astonishing trait in the instincts of these small wasps, is their manner of preserving the spiders and other food which they gather. The wasp is evidently aware that if it kills the spider or aphis before packing it in its cell, it will become putrid and unadapted for the nourishment of the worm before the latter will hatch from the egg. On the other hand, if the young spiders are enclosed in the cell alive and in full vigor, their incessant struggles to escape from their prison will wound and destroy the egg or the young tender worm which is in the same cell. How is the wasp to proceed in this dilemma without salt or spices with which to preserve from putrefaction the stock of provisions which she amasses? Nature has furnished her with a resort for effecting this, superior to any known to man for a like purpose; and if some chemist, taking the hint from these little insects, could devise some analogous mode whereby we might preserve animal food for weeks in all the perfection it has when newly slaughtered, it would be a discovery conducive to human health and comfort equal to any of the other great discoveries of this remarkable age. The wasp on seizing her prey appears to sting it slightly, injecting into the wound only so much venom as will

serve to paralyze and stupefy her victim without killing it. It remains alive, but lies perfectly still and passive. The insects thus prepared are stowed away in the cells of the wasp as skillfully and compactly as the most expert packer in our slaughter houses fills his barrels. The farmer in repairing his fences will sometimes notice on splitting a decayed rail or stake, holes excavated therein and filled with young spiders, commonly of bright beautiful colors, which lie still and quiet, with only a slight quivering of their limbs, and is puzzled to know why, when thus broken in upon, they do not awake from their lethargy and run away, little suspecting the manner and purpose of their being accumulated there. And similar interesting and curious phenomena are passing under the farmer's eye daily, as he pursues his labors—phenomena which, if

“ In nature's infinite book of secrecy  
A little he can read,”

aid in rendering his vocation beyond all comparison the most pleasant of any pursuit known to man.

In addition to ants and wasps several kinds of flies are common about cherry and other trees infested with plant-lice, being attracted hither, like the ants, for the purpose of sipping the sweet honey dew. One of these which is common during the month of July, and which will be most likely to attract notice, both on account of its prim neat appearance and the briskness of its gait when walking, is a small blackish green fly, with clear glass-like wings, which are crossed by three black bands. With its wings extended horizontally outwards, and often gently waving them up and down, with many abrupt turns it walks with a rapid pace up and down the limbs, and out upon the leaves in the vicinity of colonies of plant-lice. It is so tame that if the hand has hold of a limb it fearlessly walks around upon it. But the most curious part of its movements can only be seen with a magnifying glass. Watching its opportunity, when the ants have all left a herd of their cattle, the plant lice, unguarded, it runs in upon them, where they are crowded together as closely as they can stow themselves, and using its four hind legs for walking and turning around, with its two fore feet it gently scratches

upon the backs of the lice, its feet at this time moving with incredible rapidity, corresponding exactly with those of a dog when eagerly occupied in digging open the hole of a woodchuck; at the same time the lips at the end of its beak are held down between its fore feet, instantly sucking dry every particle of honey dew which the lice, having their backs thus briskly irritated, incontinently spirt out. Thus in a moment the fly runs about over the backs of the whole flock, milking every one of them "dry," as a dairyman would express it, and filling himself with the delicious sweet. But rapid as the fly is in doing this work, he finishes it none too soon for his own safety, for any ant that is near by, from a cry or some other signal given by the lice, seems immediately to know that a thief has broken in among the flock, and with his utmost speed hastens to the spot. As soon as the ant approaches the fly takes to his heels, as if aware he might come off minus a leg or a wing if he allowed the enraged ant to grapple him. And the ant now with his antennæ gently strokes the backs of the aphides, as if soothing them after such rude treatment, and assuring them of his future watchfulness and protection.

This fly pertains to the genus *TEPHRITIS*, in the Ortalidan group of two-winged flies (Family *MUSCIDÆ*, Order *DIPTERA*). Though of the same size it is clearly a different species from the *Tephritis 4-fasciata* of Macquart (*Exotic Diptera*, ii. 226), and also from his *3-maculata*, two species which inhabit our southern States. It may be named the Honey-dew fly, or the Honey-dew *Tephritis*, (*T. melliginis*.)

It measures about 0.23 to the tip of its abdomen and 0.28 to the end of its wings. It is polished and shining, its head black, the orbits of the eyes margined above with white; the thorax is dark green and the abdomen greenish black; the under side of the abdomen, when distended, is of a dull reddish or yellowish brown color and somewhat hyaline, with a broad black stripe in the middle, which is interrupted at the sutures; the legs are black, the basal joint of the feet dull yellow; the wings are perfectly colorless and pellucid, and are crossed upon the disk by three black bands, which are narrower than the intervening spaces; the middle and inner of these bands are oblique and shorter, not reaching the inner margin of the wing, and the inner one is broadly dilated towards its anterior end, which dilation is extended along the margin of the wing to its base. The outer one of these three discoidal bands is confluent at its anterior end with a fourth band which is situated upon the anterior

apical margin. These four bands upon the wings thus present a resemblance to the Roman numerals VII placed in an inverted position.

Another of our New-York species of *Tephritis* is closely related to the one now described, and probably has the same habits, though as I have met with it but seldom I have not had an opportunity to observe its movements. It is slightly smaller than the honey-dew fly, and like it has four black bands upon the wings, but here these bands are broader than the intervening spaces, and the two inner ones are confluent at their posterior ends, which do not reach the margin, whilst the two outer ones are confluent at their anterior ends, the bands thus resembling an upright letter V followed by an inverted one. The outer band, moreover, only touches the margin at its ends, and the wings are somewhat opaque and of a white color, with only the axillary portion hyaline. The head and antennæ are light yellow, the face white; the thorax is black, with a milky-white stripe on each side and four broad ash-grey stripes above, the outer ones interrupted towards their anterior ends; the scutellum is white and waxy, or porcelain-like; the abdomen is black, with the posterior edges of its segments whitish; the feet and shanks are yellow, the thighs black. I name this, in allusion to the marks upon its wings, the Lettered *Tephritis* (*T. tabellaria*).

In this connection I may observe that the fly named *Tephritis Asteris* by Dr. Harris (New England Insects, p. 498,) the larva of which infests the stalks of our American Asters producing globular swellings or galls therein, the size of walnuts, I have never met with. But a larger species, attacking the *Solidago* or golden-rod in the same manner, is quite common in eastern New-York. This fly, however, pertains to the genus *Acinia*, which has been separated from *Tephritis* by Desvoidy. Every farmer's boy has noticed how the slender, straight, smooth stalks of the golden-rod, growing with other weeds along old fences, quite often has one and sometimes two large round galls or ball-like swellings upon them, an inch in diameter, when the stalk above and below is less than a quarter of an inch. And many have had the curiosity to cut into these balls, and have found a plump well-fed white maggot in their centre. By the first of August the swellings have about completed their growth, although the worm within is as yet so small as to be scarcely perceptible to the naked eye. In the winter season, the leaves having fallen and left the stalks naked, these balls are more frequently observed: but at this period of the year most of them are found to be empty, with a round hole perforated in them, the worm having completed its growth and the winged fly having come out through this perforation the preceding autumn. But occasionally one of these balls

is found at this season without any hole in it. In these the worm is still remaining, "to complete its changes and continue its species the coming summer. And if one of these balls be placed in a tumbler with a piece of paper tied over it, the fly can in due time be obtained therefrom. Its form and size is much like that of the common house-fly, but it has an odd appearance from its wings being opaque and of a tawny brown color, with clear spots upon the inner margin and at the tip. It may appropriately be named the Golden-rod fly (*Acinia Solidaginis*).

This fly measures from 0.35 to 0.40 to the tip of its wings. Its body is of a pale brownish yellow or a tawny whitish color with two darker brown stripes above upon the thorax. The antennæ, mouth and legs are dull yellow, the face white, and the top of the head yellowish or reddish brown, with a blackish spot at base where the three ocelli or simple eyes are situated. The wings are tawny brownish-yellow, with blackish clouds, and with several dots and the veins lighter yellow. On the outer margin beyond the middle are two small triangular hyaline spots, and a third longer one inside of these, a large transverse hyaline spot on the apex and two large triangular ones upon the inner margin, the inner one being larger and prolonged upon the margin to the base. Upon the margin of the wing, in these large hyaline spots are some tawny yellowish dots or small spots, namely, three in the apical spot, one in the smaller triangular one, one or two in the larger triangular one, and three where this last spot is prolonged in the axilla.

Another pretty species of *Acinia*, which is commonly found resting upon brakes in our meadows in midsummer, but which I have not yet discovered in its preparatory state, may be named the New-York *Acinia* (*A. Novaboracensis*.) It measures 0.35 to the tip of its wings, and is of a pale brownish or tawny flesh color, and like the preceding species, is clothed with a short stiff beard, which is of a silver gray color, with scattered black bristles. The orbital edge of the eyes is whitish, and the eyes when the fly is alive are of a pale coppery red color crossed with three golden yellow stripes having a green reflection, the middle one of these stripes being broadest, and the upper one slightly narrower than the lower one. When dead the eyes change to blackish brown and the stripes to black, and they are now much less obvious. The antennæ are pale tawny yellow with a simple black seta or coarse bristle on their upper side. The face is whitish with two large black dots in the middle and one on each side between the antennæ and the eye, and a transverse brown spot is placed on each side between the anterior part of the mouth and the eye. The abdomen is dull pale yellow, with the apical segments black except on their posterior margins. The wings are opaque, black, with a slender, hyaline-white crescent upon their tips, the anterior horn of which is sometimes tinged with tawny yellow, and upon the middle of the anterior margin is a small streak of the same color. The whole wing is covered, except towards the anterior side and the apex, with numerous white dots, those in and towards the axilla being larger. In some specimens a pruinose powder of a more intensely white color forms a ring upon the margin of all the larger dots.

Similar to the fly last described, in size and in the dots of its wings, is another species which Macquart regards as being the *Tetanocera guttularis*, of Wiedemann, although it differs slightly from his description. The genus *Tetanocera* belongs to a small group of the Ortalidan flies, differing from the other genera in having the second joint of the antennæ equal in length to the third joint, instead of being but half as long or less. Another character presented by all the species I have seen I do not observe noticed in books. The whole surface of the wings in our American Tetanocerides is finely striated with obtusely impressed lines and intervening ridges, which have a longitudinal direction towards the apex, and an oblique one towards the inner margin. These flies also subsist upon the honey-dew secreted by plant-lice, and, according to Desvoidy, their larvæ live, some in the unripe seeds of plants, others in the parenchyma of the leaves, stems or roots. In addition to the *guttularis* or Dotted-winged Tetanocera, we have, common in the State of New York, a species which is probably the Canadian Tetanocera (*T. Canadensis*) of Macquart, although the spots in its wings are sub-hyaline rather than white, and there are six only of these spots in the outer or costal cell. Associated with this species is frequently found another, similar to it in size and colors, but without any sub-hyaline spots in the dusky outer and apical margins of the wings. From that part of our State in which I have captured this species, I propose for it the name Saratoga Tetanocera (*T. Saratogensis*), as the mineral waters in this neighborhood have given to the locality a world-wide celebrity.

The dried specimen of this fly measures 0.23 to the tip of the abdomen and 0.30 to the end of the wings. The head above is golden yellow with two small rusty stripes on its fore part, a black spot at base and dot each side anteriorly, almost in contact with the eye, and a second one, also black, on the anterior margin, between the eye and the antennæ. Face silvery white. Antennæ light yellow, second joint longer than broad, with fine short black bristles along its upper and under edge; third joint tinged with brown, narrow and curved, its upper side being concave, its lower side convex and nearly parallel with the upper side, but slightly narrowing towards the apex, which is rounded; seta yellowish white, plumose. Thorax pale dull yellow, with a faint darker stripe each side of the middle, which stripes have an ash gray reflection when viewed from the front; clothed with a short black beard and a few long black bristles. Scutel ash gray with two nearly erect black bristles each side. Poisers (the little pedicels back of the insertion of the wings,

ending in an oval knob) yellowish white. Abdomen dusky, clothed with a short black beard, hind edges of the segments pale dull yellow. Legs pale yellow, with a fine black beard, and the spine-like bristles at the end of the shanks black. Wings iridescent, smoky brown on the outer and apical margins, hyaline towards the axilla, the space between divided into numerous square hyaline spots by dusky longitudinal stripes, one stripe being placed in the middle of each cell and sending short, transverse branches to the veins at regular intervals; veins and veinlets black.

Nearly related to the flies which we have been considering are those very singular ones, called Stem-eyed flies from having straight horn-like processes extending outwards from the sides of the head, upon the ends of which the eyes are inserted. These form the old Linnæan genus *Diopsis*. About a dozen species are known, all inhabiting tropical Africa and the East Indies, with one exception—the Short-horned Stem-eye of this country, originally described by Mr. Say under the name of *Diopsis brevicornis*. As this species has the tubercles on which the eyes are inserted quite short, their length being less than their breadth, whilst in the other species they are much longer and cylindrical, Mr. Say, in the third volume of his American Entomology, plate 52, proposed for it a distinct genus, which he named *Sphyracephala*. The European entomologists, however, ignore this genus and continue to arrange our species in the old genus *Diopsis*. I am somewhat surprised at this. A specimen from Senegal, ticketed *D. thoracica* by Macquart, for which and numerous other specimens of Diptera I am indebted to M. Bigot, of Paris, indicates the foreign species of this tribe to be quite unlike ours in their general appearance. Having recently taken a second species closely related to the *brevicornis*, I think our two American species must be ranked as generically distinct from those of the old world. In addition to the extreme shortness of the ocular protuberances and the minuteness of the projecting points to the scutel and on the sides of the thorax towards its base, they are further distinguished by having an anastomosis between the costal or anterior marginal vein and the sub-marginal or short vein which runs into the anterior margin near the middle, this anastomosis taking place a short distance before the two veins unite. In the new species which I have alluded to a dusky spot or short band extends from this anastomosis across the two basal cells of the wing, and a second band half way from this to the tip

reaches nearly or quite across the wing, the same that it does in *brevicornis*, whilst the apex of the wing is hyaline, without any vestiges of the dusky spot which occurs at the tip of the wing in Mr. Say's species. This species, which I name the Two-banded Stem-eye (*Sphyracephala sub-bifasciata*), was swept from grass at the base of the bluffs of the Illinois river, north of the city of Ottawa, the middle of last October. The Short-horned Stem-eye I first captured in Saratoga county, upon a cold windy day the latter part of May, between the leaves of the Skunk's-cabbage (*Symplocarpus fœtidus*), where it had probably retired for shelter—this being the same situation in which it was originally discovered by Mr. Say. Near my present residence, upon sunny days in the middle of April several were found associated with other flies and small bees, drinking the sweet sap of a newly cut maple, beside a stream of water at the base of a hill. It was more tame and less inclined to take wing when approached than any of the other flies. It seems limited to low shady situations, for other stumps upon the side and summit of the same hill, equally frequented by other flies, had none of this species. Near the same spot I once captured a specimen the last of October, resting upon a sand bank and basking in the sun. I state these facts thus particularly, as so little is known respecting the habits of this tribe of insects.

The Two-banded Stem-eye measures 0.15 to the tip of its abdomen. It is black and polished, the thorax brownish, the head and antennæ tawny yellow, and above on the middle of the head is a black spot. The legs also are tawny yellow, and the anterior thighs have a brown cloud-like spot upon each side, the anterior shanks being black. The middle legs have a brown band above and another below the knee. The hind thighs and shanks each have a brown band at tip. The wings are hyaline, with two dusky bands, the inner one short, as already described.

Prominent among these insects which subsist upon and destroy plant-lice are the Aphis-lions as they have been termed. These are larvæ of the Golden-eyed and Lace-winged flies, insects which form the Family HEMEROBIIDÆ in the Order NEUROPTERA. In their perfect state they are delicate slender-bodied insects, most of them less than half an inch long, with four large wings beautifully reticulated with veins, resembling the finest gauze or lace-work, whence they have received the name of Lace-wings, and with prominent globular eyes, which in many of the species have a

brilliant golden appearance, which has obtained for them the name of Golden-eyes. These last are mostly of a bright pale green color, and several of these, although they have such a pretty appearance, emit a peculiar and very disagreeable odor, which remains upon the fingers for some time after one of them has been handled. This odor appears to be given out constantly by those species which possess it, and not merely when they are disturbed, as is frequently stated; for in numerous instances I have by it been aware of my nearness to one of these insects before I had seen it.

These flies may be met with daily during the summer season, generally in the vicinity of trees or other herbage infested with plant-lice. Their eggs are placed in a very curious manner. This work is done in the night time, so that no one has been able to inspect one of these insects when engaged in this operation, they being so timid as to flit away when approached with a light. Still, the mode in which the fly proceeds in this work is sufficiently evident. Nature has furnished these insects with a fluid analogous to that which spiders are provided for spinning their webs, which possesses the remarkable property of hardening immediately on being exposed to the air. When ready to drop an egg, the female touches the end of her body to the surface of the leaf, and then elevating her body, draws out a slender cobweb-like thread, half an inch long, or less, and places a little oval egg at its summit. Thus a small round spot resembling mildew is formed upon the surface of the leaf, from the middle of which arises a very slender glossy white thread, which is sometimes split at its base, thus giving it a more secure attachment than it would have if single. The egg at its summit is of a pale green color when newly deposited, but before it hatches it becomes whitish, and shows two or three faint dusky transverse bands. The larva leaves it, commonly I think in less than a week from the time it is deposited, through an opening which it gnaws in the summit, and the empty shell remains supported on its stalk, somewhat shrivelled and of a white color. And where several of these are placed together in a group, they bear a close resemblance to the fruit-bearing organs of those mosses whose capsules are elevated upon capillary

pedicels, insomuch that botanists have in some instances actually mistaken them for vegetable productions of this kind.

Authors state that these eggs are deposited on leaves in clusters of ten or a dozen. I have a small willow leaf, upon the mid-vein of which, in a distance of one inch, twenty-three of these eggs are implanted, with seven more in a row close by the side of these, and five more in a second row, making thirty-five eggs in all, which undoubtedly was the stock deposited by a single individual in one night. But, however it may be with the European Lacewings, certain it is that most of our American species of these insects do not place their eggs in clusters, but singly, one or two upon the edges or surface of the leaf. On a young apple tree in my yard, about eight feet high, I found these eggs the first of July, scattered over all the leaves. This tree had ten limbs, each about three feet long, and inserted upon the leaves of one of these limbs and its twigs I counted sixty-four eggs, and some probably escaped my notice. There was thus at least six hundred eggs upon that one small tree, all seeming to have been newly laid. And upon looking about, I discovered these eggs upon every other fruit and forest tree in my yards, and also upon the fillets of cloth by which newly set trees were tied to stakes for support, and two were even found attached to the iron trimmings of the latch to my office door. Being thus profusely scattered, it will readily be conceived what an amount of benefit these insects render us.

Having enjoyed favorable opportunities for inspecting the habits of this family of insects, and having noticed several points in their economy different from the observations which have heretofore been recorded, I give their history somewhat in detail, believing I shall thus render a more valuable contribution to the stores of human knowledge, than by occupying the same space with brief and superficial notices of a number of dissimilar insects.

From the accounts usually given in books it would be inferred that plant-lice were the exclusive food of the larvæ of this family of insects. It however is recorded that when in confinement and pressed with hunger, they will devour each other, and Mr. Curtis

relates (Journal Royal Agricultural Society, iii. 62) that having enclosed two of them in a box with a caterpillar three-fourths of an inch long, one overcome and devoured the other and then sucked the juices out of the caterpillar, leaving only the skins of his victims remaining. In the same connection, he says these larvæ "begin to feed upon the Aphides as soon as they escape from the egg." Such being the current account of the larvæ, I was surprised at meeting with their eggs in abundance upon trees which were wholly free from Aphides, and which had none of these insects established anywhere in their vicinity. The small apple tree which was stocked with so many hundred eggs had no lice or other insects upon it or near by it, that I could discover. And still more was I surprised on hatching some of these larvæ from their eggs, and putting both old and newly born plant-lice into the vials with them, to find that they died of starvation, utterly refusing to touch the lice or to devour each other. In one instance a hungry young aphis-lion was noticed to cautiously approach a louse which was standing still, and grasp one of her feet between his jaws. The louse instantly pulled her foot away, whereupon the Aphis-lion drew back in evident fear, as though expecting the aphis would pounce upon and destroy him. Had it been a spider he could not have showed more alarm. Repeated experiments produced the same results—the infant larvæ dying of starvation with young and tender plant-lice wandering around them. At length, the middle of July I found upon a leaf a cluster of insect's eggs of a brick red color, and a half-grown aphis-lion standing with his jaws sunk into one of them, sucking out its contents, three eggs in the group having been already exhausted, nothing remaining of them but the empty clear and glass-like shells. Every observer knows it is not rare on meeting with a cluster of the eggs of insects to find some of them which are mere empty transparent shells, but I believe it has never been noticed before that it is young aphis-lions which thus destroy these eggs.

The leaf above alluded to was secured with its contents and placed in a vial. Only two or three more of the eggs were sucked, when they became too old for the use of the aphis-lion, and he remained without food for a time. Six days after they were

found, small inch-worms (GEOMETRIDÆ), about 0.15 long were hatched from them. The aphis-lion was at this time reposing at the top of the vial when one of these worms approached him. It was instantly seized, and the contents of its skin were sucked out with avidity, and he now commenced searching for another worm, probing every crevice in the cork stopper with his long jaws, and then walking down the vial, examining from side to side as he went along, until he came to the leaf at its bottom, now curled and shrivelled. He first crawled through every fold of this and then wandered over its surface, till coming to another worm, it was instantly seized. Thus sixteen of these newly-born inch-worms were consumed as fast as he could find them. They were seized indifferently by whatever part of their bodies was first accessible, and he was occupied four or five minutes in sucking out the fluids of each worm. As the skin became empty it was folded together, and rolled about between the tips of his jaws in a little wad, until the last particle of juice which it contained was exhausted. The skin was then adroitly wiped off from the tips of his jaws, and he started off in search of another worm, always carrying his head down close to the surface on which he was walking. Sometimes on coming to a skin which had already been sucked, it was taken up and rolled between the tips of his jaws again, as if to ascertain whether he had done his work well. When occupied in sucking a worm he stood still, adhering more by means of his tail than his feet, and there was a pulsating motion to his body indicating the satisfaction he felt in the act in which he was engaged. If another worm approached so near as to touch him at this time, he gave a sudden spiteful shrug, whereby it was frightened away. Only three worms remained when I introduced into the vial a cocoon of spider's eggs, with some of the young spiders hatched and crawling about the cocoon. These were immediately discovered by the aphis-lion, and leaving the worms he commenced devouring these small spiders in the same manner, each spider occupying him about half the length of time one of the worms did. The fine cobweb of the spiders appeared to adhere closely to his jaws, and to wipe this off, after finishing one spider, and before seeking another, he thrust his jaws repeatedly into the cocoon. Thus quite a number of the spiders were

destroyed, when, having fully glutted his appetite, he retired into a corner of the vial to repose. This larva pertained to the species hereinafter described under the name of the New-York golden-eye.

It is thus evident that many of the species of this family of insects, contrary to what has been heretofore published, when first hatched are too feeble and timorous to attack plant-lice or any other living prey, and subsist during the first stages of their lives upon the eggs of insects. By destroying these eggs they are often as beneficial to us, probably, as they would be if aphides were their sole food. The aphis-lion, however, is perfectly indiscriminate in his appetite, consuming the eggs of beneficial as well as injurious insects, and we now learn why it is that the parent of these insects places her eggs upon thread-like pedicels, whereby they are elevated from the surface of the leaves. Hitherto it has been unknown why this insect deposits her eggs in this singular manner. By a reference to that mine of information upon all subjects of this kind, Westwood's Introduction, (vol. ii. p. 47,) we find it merely stated that these eggs have been supposed to be placed in this manner to protect them from the attacks of parasites. But we see not why a parasitic insect may not alight upon and puncture and drop its eggs within these eggs almost as readily as it could do if they were placed upon the surface of the leaf. Certainly many of these parasitic insects display far more sagacity than this would be in discovering the appropriate receptacle for their eggs. But speculation upon this subject is no longer necessary when we have facts to guide us to a conclusion. In a recent communication to the Country Gentleman, which is not yet published, (No. 5 of my series of entomological articles in that periodical,) I suggested that these eggs are elevated upon pedicels to prevent their being found by the young larvæ of their own kind, which probably would instantly devour them if they were laid upon the surface of the leaves. To ascertain more fully the correctness of this opinion, I sought an egg which was upon the point of hatching, and placed it in a vial; the next day a young aphis lion was found disclosed from this egg. Two freshly laid eggs were now obtained; one of these was placed in the vial elevated

upon its pedicel, the other was laid upon the surface of a leaf in the vial. Next morning the latter was found flattened, and with only a small portion of fluid remaining in one end, and the plump size and green tinge of the young larva showed plainly that he had appropriated the missing contents of this egg to himself, and in a short time he approached the egg and inserting his jaws into it wholly exhausted it of its remaining contents under my eye. We thus see that the young aphis-lion will devour the eggs of its own species if they are placed within its reach. Is it not wonderful that the female knows this fact when no other insect possesses this knowledge! It would seem as though she had a recollection of what her own habits were in the larva period of her life, else why does not instinct inform other insects of this same fact, and excite them to similar artifices for placing their eggs beyond the reach of these destroyers?

A cocoon of spider's eggs was now introduced into the vial last spoken of, upon which the aphis-lion therein became plump and well fed. Three days after this the other egg elevated upon its pedicel, having been wholly undisturbed, hatched, and the infant larva from it approaching the older one, which was full three times its size, the latter to my astonishment passively and without manifesting the slightest resentment, permitted the newly-born infant to pierce him repeatedly with its jaws until life was extinct. His carcase was then shoved off from the leaf and abandoned, little if any of the juices being sucked from it. I can only account for this strange phenomenon—the young and weak destroying the strong—by supposing there had been some poisonous quality in the spider's eggs on which the older aphis-lion had fed, which had rendered him diseased and weary of life, for he even seemed to sollicit his pigmy kinsman to slay him. Our American species, however, appear to be less inclined to cannibalism than those of Europe, this being the only instance in which I have known one to destroy another, and for several days I have had a *Chrysopa* and a much larger *Hemerobius* larva enclosed together and left at times without food, yet they have manifested no inclination to molest each other.

Later in the season I have known young plant-lice to be destroyed by newly born aphis-lions. And although the fact is indisputable that plant-lice are the chief food of this family of insects during their larva state, they are by no means so limited in this respect as is represented in the accounts heretofore published. They appear to seize and devour worms of different kinds with the same avidity that they do the plant-lice. I have more than once seen them devour the maggots of the Syrphus-flies which were feeding upon the plant-lice on the same leaves with them. And a few days ago I placed in a box with a newly captured aphis-lion an imbricated gall which is formed by a species of midge (*Cecidomyia*) at the summit of the stalks of the golden rod, having first torn off the outer valve-like leaves of this gall until I came to one of the larvæ residing in it. The aphis-lion immediately began to examine this gall, and coming to the maggot, instantly grabbed it, sucking out the contents of its skin with an evident relish. With his long jaws he then commenced probing the fissures between the remaining valves of the gall and soon found another worm so deep between the valves that he could only reach and pierce it with one of his jaws, and thus he remained stationary until he had sucked the fluids of this worm, the point of the unemployed jaw being pressed against the outer surface of the gall during this operation. His proceedings at this time plainly showed the purpose, I think, for which Nature has furnished these larvæ with such remarkably long slender sickle-shaped jaws, namely, to probe narrow crevices and small holes and fissures—the situation in which a portion of their prey lurks. The dexterity with which he insinuated sometimes one, at other times both of these instruments between the valves of the gall showed he was no tyro in operations of this kind. He even crowded the valves somewhat apart, at times, to reach further in between them. Whether these larvæ are able to separate the chaff surrounding a kernel of wheat sufficiently to insert their jaws therein to destroy the larvæ of the wheat-midge (*C. Tritici*), I have not ascertained, though I should judge them capable of doing this. If so it may be possible to turn the labors of the aphis-lion to a most valuable account in restraining the ravages of this insect which is making such appalling havoc in our wheat

crops of late years. A number of the small yellow grubs sufficient to destroy every kernel in a head of wheat would no more than suffice an aphid-lion for a single meal. And if these voracious creatures are usually so common as I have found them to be the present season, it would be an easy matter for a person who is familiar with them to gather such a number of the eggs and larvæ as, scattered through a wheat-field infested by the midge, would greatly diminish the damage done by this insect.

The larvæ of different species of these insects differ considerably in their colors. They are mostly of a reddish-brown color, with a darker stripe in the middle, and are cream-colored along each side. They have bodies of a long narrow weasel-like form, wrinkled transversely, with six rather long legs anteriorly. But they may be distinguished from all our other insects and larvæ by their two long slender jaws, curved like sickles, which project horizontally forwards from their heads. Along each side is a row of projecting points, one to each segment, from the ends of which several fine bristles radiate in all directions. Others have the whole of their backs covered with rows of similar elevated points and radiating bristles, giving them a truly frightful appearance. But these have the artifice to conceal themselves from view, by placing the empty skins of their victims between their radiating bristles, so that they adhere, and completely hide the insect from view. It is the skins of the woolly plant-lice which they mostly employ for this purpose. Thus covered they resemble a little mass of white down adhering to the bark of the apple tree, and at a short distance one of these insects thus covered can scarcely be distinguished from a colony of the Apple-tree blight, which is usually covered with a mass of down of similar size and appearance. Thus disguised they are able to approach their victims without exciting their alarm and putting them to flight. It is in autumn that the species which thus cover themselves appear upon the apple trees. I have noticed none but the naked kinds without bristly backs in July and August.

The LARVÆ cast their skins soon after birth and often before they have taken any nourishment. No other moulting occurs, that I have observed, until they change to pupæ. When newly born the larva of the New-York Golden-eye is 0.05 long, soft and tender, long and narrow, with the opposite sides of the head and thorax straight

and parallel, the abdomen tapering. It is white, with two dusky stripes upon the head, and the outer side of its long sickle-shaped jaws is blackish. Its back is at this time clothed with numerous long fine hairs. It walks about with an easy, sedate step, making very good progress, and could readily crawl down a tall tree and probably travel some distance therefrom before it has taken any nourishment. When full grown it is about 0.30 long, broadest in the middle and tapering thence to both ends, but more posteriorly; its color is reddish brown, paler in the middle of the back, with a narrow darker stripe the whole length of its body. It presents numerous transverse impressed lines above, those at the sutures being more conspicuous. The sides of each segment are cream-yellow and protuberant, forming elevated points, with short diverging white hairs at the apex. Under side pale. Head pale with two blackish stripes which taper and diverge from each other anteriorly. The antennæ are about as long as the jaws, slender and tapering, without any apparent joints. The jaws are tinged with dusky. The legs are pale and somewhat translucent, with a dusky band above and another below the knees; the feet are also dusky. The twelfth and thirteenth, or the two last segments are quite narrow and destitute of tubercles tipped with radiating hairs on each side, but have two black stripes on their upper side. They form a kind of tail turning in every direction, and by the tip of the last segment the insect adheres, particularly to smooth surfaces like glass, much more securely than it can do with its feet. This adhesion appears to be effected by a power of suction in this part.

The larvæ of the other species of *Chrysopa* appear to be similar to the one which has now been described. One of them, however, has fallen under my notice, having the whole surface above mottled with light yellow and brownish red, with a slender black line on the middle of the back, having a reddish spot upon it in the centre of each segment, and the head with two black spots on its base and a black stripe anteriorly upon the middle. The species which is produced from this I have not yet ascertained.

Having attained its growth, the aphis-lion for its final meal gluts itself as full as its skin can hold. For two days afterwards it remains torpid and inactive, as though sick of a surfeit. It then commences spinning its cocoon. This operation is performed by its tail, which is supplied with a glutinous fluid similar to that from which the spider spins its web, which adheres to whatever point it is applied, and hardens immediately upon exposure to the air. The amount of life and motion which the tail possesses at this time, when all the rest of the body is lying still and unemployed, is truly astonishing. Like the head of a leech it contracts, elongates and turns from side to side and up and down with the vivacity of the hand of a musician beating upon a tambourine, attaching its thread here and there as it darts around from point to point. By the New-York golden-eye scattering threads are first fixed around the hollow in the bark or elsewhere

where it lies, and to these the skins of any dead plant-lice or particles of dirt which may be within reach are affixed, to serve as more convenient points of attachment for the threads which are afterwards spun than what the naked threads would be. Inside of these the insect lies, with its tail playing around backwards and forth. At first the skin is so distended and the body so stiff that it can only bend inwards in the form of a semicircle or of a horse-shoe, and the head is thus brought opposite the tail, giving the insect a ludicrous aspect as it lies still, with its eyes gazing fixedly at the tail as if in astonishment at seeing it fly around in such a singular manner. The tail at this times reaches around to every part of the half of a sphere, and when one side has become sufficiently filled with threads, the body moves along to give it access to another side, the insect thus lying at one time upon its side or its back, and at another time standing as it were upon its head. Occasionally, as if tired with its cramped position it straightens out somewhat, thus putting the threads upon the stretch and moulding the sides of the cavity in which it lies into a smooth and even surface. As so much matter is given out from its body to form the threads of the cocoon, the skin ceases to be distended as it was at first, the body shrinks and becomes more flexible, and as the cavity in which it lies becomes more and more contracted in size by the threads which the tail is constantly adding on every side, the insect is drawn together into a smaller space and becomes coiled into the form of a ball, the head being pressed down upon the breast, with the tail directly over it briskly continuing its work in the small vacant space which here remains. The feet are now so cramped that they are incapable of turning the body around as at first, and it now only moves along slightly by a vermicular motion often repeated. The threads have now become so numerous and close that finally no open meshes are left between them, and thus a small ball of paper-like texture is formed in the centre of the cocoon, within which the insect is entirely hid from view, tightly bandaged like the feet of a Chinese lady and compressed to a quarter of its previous size. This is a most remarkable circumstance in the history of these insects—that the larvæ contract and compress themselves into cocoons of scarcely one-fourth their size, and from these cocoons come flies

which are double the size of the larvæ. It is like a full grown hen hatching from an ordinary sized egg.

It requires five or six hours for the New-York Golden-eye to spin so much of its cocoon as to hide itself from view. The threads of which it is composed are of a white color, and the little paper-like ball in its centre is scarcely the tenth of an inch in diameter. Within this the insect changes to a pupa of a pale green color, with large hemispherical eyes, and with each of the legs, the wings and the antennæ enclosed in separate sheaths. The antennæ-sheaths show the bead-like joints of these organs very distinctly. They stand out in strong relief upon the surface, passing above the eyes and along the sides of the thorax, and on the outer surface of the wing-sheaths near their anterior margin to their tips, where the remainder of their length is coiled and doubled together in a singular and curious manner.

These insects lie through the winter enclosed in their cocoons. Some of the species, however, have two generations annually, and these remain in their pupa state in the summer season about a fortnight. M. Andouin informed Mr. Westwood that they escape from their cocoons by means of a slit made in a spiral direction at one end. But this certainly is not their usual manner of opening their cocoons. One side of the cocoon where it is globular, and one end where it is oval, is cut smoothly off, so as to form a little lid, which commonly hangs to the cocoon by some of the loose exterior threads, which serve as a hinge to retain it in its place. Through the opening thus made the pupa crawls out of its cocoon before it casts its skin to become a perfect fly.

Of this family of insects, which are rendering us such important services, our American species are somewhat numerous. Only two of these, I believe, have as yet been named and described. I therefore present herewith descriptions of most of the species which are known to me. These pertain to two genera, *Hemerobius* or the Lace-winged flies, having the joints of the antennæ globular, and *Chrysopa* or the Golden-eyed flies, in which they are short cylindrical. To these genera it is necessary to add a third,

resembling *Chrysopa* in most of its details, but instead of having the antennæ inserted close together, they are separated at their bases, and a cylindrical protuberance or horn projects from the front between them. For this genus I propose the name *Meleoma*, formed from two Greek words, implying bad smell, in allusion to the odor which in common with several species of *Chrysopa*, these insects exhale. But one species is known to me, which may be named and described as follows :

SIGNORET'S GOLDEN-EYED FLY, (*Meleoma Signoretii*) is of a pale yellowish green color, and is clothed with fine short pubescence, especially upon the abdomen. The cylindrical horn which arises between the base of the antennæ is longer than broad, and is directed forward upon a line with the head and thorax. It is a third longer and somewhat thicker than the enlarged basal joints of the antennæ, is slightly dilated at its anterior end, where it is abruptly turned downwards almost at a right angle, this deflected part forming a thin transverse lamina of a light yellow color, vertically striated on its anterior face, and with a projecting acute tooth in the middle of its lower margin, which is of a brown color and turned backwards. Upon the top of the head is a transverse elevation, with a deep excavation immediately back of it. The face has a round smooth elevated brown spot upon each side of its centre. The antennæ are very pale brownish, the two basal joints light green. The basal edge of the anterior segment of the thorax is elevated, and there is a more prominent obtuse elevation forward of this, separated from the base by an intervening transverse groove. The basal elevation shows a longitudinal impressed line on its middle, and back of this a more strongly impressed line extends across the middle of the anterior elevated lobe of the second segment. The legs are whitish, the feet tinged with dull yellow, with black hooks at their tips. The wings are slightly angulated at their tips, the hind pair more conspicuously so. They are hyaline and glass-like, with a slight opacity at the stigmas or that part of the wing which is forward of the extremity of the outer margin. Their veins and veinlets are whitish except the two subapical series of veinlets of the anterior pair, and those which are given off along the inner side of the rib-vein, which are brownish black. This species measures 1.15 across the wings when spread. It was captured the latter part of July, near the summit of Mount Antonio, one of the outliers of the Green Mountain range, slightly beyond the boundary of our State, in Rupert, Vermont. I name it in honor of my valued friend, Dr. Signoret, of Paris, whose elegant Iconograph of the *Tettigoniides* now publishing in the *Annals of the Entomological Society* as well as his previous productions, are an enduring monument of the extent and accuracy of his researches in that branch of the science to which he devotes himself.

The species of the genus *CHRYSOPA* are all of a bright pale green or yellowish color; the number and situation of the veins and veinlets or short connecting veins in their wings, is the same, and they differ but little in size. To the naked eye they seem to form but a single species. I had long noticed that individuals of

this genus presented black dots and other marks upon the head and thorax, but they were in all other respects so much like others destitute of these spots, that I was in doubt whether they were anything more than mere varieties of two species, the *Perla* and *chrysope* of the old authors, or the American representatives of those species, the one having the veinlets pale green, the other having them varied more or less with black. Awaiting for some fact that would throw light upon this subject, I several years ago met with ten chrysalids upon the leaves of a yellow pine, attached near each other, and all obviously the progeny of one parent. It occurred to me that when these disclosed the perfect insect they would furnish evidence whether the same species presented those slight differences in its markings which I had noticed among different individuals of this genus. I accordingly gathered them, and in a short time obtained from them the mature flies. These were all alike in every respect, and were destitute of any dots or other marks except a tawny yellow spot upon the cheeks. I therefore regarded this mark upon the cheeks as forming the distinctive character of a species. All the specimens which were obtained in the manner stated had the veinlets of their wings pale green; other individuals, however, occurred, having the same tawny yellow spot upon the cheeks, but in which the ends of the veinlets were dark green or black. These I had been inclined to regard as only varieties of the species, until the present season I discover that these individuals which have the ends of their veinlets black or dark green come from cocoons which are globular, white, with a rough ragged surface from numerous loose fibers of silk adhering to them, whilst those which were gathered upon pine leaves were oval, pale green and smooth. From the cocoons, therefore, it is evident that they are of different species. It is thus shown that a variation in the color of the veinlets of the wings, as well as in the dots and other marks upon the head and body in this genus, is to be regarded as indicating a difference in the species. The general reader is commonly inclined to the opinion that naturalists make their favorite science unduly complicated and obscure by founding multitudes of species upon what appear to be slight and unessential distinctions. But the facts here stated will show him some of the

evidences which compel us to regard these minute and seemingly unimportant marks as valid indications of differences which actually exist in nature.

To facilitate the discrimination of these species of this genus which are here described, they are arranged in an analytical series, which, on a slight inspection, will be intelligible to every reader.

1. (18.) Sockets in which the antennæ are inserted margined more or less with black.
2. (5.) Two black or dusky stripes upon the top of the head.
3. (4.) Veinlets mostly black, a few with a short green band on their middle.

The WHITE-HORNED GOLDEN-EYE (*Chrysopa albicornis*). Antennæ whitish, basal joint with an orange-red ring surrounding it wholly or in part, second joint with a black ring; sockets at their base with an uninterrupted black margin. Head above with two parallel black stripes confluent anteriorly with the black margins of the antennæ sockets; face with an orange-red spot each side upon the cheeks and a black crescent under each eye, its anterior horn running into the black margin of the antennæ sockets. First segment of the thorax with an impressed line in its middle, and three brown spots on each side, behind which are two black dots and a fourth brown spot situated upon the basal edge; second segment with two short black lines upon its anterior and two brown spots near its posterior edge. Veinlets black, those in the disk green in their middle, those ending on the inner and apical margins green except at their bases, those of the hind wings green except the row towards the tips, those outside of the rib-vein and the bases of those branching from the inner side of the rib-vein. Wings expand 1.15. My specimens of this species were captured in the State of Mississippi in April.

4. (3.) Veinlets green, slightly marked with black at their bases.

The DISAGREEABLE GOLDEN-EYE (*C. illepidia*). Pale yellowish green clothed with short white hairs. Head yellowish white, pale yellow above with two black stripes which are often dusky in their middle and slightly converge anteriorly, their anterior ends confluent with the black margins of the antennæ sockets; a black dot on the base behind each eye. Antennæ pale yellow, becoming dark brown towards their tips; basal joint white with a pale tawny spot on the upper side; second joint with a black ring; sockets broadly margined with black except above between the anterior ends of the longitudinal stripes where is an interruption of bright tawny red. Eyes dark golden green. A black crescent under each eye, the anterior horn of which joins the black margin of the antennæ sockets in the middle of their under

sides, and from that point a black stroke is sent downwards upon the cheeks, which stroke is margined on its anterior side with tawny red. Palpi black with white rings. A small oval black spot upon each side of the throat. Thorax with a dusky or black mark each side at its apex and four spots above at the angles of an imaginary square, and behind these a faint yellowish brown spot each side of the middle. Feet pale dull yellowish. Wings pellucid, their tips angular, those of the upper pair very slightly so; an opaque pale greenish yellow stigma; veins pale green; veinlets branching from the rib vein on both sides black at their bases; two series of veinlets towards the tip of the wings black, some of them sometimes pale green. Lower wings, veinlets on the outside of the rib-vein and bases of those opposite to them black. Wings expand 1.10. Found the last of June in this State and also in Illinois. When captured it emits the disagreeable odor peculiar to several of its kindred species.

5: (2.) Head above with black dots but no stripes. A tawny yellow spot on each cheek, commonly with a black line or dot on its posterior edge.

6. (17.) More than two dots upon the top of the head.

7. (12.) Dots six in number, four at the angles of an imaginary square, the anterior two often confluent with the black margin of the antennæ sockets, and one each side behind the eye.

8. (11.) A black dot or streak on the posterior edge of the tawny spot on the cheeks.

9. (10.) Ends of the veinlets black.

The O-MARKED GOLDEN-EYE (*C. Omikron*). This is of a pale green color with a light yellow head and a black O mark surrounding the base of each antenna, broader on the under side, and above interrupted with orange red between the two anterior dots on the top of the head, which are commonly confluent more or less with these black rings. This species corresponds with the one last described in all its details, except that in addition to wanting the black stripes on the head, the veinlets branching from the rib-vein on both sides are black at their tips as well as their bases, and the remaining transverse veinlets are mostly black at their bases; and instead of a line in the tawny spot upon the cheeks this commonly has only a black dot. A variety occurs in which the tawny reddish spot on the upper side of the basal joint of the antennæ is wanting. The wings expand from 0.95 to 1.10, the females being slightly larger than the other sex. It is a common species during the month of June, and exhales the same disagreeable odor as the preceding.

10. (9.) Ends only of the veinlets on the outer side of the rib vein and bases of those given off from its inner side black, all the others green.

The YELLOW-HEADED GOLDEN-EYE (*C. xanthocephala*) is distinguished from the foregoing by having the veins and veinlets all green, except those veinlets which

are given off from the rib vein, which are black at their bases, and those on the outer side at their tips also. It is of a pale yellowish green color with a light yellow head, the orange red spot on the cheeks with a black streak towards its hind edge, and the two anterior dots on the top of the head confluent with the black margins of the sockets of the antennæ, which, between these spots, is interrupted with tawny yellow. Its wings, expanded, measure 1.10. It is much less common than the preceding species, and occurs with it in the month of June. Specimens have also been sent me from Michigan by T. E. Wetmore, Esq.

11. (8.) The tawny spot on the cheeks without any black dot or mark.

The YELLOW-CHEEKED GOLDEN-EYE (*C. fulvibucca*) corresponds with the O-marked golden-eye in the color of its veinlets, and the spots and marks upon its head, except that no black dot or streak occurs in the tawny spot upon its cheeks. Like that species also, this has an impressed line the whole length of the first segment of the thorax, but here that line is crossed slightly back of its middle by a straight transverse one, the ends of which on each side are deep black, and a pale umber brown spot extends from this backwards, nearly to the base of this segment, having an oval black dot outside of it. Forward of the brown spot is a smaller one of the same color, and on the anterior margin on each side behind the eye, as in several of the species, are two short blackish lines converging and confluent at their hind ends. The second segment has also an impressed medial line, and two brown spots upon each side. A variety occurs in which these spots last mentioned are wanting. The wings expand 1.10. This species occurs the last of July and in August.

12. (7.) Four dots only upon the top of the head, situated in a transverse row.

13. (14.) A black crescent-shaped mark under each eye.

The MISSISSIPPI GOLDEN-EYE (*C. Mississippiensis*.) The dead specimen sulphur yellow. Antennæ white, dull yellowish towards the tips, their sockets margined with black with a tawny yellow interruption above in the middle. Head with two black dots above, and one behind each eye. A black crescent under each eye, its anterior horn uniting with the black margin of the antennæ sockets, from which point a black dash is sent downwards upon the cheek, which is edged with pale tawny yellow. Thorax with spots on the first and dots on the second segment analogous to those in the following species. Legs pale green, feet pale dull yellow. Wings rounded at tips; veinlets mostly black, their middle pale green, those towards each end of the outer cell and the two veins towards the tip entirely black. Wings expand 1.20. Taken in the vicinity of Jackson, Mississippi, by my daughter, in the month of April.

14. (13.) A black dot under each eye. Tips of the wings rounded.

15. (16.) Sockets of the antennæ broadly margined with black except upon their outer sides.

The X-MARKED GOLDEN-EYE (*C. Chi*). Antennæ whitish, towards the apex black, their sockets widely edged on their inner sides with black, forming a mark resembling the Greek letter *chi*, or an italic *x*. A large black dot under each eye and another forward of it, with a black point in the centre of the face. Four large black dots in a transverse row upon the top of the head. First segment of the thorax with four large brownish black spots at the angles of an imaginary square; second segment with four black dots also forming the angles of an imaginary square, and a minute one above the base of each fore wing. Abdomen black, except at its tip. Veins black at their ends; veinlets black, the middle ones on the outer side of the rib-vein with a green band on their middle; veinlets of the hind wings which branch from the rib-vein black, those on its inner side with a green band on their middle, those branching inwards from the wavy longitudinal vein slightly black at their bases. Wings expand 1.25. Taken the last of June upon bushes in swamps.

16. (15.) A black Y-shaped mark between and dot below the bases of the antennæ.

The Y-MARKED GOLDEN-EYE (*C. Upsilon*). Light yellowish green. Antennæ dull whitish, dusky towards their tips; basal joint pale green, blackish at its apex on the under side. A black dot under each eye and a somewhat square spot forward of it towards the mouth. Mouth tinged with dirty whitish. Palpi with black rings. Four black dots in a transverse row upon the top of the head, the two inner ones larger. Thorax with four equidistant black spots upon each side in a row, the hind ones on the anterior edge of the second segment; back of these four black dots at the angles of an imaginary square, and another above the base of each fore wing. Abdomen obscure greenish above with two faint brownish dots near the middle of each segment. Wings pellucid, veins pale green, veinlets black, mostly with a pale green band on their middle, their hairs and those of the veins black; hind wings with the veinlets towards the tip, those in the outer cell and bases of those in the next cell black. Wings expand 0.90 in the male, 1.10 in the female. This is one of the earliest appearing species, coming out the last of May and early in June.

17. (6.) Two black dots only upon the top of the head.

The TWO-DOTTED GOLDEN-EYE (*C. bipunctata*). Pale yellowish green. Head pale yellow, with a black dot on each side of its base above, almost in contact with the eye. Antennæ whitish, dark brown towards their tips; basal joint white, with a tawny red band on its upper side; second joint black; their sockets margined with tawny red on the upper and with black on the under side. Eyes brilliant coppery red when alive. Face with a tawny red spot on each side, having an oval black dot in its hind margin. A black stripe under each eye sending a slender line from its lower end forwards to the margin of the antennæ sockets. Palpi white with black tips and rings. Thorax without spots. Wings rounded at tips; veinlets green, some of those arising from the rib vein slightly marked with black at their bases,

those in the outer cell of the hind wings black. Wings expand 1.05. Taken the fore part of June.

18. (1.) Sockets of the antennæ not marked with black.
19. (38.) A dot or spot upon the cheeks.
20. (29.) Cheeks with a black streak or dots under each eye.
21. (22.) Two black dots under each eye.

The COLON GOLDEN-EYE (*C. colon*). Light yellow. Antennæ pale tawny yellow, black towards their bases; basal joint light yellow, unspotted. Face with two black dots each side upon the cheeks. Thorax with a black dot on each side at the apex, and in the middle a transverse but no longitudinal impressed line. Wings slightly angulated at their tips; the two rows of subapical veinlets, those branching outwards from the rib vein and bases of those branching inwards black. Wings expand 1.40. Taken the fore part of June.

22. (21.) A black streak or short line under each eye.
23. (26.) The black line not margined with tawny yellow.
24. (25.) Several of the veinlets black at one or both ends.

The CLEAN GOLDEN-EYE (*C. emuncta*). Light yellow. Head without dots or marks except a short black stroke under each eye, anteriorly joining the narrowed end of a second black stroke. Thorax without spots, save a black point at the apex on each side. Wings rounded at tips, hind pair slightly angulated; veinlets on the outer side of the rib vein black at their bases only in part, all those upon the inner side black at base and tip. Palpi black on their outer sides. Wings expand 1.30. Taken the middle of August.

25. (24.) Veinlets all green.

ROBERTSON'S GOLDEN-EYE (*C. Robertsonii*). Pale green with a whitish stripe from the head along the middle of the back. Head sulphur yellow, without spots except a short shining black stripe under each eye. Antennæ pale dull yellow, basal joint white. Thorax without spots, Legs whitish, feet tinged with brown. Wings rounded at their tips; stigma green, slightly opaque; veins and veinlets all pale green. Wings expand 1.05. Captured at Tullehassie, in the Creek Indian Territory, west of Arkansas, the middle of May, and sent me by William S. Robertson.

26. (23.) Cheeks with a tawny yellow spot in which or on its hind edge is a black line or dot.

27. (28.) Color pale green.

The WEeping GOLDEN-EYE (*C. plorabunda*). Very pale green, with a paler cream yellow stripe from the head the whole length along the middle of the back. Head cream yellow; cheeks pale tawny yellow, with a small black stripe posteriorly under each eye. Antennæ whitish, clay yellow towards their tips. Thorax without

spots. Beneath and legs greenish white, feet pale clay yellow, Wings rounded at tips, the hind pair slightly angular; veins and veinlets pale greenish. A variety, which is common, has a brown or reddish spot above upon each side of the head, contiguous to the eye, in which an ocellus or small simple eye appears to be situated. Wings expand one inch. This is an abundant species the last of September and in October, both in this State and in Illinois, occurring upon the foliage of apple and peach trees, and also upon various wild bushes and weeds.

28. (27.) Color straw yellow.

The COUNTERFEIT GOLDEN-EYE (*C. pseudographa*). Very like the preceding species, but of a straw yellow color without any tint of green, the head brighter cream yellow, the cheeks tawny yellow with a short black stripe running downwards from the under side of the eye, the antennæ, legs and feet, and veins and veinlets of the wings pallid white, the wings rounded at their tips, the abdomen with a smooth more clear white stripe along the middle of the back, upon each side of which at the apex of each segment is a pale tawny yellow spot. A variety has a band of this last color upon the apex of each segment of the abdomen. Though so closely related to the weeping golden-eye, and associated with it, it is evidently a distinct species and is easily discriminated. The wings expand one inch. Several specimens were captured upon apple trees in northern Illinois the fore part of October.

29. (20.) No black dot or mark under the eye. Cheeks tawny yellow between the eye and the mouth.

30. (35.) Ends of some or all of the veinlets black or dark green.

31. (32.) Color sulphur yellow, with orange yellow spots each side of the abdomen at base.

The SULPHUR GOLDEN-EYE (*C. sulphurea*). Bright sulphur yellow, with an orange colored spot under each eye, one on each side of the apex of the thorax and of the basal segments of the abdomen. Antennæ, legs and feet whitish. Wings rounded at tips, the hind pair slightly angular, veins white, the rows of veinlets towards the tips of both pairs of wings and the ends of most of the other veinlets black. Wings expand 1.05. Taken in New Jersey the latter part of September.

32. (31.) Color pale green, with a pale yellow stripe on the back.

33. (34.) A row of orange colored spots above on each side of the thorax and abdomen.

SICHEL'S GOLDEN-EYE (*C. Sichelii*). Pale yellowish green with a pale bright yellow stripe along the middle of the thorax and abdomen. Head white with a large

pale yellow spot above, a streak from the eye to the mouth, a small dot between the antennæ and a spot on the base behind each eye bright orange yellow. Eyes brilliant coppery red with a golden yellow reflection in the living specimen. Antennæ white. Palpi white, their tips brownish. Thorax pale yellow above, pale bright green on each side, bluish white beneath; first segment with a row of three equidistant bright orange spots on each side, the anterior one largest and placed rather more outwardly, an impressed transverse line across the middle; second segment with an impressed longitudinal line crossing the two anterior elevated lobes, and a bright orange spot on each side on the anterior edge. Abdomen pale greenish yellow with a deeper bright yellow stripe above, on each side of which on the five first segments is a bright orange spot, each spot crossed by an impressed longitudinal line, those on the second and third segments larger, their centres tawny; those on the fifth segment small and pale. Legs pale bluish white, feet yellowish. Wings obtusely angular at their tips, the fore ones very slightly so; stigma opaque pale green; veins pale green, the marginal one white; veinlets pale green, the two series towards the tip and the ends of most of the others black. Wings expand 1.05. Taken the first of August. This is the most variegated of our American species belonging to this genus. I name it in honor of my esteemed friend and correspondent Dr. Sichel, President of the Entomological Society of France.

#### 34. (33.) No orange spots along the sides of the back.

THE NEW-YORK GOLDEN-EYE (*C. Novaboracensis*). Pale green with a pale yellow stripe from the mouth the whole length of the body. Eyes dark greenish golden when alive. A bright orange red stripe between each eye and the mouth. Sides of the head greenish white. Palpi pale dull yellowish, tips black and a black line on their outer side. Antennæ whitish slightly tinged with dusky towards their tips. Thorax commonly with a large blackish spot anteriorly on each side, formed of two or three confluent smaller ones. Beneath greenish white. Legs very-pale green, feet yellowish white. Wings angular at their tips, the hind ones more conspicuously so, veins pale green; veinlets black at both their ends except those ending in the inner and apical margin, the two series of veinlets towards the tip entirely black; veinlets of the outer cell of the hind wings black at both ends, those branching from the inner side of the rib vein black at their bases. A variety has the veinlets marked with dark green instead of black. Wings expand 1.05. Common the latter part of June and through most of the month of July, depositing its eggs singly, commonly on the margins of apple and other leaves, elevated upon threads the tenth of an inch long. This, like some of the other species, is perfectly inodorous.

#### 35. (30.) Veinlets entirely pale green or white.

#### 36. (37.) Stigma hyaline, scarcely obvious.

HARRIS'S GOLDEN-EYE (*C. Harrisii*). Like the preceding in all respects, except that it is slightly larger and the veinlets of the wings are greenish white without any traces of dark green or black at their ends. Wings expand 1.15. Taken the last of July and in August. Its cocoon is smooth, of a bright pale green color and a regular oval form, 0.14 long by 0.11 in diameter, whilst that of the preceding species is rough

externally, with numerous threads loosely attached to its surface, and of a white color and a globular form. I have heretofore regarded this species as the *Chrysopa Perla* of Europe, and it is probably the species designated under this name by Dr. Harris (New England Insects, page 215). It does not appear to be fully settled to what species this name is to be applied, the British entomologists (Curtis, Journal of the Royal Agricultural Society, iii. 63; Stephens, Illustrations Mandib. vi. 105) describing a different insect from that of Rambur (Neropteres, p. 424). But on comparing our species with the full descriptions given by these authors, it is evidently distinct from both the European species that have received this designation, neither of which appear to possess a paler dorsal stripe and some other marks belonging to our insect.\*

37. (36.) A blackish brown opaque spot on the stigma.

The VIRGINIA GOLDEN-EYE (*C. Virginica*). Immaculate, save a blackish spot on each side of the thorax at its apex. Wings slightly angular at their tips, veins and veinlets pale green, those branching from the inner side of the rib vein faintly tinged with dusky at their bases; first veinlet of the second row towards the tip black and margined with smoky; stigma with an opaque brown spot, more strongly marked on the hind pair. The small semi-oval cell which is formed in the straight mid-vein towards its base in all our other species is here irregularly quadrangular, and bounded by straight veinlets on each of its four sides. Wings expand 1.35. Taken in Virginia, near Cartersville, by the late Thaddeus A. Culbertson, of Chambersburg, Pennsylvania, whose love of science and activity in its pursuit, rendered his early death a loss to our country.

38. (19.) Cheeks pale and without any spot or dot.

39. (42.) Antennæ black towards their bases.

40. (41.) A black stripe on the outer side of the basal joint of the antennæ.

The STRIPE-HORNED GOLDEN-EYE (*C. lineaticornis*). Pale green. Head white, greenish on the top with two or three small dark brown dots on each side anteriorly, upon the upper edge of the sockets of the antennæ. Antennæ pale brown, basal

\* Next to the *Perla* Fabricius describes a species from the Society Islands in the Pacific ocean, which he met with in the cabinet of Sir Joseph Banks, which is rather larger than *Perla* and of an ash gray color with whitish wings and antennæ double the length of the body, from which last character he names it *filosus*, or the Threadlike golden-eye. I have specimens from the same locality, presented to me by Lieut. Pattison, U. S. Navy, which are perhaps the same species, as they coincide with the description in most of its points. They however are rather smaller than *Perla*, the wings expanding from 0.75 to 0.90, and only the posterior part of the thorax is ash grey, its anterior part and the head being bright yellow and without spots. The antennæ are double the length of the body, blackish, becoming yellow at the base, with a black dot on the upper side of the basal joint; the wings white, but pellucid, their veins and veinlets pale dull yellow. Should this prove to be different from the Fabrician species, as it apparently is, it may appropriately be named the *Chrysopa filicornis*, or Thread-horned golden-eye.

fourth part of their length black, basal joint white with a black stripe the whole length on its outer side. Thorax with an impressed transverse line forward of the base of the first segment, and a longitudinal one on the anterior elevated lobe of the second segment. Legs white. Wings very slightly angulated at their tips; stigma marked by a slight opacity; veinlets dusky or black. Wings expand 1.10. Taken the middle of July.

41. (40.) A black dot on the outside of the first joint of the antennæ at its tip.

The DOTTED-HORNED GOLDEN-EYE (*C. puncticornis*) is perhaps only a variety of the preceding, as it corresponds with it in all respects, except that the basal joint of the antennæ has only a black dot at its apex on the outer side and there are no dots on the edge of the sockets of the antennæ; the first segment of the thorax has two transverse impressed lines and a longitudinal one behind the middle. The abdomen has a brown stripe above on each side. Wings expand 1.15. This also occurs in the middle of July.

42. (39.) Antennæ pale.

The CONSUMPTIVE GOLDEN-EYE (*C. tabida*) is pale green, almost white; the head is white and without spots, except a slight discoloration on the cheeks in some individuals which commonly disappears in the preserved specimen; the antennæ are white their whole length; the thorax is white along the middle and pale green upon each side; the wings are obtusely angulated at their tips, their veins white tinged in places with green, the veinlets greenish white, their ends black, the two series towards the tip entirely black. Wings expand 0.95. Occurs the fore part of August.

The Lace-wing flies pertaining to the genus *HEMEROBIUS* differ from each other much more than those we have been considering. They are generally of pale dull colors, but vary greatly in size, in the veins and spots upon their wings, &c. Most of the following species have three longitudinal veins branching from the rib vein towards its base on the inner side; the three last species, however, have only two such veins, whilst the first has several, and the second has four.

The FRECKLED LACE-WING (*Hemerobius irroratus*, Say) is black and hairy with a pale yellowish stripe on the middle and another upon each side of the thorax. The head, scutel and under side of the body is also pale yellowish. The wings are hyaline and glassy, with numerous irregular blackish spots and dots, those on the margin larger and alternated with whitish spots, and there is a largish darker colored spot near the middle and another towards the tips of the inner longitudinal veins, situated upon their connecting veinlets. The veins are black alternating with white. The hind wings are without spots except in the region of the stigma; their veins are black with only the marginal and rib veins alternating with white. The wings expand from

2.25 to 3.20. This species is rather rare. It begins to be met with about the middle of July and continues until the arrival of cold weather.

Mr. Stephens has also described a species under this same name. Mr. Say, however, appropriated the name to our insect more than ten years anterior to its use by Mr. Stephens. Another name therefore becomes necessary for the British species, which, if it has not already been re-named should be designated the *Stephensii*, in honor of its first describer, the eminent entomologist recently deceased.

Mr. Say in connection with the preceding (in the appendix to Long's Expedition, page 306) describes another species, the *vittatus* or Striped lace-wing, from a specimen in the Philadelphia museum, found by Mr. Titian Peale, in New Jersey. This is of the same size with the Freckled lace-wing and closely resembles it, but has the body of a pale yellowish color with a broad blackish stripe upon each side of the thorax, and a small white spot on the outer edge of the fore wings near the tip. I have never met with this, which appears to be a rare species.

The ALTERNATED LACE-WING (*H. alternatus*) is dull whitish or yellowish white varied with dark brown, and is clothed with short pale yellowish hairs. Its face and a stripe on each side of the thorax is blackish brown. The abdomen is dull whitish with a clearer white stripe along each side, which is margined above by a row of spots and below by a slender line of a brown color. The wings are pellucid and iridescent red and green; the veins are white with alternating blackish spots giving off fine bristles of the same color. The veinlets are black, robust, and broadly margined with smoky, forming two irregular rows of spots across the wing, with a third short one between them upon the inner margin. The margin is whitish, with dusky spots of different sizes, the larger spots having two or sometimes only one smaller spot between them. The hind wings are pellucid, their veins white, those next to the rib-vein with dusky spots, the veinlets blackish but not margined with smoky; the inner fork of the innermost longitudinal vein is also blackish from the anastomosing veinlet half way to the furcation. The margin of these wings is whitish alternating with dusky spots around the apex. A dot or short line is placed on the margin between the tips of all the veins and their forks. The wings expand 0.80. This occurs the last of June, particularly upon pine and hemlock bushes.

The STIGMA-MARKED LACE-WING (*H. stigmaterus*) has the veins of the fore wings black with white bands; the cells are smoky with clearer spots at each of the white bands upon the veins; stigma opaque tawny reddish; two series of black anastomosing veinlets; a third veinlet near the inner base connecting the first longitudinal vein with the inner fork of the second longitudinal, and on the opposite side continued to a branch of the first longitudinal, thus forming two closed basal cells, the outer one of which is long and narrow, with the second longitudinal vein forking near the middle of this cell. This last mentioned veinlet is more robust and more obviously margined with dusky than the others. Head and antennæ pale dull yellow; legs paler; thorax and abdomen blackish brown. A variety which is common has the tip of the abdomen pale yellow, and another variety has a pale stripe along each side of the abdomen. The wings expand from 0.55 to 0.60. This is a common species throughout the Northern and Western States, occurring from March until October, resting upon the foliage of various evergreen and deciduous trees and upon the grass

of meadows and prairies. I have met with it upon peach but never upon apple leaves. The margin of the fore wings presents a curious appearance, being occupied like several of the other species with a row of dots, which, when magnified, resemble a string of beads, and it is almost always the case that, around the entire margin, every fourth dot is white, the other three being black.

The CHESTNUT LACE-WING (*H. Castanea*) has all the veins white alternated with black or brown rings, with the usual two series of veinlets black feebly margined with dusky; a large blackish dot on the first longitudinal vein at the apex of the outer basal cells, and a smaller one at the next fork beyond this, and similar dots on the inner rib-vein at the origin of each of the discoidal veins; wings hyaline, the margins faintly tinged with smoky. Body whitish with a large spot under each eye, a stripe on each side of the thorax and a row of spots on each side of the abdomen brown. Wings expand 0.65. This is one of the most common species throughout the northern and northwestern States, and both the larvæ and the perfect insects may always be found upon chestnut trees infested with plant-lice, and also upon the walnut and other trees, from April till October. It varies much in the depth of the color of the dots on the wings and the rings upon the veins, these being sometimes black and very distinct and at other times much more faint, either brown or tawny. The dots on the margin are white interspersed irregularly with black ones. A variety has all the rings upon the veins black and more broad than usual, and instead of the three dots which commonly occur upon the inner rib-vein this vein is annulated with black through its whole length. The larva is white or tawny yellowish, with a slender brown line in the middle and a row of blackish spots on each side, the head with two large longitudinal black spots and a black dot above the base of each leg. Its sides have a serrated appearance, from a row of projecting tubercles the tips of which are furnished with slender radiating hairs.

The PRESERVER LACE-WING (*H. tutatrix*) has translucent wings with white veins, which on the fore wings have black rings at somewhat regular intervals, and from each side of each ring proceeds a short smoky brown line, which is inclined towards the apex of the vein, thus forming a series of V-shaped marks crossing the veins at each ring; near the base of the inner margin of the fore wings are a few black dots. The body throughout is white tinged with yellowish; the thorax has three brown spots on each side which are often somewhat confluent into a continuous stripe; the abdomen has a row of eight brown spots each side of the middle, situated upon the sutures. The wings expand 0.60. This is much like the preceding species, but is a size smaller, with the wings more clear and glassy and without any dusky tinge towards their margins, and with the series of marginal dots all white. It was captured in September upon apple trees.

The UNITED-VEINED LACE-WING (*H. conjunctus*) has pellucid wings becoming dusky towards the margins; veins of the fore wings white with blackish rings and bands; a blackish spot around each of the veinlets except the two innermost ones, and a smaller spot at the base of each discoidal vein; marginal dots alternately black and brown, the black ones occupying the apices of the veins; lower wings and their veins without spots. Wings expand 0.53. The wings are spotted much like those of *alternatus*, except that the margin is wholly immaculate. Its spotted wings at once separate it from the following species, which differ from all our other lace-wings with

three discoidal veins by having, like this species, an anastomosing veinlet running inwards from the base of the first discoidal. This species occurred upon pine bushes the latter part of May.

The PINE-BUSH LACE-WING (*H. Pinidumus*). Wings hyaline, slightly tinged with smoky, the marginal dots all of a uniform brown color; veins of the fore wings white with brown rings; veinlets black margined with dusky, forming a few brown spots, of which three or four form a curved row across the disk. Body pale dull yellow, sides of the thorax brown. Wings expand 0.45. This is nearly related to *tutatrix*, from which, however, it is readily distinguished by having a slender anastomosing veinlet connecting the second longitudinal vein with the base of the third longitudinal or the first of the three which branch from the rib-vein. It may frequently be met with upon pine bushes, from May till the last of July.

The GLASSY LACE-WING (*H. hyalinatus*) is much like the preceding, but the wings are more clear and glass-like, their veins very faintly mottled with dusky, the veinlets colorless instead of brown and not in the least margined with dusky, and in the middle of the inner margin forward of the medial series of veinlets, are two or three veinlets connecting the first longitudinal vein and its branches with the margin. The marginal dots are unicolor. Wings expand 0.45. Possibly this is only a variety of the preceding. It occurs with it upon pine bushes in May, June and July.

The LITTLE FRIEND LACE-WING (*H. amicus*). Two discoidal veins only arising from the inner rib-vein, as in the remaining species. Wings hyaline mottled with smoky dots and irregular unequal spots; margin of the fore wings with a regular series of black dots, one between the apex of each of the veins, but none upon the tips of the veins; veins brown dotted with black, more conspicuously so in the axilla and the area outside of the rib-vein; veins of this last mentioned area (the costal) forked; the two rib-veins rather distant from each other, with an anastomosing veinlet towards their base; second discoidal fork anastomosing with the outer branch of the first near its base, then forking, with the outer fork anastomosing twice with the rib-vein and once with the inner fork; slightly forward of this last is another veinlet connecting the inner fork of the second discoidal with the outer fork of the first discoidal, and a second, commonly continuous with this last, connecting the outer with the middle fork of the first discoidal; another veinlet is situated half way between this and the base of these forks, which is the first of a series extending inwards and bordered with dusky, which color is continued onwards to the inner margin; there are also three veinlets towards the base. The hind wings are hyaline and without spots or veinlets; the margin has a dot between the tip of each vein. Body dull brown, antennæ yellowish, legs dull white. Wings expand about 0.42. Taken from May until October, on peach trees and on wild shrubs, both in this State and Illinois.

The WESTERN LACE-WING (*H. occidentalis*) has the wings hyaline and not mottled with smoky dots or clouds, but adorned with two faint parallel lines of a more dusky tinge in all the cells; margin dusky; veins and veinlets robust, black; a black dot on the margin between the tips of each of the veins; outer fork of the first discoidal vein anastomosing with the rib-vein near its base instead of with the second discoidal as in the preceding species, the other veinlets similar in situation to those of the pre-

ceding. Body blackish; antennæ shorter than the body, robust, thread-like and not tapering, black; legs pale. Wings expand 0.38. Taken in Illinois, on bushes beside Henderson river, the first of October.

The TITMAN LACE-WING (*H. delicatulus*). Two veins arising from the inner rib-vein, the first more towards its base, the second more towards its tip than in the preceding species; wings hyaline with dusky dots on the veins and a single row of veinlets running obliquely across the disk from the rib-vein to the first longitudinal and broadly margined with dusky; veins pale brown, those of the costal area blackish, the alternate ones towards the base forked, all the others simple; margin thinly fringed with short hairs, a dot on the tips of the veins and a smaller one between them. Body dusky yellowish; antennæ longer than the body, brownish; legs pale. Wings expand about 0.40. Swept from the grass of prairies in Illinois, the first of October.

Another insect closely related to the HEMEROBIIDÆ, and the larva of which is supposed to feed upon plant-lice, may be noticed in this connexion. It is of minute size, and by no means rare, occurring upon apple and other trees, and also upon the wing at twilight or in shady situations, from early in June until the end of July. It is so anomalous that, at one time and another, I have been occupied several days in investigating it and determining where it should be arranged. When first captured I supposed I had a species of *Aleurodes* in hand, its minute size, its mealy-white coating, and the size of its wings giving it a close resemblance to the insects of that group. Indeed the European species allied to this were at first placed by Mr. Stephens in that family. But the number of veins in the wings and of joints in the feet and antennæ, and above all the structure of the mouth with jaws for masticating food and not a beak for suction, absolutely excludes these insects from such an association, and also from being arranged with the moths, where the old authors placed them. It is obvious that our insect pertains to the order NEUROPTERA. And in this order its many points of resemblance to the *Coniopteryx Tineiformis*, Curtis, leaves no doubt that it finds its true relatives with that insect and its associates, the classification of which has so much perplexed the entomologists of Europe. Whilst Messrs. Curtis and Stephens associate this genus with the PSOCIDÆ, Mr. Westwood regards it as having more affinities with the HEMEROBIIDÆ. Important differences, however, separate it from both of these families. It is unlike the Psocidæ in having five-jointed feet, and antennæ of a different form and with joints doubly numerous; and differs from the Hemerobiidæ in having wings

with but few veins and veinlets, the hind pair smaller than the anterior, &c., and is separated from both these families by the mealy coating of the perfect insects. Its arrangement in either is evidently incongruous. Dr. Burmeister has therefore elevated these insects to the rank of a distinct family, named CONIOPTERYGIDÆ or Mealy wings, the single genus *Coniopteryx*, with its four European species, being all that is at present known pertaining to this family.

On comparing our insect with those of Europe, although its general resemblance is so close, we notice some important discrepancies in its details. The veins of its wings are more simple and less connected by anastomosing veinlets, there being but one of these veinlets in the disk of the wing, and three near the base, arranged in a continuous line, and leaving only the outer and inner veins insulated from their origin to their tips. Thus, while the European insects have three closed discoidal cells, in our insect there is but one. The veins of the hind wings in the European species are forked and connected by veinlets, whilst in ours there are no veinlets, and only one of the veins is forked. Westwood states the wings to be wholly destitute of ciliæ or fringe-like hairs along the margin, whilst here a series of short, fine erect hairs are very distinct along the apical and inner edges. The eyes moreover are widely notched and kidney-shaped, instead of being round. These differences forbid our including our insect in the same genus with those of Europe. It will therefore form a second genus in this family, for which I propose the name *Aleuroxia* (Greek ἀλευροξία, farina or dust) having allusion to the mealy coating with which these insects are covered. And as Mr. Westwood (through whose kindness my cabinet has been enriched with specimens, particularly of some of the minute and interesting species which he has described) was the first to separate the insects of this group generically, this species may appropriately be dedicated to him. Whilst the more simple veins of its wings would approximate this family more closely than heretofore to the Psocidæ their ciliated margins give it an additional resemblance to the Hemerobiidæ, and leave the question as to which

of these families the present is most nearly related in much the same doubt in which it has hitherto been.

WESTWOOD'S MEALY-WING (*Aleuroia Westwoodii*) measures one-tenth of an inch to the tips of its wings which project a third of their length beyond the tip of the abdomen, against the sides of which they are held almost perpendicularly when at rest. It is of a blackish color, its abdomen bright yellow of a paler or deeper tint, its legs pale, and the whole surface of its body and limbs is dusted over with a white meal-like powder, except the antennæ, which are black, thread-like, about two-thirds the length of the body and composed of about twenty-eight joints, whereof the basal is the thickest, and the second is longer than those which succeed, which are all of equal size and short cylindrical, their length and breadth equal, the apical oval. The head is elevated upon a short neck in the living specimen and is wider than long, round and flattened in front; the palpi rather long, five-jointed, the apical joint oval, and as long as the two which precede it taken together; the labial palpi three jointed, their apical joint large and egg-shaped. Legs of medium size, the hind pair longest and about equalling the body in length; feet five-jointed, the basal joint cylindric and forming nearly half of their whole length, the third joint shortest, the tips ending in two minute hooks. The wings are broad, rounded at their ends, with six veins proceeding from the base, whereof the second or rib-vein gives off two branches, one at the end of the anastomosing veinlet near the base and the other forward of the middle, both of these branches forking rather beyond their middle, thus making ten veins which end in the apical and inner margin. The first of these branches forward of its furcation sends an anastomosing veinlet inward to the next or mid-vein, which, with the rib-vein, are obviously thicker and more robust than the other veins. The hind wings have five veins ending in their margin, whereof the second and third unite near the middle of the wing.

Having occupied so much space in describing the aphidions and their habits, we present but a brief sketch of the habits of the remaining destroyers of the plant-lice, reserving a description of their species for a future occasion.

Equal to, or even surpassing the aphidions, in the havoc which they make among colonies of plant-lice and the numbers which they devour, are the insects popularly called lady-bugs or lady-birds. These pertain to the Family COCCINELLIDÆ, in the Order COLEOPTERA. The eggs of these insects—smooth, oval, and of a bright yellow color—may frequently be met with upon the under surface of leaves, placed in a cluster of twenty, thirty or forty, in contact with each other, and gummed by one end to the leaf. These hatch within a few days, a small blackish larva coming from them, which is slender bodied, tapering posteriorly and with six legs anteriorly. It walks about with much animation, and

coming to a plant-louse, much larger than itself it may be, the little hero, though only a few minutes old, boldly seizes the louse, which, like a cowardly poltroon, makes no resistance except trying to pull himself away. But the little assailant hangs lustily to him, preventing his advancing a single step further, and using his anterior legs as arms, he commonly raises the louse off from the leaf and leisurely devours his body, leaving only the empty skin remaining. As he grows, the sides, and in some species the whole surface, becomes diversified with bright red and yellow spots and rows of tubercles or elevated points. He is a most active voracious little creature, running briskly over the limbs and leaves in search of his prey, and consuming hundreds of aphides. He grows to about a quarter of an inch in length in the course of two or three weeks; he then fixes himself by his tail to a leaf, or the limb or trunk of a tree, and hanging with his head downwards the skin cracks open along the middle of his back, and the smooth back of the pupa protrudes partly out of the prickly skin of the larva, and thus remains, the old larva skin continuing to cover the pupa on each side and beneath. But in some of the species, a fact which I do not find mentioned by authors, the larva skin is thrown entirely off, its shrivelled relics remaining around the tail. It is thus with one of our largest species, named the apple-tree lady-bird (*Coccinella Mali*) by Mr. Say, but which had long before been described by the celebrated French entomologist Olivier, under the name of the fifteen-spotted lady-bird (*C. 15-punctata*); and probably the pupa of the European *C. ocellata* will be found to throw off its larva skin in this same manner, as these two species are closely related, and have been elevated to a distinct genus named *Anatis* by Mulsant. The pupa of the fifteen-spotted lady-bird is quite pretty, being of a clear white color with the middle of its back tinged with flesh-red, and with from two to six black spots of different sizes on each of the segments, the sheaths of the elytra also having a broad black border upon their inner side and four black spots. Exposed as the pupa is upon the surface of a leaf or of the bark, it probably is often discovered and devoured by birds, and to save it from such a casualty appears to be the design of Nature in having most of the species retain their prickly larva skins. When annoyed by the

approach of a fly or other insect, the pupa gives a sudden spiteful jerk, by which to frighten the intruder away, and if this fails, by a sudden spring it elevates itself so as to stand out at right angles from the surface to which it is attached, remaining motionless in this posture about a half minute, when by a similar spasmodic snap it returns to its usual position.

The insect remains dormant in its pupa state about a fortnight, when its hard exterior shell cracks open, and from it crawls a small shining beetle nearly the size and shape of a half pea, though often much smaller than this. The species generally are prettily colored, being bright red, yellow or white, with black spots, or black with red or yellow spots. These different spots and colors serve as marks whereby to distinguish the different species, of which nearly a hundred are named and described, inhabiting the United States. The perfect insects subsist upon plant lice also, though they pursue and devour them with less avidity than when in the larva stage of their lives. They may always be met with where plant-lice abound, and I have known persons who supposed that it was these insects which bred the plant-lice, and who consequently made it a point to destroy every one which they could discover upon the currant bushes, cherry trees, &c., in their yards, and who were surprised to find that notwithstanding all their care and pains in searching out and destroying these "old ones," their shrubs and trees appeared every year to be worse infested with lice than were those of their neighbors. This fact is but one of a multitude which might be adduced, showing to what sad mistakes ignorance leads, and how important it is that information with respect to our insects and their habits should be diffused among our citizens.

Other inveterate enemies of the plant-lice are certain two-winged flies pertaining to the Family SYRPHIDÆ, in the Order DIPTERA, which family has the genus *Syrphus* as its type. These flies resemble our common house-fly in size and shape but are much handsomer, being of a bright yellow color with various spots and bands of black, according to the species. They may frequently be seen in summer hovering around and alighting

upon flowers. These flies drop their eggs, one in a place, upon leaves and twigs which are infested with plant-lice, so that their young may have their appropriate food immediately around them the moment they require it. One can seldom inspect many infested leaves without meeting with one or more of the eggs of these flies scattered around among the lice—little white smooth oval bodies, much like the eggs which the bot fly glues to the hairs of horses' fore-legs. From them a maggot hatches which in its motions will remind one of a leech or blood-sucker. It has no eyes, and consequently cannot see in which direction to crawl in search of its food; but fixing the hind extremity of its body to the surface of the leaf, it reaches as far as it is able to stretch itself and feels around first upon one side and then upon the other. If nothing is discovered it moves along one or two steps and again feels all around, until finding a plant-louse it at once fixes its tiny mouth at the slender-pointed anterior end of its body to its prey, having such power of suction as not only to hold the louse from escaping but to tear it away from its attachment and raise it up in the air wholly away from the surface of the leaf. The louse sprawls its long legs about in a vain endeavor to touch some support to enable it to escape. Its body is soon perceived to be diminishing in size, the worm sucking out the fluids which it contains, and in a minute's time, or less, nothing of it remains but an empty shrivelled skin. These Syrphus-worms are of various colors, almost transparent and watery, or white, or greenish, and commonly clouded or spotted, particularly in the centre of their bodies, with more opaque white, yellow, tawny or red, and their skin is so thin and transparent that the circulation of the fluids within may be distinctly seen even with the naked eye in the larger worms. Some of them have two cylindrical processes like little straight horns jutting out from the hind part of their bodies. One or more of these worms may almost always be met with wherever a colony of plant-lice is located, and one medium sized worm will consume a hundred of these insects in an hour. The ants do not appear to molest them, but the aphid-lions, as already remarked, devour them with avidity. When the worm has completed its growth it fixes itself to the surface of the leaf or the bark, and contracts to a shorter oval form; its skin becomes hard

and horny, with numerous impressed transverse lines, and changes to a dull yellow or a black color, and those species which have two horns forward of the tip still retain them. Within this shell the insect puts on its pupa form, from which the fly subsequently hatches.

The aphid likewise has foes within as well as without. In addition to the several insects of which we have now treated, all of which attack it externally, it has internal enemies also, a group of insects which dwell in the interior of its body during their larva state, and eventually kill it. These are nearly as efficient in keeping its numbers reduced as any of those which we have been considering. We will speak more particularly of them in connection with the aphid which infests the cherry.

A succession of the several species of these different kinds of destroyers are making their appearance the whole season through, and as many of these species are among our most common insects, it will at once be perceived that they render us most important services in destroying these pests of vegetation, and preventing them from becoming excessively multiplied notwithstanding their unparalleled fecundity. But without actually observing them at their accustomed work no one can fully appreciate their value to us, and the amount of herbage which they save from destruction. Wherever plant-lice become numerous there these several kinds of enemies speedily congregate and rapidly multiply, devouring incredible numbers of these vermin, and often in a surprisingly short space of time completely exterminating them.

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#### AFFECTING THE FRUIT.

In a round cavity ate near the tip end of the young fruit; a minute, very slender blackish-purple insect, with narrow silvery-white wings upon its back resembling a long Y-shaped mark.

THE APPLE THRIPS. *Phlæothrips Mali.*

Although a profusion of flowers in the spring is often hailed as a harbinger of a copious yield of fruit, this expectation is very frequently disappointed. Whilst they are yet young, quantities of

apples, plums, and other fruits wither and fall from our trees, often literally covering the ground beneath them. Young apples are thus blasted in consequence of the punctures and wounds which they receive from the Apple worm or Codling moth, the Plum weevil, and other insects. Among these destroyers is one which has hitherto escaped notice, more in consequence of its minute size, probably, than its rarity; for we suspect it will prove to be a common insect.

In the month of August several apples were noticed upon the trees which were small, withered, and ready to fall, yet without any of those worms in them which occasion the destruction of so much fruit at this season of the year. On searching for the cause



of this withering of these apples we found a small cavity or little hollow at the tip end, commonly close beside the relics of the flower. This cavity had the appearance of having been gnawed; it was about the size of a pea, and its surface of a black color. Several

of these cavities were occupied by a minute slender insect; and from appearance I inferred that the young of these insects had taken up their residence upon the apples whilst they were quite small, and by wounding them slightly day after day, had retarded their growth and finally caused them to wither. It is possible that some other insect had originally produced these wounds, and that these which were now there had been attracted to the wounds to suck their juices; but every appearance indicated that these were the real culprits. They pertain to the group THRIPSIDÆ, which is composed almost entirely of minute species like the present, which subsist upon the juices of plants, especially melons, cucumbers, beans, &c., to which they are often quite injurious, producing small decayed spots upon the leaves. They also occur in numbers upon different flowers. We have several American species of these insects, none of which have yet been studied out and described. This which occurs in wounded spots upon young apples, appears to pertain to the genus named *Phlæothrips* by Mr. Haliday, and I propose for it the specific name *Mali*, or the Apple Thrips.

This insect measures only six hundredths of an inch in length and one hundredth in width. It is polished and shining, and of a blackish purple color. Its antennæ which are rather longer than the head and composed of eight nearly equal joints, have the third joint of a white color. The abdomen is concave on its upper side, and is furnished with a conical tube at its tip which has a few bristles projecting from its apex. The wings when folded are linear, silvery-white, and as long as the abdomen; they are pressed closely upon the back, spreading asunder at their bases, and appear like an elongated white Y-shaped mark. Viewed from above, the head is of a square form, longer than wide. The first segment of the thorax is well separated from the second, is broadest at its base, and gradually tapers to its anterior end, where it is as wide as the head. The following segment is the broadest part of the body and square, with its length and breadth equal.

The insects of this tribe, abroad, are found to be great pests and difficult to exterminate. Dusting the vegetation which they infest with flower of sulphur and washing it off a few days afterwards has been found successful in some cases. It is probable that when young and in their larva state they are more tender and more easily destroyed than when mature. But until the history of this species which infests our apples has been more fully observed we shall scarcely be able to decide upon the most judicious measures for combatting it.

## 2. THE PEAR.

### AFFECTING THE LIMBS.

A hemispherical chestnut-brown scale, the size of a half pea, upon the under sides of the limbs the latter part of June.

The PEAR BARK-LOUSE. *Lecanium Pyri*, SCHRANK.

As the pear is so closely related to the apple, most of the insects which affect one of these trees will be found upon the other also. We have already noticed this fact in repeated instances when considering the insects of the apple tree. But in addition to those species which are common to both, there are others which are limited to one of these trees and never invade the other, except perhaps in those extreme cases when they become so multiplied upon their appropriate tree that it fails to afford sufficient room and nourishment for all the individuals which are called into existence.

Of those insects which are peculiar to the pear, the only one which has as yet fallen under my notice is a species of bark-louse, which, it is altogether probable, is the same which occurs upon this tree in Europe, named *Coccus Pyri* by Schrank (Fauna Boic. ii. 1. 145), and which pertains to the modern genus *Lecanium* in the Family COCCIDÆ and Order HOMOPTERA. This insect had never been publicly noticed as an inhabitant upon this side of the Atlantic, that I am aware, when, upon the first of July, 1854, I met with it quite common upon pear trees in the cities of Albany and Troy. I observe, however, that Dr. Harris, in his discourse before the American Pomological Society in September last (page 8), incidentally mentions the fact that our pear trees "suffer occasionally from bark-lice."

The form under which this insect appears is that of a hemispherical scale about 0.20 in diameter and of a chestnut brown

color, adhering to the bark on the under sides of the limbs, particularly of young trees which are growing thriftily. These scales are the relics of the dead females covering and protecting their young. Some are of a darker color than others, and smaller ones occur which are of a dull yellow hue. These scales are not freckled with paler spots like many of our species of bark-lice; their surface frequently presents shallow indentations as though it had been slightly pressed upon in places with the head of a



pin, and the outer margin is wrinkled, as shown in accompanying figure, and is sometimes marked with faint black bands. If one of these scales is removed a round white spot the size of the scale remains upon the bark, appearing as though made with chalk. Upon the underside of one small twig, in a distance of nine inches, thirteen of these scales occurred and five white spots where other scales had been rubbed off.

At the time when I noticed these scales the young lice under them were active and so minute that they appeared to the eye like particles of dust. I conveyed a twig to my residence and bound it to a thrifty limb of a young apple tree, to ascertain whether they could subsist upon this tree; but they all perished, not one of them leaving the pear twig, that I could discover. The following May the chalk-like spots where the scales had been fixed upon the twig were still distinct, the storms and frosts of autumn and winter having scarcely dimmed them in the least.

Beneath the scales the young lice are interspersed through a mass of white cotton-like matter. This subsequently increases in volume and protrudes from under one end of the scale, elevating



it from the bark, as shown in the annexed cut. The young lice now crawl out from among this matter and diffuse themselves over the smooth bark, appearing to the eye like minute whitish specks or fine dots. When magnified they are found to be of an oval form, somewhat flattened, about the hundredth part of an inch in length, and two-thirds as broad as they are long. They are of a dull white color, with six legs and two short antennæ of a hyaline-white appearance. The antennæ are thread-like or of equal diameter through

their whole length, and are about one-fourth the length of the body. They are composed of several small joints and are clothed with a few fine longish hairs.

I have not had an opportunity to trace the history of this insect further, but doubtless, like the other species of this genus, the young larvæ in a short time fix themselves to the bark and increase somewhat in size, but retain the same form through the winter; and early in the spring the males enter their pupa state, and soon after come out under the form of minute delicate flies with only two wings; whilst the females, without undergoing any very obvious change, gradually grow to the size and form of the hemispherical scales already described.

A parasitic insect, which probably pertains to Mr. Westwood's genus *Coccophagus*, in the Family CHALCIDIDÆ and Order HYMENOPTERA, lives in the bodies of the females, subsisting upon their young. The worm, which is doubtless similar to that noticed under scales of the Apple bark-louse, but of a larger size, having completed its changes makes its escape through a rather large round hole which it gnaws in the scale. Several scales were observed which were thus perforated, the hole being rough and jagged at its edges, and the scale being of a paler color at the part surrounding this perforation.

This insect cannot but prove very detrimental to the pear tree when the females are present in such numbers as they were in the instances in which I met with them. No tree can remain thrifty and vigorous with such a number of tiny beaks inserted every where in the smooth tender bark as a few of these females upon each limb will breed. Fortunately they are of such a size that they can easily be seen upon a careful inspection of the under sides of the limbs, and can readily be removed. They should be looked for the latter part of June, as the females will then have attained their full size; and wherever they are discovered the under side of the limbs should be rubbed with a brush or a sponge to dislodge every scale which can be perceived. Being at this time nearly or quite dead, and wholly destitute of legs, they will be unable to reascend the tree when brushed off, nor are the young sufficiently strong to crawl away from their parents.

### 3. THE PEACH.

#### AFFECTING THE ROOT.

Cankering and destroying the bark of the root and causing the gum to exude profusely; a white cylindrical fourteen-jointed worm, with six true legs and ten pro-legs.

THE PEACH-TREE BORER. *Egeria exitiosa*, SAY.

With all the care and attention which can be bestowed upon the Peach tree, it is much more short lived at the present day than when the country was newer. What medical men would term a change of "diathesis" appears to have taken place; some alteration in the soil or climate has occurred, whereby this valuable fruit tree cannot be grown so readily and successfully as formerly. Hon. John A. King informs me, that when the property which he now occupies at Jamaica, on Long Island, was purchased by his father, in the year 1816, there were growing contiguous to the farm mansion, peach trees which were thrifty and vigorous, although they were scores of years old and of such size that it was necessary to climb up among the limbs to gather the fruit. The fruit, moreover, was of a finer quality and a more delicious flavor than any which is met with at the present day. Upon the same ground he can now obtain but one fair crop of fruit; as soon as a tree has yielded this it produces no more, but rapidly dwindles and dies. The Messrs. Parsons, nurserymen at Flushing, confirm this statement. They say that four bearing years is the utmost that can be anticipated from this tree, and that to insure a supply of this fruit annually, it is indispensable that new trees be set out every year. They say there would seem to be some peculiar principle or quality in the soil favorable to the growth of the peach, which has now become exhausted upon

Long Island and in the adjacent districts, so that this tree does not now flourish as formerly. And similar to this is the concurrent testimony of nurserymen and writers in our agricultural periodicals. Whilst upon new land at the west and southwest, without any of the care and attention which we here bestow, this tree grows with all its pristine vigor and luxuriance.

Two maladies, more particularly seem to attack and destroy this tree, preventing it from attaining that age and size which it formerly acquired. These are, the "yellows," which seems to be a kind of decline or consumption peculiar to this tree, and the borer or grub at the root, the insect which we are now to consider. This last is confessedly the worst enemy which the peach tree has to encounter in our country. During the past year, 1854, I noticed it everywhere, from the banks of the Hudson to those of the Mississippi. At the west, however, it is much less common, and by no means so destructive as with us. My own residence is near the northernmost limit where the peach can be cultivated, the severity of the winters commonly destroying the trees whilst they are young and tender; and as I here had never captured the moth which produces these borers, I have hitherto supposed this was beyond the limit to which this insect reaches. But of a dozen peach trees in my yard, now about ten years old, I the present spring find all except one are destroyed, the roots being surrounded and enveloped in a mass of jelly-like gum from one to three inches in thickness at the surface of the ground, and the bark entirely eroded and with worms of all sizes burrowing in it. And throughout this district of country the peach trees are almost all found to be dead the present spring. It is universally supposed and confidently affirmed that it has been the winter which has destroyed them. But in several instances where I have informed persons of the condition of my own trees, they find, on coming to examine theirs, that the roots are surrounded in the same manner with a bed of exuded gum, in which a number of worms are nestled. It is thus evident that it is the borer and not the winter that has occasioned this wide-spread calamity, and that the evil which we have suffered might have been averted by

timely care. It would appear that the excessive drouth of the past summer and autumn had favored the multiplication of the moths which produce these borers, bringing them out in such numbers that the roots of all our peach trees were stocked to repletion, and the insects were obliged to resort to other kinds of trees to dispose of a surplus portion of their eggs, as we shall presently see.

Many intelligent persons, who are acquainted with this insect and the Apple tree borer only in their larva states, cannot fully persuade themselves that the two are really different insects, so much do the worms resemble each other in their external appearance and the habit of attacking the trees at the surface of the ground. But any one who places them side by side will readily perceive that they differ from each other in several important particulars. The Peach borer is cylindrical and not broader anteriorly, like the Apple tree borer; it has three pairs of small feet, whilst the Apple tree borer has none; it has only a few scattered coarsish hairs, whilst the Apple tree borer has numerous fine shorter ones. Such important differences prove that these worms are really distinct. They differ much more widely when they come to attain their perfect state. Whilst the Apple tree borer is transformed, as we have already seen, to a Long-horned beetle, the worm of the peach tree changes to a four-winged fly, bearing some resemblance to a large wasp, and pertains to the Family *ÆGERIDÆ* of the Order *LEPIDOPTERA*.

This insect was named *Ægeria exitiosa* or the Destructive *Ægeria* by Mr. Say, and was described by him in a communication giving an account of its habits by Mr. James Worth, which was published in the Journal of the Philadelphia Academy of Natural Sciences, (vol. iii. p. 216) in the year 1823. Mr. Worth having obtained the winged moths in July supposed this month only was the one in which the perfect insect makes its appearance. But whoever examines infested roots will find worms upon them of all sizes, at all times of the year. Even in the winter small worms occur with others which are full grown, showing that these last will complete their changes much earlier in the season than

the former. The insect, however, does not commence coming out in its winged form so early as would be expected from the large size and matured appearance of many of the worms in the winter season. The stumps of five of my dead trees were allowed to remain undisturbed. Around these thirteen chrysalids were found upon the tenth of July, none of them having hatched the perfect insects. They were removed to a pot of moist earth, and the first winged moth came out upon the fourteenth of that month. The first female appeared upon the twenty-fourth, six males having hatched upon the preceding days. Twelve more chrysalids were found at this date and were placed in the pot with the others. Males and females continued to come out in about equal numbers afterwards, the two last of this stock making their appearance upon the fifteenth of August. The pupa state therefore lasts at least three weeks in the warmest part of the summer, and it appears to be the latter part of July and in August that the females come abroad to deposit their eggs in this latitude. Farther south they doubtless begin to appear earlier in the season.

The eggs are smooth, oval, slightly flattened, of a dull yellow color and 0.025 long. Some of the dark blue scales from the tip of the abdomen of the parent are often glued to them. They are deposited upon the bark at the surface of the ground, and the worms hatching from them work downwards, at first in the bark of the root, forming a slender flexuous channel which becomes filled with gum. At the distance of an inch or two below the surface the whole of the bark of the root becomes consumed in badly infested trees, and the soft sap-wood is also extensively gnawed and eroded, so that frequently the root is nearly severed, as shown in the accompanying figure. The larger worms in the winter season repose with their heads upwards, in contact with the exterior surface of the root, commonly in smooth longitudinal grooves



which they have excavated, their backs being covered over with their castings mingled with the gum and with cobweb-like threads,

thus forming a kind of cell the cavity of which is considerably larger than the body of the worm inhabiting it. The smaller worms have no such cells, but lie promiscuously in the gum or between it and the root. Although from their habits they would seem to have no particular use for it, these worms, like those of their order generally, spin a silken thread as they crawl about, which is of sufficient strength to hold them suspended in the air when one drops from a stick on which he is placed.

When ready to enter its pupa state the worm crawls upwards to the surface of the ground, and there forms for itself a follicle or pod-like case of a leathery texture, made from its castings, held together by dry gum and cobweb-like threads. This follicle is of a brown color and oval in its form, with its ends rounded; it is about three-fourths of an inch long and over one-fourth in diameter, but is variable in its size, being sometimes but half an inch long. Its inner surface is perfectly smooth and of the color of tanned leather. It is placed against the side of the root, often sunk in a groove which the worm appears to have gnawed for this purpose, with its upper end slightly protruding above the surface of the ground. But if the earth has been recently stirred so as to lie loose around the root, the worm will commonly form its follicle an inch or more below the surface.

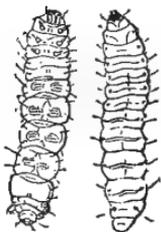
Among the means whereby to grow the peach securely from the depredations of this worm, Dr. Harris, in his discourse before the Pomological Society (page 9), suggests that of grafting it upon plum stalks, saying when it is thus reared he believes it is never injured by the borer. Unfortunately for the success of the plan proposed, the root of the plum is attacked by this same borer, in which it appears to thrive equally as well as in the peach root. My friend Mr. J. E. Gavit, of Albany, who is a close observer, recently assured me of this as an item of information which he presumed I would be reluctant to credit, not supposing I had myself already noticed the same fact. Some young plum trees in my grounds were found to be dead this past spring, and on rooting them up the peach borer was discovered to be the

cause of the mischief, several of the worms being present in the roots. This, taken in connection with the modification which the habits of the worm undergo when in this situation, is a remarkable fact. Although the plum abounds in gum like the peach, none of this gum exudes from its root when attacked by this borer. The worm, therefore, having no covering to protect it, does not erode the bark and nestle upon the outside of the root of the plum as it does in the peach, but lies under the bark and subsists entirely upon the soft sap-wood of the root. Commencing slightly below the surface of the ground it works its way downwards immediately under the bark for a distance of about four inches, forming a long and somewhat irregular cylindrical channel. The annexed cut shows this burrow as it appears when the bark is removed from the root. As the worm moves along it packs its castings, which appear like a tan colored powder, into the channel behind it.



This is an important fact, showing that if no peach trees were cultivated in our country this species would still sustain itself without difficulty in the roots of the plum. Indeed, as this insect is a 'Native American,' wholly unknown in the peach trees of other countries, it is quite probable that before the peach was introduced upon this side of the Atlantic it bred exclusively in our indigenous species of plums, and has now almost entirely forsaken these and attached itself to this more congenial foreigner.

The LARVA is a naked soft white cylindrical grub, slightly flattened on its under side (of which the left hand figure of the accompanying cut gives a view), and when full grown measures over half an inch in length and nearly a quarter of an inch in diameter. It is divided into fourteen nearly equal segments by broad shallow transverse constrictions. Its head is shining yellowish red, marked in front with black and at base in the middle with whitish, which last is also the color of the throat. Two impressed lines on the face converge and meet each other towards the base of the head and then diverge.



Inside of and parallel with these are two slender black lines meeting each other in the form of a letter V. The jaws are black and strongly notched at their tips, forming two sharp equal teeth. The upper lip is blackish with a pale stripe in the middle. The palpi or feelers are conical and two-jointed, and inside of their base is the

apex of the lower jaws, a short obtuse projection with minute hairs at its tip. The antennæ are conical and three-jointed, the last joint minute and the second one armed exteriorly with a short bristle. At their base on the under side of the head are three or four dilated punctures. There are a few scattered brown bristles upon the head and also upon each of the other segments; those on the third, fourth, twelfth and thirteenth segments are arranged in transverse rows, and on the other segments they are placed symmetrically and arise from faint smooth wart-like spots. The second segment is tinged with yellowish above and has a breathing pore upon each side. The two next segments are somewhat shorter than the following ones and are destitute of breathing pores. These three segments each bear a pair of conical legs ending in a black polished claw. The remaining segments except the two last show a faint stripe, at least posteriorly, upon the middle of the back, and each has also a transverse impressed line in the middle and a breathing pore upon each side. The two last segments, which perhaps should be regarded as one double segment, are narrower, shorter, and retractile, shutting into each other and into the segment forward of them, like the joints of a telescope. Beneath is a pair of prolegs upon the seventh and three following segments, which scarcely protrude from the general surface, but are very perceptible from their soles being furnished with two transverse rows of minute black hooks, about twelve hooks in each row; and the last segment has a single shorter row of six similar hooks upon each side.

The young worm is quite similar in its details to the mature one; its breathing pores upon the second and the twelfth segments, however, are much larger and more obvious than the intervening ones.

The PUPA enclosed within its follicle is at first white, the wing and leg sheaths and the thorax being slightly tinged with tawny yellow. The breathing pores form a row of tawny dots along each side of the abdomen, each segment of which has a row of little sharp-pointed teeth on its anterior and a second shorter row of smaller ones on its posterior margin, extending half way around, from one row of breathing pores over the back to the opposite row, these teeth being of a pale tawny color and directed backwards. The three apical rows of these teeth, however, have no intervening rows of smaller ones. At the tip is a row of eight larger teeth extending entirely around. It is by means of these teeth that the pupa when ready to disclose the winged fly crowds itself forward, out of its follicle. All the teeth become longer and more sharp-pointed as the pupa approaches maturity, and the whole of the surface now assumes a pale tawny yellow color, with a darker ring at each of the sutures.

The mature insect, like most of the species of butterflies and moths, varies considerably in its size. It measures from one-half to three fourths of an inch in length, and the wings when extended are from 0.80 to 1.30 across, the female being more variable in its size than the male and furnishing both the smallest and the largest individuals. The wings of the female also measure more than those of the male when their bodies are of equal length, the more thick and heavy body of the female plainly requiring larger wings to sustain it in the air.

The MALE is of a deep steel blue color with various sulphur yellow marks and has a glossy lustre like that of satin. The antennæ are black, less than half as long as the body, abruptly curved outwards at their tips and densely fringed along their inner

sides with numerous fine short hairs, with a slight vacancy between them at each of the joints. The feelers are yellow on their lower sides; there is a paler yellow spot between the bases of the antennæ and a deeper yellow transverse stripe at the base of the head both above and beneath. The thorax has a yellow stripe on each side of its middle, a transverse one at its base which is slightly interrupted in the middle, and a short broader one on each side under the wings; its base on the underside is white. The abdomen commonly has two slender yellow bands above, at the apex of the second and fourth segments, and a white line on each side of the tuft of hairs at its tip. The forward hips are yellow on their anterior face, the four others at their tips. The shanks are yellow at their tips, the hind ones have a yellow ring on their middle interrupted on the inner side, the other four have a large yellow spot on their anterior sides; their spines are white, their upper sides black at least on the basal half. The fore feet have a white ring at the apex of each joint and a broad white stripe upon the inner side; the middle and hind feet have a slender white line on their inner sides, which is often nearly obliterated, showing only a few white scales at the apex of each joint. The wings are transparent and glass-like with a slight tinge of smoky yellow; their veins, margins and fringe is steel-blue. The fore-wings have a steel-blue band beyond the middle upon their transverse anastomosing veinlet, a slender yellow line upon their outer or anterior margin both above and below, and a similar line on the inner edge of their inner margin, the hind wings also have a similar line on the inner edge of their outer margin.

The following VARIETIES occur in this sex:

- a. The pale yellow spot between the bases of the antennæ wanting.
- b. The same spot enlarged and extending backwards to the neck.
- c. The abdomen without white stripes upon the sides of the tail.
- d. The abdomen without any yellow bands.
- e. The abdomen with but one band, that upon the apex of the second segment wanting.
- f. Three yellow bands, one on the apex of the fifth segment. Common.
- g. Four bands, one on the apex of each segment from the second to the fifth inclusive, that upon the third segment often imperfect.

The FEMALE differs from the male so much that it would not be supposed to pertain to the same species. The abdomen is of a long oval form instead of being slender and cylindrical, and is twice as broad across the middle as that of the male. This sex is of a glossy steel blue color with a purplish reflection in places and blackish upon the face, and upon the middle of the abdomen is a broad band of a bright glossy orange yellow color occupying the whole of the fourth and fifth segments\* except upon the middle of the underside, where, at least on the fourth segment some orange scales often occur interspersed with the steel blue ones. The antennæ have no fringe along their inner sides. The fore wings are opaque and of the same steel blue color as the body, their tips and fringes being of a purplish tint both above and beneath. The hind wings are transparent broadly margined upon both sides and marked at the base with steel blue, the glass-like portion being crossed by five robust veins, and commonly there are traces of a strawyellow stripe on the outer margin towards the tip.

\* Say describes the abdomen as having only the fifth segment of an orange color, but in every specimen which I have seen the fourth segment also is of this color.

The female presents the following VARIETIES:

- a. A slender transverse black line in the middle of the orange band upon the suture between the fourth and fifth segments of the abdomen. Common.
- b. The outer edge of the hind wings with a slender straw yellow stripe its whole length.
- c. No vestiges of a straw colored stripe on the outer edge of the hind wings.
- d. The space between the two inner veins of the hind wings nearly or quite covered with blue-black scales, forming a stripe which divides the transparent disk into two parts. Quite common.

Various remedies have been proposed for protecting the peach trees from this pernicious insect, by the numerous writers who have treated upon this subject in our agricultural and horticultural publications, such as raising a mound of earth around the tree and removing it during the winter season; pouring boiling water around the root; placing around it a bed of cinders, of ashes, of lime, &c.; surrounding it with a collar of mortar; enveloping the root and base of the trunk in matting or in paper. There is much testimony showing that several of these measures are, singly, a sufficient safeguard. Recently an article has been going the rounds of the papers, stating that tany set out around peach and other fruit trees would protect them against this and other insects. Attention was said to be directed to this remedy from the fact of a large peach tree, upwards of forty years old, being noticed as having a bed of tany growing around its trunk, and the account states that upon setting out this herb around several trees it grew thriftily, and it appeared that whilst sound trees were preserved by it, unsound ones were renovated. Although some editors have expressed themselves as skeptical with regard to the efficacy of this measure, I am inclined to think it merits a trial. That this herb is repulsive to insects generally I infer from the fact, that on sweeping it for insects only a very few can be obtained, when a similarly dense growth of other weeds is certain of yielding to the collector quite a variety. This at least has been my own experience. One of my correspondents, however, thinks he has captured insects as abundantly from this as from other weeds.

The hollow cavity extending down the side of the root of the peach tree, which is formed by the peach borer, does not become

obliterated after the worm has left it, but remains often for years afterwards, and forms a favorite abode for those pseudo-insects which are commonly designated sow-bugs or wood-lice. When one of these old burrows of the borer is examined, these little animals will commonly be found huddled together within it, and covering the sides of the cavity as closely as they can stand. And on digging around the root of a peach tree at any time several of them will commonly be found. As no notice of our American species of these creatures has ever been published, that I am aware, some account of them may appropriately be given in this connection.

These animals are popularly known in different countries under the names of millipedes, wood-lice, hog-lice, slaters or sclaters, and sows. In this section "sow bugs" is the popular name invariably given to them, whilst the name wood-lice would here be understood as designating the wood-tick, *Ixodes Americanus*, and its kindred species, and millipede would be regarded as a synonym of centipede or "thousand-legged worm," a species of *Julus* or *Scolopendra*. The sow-bugs were ranked as insects by the older naturalists, but by most writers at the present day they are grouped with the lobster, crab, craw-fish, horse-hoof, &c., in a distinct class, which is named CRUSTACEA, in allusion to the hard shell-like *crustaceous* covering which forms the exterior coat in most of the species. They differ from true insects essentially in their breathing apparatus, which is a kind of gills of a pyramidal form, and made up of thin plates or short threads placed on the under side of the body, commonly at the base of the legs. Insects, on the other hand, respire through spiracles or breathing pores, placed in a row along each side of the body, through which, by small pipes, air is admitted into two principal tubes which run parallel to each other, and are extended the whole length of the body. The crustaceans, like insects, have jointed antennæ and legs, and the body composed of a number of segments connected by transverse sutures, but they differ from most insects in being destitute of wings, and in undergoing no metamorphosis, the young when first hatched having the same form and parts which belong to it when mature. In this class

the animals under consideration pertain to the order ISOPODA, i. e. equal-footed, having fourteen pairs of legs of nearly equal size, and to the family ONISCIDÆ, which, like other families of this order has four antennæ, but here the inner pair of these antennæ is quite short and little apparent, consisting at most of only two joints. The typical genus of this family, named *Oniscus* by Linnaeus, is by modern naturalists restricted to those species in which the external antennæ have eight joints, the three last joints being much more slender than the others, and the sutures separating them much less distinct than those between the other joints. I have never met with any American species having this number of joints to the antennæ. The genera *Porcellio* and *Armadillo* differ from *Oniscus* in having the slender terminal portion of the antennæ divided into but two joints instead of three, making the number of joints seven in all.

The genus *Armadillo* is distinguished from *Porcellio*, and from *Oniscus* also, by being destitute of the two conical projecting points or short tail-like processes which we observe at the tip of the abdomen in those genera, and also by having the faculty of rolling itself into a ball, resembling when thus rolled up a pea or pill, whence they are popularly named pill-millipedes. We have one or more species of these inhabiting the southern part of the State and Long Island, but they do not extend to the neighborhood of my residence, and I have not examined them sufficiently to determine whether they are different from the European species of this genus.

All the animals of this family which have yet been discovered in the central and northern sections of our State pertain to the genus *Porcellio*. These crustaceans are everywhere common about the roots of trees, under logs and stones, in the crevices of the foundation walls of our buildings and in our cellars, and they are particularly numerous under any logs or billets of wood which are left in our chip yards. They occur, in short, in all situations that are damp, cool and dark. Frequently, by night in wet weather, they crawl about the rooms in our dwellings. They are perfectly innocent and harmless, subsisting upon decay-

ing vegetable and animal substances. They afford a dainty bit to domestic fowls, which devour them with avidity, and are always scratching our yards in search of these more than any other article of diet. This is their chief importance in an economical aspect, and being so abundant they form an item of no small value to the poultry breeder, though one of which but little notice is taken. In former times the species of this family were highly reputed for their supposed medicinal virtues, and old books upon the materia medica inform us that when dried and pulverized "they have a faint disagreeable smell, and a somewhat pungent sweetish nauseous taste, and are highly celebrated in suppressions, in all kinds of obstructions of the bowels, in the jaundice, ague, weakness of sight, and a variety of other disorders." And the wine of Millipedes, prepared by crushing these animals, when fresh, and infusing them in "Rhenish wine," is spoken of as "an admirable cleanser of all the viscera, yielding to nothing in the jaundice and obstructions of the kidneys." In the light of modern science we can impute the cures attributed to these creatures only to the effect produced upon the imagination of the patient, and the curative powers of nature, for beyond some slight demulcent qualities, they must be wholly inert, and are now wisely discarded from the pharmacopæias.

Six American species, pertaining to the genus *Porcellio* are known to me, as follows:

The SMOOTH PORCELLIO (*P. glaber*) has the surface of the body smooth and slightly shining, of a brownish black color, each segment presenting, except along the middle of the back, numerous short whitish lines or oblong dots arranged longitudinally and near the outer margin a whitish spot; under side and legs white or cream yellow; antennæ and projecting apical filaments unicolor with the body. Length half an inch. This sometimes when captured doubles itself into a ball, similar to the Armadillos, but is incapable of assuming a form so compact and perfectly spherical as the crustaceans of that genus. It is less common than our other species. Young individuals are slightly paler, and a variety which I name *confluentus*, and which is quite rare, has the oblong dots more or less confluent, forming irregular white spots. This is at once distinguished from all our other species by having the surface perfectly smooth and even, without either elevated points or granules. I had long regarded this as identical with the *P. laevis* of Europe, but specimens of that species, taken in the forest of St. Germain, France, and kindly sent me, with other species of these crustaceans pertaining to western Europe, by my esteemed friend and correspondent, Andrew Murray, W. S., Edinburgh, show it to be different. That

species has a dusky spot below the knees which does not appear in ours. It also has a double row of whitish lines, more or less distinct, towards the outer margin, which in our species is replaced by a single row of whitish spots. Other differences might be specified, but these suffice to show the *glaber* distinct from its European analogue.

The UNSPOTTED PORCELLIO (*P. immaculatus*) is dull blackish brown or leaden brown with faint short pale lines and the middle of each segment rough from elevated granules; under side and legs white or lurid. Length 0.80 or less. This is readily discriminated by its uniform brown color unvaried by spots or stripes save the short longitudinal lines which are so faint as scarcely to be perceived and are frequently wholly wanting. It is also our smallest species. It probably occurs throughout the United States, for I met with it in Illinois, and specimens have also been sent me by Mr. Robertson from west of Arkansas.

The STRIPED PORCELLIO (*P. vittatus*) is black or leaden blackish with the head deeper black and the under side whitish; the segments are rough from elevated granules with their hind margins smooth; along the middle of the back is a row of white spots and another more distinct near the outer margin; these spots are often confluent, forming continuous stripes. Length 0.35. The same pale short longitudinal lines which are common in other species are more or less perceptible in this also. Young individuals are of a pale or even whitish color but show the usual stripes of a more clear white. It is one of our most common species.

The MOTTLED PORCELLIO (*P. mixtus*) is tawny yellow variously dotted and spotted with black, and with a row of whitish spots which are often confluent into stripes along the middle of the back and near the outer margin; outer edge pale, at least on the angles of the segments; segments rough from elevated black granules, their basal and apical margins smooth. Length 0.40. The elevated granules form round and oblong black dots, and often on each side of the back the intervals between them are white, thus presenting short longitudinal lines of this color, and in a variety (*variegatus*) these lines are confluent, forming a longitudinal row of white blotches between the dorsal and lateral stripes. Sometimes the stripe on the middle of the back is tawny yellow instead of whitish. This appears to be the most rare of any of our species.

The PRETTY PORCELLIO (*P. limatus*). Black or blackish, with a stripe each side and the outer margin broadly whitish, and two rows of bright yellow spots along the back; the segments rough with raised granules over their whole surface. Length 0.50. This is our most common species, being thrice as numerous as any other. It occurs in abundance in our cellars and under stones and billets of wood in the yards about dwellings and barns. It is quite variable in its colors. In young individuals the two rows of spots along the back are pale or whitish. As it increases in size they all gradually change to yellow, or one or two of these spots take on a bright yellow color whilst the rest remain whitish, but this yellow color is successively assumed by the others, and in old individuals the whole become of a vivid ochre yellow. Dots of this same color sometimes appear also upon the narrow posterior or caudal segments prolonging the rows to the tip of the body. The following varieties of this species may be distinguished.

*a. dorsalis.* The space between the rows of yellow spots of a deeper black color than other parts of the body, forming a broad black stripe along the middle of the back. This stripe is much more obvious in the living specimen than after death.

*b. multiguttatus.* A row of smaller whitish spots along the middle of the back between the yellow ones. Common.

*c. marginatus.* The hind margins of the segments pale or whitish.

*d. lateralis.* The outer fourth part of each segment whitish with a black spot therein.

*e. limbalis.* The spots of var. *d* confluent forming a black stripe with a brown or blackish spot on each side of each segment outside of the stripe.

It is difficult, in short, to find two individuals of this species which are alike in every respect. Still, the species is in all instances readily distinguished by its sculpture, the raised granules occupying the hind margins of the segments although they are less elevated here than upon the disk. In all our other species having the surface granulated, these margins are smooth.

The ROUGH PORCELLIO (*P. scaber*, Latreille). Blackish lead-colored often varied with irregular blotches of whitish, the surface rough from numerous elevated points which are arranged in irregular transverse rows. Length 0.45. This is much more rough and the elevated points more acute than in either of the foregoing species. I have not met with it in this State. Specimens sent me from Ohio by Dr. Robert H. Mack, and from Illinois by R. W. Kennicott, differ in no respect that I am able to perceive from European individuals of this species.

## THE PLUM.

### AFFECTING THE LEAVES.

Wrinkling and distorting the leaves; a black, shining plant-louse, with a pal green abdomen.

#### THE PLUM LEAF-LOUSE, *Aphis Prunifolia*.

The *Aphis* which infests the under sides of the leaves of our native and also our cultivated plums, curling and distorting them, is one of the most variable species which I have met with pertaining to this family. And so much does it disagree with the accounts which we have of the plum louse of Europe (*Aphis Pruni*, Fab.) that I am constrained, though with some doubt, to record it as a distinct species. The descriptions given of the plum louse are quite discordant. Walker (List of British Museum, p. 989) describes the viviparous winged female as dark gray with nectaries hardly projecting above the surface of the abdomen, whereas, in all the winged individuals of our American insect which have fallen under my observation, the nectaries are cylindric, nearly or quite equalling the tip of the abdomen. It further disagrees with his description, in having the third vein of the fore wings not much further from the second at tip than at base, and the fourth vein strongly instead of slightly curved. Fabricius (Ent. Syst. iv. 213) describes the European insect as having a greenish body, antennæ and legs, with a darker abdominal stripe and point each side of the base, and the margin plaited. Unless this description is very faulty our plum louse must be distinct, it having the thorax and antennæ uniformly black, and no plication on the sides of the abdomen; nor can the large dusky spot be termed a stripe. Since the foregoing was written I notice that M. Amyot (Annals Entom. Soc. 2d series, v. 476,) gives the top of the head and the thorax of the plum aphid as brown and dusted with a white powder. This more strongly

indicates the European species to be distinct from ours, which has a smooth shining thorax not in the least coated with any meal-like matter.

This aphid is much less common than those which pertain to our other fruit trees. Its generation and habits are so similar to those of the Apple plant louse that a separate account would be little more than a repetition of what has already been related. It only remains, therefore, to give a description of this species in its larva and its perfect states.

The LARVA when first hatched is of a white color, the body slightly tinged with green, the feet, tip of the beak and eyes black. As it increases in size three stripes of a deeper green begin to appear and become more distinct and are finally of a bright green color. One of these stripes extends along each side of the thorax and abdomen, and has in it on the thorax a large deep green dot, and upon the abdomen two or three less deeply colored dots; the third stripe is on the middle of the abdomen and is not extended to the thorax. The body has now become of a greenish white color, the legs, nectaries, antennæ and beak white without any tint of green, and somewhat pellucid. The tip of the beak, the ends of the feet and the eyes are black. It is of an oval form, and measures 0.06 in length by 0.03 in width.

The WINGED PLUM LEAF-LOUSE is 0.14 long to the tip of its wings. It is black and shining, its abdomen pale green with a black dot on each side of the middle of the two or three anterior segments, a large dusky spot rather behind the middle, and a short dusky band between this and the base; tip of the abdomen acuminate; nectaries cylindric, equalling the tip. The legs are pale yellowish, the tips of the thighs and the feet dusky or black. The antennæ are black, their bases pallid. The wings are pellucid, their veins slender, blackish, the rib-vein and base of the third vein pallid; inner margin with a black line extending inwards from the apex of the first vein. The veins are analogous to those of *A. Pruni* in their relative distances, except as already noticed; they, however, vary so much that it is seldom an individual occurs having them normal in both wings. The third vein is as near the second at its apex as at its base, oftener than it is more distant.

The following are some of the VARIETIES which may be met with among individuals of this species:

- a. Abdomen above deep black and shining.
- b. Abdomen pallid whitish; tips of the thighs and veins of the wings dusky, not black.
- c. First fork at tip as far from the tip of the second fork as from the third vein.
- d. First fork at tip much farther from the tip of the second fork than from the third vein, the cell between the first fork and third vein narrower at its base.

- e.* First fork at tip much farther from the tip of the second fork than from the third vein, the cell as broad towards its base as at its apex.
- f.* The same cell very narrow, not half the width of those each side of it.
- g.* Only a single fork in the left wing.
- h.* Only a single fork in the right wing.

The remedies already stated for the apple aphid, will be equally efficacious for this and other species of this family.

## 5. THE CHERRY.

### AFFECTING THE LEAVES.

Black wingless lice with a few winged ones, their wings appearing like white parallel lines each side of the body; covering the under side of the young leaves.

The CHERRY PLANT-LOUSE. *Aphis Cerasi*, FABRICIUS.

No tree or plant within the sphere of my observation is so constantly infested with Aphides as the garden cherry, the *Prunus Cerasus* of Linnæus, *Cerasus vulgaris* of modern botanists. Upon other vegetation where these vermin become located they are commonly broken up by their insect enemies after a time and do not again become established upon the same tree. But upon the cherry within a week or two after every individual appears to be destroyed new colonies are discovered to be planted upon one and another of the young leaves.

This species commences to appear as soon as the leaves begin to put forth in the spring, these first individuals being hatched from eggs which were deposited the preceding autumn. All the individuals which are bred during the spring and summer appear to be females, some of them with wings upon almost every leaf, but most of them without wings. The individuals which are hatched from the eggs resemble the mature wingless females, except that they are smaller and lighter colored, none of the species of this family passing through those remarkable changes in their form which most of the orders of insects undergo. They bring forth their young alive during the continuance of warm weather. These huddle around their parents upon the under surface of the leaves as closely as they can crowd themselves; indeed they often are found two deep, a portion of the colony standing upon the backs of the others, requiring only sufficient space between them to insert their beaks into the leaves to suck their juices. The

numbers which thus make out to stow themselves within a narrow compass are almost incredible. Upon the under surface of a small leaf three-fourths of an inch long and half an inch wide I have counted upon one side only of the mid-vein one hundred and ninety of these lice. Yet this leaf was not more densely covered than many others. The two surfaces of a small leaf but an inch long would therefore furnish ample space to accommodate a thousand of these insects.

As all the leaves are tender and juicy early in the season the aphides multiply rapidly, and in about a month after the first individuals make their appearance, namely, between the 15th and 25th of June, as I find the dates entered several times in my notes taken in different years, some of the trees become literally overrun with these vermin, their black bodies covering not only the under sides of the leaves but also the leaf-stalks, the tender succulent ends of the twigs, and sometimes the green young cherries and their stems; whilst a swarm of flies, wasps and other insects, attracted to them to feast upon their honeydew, keep up a constant buz and hum around the infested trees during warm sunny days. The leaf of the cherry, however, is of such a tough coriaceous texture that it does not become curled and corrugated like those of most trees when similarly circumstanced. Its edges merely turn backwards or become slightly rolled. The tips of the twigs, however, and the young leaves growing from them, having their juices pumped out and drained by such a multitude of tiny beaks, shrivel and die, looking as though they had been scorched by fire; and the whole tree would soon perish, it is evident, if this severe infliction was protracted. But when the aphides become thus numerous their natural enemies and destroyers are attracted to the tree and multiplied in such numbers as to make the most astonishing havoc among this feeble race of beings. Although single trees in my grounds have been equally infested in some former years, I never knew them all to be overrun with these lice as they were the 25th of June the present year. It was evident if the evil continued the trees could live but a short time. But on examination upon that day I found two or three yellow larvæ of the *Syrphus* flies upon almost every

leaf, whilst the Lady birds or *Coccinellidæ* with their larvæ and Aphis-lions and other destroyers were equally numerous. All fears as to the result, were consequently allayed. Still I little anticipated such a rapid and utter extermination of these vermin as actually occurred. A week afterwards upon a careful examination not a living aphis could be found upon the leaves of any of the trees, and the conquerors had already disbanded their forces and had nearly all retired. The empty skins of the slain, adhering to the leaves, with the swollen bodies of others which had been punctured by parasites—for these too it appeared had stepped in to give their progeny a share in the feast—were the only relics of the teeming myriads which had so recently swarmed there. It is by looking at the works of Nature in a definite manner and tracing out her operations specifically and in their minute details that we arrive at some faint conceptions of their magnitude and grandeur, and become vividly impressed with the truth that no other agency than that of a Creator infinite in wisdom and power could have peopled the world which we inhabit with such countless numbers and such an endless variety of objects animate and inanimate, each occupying its appropriate sphere, and all so arranged as to fulfil the objects for which they were called into existence. Has the reader as he has passed a forest ever attempted to conjecture the number of trees which it contained?—and has his mind passed onwards to a surmise of the probable number of leaves growing upon each tree, and onwards still to the number of insects which may be drawing their sustenance from each one of these leaves, and still further to the number of minute and infinitesimal parasites which may be subsisting upon each of these insects? Among the cherry trees alluded to above, was a row of seven young ones which had attained a height of about ten feet. By counting the number of leaves upon some of the limbs and the number of limbs upon the tree, I find a small cherry tree of the size above stated is clothed with about seventeen thousand leaves. And at the time alluded to these leaves could not have averaged less than five or six hundred lice upon each, and there was fully a third more occupying the stems and the tips of the twigs. Each of these small trees was therefore stocked with at least twelve millions of these creatures. And yet so vigilant, so

sharp-sighted and voracious were their enemies that at the end of a few days the whole were exterminated.

The aphides being thus swept away from the cherry the latter part of June, almost every year, the trees enjoy a temporary respite. But the insect soon shows itself again. Most of the foliage, however, has by this time become so mature and hardy that their weak beaks appear unable to pierce it. They therefore occupy only the few young and tender leaves at the ends of the twigs and upon the young shoots which start up from the roots. This being the only foliage from which they are able to draw their nourishment they do not again multiply and flourish as at the beginning of the season. But they continue to dwell upon these tender leaves through the summer. On the approach of cold weather males are produced, a stock of eggs is placed about the bases of the buds and in the fissures of the bark for the continuance of their race another year, and their career for the season terminates. The leaves fall from the cherry earlier in autumn than from the apple and peach, and whilst the lice which infest those trees are still abroad in full force those of the cherry have all disappeared.

A small black ant is a constant attendant upon the plant-lice of the cherry tree. It remains with them more constantly and in much greater numbers than the New-York ant which we have described upon a preceding page as accompanying the aphides upon the apple and other trees. Upon one small leaf half a dozen or more of these ants are often present, a part of them industriously occupied in vibrating their antennæ over the backs of the aphides so as to rub them gently. They are constantly engaged in this employment and appear to be much more attentive and faithful nurses than the larger New-York ants. They pertain to the genus *Myrmica* of Latreille, differing from the true ants in being furnished with stings. These insects however are so small and this implement is so weak that it is wholly incapable of penetrating the human skin. It may be seen in preserved as well as living specimens, resembling a short fine hair protruding from the tip of the abdomen. In addition to this, in place of the single wedge-like scale on the peduncle at the base of the

abdomen which we meet with in the true ants, these have two round knot-like swellings; and their thorax is also armed with thorn-like spines, of which there are in most of the species two, situated at its base and projecting backwards.

Altogether the most abundant and annoying species of ant which we have in the State of New-York pertains to this genus. It is commonly called the "Little yellow ant" and was named the Troublesome ant (*Myrmica molesta*) by Mr. Say in a communication published in the first volume of the Boston Journal of Natural History, page 293, and by a strange oversight the same species is again described upon the succeeding page under the name *M. minuta*. The neuter or worker of this species is of a honey yellow color with the head and abdomen tinged with brown, the abdomen being broad oval and almost globular. It is but six hundredths of an inch in length, and being so small it is able to penetrate the slightest cracks in boxes or cupboards. It is common in our dwellings, and when an individual finds any saccharine substance the information is communicated to the rest of the colony, and before the housewife is aware of the depredation that is going on, the dish of sweetmeats or other preserved substance becomes covered with them, whilst a procession of individuals going and returning in a particular track may be traced along the shelves and wainscots, frequently extending through different rooms of the house. I have experienced some difficulty in preserving my collection of insects from this depredator, some box or drawer not perfectly tight being invaded by them ere I am aware of it, almost every season. But by crushing every individual which does not escape into some crevice, and permitting their bodies to remain where they are slain, their comrades take warning and cease to frequent the spot. The vapor of camphor also repels them. Small colonies of this same species are also common in our gardens, throwing up in the paths and beds little hillocks of dirt around the hole which leads to their underground dwelling. It is also common in our pastures and plowed fields, and sometimes does much injury in cornfields, gnawing the blades of corn when they are but a few inches high, for the purpose of drinking the sweet juice which flows from the wounds. It was

on this account much complained of in this vicinity in the spring of 1850, being so numerous and active in some fields as to threaten to cut off every blade of corn in them.

The species which accompanies the plant-lice of the cherry tree does not appear to have been described hitherto, I therefore name it

The CHERRY ANT (*Myrmica Cerasi*). The neuters are 0.14 long, of a dark brown color and slightly translucent, resembling resin; their abdomen is deep black and highly polished, egg-shaped and acutely pointed at its apex, its basal segment covered with minute punctures of an oval form placed longitudinally, and the remaining segments are similarly punctured upon their apical margins; the head, thorax, and anterior sides of the legs are also covered with similar punctures, but more fine; the jaws are reddish-brown and have four teeth of equal size along their inner edge; the antennæ are black, their tips brown and clothed with very fine short hairs, the long basal joint punctured; the legs are black, their bases and the tips of the shanks pale brown, and the last joints of the feet brown; a few gray hairs are scattered over the head and body.

The abdomen of this ant presents a curious appearance. It is flattened upon its upper side and very convex on its under side, thus looking as though it was attached to the thorax in an inverted position. This, however, adapts it to the direction in which it is frequently used—this ant being accustomed to throw its abdomen upward over its head and back, thus presenting its sting to anything which molests it in front. The venom of its sting has a peculiar pungent smell which remains upon the fingers when they crush one of these insects. This venom is ejected copiously and may frequently be seen forming a small clear drop at the end of the sting. And being thus armed these small ants are able to defend themselves against other insects far superior to them in size. It is wonderful to witness this ant conquer the large New-York ant and rob him of his flock of aphides. This may be witnessed by placing two or three of the cherry ants in a vial and introducing into it a leaf of poplar or apple-lice with one of the New-York ants attending them. No sooner does one of these small ants approach, than, jealous of the intrusion, he seizes it by its thorax in his powerful jaws, but is instantly informed of the fact that it carries a sting in its tail and knows how to use it. He is as prompt to drop his intended victim as he had been to seize

it, and returns to guarding his flock of aphides, till another of the small ants approaches, which is similarly seized, but with the same result as before. After two or three such encounters he seems to suspect that some mischance has thrown him out of his proper latitude, and he walks around to take a survey of the parts adjacent. He no sooner leaves the flock of lice than one of the small ants hastens to them and rapidly passes its sting around among them, hereby marking them as its own property. From that moment the large ant ceases to notice them, and the small ones gather around and commence rubbing and nursing them as attentively as though they were old acquaintances. It is evidently the pungent fluid of their stings which they throw around among the aphides which render them repulsive to the large ant; and when he first seized one of these small ants it was the suffocating fumes of this fluid which induced him to drop his victim so hastily, for their sting is not powerful enough to penetrate the hard horny outer surface of his body.

It is somewhat remarkable that, so closely related to each other as the different kinds of cherry trees are, the aphides which infest one of these kinds of trees do not establish themselves upon the others also. Yet we never see the black aphid of the garden cherry invading any of our native or wild cherry trees, and these appear each to have a species of plant-lice peculiar to them which seldom if ever fix themselves upon the foliage of the other kinds. Thus a species which I described in the Fourth Report of the State Cabinet, page 65, under the name of the cherry-inhabiting aphid (*A. Cerasicolens*), pertains to our common black cherry. Another species may here be noticed which infests the under sides of the tender apical leaves of the choke cherry, curling their margins downwards and inwards, and changing them to a paler yellowish green color. It may be named and characterised as follows:

The CHERRY LEAF PLANT-LOUSE (*Aphis Cerasifoliae*), measures 0.08 to the tip of its abdomen, and 0.15 to the end of its wings, which expand 0.26. It is black with a pale green abdomen, which has three dark green dots on each side forward of the nectaries, and above these a row of impressed deep green dots extending backwards past the nectaries with a deep green stripe upon the middle of the back which does not reach to the tip; the sutures are also of a deeper green color; the nectaries reach

half way to the tip and are dusky at least at their ends; the neck and lower side of the head are green; the antennæ are two thirds of the length of the body, dusky, and in young individuals green at their bases; the beak is short, pale green, its apex blackish; the legs are dull white, the feet and four hind thighs except at their base, blackish; the wings are pellucid, the stigma salt white margined with dusky, more widely so on its inner side, the veins black, the rib-vein white, the second fork very short.

The *wingless females* are 0.08 long, egg-shaped, pale yellowish green, their abdomens coated with a white meal-like powder except at the sutures and on the medial line, which last is deeper green, and the legs and antennæ dull white.

The *larvæ* when young are pea green with white antennæ, nectaries and legs. When older a deeper green stripe appears along the middle of the back and a row of deeper green spots each side which are more or less confluent into stripes.

The aphid upon our garden cherry is the species which is named *Aphis Cerasi* by Fabricius. It undoubtedly has been introduced upon this side of the Atlantic with the tree which it infests. M. Fonscolomb (*Annals Ent. Soc.* x. 173), speaking of this species in the southern part of France, says it occurs the last of July, and that he has never met with any winged individuals. This would indicate the species to be much more rare than it is with us. Here from the middle of May till the last of September it is the most common of any species of this family. For years when I have wished to investigate any fact in connection with the aphides I have turned to this species, always finding it at hand, and always with two or three winged individuals upon every leaf, in company with larvæ, pupæ and wingless females.

The *LARVÆ* when newly born are about 0.03 long, of a dull white or pale yellow color, with transparent and colorless legs and antennæ. They are of an oblong oval form, with the opposite sides of their bodies parallel and their nectaries shorter than to the tip and transparent or slightly dusky. As they become larger they are broader across the abdomen and deeper yellow, the tips of the antennæ and the feet dusky and the nectaries black. After casting their skins they are dull reddish brown or chestnut colored with black heads, and are much broader across the abdomen, being now shaped like an egg and measuring 0.05 in length. Their legs, antennæ and nectaries are whitish transparent, the last equalling the tip. Others of this same size and form have the thighs, feet, nectaries and tips of the antennæ dusky.

The *wingless females* are 0.05 long, with very plump broad egg-shaped bodies, which are black and shining, with a slightly projecting tail, the nectaries equalling or even surpassing its tip and of a black color, the antennæ shorter than the body and whitish, their two short basal joints and the apical half black; the beak whitish with a black tip; the legs white with the feet, tips of the shanks, and commonly the

thighs at least of the hind legs, except at their bases, black. The abdomen has an elevated lateral margin, upon the upper side of which is a row of large impressed punctures.

The PUPÆ are 0.06 in length, and like the wingless females in the details of their colors and like the larvæ in their form, but are known by having the rudiments of wings which appear like vesicular scales of a white or pale green color on each side of the body rather forward of its middle, and as it approaches maturity the thorax between the fore part of these scales becomes swelled, presenting a blistered-like appearance of a dull reddish yellow color, which sometimes is the color of the body also; its nectaries equal the tip, which has no projecting tail-like appendage. If M. Fonscolomb had confined the pupæ which he describes, they would probably have furnished him with winged specimens within twenty-four hours. When the perfect insect crawls out of its pupa skin the head and thorax are dark reddish brown, and the wings are milk white and still folded in the form of small scales, as they are in the pupa; but in a few moments they start out longer and longer, gradually extending and unfolding until they attain their full size, but still retaining their white hue. They soon, however, become transparent, but like all the other aphides when newly hatched, the wings remain dim for several hours, their surface appearing as though it was sprinkled over with dew. The antennæ and legs are also white when it first comes from its pupa state.

The WINGED FEMALES measure 0.05 to the tip of the abdomen, and 0.12 to the ends of the wings, which when spread are 0.20 across; they are deep black and shining, the abdomen nearly twice as broad as the thorax, and egg-shaped, with an acute apex from which projects a short conical tail-like appendage, the nectaries reaching to its base; antennæ black and about three fourths as long as the body; the beak short, arising between the two fore legs and scarcely reaching the bases of the middle pair, its color black or dusky with the tip black; the legs black with the shanks except at their tips, and the basal half of the thighs white. The wings are transparent, their bases, outer margin and rib-vein white, the remaining veins blackish with their bases pale; the stigma opaque and dull white with its margins black, that on the inner side being wider; the second vein is about a third farther from the first at its tip than at its base; the third is slightly farther from the second at its tip than at its base, and rather farther from the second at its base than this is from the first; the tip of the first fork is but little nearer the tip of the second fork than to that of the third vein, much nearer the tip of the third vein than that is to the second; second fork nearer at tip to the fourth vein than to the first fork, much nearer the fourth vein than this is to the tip of the rib-vein.

*Varieties* have been observed in which the tip of the third vein is equidistant between the first fork and second vein, in which the left wing has but one fork, and in which the right wing has three forks.

The remedies already spoken of in connection with the Apple plant-louse are equally applicable to this species, and the same destroyers which were there described, namely the Aphis-lions, the Lady-birds or *Coccinellidæ* and their larvæ, and those of the

Syrphus flies are equally efficient in destroying this and all the other species of plant-lice. In connection with our account of those destroyers, all of which attack the aphides externally, it was stated that there were others which live in the bodies of these insects and thus destroy them. And we come now to present to the reader some information respecting our American species of these insects whose habits are so remarkable.

It was anciently supposed that an Egyptian quadruped which is named the Ichneumon had the habit of darting down the throat of the crocodile when it was sleeping, and there remaining, feeding upon the entrails of this reptile until it perished. This, however, has long been known to be fabulous. But among insects there is an extensive group, resembling wasps and bees, which possess this very habit which was formerly ascribed to the Ichneumon. They in their larva state reside within the bodies of their victims, feeding upon them until they destroy them. They have from this circumstance obtained the name of Ichneumon-flies, and they form the Family ICHNEUMONIDÆ in the Order HYMENOPTERA. One branch of this family is composed of species which feed internally upon plant lice. It consists of the genus named *Aphidius* and other genera, of the group which is named *Aphidiides*. These are all exceedingly small insects little exceeding the twentieth of an inch in length, and mostly with black bodies variously adorned with bright tawny yellow and pale sulphur yellow bands and other marks. One of these small ichneumon-flies, resembling a winged ant in appearance, may occasionally be discovered busily at work among a colony of aphides. With her long thread-like antennæ stretched out in front of her and rapidly vibrating, she approaches an aphid and touches it gently, much like an ant when nursing these creatures. By this slight touch she at once ascertains whether the aphid has been previously visited. If it has not she curves the tip of her abdomen forwards under her, puncturing the body of the aphid and inserting an egg therein. She then passes to another and another. From this egg hatches a minute worm which resides within the aphid, subsisting upon the juices which the latter extracts from the plant. Thus it grows with the growth of the aphid, which furnishes the exact amount

of sustenance which the worm requires for bringing it to maturity. It is singular that the parent ichneumon-fly knows if two eggs were deposited in the aphid the worms from them would die for want of a due supply of food, and that by a mere touch with her horns she is able to ascertain which individuals have already been impregnated. Some of the species of *Aphidius* are larger than others and their offspring consequently require a larger quantity of food; but each parent has the instinct to select an aphid of such size as will yield the precise amount of sustenance which its young requires.

By the time the worm has attained its growth the aphid becomes so exhausted that it dies. If it should now drop from the leaf to the ground it would be liable to be found and devoured by centipedes or other insects which feed upon the carcasses of animals of this class, and thus the worm within it would be destroyed. Nature has therefore so constituted the aphid that in these circumstances it dies without a struggle or a spasm, with its beak inserted and its claws clinging to the surface of the leaf, standing with its antennæ turned backwards and its whole aspect so life-like that in the infancy of my studies I supposed these were one of the varieties natural to the species with which they occurred. Their bodies are remarkably plump and smooth, commonly clay colored or the hue of brown paper, and the aphid-lions and other insects which destroy the aphides appear to pass by those which have these parasites within them. Hence where a leaf or twig has recently been cleared of plant-lice by their enemies, several of these ichneumonized individuals may frequently be found remaining upon it, dead and unmolested. In other instances the whole colony of aphides appears to be exterminated by these parasites alone, the dead swollen bodies of their victims covering the surface of the leaves or twigs as closely as they can stand. The worm remains within the body of the dead aphid during its pupa state. It then cuts a circular hole through the dry hard skin and comes out in its winged and perfect form.

These parasitic insects which feed internally upon the aphides are as efficient in destroying them as the aphid lions or any other class of their enemies. And it is truly wonderful that whilst

every kind of tree and plant appears to have one or more species of aphid infesting and blighting it, each species of aphid seems to have a particular parasite preying upon and devouring it; for each kind of aphid from which I have reared these insects has furnished a species differing from all the others, and in some instances two species have been obtained from one kind of aphid. The British entomologists enumerate upwards of fifty species of these insects, which is nearly equal to the number of their aphides. They differ from all the other insects of the family to which they pertain, by having commonly a very large triangular stigma to the fore wings, and very few veins, and these commonly end abruptly without reaching the apical or inner margins. Hence there are but few if any closed cells or panes to the wings. One of our species having the wings more fully veined and forming complete cells may be met with accompanying what appears to be an undescribed species of aphid which infests the stalks of lettuce in our gardens. This in my manuscripts is named

The LETTUCE-LOUSE APHIDIUS (*A. Lactucaphis*). It is deep black with legs tinged with brownish, their bases and knees very slightly paler; the abdomen long obovate, flattened, rather narrower than the thorax, its apex rounded; antennæ almost as long as the body, 19-jointed, second joint smallest, globular, third joint longest with a slight constriction in its middle, the succeeding joints successively shorter, the last scarcely longer than the preceding one, long ovate; wings slightly smoky, outer marginal vein and the vein bordering the cell beyond the stigma black, the outer veins brown, stigma dusky white. Length 0.06 to the tip of the abdomen.

One of the prettiest species which I have met with was bred from aphides upon the spotted knot-weed (*Polygonum persicaria*), and may be named

The KNOT-WEED APHIDIUS (*Praon Polygonaphis*). It is black and shining with a slender elliptical abdomen of a bright sulphur-yellow color tinged with dusky above and at its tip beneath, with broad clear yellow bands at the anterior sutures, its base being narrowed into a short cylindrical pedicel, which with the legs and bases of the antennæ are of a bright reddish or beeswax yellow color, the tips of the feet being black; its antennæ are inserted on slight broad elevations upon the front of the head and are 17-jointed, the two short basal joints being a third thicker than the following ones, which are equal, cylindric, four times as long as they are thick, the last rather longer than the preceding, its apex abruptly rounded. Length 0.08, wings expand 0.15.

Another species is a common destroyer of a species of aphid which infests the fruit stems of the high cranberry, (*Viburnum*

*Opulus*, var. *Americanum*). These stems are often covered with lice, and the aphidius discovering them passes from one individual to another, dropping an egg into the body of each. The whole colony is thus destroyed by this parasite alone, the dead swollen bodies of its victims remaining upon the stems crowded together as closely as they can stow themselves. I name this species

The CRANBERRY APHIDIUS (*Praon Viburnaphis*). It is black and shining, with the short abdominal pedicel and the anterior legs wax yellow, their feet blackish at the tip, the hind knees yellowish; antennæ 15-jointed, the basal joint wider than long, the second nearly globular and slightly thicker than the following ones, the last not larger than the one preceding it; wings hyaline, veins outer margin and stigma black and shining. Length 0.075, wings expand 0.15.

In the following species the veins are fewer in the fore wings and do not form any closed cells in the disk; there is merely a short robust curved vein from the inner angle of the stigma directed towards the apex and ending abruptly, and a vein running obliquely from the mid-vein to the outer margin forward of the stigma. These pertain to the genus *Trioxys*.

The latter part of June the present year the willows in this vicinity were overrun, and many trees were almost defoliated by an undescribed species of aphid. But in a short time these insects were all destroyed by their enemies, and the under surface of the leaves were thickly covered with the swollen gray bodies of those which had been killed by parasites. These yielded the following species:

The WILLOW APHIDIUS (*Trioxys Salicaphis*). This is black and shining, with a long elliptical abdomen, of a honey-yellow color at its base gradually passing to black on its posterior part; legs honey yellow, tips of the feet and of the shanks and sometimes the outer sides of the thighs dusky; femora honey yellow; antennæ black, two-thirds as long as the body, 13 jointed, the third and following joints nearly equal, cylindrical, thrice as long as wide; stigma dusky. Length with the abdomen in its usual arched posture 0.06.

The POPLAR APHIDIUS (*Trioxys Populaphis*) is black and polished, the abdomen long elliptical and much narrower than the thorax, the basal sutures sulphur yellow; legs sulphur yellow, the hind thighs black; antennæ nearly as long as the body, 15-jointed, third and following joints about equal, cylindrical, the last joint rather longer and thicker, oval with its apex rounded; stigma dusky, veins and outer mar-

gin of fore wings blackish. Length about 0.07. Hatched from an undescribed aphid infesting the base of the leaves of the Balm of Gilead (*Populus candicans*).

But without dwelling longer upon this interesting group of insects which render us such important services, we close with a notice of a species which destroys the aphid of the garden cherry, and which differs from all the foregoing in its residence when in the pupa state. As if fearful that the beak and feet of the dead aphid would not hold its swollen body securely to the smooth surface of the cherry leaf, the worm of this species when ready to enter its pupa state perforates the abdomen of the aphid upon its under side, probably as soon as its life is extinct, and spins a cocoon for itself between the leaf and the body of the aphid, the leaf forming the floor of the room for its residence, the abdomen of the aphid forming its roof, and a gray paper-like membrane which it weaves constituting the sides and attaching the body of the aphid securely to the leaf. The walls of its domicil are so thin that the inclosed pupa can sometimes be seen faintly through them, of a bright yellow color.

The CHERRY APHIDIUS (*Trioxys Cerasaphis*) is black with its palpi or feelers and legs pale yellowish brown; antennæ almost as long as the body, 18-jointed, the third and following joints equal, cylindric, thrice as long as broad, the last elongated ovate; abdomen elliptic, rather narrower and shorter than the thorax, scarcely pedicelled at its base, shining, tinged with brownish; wings pellucid, stigma smoky white. Length 0.07.

## 6. THE GRAPE-VINE.

### AFFECTING THE LEAVES.

A pale green cylindrical worm, nearly half an inch long, with rows of white elevated dots sending out radiating white hairs. Consuming the young leaves, and hiding itself in a hollow ball made of leaves drawn together by cobweb-like threads.

The GARTERED OR GRAPE-VINE PLUME. *Pterophorus periscelidactylus*.

Both in Europe and in this country the leaves of the Grapevine constitute the favorite food of a number of larvæ as well as of several insects in their perfect state. Dr. Harris has given the history of seven American larvæ, mostly of the larger moths, which feed upon these leaves; and every season, species which have not yet been described are presenting themselves to notice. One of these equally interesting and quite as injurious as either of the species whose history has already been published, I here present to the reader's view.

On a visit to Union Village upon the 16th of June, John T. Masters, Esq., pointed out to me several curious instances of the depredations of insects, in trees along the village streets, and in the vegetation of his garden and yards. One of these insects was then in the midst of its career, consuming the young and tender leaves of his grape vines, which are mostly of the Isabella variety, and forming a retreat for itself by drawing the edges of one, two, or three leaves together, by means of fine silken threads like cobweb, thus making a large roomy cavity, commonly of a globular form, within which the worm appeared to lie in repose during the day time. If the edges of the leaves at any place did not exactly come together, the gap between them was closed by a patch made of silken threads woven together into a membrane resembling bank note paper.

The *larva* when full grown measures about half an inch in length. It is almost cylindrical, sixteen-footed, of a very pale green color, divided into fourteen segments by rather deep wide transverse constrictions. It has two rows of elevated white spots along the back and one along each side, each segment having one spot in each row, or four spots in all, and between the spots is a smaller white elevated dot, and another similar dot below the lower spots. From each of these elevated spots and dots white bristles of different lengths stand out in all directions.

Two of these worms which I inclosed in a breeding cage had changed to pupæ on the 25th of June, one suspending itself from the gauze top of the cage, and hanging obliquely downwards, the other attaching itself to the glass side of the cage, having first spun several short threads here and there upon the surface of the glass as if to ascertain whether they would adhere to it, and then making a small patch of numerous threads, into which to insert the minute hooks at its tail, whereby to suspend itself. The relics of its larva skin, forming a little lump of fine hairs, remained adhering to the glass, downwards and to one side of the spot where the pupa was attached, being as far off as the length of the insect enabled it to reach. After releasing itself from this skin the pupa had turned to the opposite side, and thus remained hanging stiffly downwards and outwards from the surface of the glass, resembling the dead fragment of a little scraggy twig. It is of a slender conical form, obliquely truncated at the head, and has two long compressed horns placed side by side and jutting upwards from the middle of its back. Numerous smaller projecting points and ridges diversify its surface, a particular description of which would occupy a page or two. I therefore limit myself to a recital merely of some of its most prominent marks.

The *chrysalis* is about 0.35 long and 0.08 in diameter. About the mouth and head are divers raised lines and projecting angular points. The obliquely truncated face is convex or gibbous in the middle, and here commence two elevated carinæ or sharp edged ridges which extend backwards nearly parallel with each other to the middle of the back, where they shoot upwards into the compressed horns already spoken of. Their length is equal to half the diameter of the body. Viewed laterally their outline is egg-shaped, with the edges irregularly toothed and the apex drawn out into a long sharp thorn-like point. Forward of these horns the raised lines are more elevated in the middle of each segment, where they present two small tooth-like spines, the anterior one larger, and also two short diverging white bristles which are club shaped or enlarged towards their tips. And on the five abdominal segments next back of the horns and in a line with them is a row of spines, one on each side of each segment near its middle, which spines are inclined forward, and each has a

slight tooth upon its posterior face, and two short diverging club-shaped white bristles. Lower down upon the sides is a row of slight oblong elevations, one on each segment, below which the breathing pores form a row of minute round points, and below these an obtuse angular edge divides the lateral from the under side. On the under side are four longitudinal rows of short white club-shaped bristles, inclined backwards, two bristles at each point. Between the two inner rows of these bristles are two rows of small, elevated, wart-like pimples, which are the scars left by the pro-legs of the larva. The legs, antennæ and wings are enclosed apparently in a common sheath, the forked veins of these last forming faint elevated lines upon the smooth outer part of the sheath. The chrysalis varies in color. One of the specimens was bright pale green with a deeper green stripe along the middle of the back, and the long horns and a spot on the crown of the head dull brownish yellow. The other was pale brownish yellow throughout, with a black stripe along its middle.

These insects remained at rest in their pupa state only six and eight days when they hatched moths, pertaining to the genus *Pterophorus* in the family ALUCITIDÆ and the order LEPIDOPTERA. The moths of this family are distinguished from all others by having their wings singularly cleft into two, three or more long narrow lobes, whence they were termed *Fissipennes* or Split-winged moths by Latreille. The lobes are densely ciliated with fine hairs, which, along their inner margins are very long. They thus resemble the feathers of a bird, and have hence in English received the name of Plumes. Their legs are long and slender, and are furnished with long robust spines, of which there is a single one at the tip of the forward shanks, and a pair at the tip of the middle shanks, whilst the hind ones have a pair at their tips and another near the middle.

The names of all the species belonging to this family are compounds ending with the word *dactylus*, meaning a finger; Linnæus at first, when but a half dozen species were known to him (*Systema Naturæ*, 10th edition, 1758), having supposed they could all be distinguished merely by the number of the branches of their wings, he hence numbered them two-fingered, five-fingered, &c.; and at a later period, when two or more species were discovered which were alike in the number of their lobes, he named these wing-fingered, square fingered, &c. The species of which we are speaking, at each pair of spines, has tufts of scales of a tawny yellow color surrounding its hind legs

like a garter, and as its wings are also banded, the name *periscelidactylus* or Gartered Plume, may appropriately be given to it.

Like other species of this family, this moth is very agile, rapid, and impetuous in its motions, when disturbed, bounding from side to side of the cage in which it is confined, almost with the velocity of lightning, for a moment, and then resting, clinging with its four anterior feet to the top of the cage, its wings spread and its body hanging perpendicularly downwards and swinging to and fro with the wind, with its long hind legs extended as if to protect the sides of the abdomen, and the feet nearly in contact below its tip. It is of a tawny yellow color, the fore wings with three white spots and beyond these two white bands, the fringe white with a blackish spot on the middle and another on the apex of the inner margin.

This moth measures 0.35 to the tip of its abdomen, and its wings expand 0.85. Its antennæ are 0.20 long, black, with a row of small white spots on each side running their whole length. The palpi, which curve upwards in front of the head to a level with its crown, resembling two little horns, are tawny brown or rust-colored in front, their bases whitish. The thorax is tawny yellow, white at its base. The three first segments of the abdomen have a white spot at their bases and the third has two diverging white stripes which reach its apex. The fourth segment is without spots and of a darker color, its apex blackish. The remaining segments have two parallel white stripes which are faint or obsolete on the base of each segment. Beneath, the abdomen is snowy white with two tawny yellow stripes, or tawny yellow with three rows of large white spots confluent into stripes at the base. Legs white; haunches with a tawny yellow stripe on their outer side; four anterior legs with black stripes; middle shanks with a projecting spine-like tuft of tawny yellow scales above their middle, and encircled at tip by a darker colored tuft; hind shanks with a similar tuft at each pair of spines; spines black beneath and at base, those of the hind shanks black at their tips also. Feet white, apical joints of the four anterior ones, and a band on the apex of each of the other joints tawny yellow. Fore wings bifid, the cleft reaching almost to their middle, tawny-yellow, with two oblique white bands crossing both their forks, the space between these bands often rusty brown; a transverse white spot at the commencement of the cleft, edged on its inner side with rusty brown; two white spots inside of this, the first towards the outer the second upon the inner margin. Fringe white with a blackish spot on the middle and a larger one at the apex of the inner margin. The inner lobe of the wing between the black spot and its tip notched in the form of a semicircle, with a blackish line upon the base of the fringe in this notch. Hind wings trifid, the anterior cleft reaching their middle, the posterior one extending to the base; rusty brown, tawny yellow at base; hind lobe slender, white and fringed with white with a broad blackish band near its tip.

As this insect completes its transformations so early in the season, it is quite probable there are two generations of it annually, the moths which come out the first of July laying their eggs for another brood of worms at a later period, when the foliage upon the vines will be so dense that they will be much less liable to be noticed. Whether this second generation completes its transformations and the winged moth appears in autumn, and deposits its eggs to be hatched the following spring, or whether it only reaches its pupa state, and thus remains through the winter, future observations must determine. The former, however, appears most probable.

When these worms are neglected and are permitted to feast unharmed upon the foliage of the grape vine, unless they are kept in check by their natural enemies, they will be liable to appear in increased numbers, with each succeeding generation. To prevent them from becoming so multiplied as to injure the vines, they should be carefully sought for in the fore part and middle of the month of June. Wherever one or two leaves are found drawn together by cob-web like threads, forming a lurking place for one of these worms, they should be picked off, gently, that the worm may not be alarmed and escape from his retreat, and thrown into the fire, or crushed beneath the foot. The pupa probably attaches itself to the trellis work of the arbor, most commonly, during the few days that this stage of its life continues, and if any of these happen to be seen, they also should be crushed, or cut asunder with a knife.

This, I believe, is the first American species of this family of moths that has ever been described. In connection with it, therefore, a few other species pertaining to the same genus may be briefly noticed. The genus *Pterophorus* embraces those species of ALUCITIDÆ which have the fore wings divided into two and the hind wings into three lobes. The two first of the following species have several points of resemblance to the Gartered Plume, but are much darker colored, and are otherwise clearly distinct from it.

The LOBE-WINGED PLUME (*Pterophorus lobidactylus*) is of a blackish color. Its fore wings are ash grey towards their bases, freckled with tawny brown atoms; to-

wards their tips brownish black. An oblique tawny yellow band ending in white on the outer margin extends across the outer lobe near its base, and on the apex of the outer margin is a white stripe. The fringe along their inner margin is blackish, with a few white hairs forming a small spot at its apex, another white spot forward of it, a larger one towards the base of the inner lobe, and a small one forward of the base of this lobe. The hind wings and their fringes are blackish brown, and the inner lobe near the middle of its inner side sends out some coal black scales forming a spot of this color in the fringe, with a faint ash gray spot immediately forward of it. Beneath, the wings are blackish brown and the anterior pair have three equidistant white streaks on the outer margin, the first rather forward of the middle and the last on the apex; the outer lobe of the hind wings has a white spot near its tip, the inner lobe has a slight white spot on its apex and another on the middle of its inner margin. The antennæ are black with white rings, and on their under sides ash grey. The abdomen has white stripes on its under side. The legs are striped alternately with black and white and are banded with a broom-like tuft of black scales at each pair of spines. The spines are white, their bases, under sides, and also the tips of those on the middle shanks, black. The feet are white with a black band on the apex of each joint, and the first joint of the two anterior pairs has a black stripe on its outer side. The wings when spread measure 0.80 from tip to tip. Taken the last of June on bushes in meadows.

The **SLENDER-LOBED PLUME** (*P. tenuidactylus*) is of a dark tawny brown color somewhat tinged with coppery red, and on the fore wings has a white spot towards the base of each lobe, and often on the outer lobe a transverse white streak between the spot and the apex; their fringe is whitish, with a black spot in the middle and larger one at the apex of the inner margin. The hind wings are of the same color, their lobes very slender, the inner one thread-like, white, its fringes white with a broad black band near the tip. The legs are white, striped with black, the feet and hind shanks with black bands. The antennæ are white with a slender black ring to each joint. The abdomen is blackish, and at base on the under side silvery white. The wings when extended measure 0.60 across. This species is common upon brakes and other weeds growing in swamps in the middle of July.

The **ASHY PLUME** (*P. cineridactylus*) is ash gray throughout, of a darker tint upon the breast. The fore wings are sprinkled with blackish brown atoms, chiefly towards the inner margin and the base. The antennæ have a pale brown ring on each joint, which is widely interrupted on the under side. The feet and shanks are whitish and the hind shanks have a faint brownish band at tip and another on the middle. The expanded wings measure 0.75. Taken the fore part of July, in yards around dwellings.

The **BROWN-BORDERED PLUME** (*P. marginidactylus*) is tawny brown, the fore wings varied with white cloud-like spots, whereof there is one on the outer margin towards the tip and two on the inner margin, the apical and outer margins and a cloud-like central space extending from the cleft inwards are of a dark brown color; fringe whitish, brown at the outer and inner apical angles, and a small brown spot beyond the middle of the inner margin; under side and hind wings pale tawny brown; legs white, thighs, anterior shanks and apical third of the hind shanks brownish on

their outer sides. Wings expand one inch. Occurs the latter part of June, on weeds along the borders of meadows.

The CLOUDY PLUME (*P. nebuladactylus*) is milk white, the fore wings clouded with pale tawny brown which color occupies the basal portion and forms two broad bands towards the apex, the last one often faint and not perceptible on the inner lobe; hind wings and their fringe and under side of both pairs of the same pale tawny brown color; abdomen white, sides and stripe on the middle of the back pale tawny brown; legs white. Wings expand one inch. The tawny marks on the fore wings are often obscure in old individuals and sometimes wholly obliterated; still the species may be discriminated by the pale tawny color of the hind wings and the under surface of the fore ones contrasting with the whiteness of their upper surface. It is our most common species, occurring from the middle of June till the middle of July, in yards around dwellings, frequently entering opened windows in the evening, being attracted by the light of the lamps.

The FRECKLED PLUME (*P. nevosi-dactylus*). Milk white, the fore wings sprinkled with black atoms, which form a black spot at the commencement of the cleft and a dot half way from this to the base; a tawny brown spot on the outer margin near the tip; fringes, under side, hind wings and their fringes ashy brown. Wings expand 0.90. Appears towards the middle of August, in the same situation as the preceding.

The CHALKY PLUME (*P. cretidactylus*) is white tinged with tawny yellow, and has a small brownish black spot on the fore wings at the cleft and a brown streak on the outer margin slightly beyond the black spot, with traces of a brown oblique band from the one to the other; legs white, four anterior shanks banded each with a broom-like tuft of scales of a pale tawny yellow color at tip and another upon the middle. Expands one inch. Taken the middle of July, in forests.

## INFESTING INDIGENOUS FRUIT TREES.

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### THE HICKORY.

#### AFFECTING THE TRUNK AND LIMBS.

Boring large holes, lengthwise in the heart-wood; a long, soft, whitish, flattened grub.

THE TIGER CERAMBYX. *Monohammus tigrinus*, DE GEEB. *M. tomentosus*, ZEIGLER.

The insect which we are now about to consider is one of the largest and finest of our American insects pertaining to the family CERAMBYCIDÆ or Long-horned beetles. Hitherto it has not been known in what kind of wood the larva of this species occurred. Indeed, the insect itself is rarely met with in collections, having been captured only in the State of Pennsylvania. But from the numbers of its burrows, which I find in almost every hickory and walnut tree which I have had an opportunity of examining, I am impressed with the belief that this is a much more common insect than has been hitherto supposed, and now that the trees which it frequents are known, it will probably be readily found, over a considerable extent of our country.

Some hickories and bitter walnuts which were split for fuel at my door, gave me opportunities for observing the extensive excavations made by this borer and by the ants next to be noticed, which take up their residence in the burrows which this worm forms. The trees alluded to had stood solitary in the open fields, a situation in which all trees are much more liable to be infested with insects than when growing together in forests. And though to external appearance, these trees were sound and healthy, they

had for many years advanced but little in size, and some of their limbs were annually perishing and falling to the ground. And in every instance where a tree was infested at all, it was badly infested; and the wood of the hickory which is so much esteemed, and for particular uses is so valuable in consequence of its toughness and elasticity, when once attacked by these borers and the ants which succeed them, becomes so extensively perforated and mined as to be worthless for anything except fuel.

The burrow of this worm is excavated in the solid heart-wood of our American hickories and walnuts, and is almost two feet in length. It runs longitudinally upwards, increasing in diameter as the worm has increased in size. The annexed cut gives a view of portions of two of these burrows much reduced in size. The hole which the worm bores is somewhat flattish, or more wide than high, and in its largest part it is nearly half an inch in width, and considerably over a quarter of an inch in depth. At its upper extremity it turns obliquely outwards through the sap-wood to the bark.



All the lower part of this gallery is filled with

a fine powder, of a tan color, the castings of the worm; and some two or three inches below its upper end, in place of these fine castings, it is stuffed for a distance of an inch and a half, or more, with a coarser material, namely, short fibres of wood, which are bent and packed together commonly in a perfectly regular manner. Above these is another layer of the finer castings, the upper end only of the burrow being vacant. And I presume this borer, like that of the apple tree, having completed its burrow and opened it out to the bark, retires backwards a short distance and stuffs the upper end of the cavity with its castings, having the castings above it and the cushion of coarser woody fibres immediately below it during its inactive larva and its pupa state—the coarser fibres being placed there as a bed for the pupa to lie upon—by their elasticity yielding to any elongation or other motion of the slumbering insect, which the fine castings would become too compact and solid, by their settling together, to per-

mit. And when the beetle hatches from its pupa, it tears away the fine powder above it, as it crawls forward, which powder thus falls down upon the cushion of woody fibers, where we meet with it in the evacuated cells—and breaking through the bark, it emerges from the tree.

What is here described seems to be the common habit of most kinds of our timber borers. They complete their burrow by gnawing a passage out to the bark, and then retire backwards a short distance and stuff this upper extremity of the burrow with their castings, that birds, especially the woodpecker, may not be able to detect, by its hollowness, the hole which they have here formed under the bark. But this artifice is not always successful. Mr. P. Reid informs me that he once observed in the trunk of a sapling, a funnel shaped opening which had been dug by a woodpecker, some two inches in depth, at the bottom of which, incased in the wood, was the shell-like relics of a pupa which the bird had devoured, and below was the track by which the worm had come upwards in the wood to this point. At first he was excessively puzzled to account for this phenomenon—by what instinct or other faculty it was possible for a bird to discover a worm which was buried two inches deep in the wood, so as to be able to bore directly inwards to the exact point where it was lying—until it occurred to him that the worm had itself made an opening outwards to the bark, by which to effect its escape after its changes were completed, and had then retreated backwards into the wood again; and the woodpecker by tapping upon the bark had ascertained that there was a cavity beneath, and immediately thereupon opened and enlarged this cavity sufficiently to enable him to reach the insect. What curious habits, what astonishing instances of foresight and intelligence do we daily meet with in studying the works of nature, all concurring to show that these myriads of creatures, each furnished with its peculiar organs, and endowed with such marvellous faculties and instincts, could have been formed no otherwise than by a Creator who is infinite in his attributes.

Except in those cases where its burrow is taken possession of by ants, the exterior opening which is made by this beetle when it crawls out from the tree, soon closes up, leaving a round, ragged scar upon the smooth back of the bitter walnut and the limbs of the shag-bark walnut, which is visible for many years afterwards. Two of these scars are represented in the annexed cut. By the occurrence of these scars upon the bark we may be able to ascertain what trees have been infested by these and other borers, and will consequently have the wood perforated with holes and unfit for any valuable use.



Neither in Dr. Ratzeburg's celebrated work upon forest insects nor any other author which I have at hand do I find any account of the larvæ of the important genus of wood-boring beetles to which this species pertains. I therefore give a more full and particular description of it.

The LARVA when full grown is somewhat over an inch in length and a quarter of an inch in diameter across the second or broadest segment. It is a soft, smooth and slightly shining worm of a cream yellow color and a cylindrical form, slightly bulged and broader at the thorax, and is divided into thirteen segments by strongly impressed transverse lines, the sutures of the abdominal segments being more wide than those of the thorax. The nine breathing pores upon each side form elliptical pale yellow spots with a dark chestnut colored line in the centre of each; the first pore is situated in the suture at the base of the second segment, the others are near the middle of the fifth and each of the following segments. A faint darker stripe extends along the middle of the back and is interrupted at the sutures, and upon the top of each segment



except the three first and two last is a transverse oval space composed of somewhat irregular rows of small elevated points, one row forming a ring upon the outer margin of the oval space and one or two other rows running transversely across its disk. Beneath, upon these same segments is a similar oval space, but the elevated points are here rather more confused and indistinct. The second segment is longest and the two next are shorter than any of the following ones. The second segment upon its upper side is flat and inclines obliquely downwards and forwards; it is clothed with fine brown hairs, and similar hairs are scattered along the sides of the body; across its middle is an impressed transverse line forming the arc of a large circle, the ends of which line are turned backwards and are continued to the basal margin by a small semicircular impressed line. The anterior part of this segment is of a pale tawny color, with numerous minute punctures; its basal part has coarser punctures and short impressed longitudinal lines which are more or less confluent with each other.

The head is retractile within and but half as broad as the second segment, and is coal black except at its base, the black being edged posteriorly with chesnut brown. The upper lip or labrum is transverse oval, rather broader towards its base, honey yellow, and covered with short yellow hairs which incline forwards. The upper jaws or mandibles are robust, with an angular obtuse tooth-like projection near the middle of their inner sides, their tips being simple and rather blunt. The antennæ are minute conical two-jointed points projecting outwards at the base of the mandibles and distant from the base of the head. The feelers are thrice the size of the antennæ, conical, three-jointed and of a chesnut brown color; the lobe of the lower jaws or maxillæ projects at the inner base of the feelers and is more than half their length and clothed with short dense pubescence. The feelers of the lower lip or the labial palpi are minute but perceptible. The throat is whitish, the suture at the base of the oral organs black edged posteriorly with chesnut brown. The apical segment of the body is divided into two parts by a transverse impressed line, and might, as in many other larvæ, be counted as two segments, the last one being much more narrow and short in this insect.

The celebrated Swedish entomologist, Baron De Geer, long ago published a description and figure of this beetle in the fifth volume of his *Memoires on Insects*, page 113, under the name of *Cerambyx tigrinus*, or the Tiger Cerambyx, a name suggested perhaps from its size and colors. It has lately been described by Rev. D. Ziegler, and by Prof. Haldeman, under the name of *Monohammus tomentosus*, or the Woolly Cerambyx, which name, however, must give place to that which was previously bestowed. Some of the descriptions that have been published have evidently been drawn from imperfect specimens, denuded of their pubescence in places.

The medium length of this beetle is about one inch, though, like most other Long horned beetles the two sexes differ much in size, the males being often only 0.85, whilst the females are 1.15. The ground color is brown, sometimes tinged with reddish or on the elytra with pale yellow; and the surface is covered beneath and for the most part above with fine short appressed hairs of an ashy or a tawny-yellowish white color. The head is punctured, at least on its summit, and has an impressed line in its middle. The mouth is of a honey-yellow color above and beneath, the upper lip being hairy and blackish except at its anterior edge, and the mandibles are deep black, their bases brown. In the notch of the eyes is an elevation on which the antennæ are inserted. These are rather shorter than the body, eleven-jointed, the second joint very short and more broad than long; the basal joint is double the thickness and but half the length of the third joint, which, with those that succeed it are about equal in length and gradually diminish in thickness. The two basal joints are brown, all the others whitish or pale yellow and stained with brown at their tips. The thorax is everywhere covered with short appressed hairs, which are more dense beneath, and has on each side in the middle, a conical erect spine rounded at its apex. The scutel is brown, its apical half covered with whitish or light yellow hairs. The

elytra are covered with similar appressed hairs on the middle and posterior parts, leaving a broad brown band behind the middle (which is interrupted at the suture and sometimes does not attain the outer margin), and at the base a similarly colored band, which, posteriorly, is gradually shaded and without any definite edge. The anterior half of the elytra is punctured, the punctures black and becoming more dense and coarse towards and at the base, where they open backwards and have their anterior edges elevated into little callous points, rendering the surface rough and shagreened, each puncture yielding a short black bristle. The hooks of the feet are pale yellow.

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Mining long narrow passages in the trunk and limbs, and staining the wood light brown; a longish, black, shining ant, its abdomen with equidistant transverse rows of fine bristles, two rows upon each segment.

THE WALNUT ANT. *Formica Carya*.

The fact is reported in the Albany Cultivator (1853, page 116) by C. B. Brown, of Damascus, Pa., that a house that was overrun with ants had been rid of this pest by placing a piece of shag-bark hickory wood upon a shelf in the pantry where these vermin appeared to be the thickest. The ants gathered upon this billet of wood in the course of an hour or two in such numbers as literally to cover it, whereupon they were brushed and shaken off into the fire, and the stick was replaced to collect another swarm; and in this mode the house was soon entirely cleared of them. No reason is assigned for the ants being thus attracted by this wood, but there can be no doubt that the sweet syrup-like sap of the hickory was more congenial to their taste than any other food within their reach, and was the cause of their collecting together in the manner stated. And it is quite probable that a recently cut piece of hickory wood may prove in other cases one of the best traps for these pests, which occasionally become quite an annoyance in our dwellings. Hickory and walnut trees whilst growing are also a favorite resort of these insects, and we have one American species which appears to be a constant resident upon them, to the great injury of the trees. In the winter season I have repeatedly met with little clusters of this ant, when searching for insects under the loose scales of bark of the hickory, and on coming recently to work up some of these trees for fuel, these same ants were found in the wood, occupying most of the galleries which the tiger cerambyx had bored therein, which gal-

leries they had extended and connected together by their own mining labors. These passages were extended every where through the wood of the trunk and branches, often running out even into the small limbs less than three inches in diameter.

Our other wood-eating or carpenter ants (*Formica Pennsylvanica ligniperda*, &c.) seem to reside only in the dead wood of the interior of trees and in the timbers of our buildings, but this species is of a more pernicious character, attacking the sound wood of living trees. Its burrows are long narrow passages, never widened into those spacious apartments which our other carpenter ants excavate. Sometimes portions of dead wood in the heart of the tree and at its butt will be met with, mined in a different manner, large chambers and galleries being excavated which are separated by partitions no thicker than pasteboard; and not unfrequently a few dead individuals of the Pennsylvania ant, which is a larger species, may be found lying in these galleries, showing that these apartments were constructed by them and not by the walnut ant. And it appears to be a common occurrence for a colony of the Pennsylvania ants to establish themselves in the dead wood of the walnut, and to be afterwards so encroached upon by the more numerous and thriving colony of the walnut ants that they abandon or are driven from the tree, for I have never met with any living individuals of this species in these cavities, which had manifestly at some previous period been excavated by them.

It has been remarked of one of the European ants (*Formica fuliginosa*) that the sides of its burrows are always of a black color, and our American ant has a similar habit. It paints the walls of its rooms, as we may say, of a butternut or snuff brown color. Huber could not satisfy himself whether the black color of the wood occupied by the European ant alluded to was caused by its being exposed to the air, by some vapor emanating from the bodies of the ants, or by its being acted upon and decomposed by the formic acid which ants secrete. To us it appears that the last of these is probably the cause, for with our species this discoloration is not confined to the surface of the burrow, but penetrates through the wood surrounding it on all sides, to the dis-

tance of an inch or more. This discoloration will be observed in every part of the trunk and limbs of the walnut tree, wherever the burrows of these ants occur. And it seems quite probable that the ant by thus saturating the wood with acid, hastens its decay, in order to adapt it for being more easily mined. If we are correct in this supposition, this curious faculty which our walnut ant possesses of softening the wood in order that it may be able to gnaw and excavate it more readily, renders this species much more injurious than it otherwise would be.

It is commonly stated of the insects of this family that males and females are developed only in the summer, and that it is the neuters alone that are to be found at other seasons of the year; but of this species I meet with all three of the sexes, in a torpid state in their burrows, in the winter season. Those parts of the burrows where the ants were present had their walls quite wet, probably from the perspiration given off from their bodies. And nestling in this wet surface a few larvæ of the ants were also met with.

These *larvæ* were very small footless grubs, measuring from 0.03 to 0.08 in length, the largest individuals being about 0.03 in diameter. They are of a cylindrical form, but always lie with the body doubled together in the form of the letter U, or in the larger individuals with the head bent downwards against the breast. They are of a white color, shining and semipellucid, with a blackish cloud in the center of the body from alimentary matter in the viscera. The surface is covered with numerous shortish white hairs, and the segments are marked by transverse impressed lines, which are much more obvious in the large than in the small individuals. No projecting jaws can be discerned at the mouth.

Upon the wet surface of the walls of the cavities occupied by these ants, extremely minute ticks may also be met with, numerous in particular places, and of a pale red color, bearing some resemblance to a minute Coccinella or Lady-bird. These, it is probable, are parasites living upon the ants. They are similar in their form, texture, &c., to the common Beetle-tick (*Gamasus coleopratorum*, Lin.), but the hard shining plate covering their backs consists of one piece only. They consequently pertain to the genus *Uropoda* of Latrielle, and the species may appropriately be named *Formicæ*, or the Ant-tick. Of the species figured in Baron Walckenaer's Atlas of Apterous Insects, it bears the closest

resemblance to that of *Uropoda vegetans* (Pl. 34, fig. 6), a species which is quite common upon several of our American beetles.

The ANT-TICK measures from 0.010 to 0.015. It is of a cherry red color, younger individuals being translucent and pale reddish; it is shining, with translucent legs clothed with short hairs. It is of a circular form, very slightly longer than wide, flattened, and commonly presents a translucent margin. The legs are shortish, taper gradually, and the feet are not half the thickness of the shanks. The anterior legs have not the slender feet of the three other pairs, but are antennæ-like, and have at their tips several short coarsish hairs and a single bristle slightly longer than these hairs. The palpi or feelers rarely project beyond the anterior margin, and their tips are also clothed with short hairs.

This ant appears to be a distinct species from those which have been heretofore described, and I therefore propose for it a name in allusion to the situation in which it occurs. It may be distinguished by the segments of its abdomen being glabrous and polished at their bases and minutely punctured on their posterior half, with two transverse rows of fine erect bristles, one in the middle the other at the tip of each segment. The Silky ant (*Formica subsericea*) described by Mr. Say in the Boston Journal of Natural History (vol. i. p. 289), is closely related to this species, but is destitute of punctures on the abdominal segments.

The MALES of this species measure 0.30 to the tip of the abdomen which is about 0.08 in diameter, 0.32 to the tip of the closed wings, and the wings spread 0.45. They are black and shining. The head is nearly globular, and there are, as usual in this sex, three distinct ocelli or little eyes upon the crown, and from the anterior one of these a fine impressed line runs forward to the face. The face is rough and unequal, with impressed punctures, from each of which arises a short hair. The tips of the jaws are tinged with brown; the upper lip is blackish-brown or sometimes cinnamon-yellow; the feelers are long slender and thread-like, and clothed with fine short hairs; the antennæ are long and slender, of equal thickness, their tips with an ash-gray reflection. The thorax is slightly broader than the head, oval, smooth, and without punctures or hairs. The abdomen is somewhat wider than the thorax, and composed of seven segments, of which the basal one is contracted as usual, forming a slender pedicel, with an erect hump or scale on the middle of its upper side, which, viewed laterally, is of a wedge-shaped form, short and thick, and bears a few short hairs; its summit is cut off transversely and is distinctly notched in its middle. The remaining segments form a regular oval mass, rounded at base and pointed at tip. The basal third or half of each segment is glabrous and shining, the remainder is minutely punctulated and clothed with fine short hairs, scarcely perceptible, whilst on each segment are two transverse rows of fine bristles which are sometimes interrupted along the middle of the back, one row on the posterior margin, the other near the middle, these bristles arising from rows of equidistant punctures. At the tip

protrude three short thread-like processes, of which the outer ones are slightly longer. The feet are long slender and tinged more or less with brownish towards their tips. The single spur at the tip of each of the shanks is of a pale yellow color. The wings are transparent and glassy but not clear, the surface being minutely granular as usual in this genus and strongly iridescent. Their veins are honey-yellow and have a waxy appearance; those which traverse the posterior portion of the wings are hyaline and colorless, and become abortive at their tips in the margin.

The FEMALES differ from the males in being of a much larger size, measuring almost half an inch to the tips of the wings, which, when spread, are three-fourths of an inch across. The head approaches to a square form, and is broader than the thorax; the upper jaws are more robust, and of a dark reddish brown color; both the head and thorax are minutely punctured and pubescent; the abdomen is proportionally larger and less narrowed towards each extremity, is but six jointed, and has no projecting processes at its tip, the scale on the peduncle at its base is very slightly and sometimes not at all notched, and the two transverse rows of short bristles on each segment are much more distinct; the feet and sometimes the shanks are of a dark reddish brown color; and in the wings the vein which bounds the inner side of the cubital cell arises outside of the middle of the transverse medial vein, instead of in the middle, which is the point where it originates in the males. Some females are met with which have gnawed off their wings and cast them away, this being a common habit among ants of this sex. These wingless females may be distinguished from the largest sized workers by being of a still larger size, and the cicatrices of the cast off wings are very obvious on the sides of the thorax.

The NEUTERS or workers are always destitute of wings, and are generally smaller than the males, varying in length from 0.20 to 0.33. In all other respects they resemble the females, except that they have no ocelli and a very narrow thorax plainly divided into three segments by impressed sutures. The scale of the abdominal pedicel is almost circular, being a little higher than it is wide, and is regularly rounded above, without being cut off as in the female, or notched as in the male; it is convex on both sides, but with a slight concavity in the middle of its posterior face.

The following VARIETIES may be found among these ants:

- a. Female. Scale of the abdominal pedicel not at all notched.
- b. Female. Middle transverse sutures of the abdomen strongly constricted.
- c. Female. Middle suture of the abdomen pale, forming a transverse band.
- d. Neuter. Basal suture of the abdomen pale yellowish brown.
- e. Neuter. Two basal sutures of the abdomen pale yellowish brown.
- f. Neuter. Antennæ and legs dark reddish brown, instead of black. These are probably young individuals, recently hatched.

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Upon the twigs and leaf-stalks, hollow green bullet-like galls of a leathery texture, their inner surface covered with minute white and yellow lice; the gall afterwards turning black, opening and becoming cup-shaped.

The HICKORY-GALL APHIS. *Pemphigus Caryæcaulis*.

A disease of the young limbs of the hickory, which will remind one of the well known black knots upon the cherry, is of such

frequent occurrence that it has probably been observed by many of my readers. About fifteen years ago I first noticed a tree upon my farm which was severely affected by this disease, and which has continued to suffer from it annually down to the present time. Within two rods of this tree are two others which have remained wholly unaffected, and have regularly produced a fair yield of fruit, whilst not a single nut has been matured upon the diseased tree. The excrescences upon the limbs at the time of gathering the fruit in autumn, which was the only time I had heretofore noticed them, are black, ragged, leathery and cup-shaped, having a marked resemblance to some of the species of fungi of the genera *Peziza*, *Cenangium*, and their kindred. But whether they really were of a vegetable nature or were the work of insects I was unable to determine from their appearance at that period of the year. Mr. T. B. Ashton having recently informed me that he had always met with the Elegant weevil (*Conotrachelus elegans* Say), a species most nearly related to the Plum weevil (*C. Nenuphar* Herbst), exclusively upon these diseased hickory trees, although I had myself captured it upon butternut, hazlenut and other foliage, I resolved the present year to investigate these excrescences at the commencement of their growth, and ascertain their cause, not knowing but it might throw some light upon the mooted origin of the black knots upon the plum and cherry. I have been successful in this examination, and have ascertained that although these excrescences are of insect origin, the weevil alluded to has no direct connection with them, and if it really is more common upon these diseased walnut trees than elsewhere, as Mr. Ashton's observations indicate, it is only because, like many other insects, it prefers diseased and weakened vegetation to that which is healthy and of rank vigorous growth.

The insect which forms these excrescences is a female plant-louse, and her proceedings and the effect which they produce is truly wonderful. Hatching probably from eggs that were laid the preceding autumn, each individual, early in the season, stations herself at a particular spot, either upon the mid-vein of one of the leaflets, upon the leaf stalk, or still farther down, upon the green succulent twig which is the growth of the present year.

This last is most frequently the situation which she prefers. Puncturing the part with her beak she causes a profusion of sap to flow from the wound. This evaporating and coagulating becomes organized vegetable matter, which gradually grows upward into a wall around her, and as she continues to puncture it its growth continues until it finally closes together over her, and shuts her into a cavity having only sufficient room for her to turn freely around in it. Yet within this cell in which she is thus closely imprisoned, she is to give birth to several hundreds of young. To make the cavity sufficiently roomy for them she continues to puncture its walls upon every side, thus causing them to expand. Her young also, as soon as they are born, fix themselves to the inner surface of the gall, inserting their beaks therein to feed upon the vegetable juices, thus adding to the irritation and expediting the growth of their domicile. Thus as they increase in number and size the gall increases, so as to furnish the amount of room which each requires, without any vacant space between, the whole surface being covered with these young lice.

It is thus that these excrescences are produced. They are of a globular form and of different sizes, from that of a pea to an ounce ball, and are attached to the side of the stem the whole length of their base, often causing a bend or distortion of the stem, especially when two or three are contiguous and confluent, as they frequently are. The walls of the gall are about the tenth of an inch in thickness, and of a succulent fleshy texture, white upon the inside and green on the outside at first, but soon becoming discolored with black, which spreads until the whole is of this color. The hollow inside has its surface covered with minute smooth shining lice of different ages and sizes, so that it resembles the geode of a mineral, the surface of which is lined with a multitude of minute crystals, whose sparkling points are everywhere glittering in the light. Numerous dusky specks are also observed among the lice. These are the cast skins of the lice, all of which moult as they increase in size, their original skins becoming too small to contain them, and being of too firm a texture to expand with the growth of the insect.

In addition to the dusky cast skins which have been mentioned, in many of the galls numerous round black grains occur. These

are the excrement of a larva which lives in the walls of the gall, mining cylindrical channels in it. This larva is about the tenth of an inch long, shining watery whitish, with a pale yellow cloud in the middle of its body, from visceral matter in the intestines, and a flattened polished pale tawny head with the jaws appearing like two brown dots on its anterior edge. It has no feet, and to crawl forward it elongates itself and with its jaws grasps the spongy side of its burrow, and then contracting, it draws its body up towards its head. By this singular mode of progression it moves along with rapidity in its burrow, but when placed upon paper it strives in vain to lay hold of the smooth surface with its jaws, and is incapable of advancing. It is quite probable that this worm is the larva of the Elegant weevil above spoken of.

It would be supposed that the lice which occupy these galls, being wholly shut in as they are by a thick wall upon every side, would be secure from the assaults of the numerous and inveterate enemies of the aphides which have been noticed in the preceding pages. But in one instance, four worms, which from their appearance and motions I supposed to be the larvæ of a Syrphus-fly, were met with in one of these galls. They were the tenth of an inch long, of an elongated oval form, more pointed anteriorly, and of a pale rose-red color, with a broad yellow stripe in the middle from inclosed visceral matter.

Though I have not been able to find winged individuals of the insect which forms the galls upon the hickory twigs, it is so like the *Pemphigus bursarius* of Europe in its habits, a species which forms similar galls upon the leaf stalks of the poplar, that I entertain no doubt our insect is co-generic with that species. We have still another species which is closely related to these in its habits. It is the grape leaf louse (*Pemphigus Vitifoliae*) of my manuscripts, and forms small globular galls about the size of a pea, upon the margin of the leaves of the grape vine. They are of a red or pale yellow color, and their surface is somewhat uneven and woolly. They are met with the fore part of June, having only the wingless females inclosed within them at that time. These closely resemble the same sex in the species under consideration.

The *larvæ* which occur in the walnut galls are of different sizes, the largest being 0.025 long, of an oval form and a light yellow or yellowish green color, with dusky legs and antennæ. Younger individuals are white, shining, and somewhat hyaline, with pellucid white legs. The antennæ are short and robust, consisting of two short thick basal joints and a longer terminal one of a conical form, and giving off a short bristle on one side near the tip. The legs are also short and thick.

The WINGLESS FEMALES, of which one is found in each gall, she being the parent of the multitude of *larvæ* around her, measures 0.04 in length, or somewhat more. She is of a plump egg-shaped form, narrower posteriorly and flattened on the under side. The segments of the abdomen are much longer than those of the thorax, and are separated by impressed lines. The legs are short, scarcely projecting beyond the outer margin, and with the antennæ are blackish, the general color of the body being yellow, often of a dull or dirty tinge.

Trees are much disfigured by the excrescences upon the ends of the limbs which this louse produces, which show conspicuously after the leaves have fallen. It requires two or three years for them to decay and become obliterated, and in the mean time a new stock is annually added, for where these insects obtain a lodgment they continue year after year, stunting the tree in its growth and blasting its fruit. Though there sometimes grows upon such trees nuts which are full sized and appear externally to be fair and well formed, they are found upon cracking to be destitute of meats.

It is quite probable that these insects may be expelled from the trees which they infest by rubbing the ends of the limbs with soft soap soon after the leaves put forth. Or a month afterwards, when the galls are green and filled with lice, by cutting off and burning all the twigs and leaf-stalks on which these galls are growing, the tree will probably be relieved from a renewed attack the following year.

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#### AFFECTING THE LEAVES.

Consuming the leaves; white caterpillars with eight tufts of converging black hairs on the back and towards each end a pencil of long black ones on each side.

The HICKORY TUSSOCK-MOTH. *Lophocampa Caryæ*. HARRIS.

Of the caterpillars of our State, one which will be most apt to be observed on account of its' clean neat appearance, and the re-

gular arrangement of the colors to the tufts and long pencils of hairs with which it is clothed, is the hickory tussock-moth. And any one who is desirous of rearing an insect in order to inspect the remarkable changes which it undergoes as it grows up to its perfect state will succeed better with this, probably, than with any other species. One or more of the caterpillars placed in a tumbler or a box, and supplied with fresh leaves two or three times a week, will require no further care. So hardy are they that they will even feed upon leaves which are dry and brittle, and their cocoons may be kept in a warm stove-room during the winter without the inclosed insect withering from the dryness of the atmosphere.

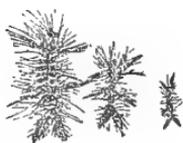
Although the hickory and walnut appear to be the trees of which these caterpillars are most fond they are by no means limited to them. Dr. Harris records his meeting with them upon the ash and elm, and I have found colonies of the young worms upon the butternut, the sumach and the slippery elm. They hatch from the eggs early in July, and whilst young they remain together, a hundred or more in a company, all being probably from one parent. They occupy a leaf near the end of a limb, forming for their residence a slight covering or tent made of the fine silken threads which they spin. If the limb is jarred most of them let themselves down from it by means of their



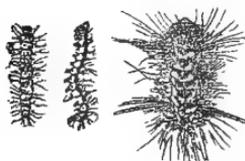
threads, some dropping to the ground, others remaining suspended in the air at different heights. They have their regular periods for feeding and reposing. They consume the whole of the leaves where they reside, leaving only the midveins and some small fragments of the green tissue remaining. The annexed figure is taken from a leaf partly consumed by them. If when engaged in feeding a fly or other insect annoys it, or even if the rays of the sun shining

through the foliage happen to fall directly upon it, it moves away to another place; and if when thus crawling away its hairs touch

those of one of its comrades, he too stops feeding, and moves at least a short distance aside. When ready to cast its skin it fixes itself to the surface of the leaf by means of the minute sharp hooks of its feet; its exterior skin separates, and through a cleft at its anterior end the worm crawls from it, leaving the empty skin with its white and black tufts and pencils of hairs adhering to the leaf, with the legs, particularly the pair at the extremity of the body spread widely apart. They cast their skins three times in attaining their growth. The accompanying cut gives a view of these cast skins at each of the moultings, and shows the increase which takes place in the size of the caterpillar during the intervals. With each change of its skin a very perceptible alteration takes place in the appearance of the caterpillar. Its hairs, which at first are so fine as to be scarcely noticed by the naked eye, become so coarse and numerous at last as to hide from view the skin and the dots with which it is ornamented.



The LARVA or caterpillar is sixteen footed, cylindrical, clean clear white, with numerous black dots, and clothed with tufts and longer pencils of hairs, which are beautifully branched or bearded, and of a white color, interspersed with other tufts and pencils which are black, the longest of the pencils being half as long as the body.



The accompanying figures present a dorsal and lateral view of the young and a dorsal view of the mature caterpillar, the last much contracted in its length, being taken from a dried cabinet specimen. On the anterior segments the black dots are arranged in a transverse row; on each of the others there are four black dots above, at the angles of an imaginary square, the anterior two being nearer each other, and upon each side is a row of three equidistant dots, the upper one larger, with three minute black dots slightly below it, and a short black stripe back of it. From each of these dots arises a tuft of white or black hairs, there being a row of eight black tufts along the back, the ends of which converge in the form of a steep roof, and two pencils of long black hairs on the fourth and also on the tenth segments. Some long white hairs overhang the head, which is black, smooth and shining, the bases of the feelers and of the jaws and upper lip being white. The neck has a large crescent-shaped spot above, placed transversely, and two small black dots on each side, with two larger ones anteriorly below these. The legs are black, the prolegs white, with a large black spot on their outer sides.

The caterpillars attain their full size in about two months, and are then nearly an inch and a half in length. Before they are

half grown they scatter themselves and thenceforth live apart and solitary. The state of the atmosphere influences them somewhat as to the time of spinning their cocoons. Ten worms which I reared in a cage together from their infancy, after a period of severe drouth, on the occurrence of a rainy day the second of September, spun their cocoons simultaneously, all save one, which performed this labor ten days earlier. When ready to form its cocoon the caterpillar crawls into some secure cavity, in the crevices of a wall or beneath a stone, to which the cocoon is very slightly attached. From this the winged moth is given out the following spring, though when reared in a dry room I have known individuals to come forth in their winged state the latter part of October and in November. These moths pertain to the family ARCTIDÆ or the Tiger-moths. They cannot be referred to any of the genera defined by the European naturalists, and Dr. Harris (New England Insects, p. 279) has therefore constructed for them a genus which he names *Lophocampa*, a word meaning crested caterpillar. He indicates four species pertaining to this genus, and the caterpillars of two additional species are known to me.

The Cocoons of the hickory tussock-moth are of a regular oval form, nearly an inch long and over a half inch broad, of an ash gray color, composed exteriorly of the short stiff hairs of the caterpillars, woven loosely together and with their points standing in all directions, so that it is impossible to touch one of these cocoons without having the skin filled with these hairs, resembling cowhage and producing the same irritation of the skin which that substance causes. The pencils of long black hairs of the caterpillar are separated and drawn in among the others so skilfully that the eye is seldom able to discern their color. The whole are held together by a thin clothlike fabric formed of white silken threads matted closely together which lines the cocoon upon its inner side. Its texture is so slight that when the moth is ready to leave the cocoon, by merely crowding its head forward it ruptures it at one end and forms a round orifice through which it makes its exit, elongating the cocoon slightly hereby, at this end, as represented in the accompanying figure.



accompanying figure.

The CHRYSALIS or Pupa lies in the cocoon with the black head and other relics of the larva at its pointed end. It is 0.70 long by 0.30 in diameter, of a pale chestnut color, its sutures marked by slender black impressed lines and the breathing pores forming a row of seven oval black dots along each side. Its surface is smooth, without those rows of little spines which we see in the pupa of the peach borer and several other moths, and the empty shell remains within the cocoon after the moth is disclosed. The figure presents a dorsal view of the sutures, breathing pores, &c., but is unduly contracted on the anterior half, the width here being the same as across the middle.



The winged MOTH measures from 0.65 to 0.80 in length to the tip of its abdomen and the expanded wings are 1.70 to 2.20 across, the females being larger than the males. It is of a pale ochre yellow color, hairy above, the abdomen on its under side covered with scales of a whitish and somewhat silvery appearance, with a row of tawny spots in the middle in the female; a band in front between the eyes, two dots on the neck and the inner edge of the shoulder covers tawny; eyes spotted with black; antennæ three-fourths the length of the body, tawny yellow, with two rows of teeth along their inner sides, which are short in the female and in the male long and comb-like. Fore wings long and narrow, somewhat pointed at their ends, nankia yellow freckled with tawny yellow atoms, and with the veins and a ring surrounding each of the spots tawny yellow; spots mostly round or oval, white and somewhat transparent, arranged in three rows extending obliquely across the wings parallel with the hind margin, each row having one spot between each of the veins, the number being eight in the two hindmost rows and six in the forward one; the third spot in the middle row the largest; the forward row situated half way between the middle one and the base, with two additional spots behind and two forward of it, and a large irregular spot upon the inner margin at its base; under side similarly colored and marked. Hind wings whitish, thin and semitransparent, without spots. The spiracular tongue is almost as long as the antennæ. The feelers project horizontally forward and are clothed with hairs similar to those upon the head, their apical joint being covered with scales only.

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On the under surface of the leaves, sucking their juices; small flattish pale yellow lice, their antennæ with black rings.

The LITTLE HICKORY APHIS. *Aphis Caryella*.

The extensive genus *Aphis*, several species of which we have had occasion to treat of in the preceding pages, is well characterised by having three oblique veins crossing the disk of the fore wings, the third one of which is twice forked, and seven-jointed antennæ. The species, however, which are embraced in this genus admit of being divided into smaller groups. This has been shown in a very able manner by M. Kaltenbach, whose arrangement is reproduced by M. Amyot in his valuable review of these insects in the *Annals of the Entomological Society of France*, 2d series, v. 473-480. But none of the sections which these authors define appear to present differences of sufficient value to warrant their elevation to the rank of genera, although Mr. Curtis in his *British Entomology* has proposed to separate those having the antennæ shorter than the body, and the beak arising from the lower part of the head instead of between the base of the fore

legs into a distinct genus under the name *Cinara*. But we have certain American species inhabiting the leaves of the hickory; oak, and high cranberry, which differ so much both in their form and habits from the general character of these insects, that they will probably be regarded as entitled to the rank of an independent genus. Having the last joint of the antennæ shorter than that which precedes it, they would be included in the last section of M. Amyot's arrangement, the type of which is the *Aphis Tiliæ*. But, from specimens of this species received from Dr. Signoret of Paris, and the descriptions given of it by M. Fonscolomb and others, our American insects differ in several important points. Their wings are not elevated in the usual steeply inclined manner but are laid flat upon the back in a horizontal direction; their bodies are strongly depressed; their nectaries are merely pores without any perceptible elevation, though in one instance, examined when a globule of honey dew was protruding, the end of an exceedingly short cylindrical tube could be discovered with a lens, which tube appeared to be retracted and became imperceptible soon after. Their secretion of honey dew appears to be quite limited as compared with other aphides, nor do they extract a sufficient amount of juices from the leaves to cause any very perceptible distention of their flattened abdomens. They do not remain fixed to the leaves with their beaks inserted therein, but are wandering over its surface much of the time, nor do they live in societies like other aphides, only a few being met with upon the same leaf, and these are scattered upon its under side, chiefly along the sides of the midvein, in the angles where the lateral veins are given off from it. Ants, moreover, are never met with accompanying them.

These aphides are smaller and of a more tender delicate appearance than their kindred. Most of the species are of a pale yellow or white color, with black rings upon their antennæ, and their legs and wings are frequently varied with black or brown marks, which are much more clear and distinct than is usual in this family, the species of which, Linnæus well remarks, are difficult to distinguish and more difficult to describe. That which is

most common upon the leaves of the hickory may be distinguished by the following characters.

THE LITTLE HICKORY APHIS (*Aphis Caryella*) is pale yellow with white antennæ which are alternated with black rings, the wings transparent and without spots, their veins slender and pale yellow, the legs yellowish white to their ends. Length 0.12 to the tips of the wings. The abdomen is depressed, egg-shaped, its apex slightly narrowed and elongated. The antennæ are longer than the body, tapering, seven-jointed; two basal joints as broad as long, twice the diameter of the following joints; third joint longest, slightly thicker towards its base; fourth and fifth joints rather shorter than the third, cylindrical; two last joints together about equaling the fifth in length; the sixth swelled at its tip into a long oval knob, the seventh more slender but not capillary, shorter than the sixth; a broad black band at the apex of the third and each of the three following joints. First vein of the fore wings straight and almost transverse; second vein bent near its base, running first towards the apex and then turning rather abruptly and continuing straight to the inner margin, more than twice as far from the first at tip as at base; third vein arising from the stigma near its anterior end, and not from the rib-vein forward of the stigma, as it does in the aphides generally, except those pertaining to this group, its base and its apex about the same distance from the second vein that this is from the first, forking rather forward of its middle, strongly bent at this point, and from hence to its tip parallel with the third vein or but slightly diverging from it, its tip a third nearer that of the third vein than this is to the second; second fork nearer the fourth vein at tip than to the first fork, the triangular cell between it and the first fork with its three sides equal; fourth vein short and often nearly abortive, shorter than the second fork, equally curved through its whole length, its tip much nearer that of the rib-vein than that of the second fork; rib-vein very slightly diverging from the margin from the base to the stigma, curved from thence to its tip. Stigma oval, about twice as long as wide, watery, sometimes tinged with yellowish. A variety has the stigma dusky at its tip. Another variety (*costalis*) has the rib-vein coal black interrupted with whitish towards the stigma, which is dusky, and black at each end.

In addition to the species now described, four others occur upon the under surface of the leaves of the hickory and walnut, similar to it in size, form and general color, and as some of these are frequently met with upon the same leaves with the preceding they might be suspected to be mere varieties. Their spots and marks, however, are so clear and definite and the veins of their wings are so dissimilar that we are obliged to regard them as distinct species. They may be named and briefly characterized as follows:

THE LITTLE DOTTED-WINGED APHIS (*A. punctatella*) is much like the preceding in the color of its body, antennæ and wings, but has black feet and a black dot on the base and another on the apex of each of the veins of the fore wings; the stigma is salt-white with a brown streak at each end; the second vein is wavy and at its tip is

curved towards the tip of the first vein; the third vein arises from the basal extremity of the stigma and forward of its furcation curves perceptibly towards the apex of the wing; the fourth vein is longer than the second fork.

THE LITTLE SPOTTED-WINGED APHIS (*A. maculella*) differs from *Caryella* in having only a slender black ring at each articulation of the antennæ, the feet and a band near the tips of the hind thighs blackish, the stigma salt-white, its base black, its apex dusky; fourth vein with a black dot on its base and a dusky one on its apex; the first vein, apical third of the second vein, and the first and second forks broadly margined with smoky brown; second vein wavy and parallel with the third vein till near its tip where it curves towards the first vein, its base a third nearer the third than it is to the first vein; third vein arising from the anterior extremity of the stigma, with a dusky spot on its apex.

THE LITTLE SMOKY-WINGED APHIS (*A. fumipennella*) is of a dull yellow color with blackish feet and the wings smoky with robust brown veins, the rib-vein much more distant from the margin the first half of its length than in the other species, and from its middle to the stigma approaching the margin, the fourth vein long, equaling the stigma in length.

THE LITTLE BLACK-MARGINED APHIS (*A. marginella*). Pale yellow, antennæ white, their bases and four bands black; a coal black band in front between the eyes and continued along each side of the thorax to its base; elytra pellucid, stigma, outer margin and rib-vein coal-black, first vein with a black dot on its base; fourth vein slender, black, the other veins colorless; outer margin of the hind wings black. Length 0.15.

In addition to the preceding a remarkably large aphid is described by Dr. Harris, under the name of *A. Caryæ*. A species which forms plaits or folds in the veins of the leaves and which probably pertains to the genus *Pemphigus*, and also a woolly aphid (*Eriosoma*) inhabiting this tree is known to me. These, with the species which forms galls upon the leaf-stalks and twigs, make nine different kinds of these vermin which live at the expense of our hickory and walnut trees.

# INFESTING FOREST TREES.

## THE PINE.

### AFFECTING THE TRUNK.

Patches of white, flocculent, down-like matter on the smooth bark, covering exceedingly minute lice invisible to the naked eye.

The PINE BLIGHT.—*Coccus Pinicorticis*.

Upon young White Pine trees, especially those which are transplanted to ornament our yards, may frequently be seen a species of blight, showing itself in the form of a white, flocculent cotton or down-like substance growing upon the smooth bark, particularly around and immediately below the axils where the limbs are given off from the main trunk of the tree. Often small white spots of this same substance are scattered irregularly and more or less densely over the whole of the bark from one whorl of limbs to another. It is upon the north or shaded side of the trees that these patches are most numerous, and upon the lower part of the body of the tree, where the foliage of the limbs growing above, produce a constant shade. Those parts of the body of the tree which are much exposed to the light of the sun are seldom, if ever, coated with any of these spots.



Where a tree is much coated with this white substance, it becomes sickly and presents a slender, dwindled appearance, its leaves are short and stunted in their growth, and of a dull green color, and the annual growth of the tree is much curtailed.

If, with the point of a needle, this white cottony substance be carefully parted asunder, under it, attached to the bark of the tree, may frequently be found the insect which is the cause of this

evil. When parted under a magnifier, the white matter appears like very fine Saxony wool, the crinkled fibers drawing apart as do those of wool. And under them, in each tuft, is discovered by means of the lens, a cluster of the insects alluded to, huddled closely together and fixed to the bark. They are so very minute, and so like the bark in their color, that it was not till after repeated examinations that I was able to detect them. The insect is a louse, so exceedingly small as to be wholly imperceptible to the naked eye, and is discovered with difficulty even when the eye is aided by a magnifying glass. Of these lice the larger individuals are little over the hundredth part of an inch in length, and smaller ones are associated with them not half this size. They are broad oval and nearly hemispherical in form, soft, of a black or blackish brown color, with their backs coated over more or less with a whitish meal like powder. Three pairs of legs are perceptible, which are equidistant from each other. They are short, filiform and black. Little more than what has now been stated can be discerned with a common magnifying glass. When placed upon white paper, the dark color of the insect renders it very perceptible, and a very slight motion may be seen, but for which, one would deem it a speck of shapeless inorganic matter. Its powers of locomotion are so small that it does not attempt to crawl away from the point where it is placed, a slight gliding motion, to the distance of little more than a hair's breadth, being all that it commonly accomplishes.

When highly magnified, the white meal-like substance upon the back of this insect is found to be a mass of short curling uneven filaments, coating the back and giving it a rough, shaggy appearance. The legs are short and robust, the shanks being nearly equal to the thighs in diameter, and the feet but little narrower at base than the shanks; they are conical, and seem to be of one single piece, ending at tip in two minute short bristle-like setæ. The shanks are but little longer than broad and slightly enlarged towards their tips. The thighs are slightly longer than the shanks and thickest in their middle. There are no thread-like or other projections at the hind end. The head appears to be separated from the body by a very faint transverse line. In the meal-like powder with which it is coated, no antennæ or organs to the mouth can be discerned, but on carefully rubbing off this powder two little projecting conical points, one upon each side of the head, standing outwards like little ears, appear to represent the antennæ. Often the white powder upon the back appears like transverse bands, separated from each other by the slightly constricted black sutures of the body. The flat under side of the body is of a pale color, and in some individuals the upper side is also tinged with pallid.

I have never succeeded in discovering any winged individuals of this species, and hence cannot decide with confidence as to its genus. The one-jointed feet indicate that it pertains to the Family COCCIDÆ of the Order HOMOPTERA, and the facts in its history which are above recited, leave but little doubt that it belongs to the genus *Coccus* as restricted in systematic works at the present day.

By many the white pine is much esteemed as a shade tree around dwellings, particularly upon their north and west sides, for breaking off the winds of our severe northern winters. It is also highly prized as an ornamental tree in those sections of our country where it does not grow naturally. Hence whatever retards the growth and impairs the health of these cultivated trees, becomes a matter of interest. I have repeatedly noticed this blight upon transplanted trees, but have never observed it upon trees growing in their native situations.

There is every probability that scrubbing the affected parts of a tree with soap-suds, will prove a sovereign remedy for this as it is known to be for other species of lice. And this remedy will be of easier application here, than in most other cases where it is the small twigs of trees which are infested with these vermin. As this blight is located upon the trunks, chiefly of young trees, it can be readily reached by the scrub-broom. The remedy is so simple and so easy of application, that no one should suffer the young pines in his yards to dwindle and become stunted and sickly from this cause.

## INFESTING GARDEN VEGETABLES.

### THE CABBAGE.

#### AFFECTING THE LEAVES.

Eating holes in the outer leaves late in autumn; a small cylindrical pale green worm, wriggling briskly when disturbed, and letting itself down by a thread.

The CABBAGE MOTH. *Cerostoma Brassicella*.

One of the most important culinary vegetables which we cultivate, the cabbage, is in Europe subject to the attacks of quite a number of caterpillars and moths, some of which prey voraciously upon it. In our own country this vegetable probably has as many of these enemies as abroad; but so little attention has been bestowed upon our noxious insects, that only two of these have as yet been publicly noticed—the cut worm, which is everywhere such a grievous pest, and the caterpillar of our white butterfly, which, however, subsisting upon mustard, turnip, and most other plants of the extensive order *Crucifera*, seldom invades cabbages in such numbers as to injure them. But I come to speak of another worm, a moth, which makes greater havoc upon the leaves of the cabbage than any insect which has yet been noticed at home or abroad. And although it has not yet been observed within the confines of our own State I entertain no doubt that it exists here, and that it will at times become multiplied in particular localities, to the same extent that it has been in one of our sister States the past season.

In the neighborhood of Ottawa, Illinois, in October last, I observed the cabbage leaves in the gardens perforated with numerous holes of variable size and irregular form, by a small green worm. Some gardens were so much infested that all the outer

leaves of the cabbages were literally riddled with holes, more



than half their substance being eaten away. And at almost every step, numbers of the little moths which hatch from these worms would arise upon the wing and flit away a few yards, to some covert. Fortunately, it is only the free outer leaves of the cabbage which are preyed upon by this worm, whilst the compacted inner leaves, forming the head,

on which the value of this vegetable depends, are left uninjured. But there is no doubt the eating away of the outer leaves, to such an extent as is frequently done by this worm, weakens and stints the growth of the head, which, it is well known, continues to advance in size until the very end of the season. And among those varieties of the cabbage which do not form large and compact heads, such as the Savoy and broccoli, this moth must be utterly ruinous. Even if it did no direct injury to the vegetable, the presence of these little green worms, in such numbers upon the leaves, wriggling about so spitefully when disturbed, is quite annoying; and the eroded leaves mar the tidy appearance of the garden.

It is a little remarkable that this species occurs in all its states so late in the autumn as the middle of October, as the several British moths which are co-generic with it all make their appearance in July and August. It is hence altogether probable that there are two generations of the moth in each year; and if so, the first generation will make its appearance, it is quite likely in the month of June, or at all events before the heads have begun to form and when all the leaves are young, open, and adapted for its resort. It will consequently be liable, then, to do great injury to this vegetable.

This worm, in its appearance, motions and habits, has a close resemblance to the Palmer worm which has recently stripped the foliage from our orchards and forests so extensively, and to

which, as we shall presently see, it is nearly related. When it is disturbed, with a wriggling motion it runs briskly backwards, or by a fine cob-web like thread lets itself down from the leaf. Its castings are little black grains, which appear like gunpowder sprinkled thickly over the leaves and the ground beneath them. The pupa or chrysalis is enveloped in a very pretty gauze-like



cocoon, which may be found attached to the e ten leaves, two or more of them frequently in a cluster together. It is spun of clean white threads, crossing each other and forming an open net-work, through the meshes of which the inclosed chrysalis may be distinctly seen. The threads composing the net-work are coarsish and not very stout. They may readily be broken with the point of a needle, and the inclosed pupa be thus removed from its case for examination, though the cocoon is so slightly attached to the leaf that it is frequently torn loose in thus breaking it open.

Interspersed with these gauze-like cocoons upon the leaves, others may be met with quite different in their appearance, being opaque and of a thick paper-like texture and a brown color. They are of an elliptic form, rounded at both ends, and only about the tenth of an inch long and a third as broad. These have been constructed by the larvæ of parasitic Ichneumon-flies which have destroyed the worms of the cabbage moth. And from the information I possess, it appears that this parasite deposits but a single egg in each worm, from which a maggot hatches, which feeds internally upon the worm, yet without attacking any vital part whereby the worm would be prematurely destroyed. Thus the parasite, as in other cases of this kind, attains its growth at the same time that the worm reaches maturity, when the maggot finishes its work by destroying the little that remains of its foster parent, and immediately incloses itself in this paper-like cocoon. Of three mature worms which I inclosed in a small box over night, only two were found the next morning. All vestiges of the third had disappeared, and in place of it was one of these paper-like cocoons.

But as the worm of the Cabbage moth is such a choleric, mercurial little fellow that when he is molested, be it ever so slightly,

he darts backwards and wriggles about so suddenly and spitefully, it will be an interesting topic for some future observer to notice by what artifice his mortal foe induces him to remain quiet or is able to cling to him long enough to puncture and drop an egg within his skin. The knowledge and skill which these Ichneumon and other parasitic Hymenopters often show in their proceedings is truly wonderful. Every person will recollect the larva of the Isabella tiger-moth (*Arctia Isabella*)—the large caterpillar with stiff even-shorn hairs of a tan color and black at each end of his body, which crawls about our yards and often enters our dwellings—and will probably have observed the fact that if when crawling he is rudely touched he suddenly stops and doubles himself together for a moment, and then straightens himself again and resumes his journey. The long stiff hairs with which he is protected much like a porcupine, we should think would render it impossible for an insect enemy to place an egg anywhere upon his skin. Mr. P. Reid tells me he once saw one of these caterpillars crawling with a hurried eager step across a dusty road, with an Ichneumon fly pursuing him, striving to cling upon his back, but falling off in consequence of the rapid motion of the caterpillar. The fly finding itself frustrated in its every effort, next, as if humming to itself the refrain “’Twill never do to give it up so,” flew a few feet forward of the caterpillar, and turning, darted back with all its energy, hitting the caterpillar square in his face. The caterpillar thus roughly assailed suddenly stopped and bent himself together in his accustomed manner, and in an instant the fly, alighting upon his back, appeared to fix an egg at the margin of one of the breathing pores, which had become fairly exposed by the caterpillar doubling his body thus together. In a moment the caterpillar was recovered from his shock and was crawling rapidly forward again, when the fly struck him a second time in the same way, and thus he was stopped and had an egg deposited upon his side three times, before he reached the tall grass beside the highway, in which he was secure from further molestation. And it is probable that by some artifice equally curious and remarkable, the parasite of the Cabbage moth is able to drop an egg into the skin of his irritable, brisk motioned victim.

This moth pertains to the genus *Cerostoma* of Latreille and the British entomologists, a genus belonging to the family TINEIDÆ, and intimately related to that to which the Palmer worm pertains—both genera having the feelers with a tuft of scales projecting forward like a beak, from the middle of which beak the slender terminal joint stands upwards like a little horn. The larvæ of the two genera are also identical in their appearance and habits. The genus *Cerostoma* is described as differing from that of *Chatochilus* in having the wings narrower and rounded at their ends, differences which are so slight as to be scarcely discernable on a comparison of this species with the moth of the Palmer worm. The antennæ, moreover, are directed forward instead of being turned backwards and lying upon the back; but this is a character which is liable to be deceptive except when observed in the living specimen. The light color of the inner margin of the wings, however, and the lace-like cocoon of the pupa, leave no doubt that it is the genus *Cerostoma* to which our insect must be referred. Stephens (Illustrations, Haustellata, vol. iv. p. 341) says the spiral tongue in this genus is “shortish,” whilst Westwood (Humphrey’s British Moths, vol. ii. p. 245) gives it as “long and slender.” The latter is certainly its character in our insect, where it is about equal to the antennæ in length. Our species is closely allied to the *C. porrectella*, Lin., the worm of which Mr. Westwood found feeding upon buds of the White Rocket, a plant of the same family with the cabbage, and which forms an open-net work cocoon the same as our species.

The worm of the Cabbage moth is nearly cylindrical in its form, rather thickest in the middle, and slightly tapering towards each end. It is over a quarter of an inch long, measuring when full grown 0.35, and is the thickness of a coarse knitting needle. It is variable in its color, but is most commonly pale green, of the same hue as the cabbage leaf. Some are of a deeper tinge and others paler, varying to greenish yellow or pale yellow. Often the hind part of the body is paler than the fore part. Frequently the head or the apical segment or both are pale yellow, the rest of the body being of the usual green hue. Individuals may sometimes be met with having the head dusky or black with dusky clouds. The neck is frequently tinged with red. Commonly a stripe along the middle of the back is more or less distinct, of a deeper green color, or blackish in places; and on each side of the back a similar stripe may be discerned, whilst low down on each side a whitish stripe is sometimes apparent. With a magnifying glass the body is perceived to be clothed with several short black hairs which proceed from minute



black dots each of which is surrounded by a faint pale ring. These dots are symmetrically arranged, and are situated the same as in numerous other larvæ of moths, each of the segments of the body having four of them above, placed at the angles of an imaginary square, of which the anterior side is shortest; whilst on each side are four other dots, placed at the angles of an imaginary rhombus, the upper and lower angles of which are very acute. There are numerous dots on the neck, and the head is commonly freckled with a number of dark brown dots. There are sixteen legs, and the two first segments of the abdomen at first glance appear to be furnished with legs also, being bulged on their under sides, so-as to touch the surface on which the worm stands.

The *CHRYSLIS* or pupa is one-fourth of an inch long by 0.05 in width. It is commonly of a white color, with large deep-black eyes situated inside of the base of the antennæ sheaths. Quite frequently the white color is varied with umber-brown stripes, whereof there is one on each side of the back, with a very slender brown line between upon the middle of the back.



The wing sheath is brown on the upper margin, with a brown stripe in the middle and a more slender one inside of it, parallel to each other, and both running into the marginal stripe, this last being prolonged upon the abdominal segments to the tip. The sheaths of the antennæ and of the legs are also brown. These brown stripes remain upon the pupa skin after the moth has been hatched from it, but the black color of the eyes then disappears.

The winged moth measures 0.30 in length to the tips of the closed wings, and these when expanded measure 0.58. It is of an ash gray color. The fore wings are freckled with black dots on the disk and apex and have a common white stripe on their inner margin reaching to the hind angle, which stripe is wavy upon its inner edge and near the middle of the wing is bordered by a dark brown streak; the fringe of these wings is traversed by one or more blackish lines which are parallel with the margin. The hind wings and also the under sides of both pairs are leaden brown, glossy, and without any spots or dots. The antennæ and the under side of the abdomen are white. This moth is somewhat variable in the depth of its color, being frequently dark gray, and the stripe on its wings is not always pure white and distinct.

Facts so far as observed indicate that when this and its kindred species are favored with unusually dry weather at the date of their appearance in the larva state, the species suddenly becomes excessively multiplied, overrunning particular sections of country like an invading army. When I observed this cabbage worm a drouth was prevailing through northern Illinois, that was said to be without a parallel since its settlement. And hence we infer that thoroughly showering the vegetation which is attacked, with water, will be found a most effectual remedy for the expulsion of the worms of this group. With the cabbage moth this measure can easily be resorted to, a common watering pot being the only apparatus which is required.

# THE GOOSEBERRY.

## AFFECTING THE FRUIT.

The young fruit becoming red and putrid, containing within it one or more small bright yellow maggots.

THE GOOSEBERRY MIDGE.—*Cecidomyia Grossularia*.

It is common to find upon the gooseberry bushes in our gardens some of the young fruit of a prematurely ripe appearance, turning red and dropping to the ground. Some years much of the fruit is lost in this way. This premature ripening of the gooseberry is caused by insects puncturing and depositing their eggs in it. We have at least two insects which thus attack the gooseberry. One of these appears to be a species of moth which I have not yet obtained in its perfect state. The other is the larva of a midge or a small two-winged fly, of the genus *Cecidomyia* and family TIPULIDÆ. On examining some of these affected gooseberries early in July, their pulp was found to be putrid and infested with small maggots of a bright yellow color and oval form, their bodies divided into segments by five impressed transverse lines, and their whole appearance being closely like the larvæ of the Wheat midge, found in the ears of wheat. These completed their transformations and gave out the winged flies the latter part of the month of July. In size, number of joints to the antennæ, etc., these correspond with the *C. Ribesii* of Europe, but that is described by Macquart (*Dipteres*, vol. i. p. 162,) as having black bands upon the thorax, the abdomen blackish, &c. Hence it is evidently a much darker colored species.

THE GOOSEBERRY MIDGE is scarcely the tenth of an inch in length to the tips of the closed wings. It is of a pale yellow color, the thorax paler than the abdomen and of a wax-yellow hue; eyes black; antennæ blackish, of twelve joints, separated by hyaline pedicels one third as long as the joints, which are short-cylindrical with rounded ends, their length scarcely more than double their breadth; legs straw yellow faintly tinged with dusky towards their tips; wings hyaline faintly tinged with dusky.

It is probable that those flies which come out the latter part of July deposit a second crop of eggs in the gooseberries, or else resort to some other fruit of a similar nature, and that the larvæ which come from these eggs lie in the ground during the winter; for we do not perceive how, otherwise, there can be flies in June to deposit their eggs in the young fruit.

All fruit upon the gooseberry bushes which is found prematurely decaying and assuming a ripened appearance, and all which falls to the ground, should be gathered and thrown into the fire, to destroy the worms which the berries contain. By attention to this measure the haunts of this insect in the garden can be easily broken up, whereas, if this step is neglected the evil will be liable to continue year after year. As this insect breeds equally well in the wild gooseberries, we cannot hope to exterminate it from our country. But none of these wild gooseberries should be permitted to grow in the vicinity of the garden, for from them, if near, this midge will continually be finding its way to the bushes of the cultivated gooseberry.

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