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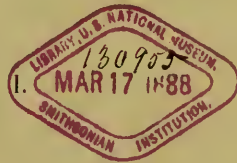
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Yellows in Peaches, supposed Cause of.....	100
Young Pecan trees girdled.....	80

ERRATA.

Page 19, column 2, line six, for "joints" read "joint." Page 59, column 2, line 14, for "menaceous" read "menaeing." Page 60, column 2, line 9, for "Dauber" read "Digger." Page 79, column 2, par. 2, line 19, for "G. C. Rye" read "E. C. Rye." Page 73, column 1, line 7 from bottom, for "former" read "latter." Page 90, column 1, note, line 9, for "*Anchylopera*" read "*Anchylopera*;" same page, column 2, line 12, for "too" read "two." Page 99, column 1, 3d paragraph, for "Greenhouse Plants" read "Greenhouse Pests;" same page, column 2, line 25 from bottom, for "wing, covers" read "wing-covers." Page 104, line 20 of note, for "one-third of the way" read "two-thirds of the way." Page 108, column 1,

line 15 from bottom, for "Early in the spring" read "Early in June;" same page, column 2, line 8 from the bottom, for "Early in the spring" read "Towards the end of May." Page 114, column 2, line 20, for "Some markings" read "Some yellowish markings." Page 118, column 2, line 20 from bottom, for "flower-hunting" read "flower-haunting." Page 130, under the figure, for "Black and dull yellow" read "Black and bright yellow." Page 151, column 1, line 7 from bottom, for "from 0.004 to 0.006" read "from 0.04 to 0.06." Page 174, column 1, line 19, for "short-winged" read "long-winged." Page 235, column 2, foot note, line 5, for "wing cans" read "wing cases."

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SALUTATORY.

To the Agriculturists and Horticulturists of the United States.

Few persons are aware of the enormous amount of wealth annually abstracted from the pockets of the cultivators of the soil by those insignificant little creatures, which in popular parlance are called "bugs," but which the scientific world chooses to denominate "insects." Scarcely a year elapses in which the wheat crop of several States of the Union is not more or less completely ruined by the Chinch-bug, the Hessian Fly, the Wheat Midge, or the Joint Worm. It is notorious among fruit growers, that the Curculio has now almost entirely vetoed the cultivation of the plum; and of late years this pernicious little Snout-beetle has extended its ravages to the peach, and even to the apple and pear, to say nothing of those rarer and choicer fruits, the nectarine and the apricot. The strawberry and the grape vine are infested by a host of insects, some of them known for many years back to science, others described and illustrated for the first time by the editors of this paper in various publications; while there are still others the natural history of which has never yet been published to the world, and which will be figured and described by the editors in the progress of this work. What with the Bark-louse in the North, the Apple-root Plant-louse in the South, and the Apple-worm everywhere, the apple crop in North America is gradually becoming almost as uncertain and precarious as the plum crop. The White Grub attacks indiscriminately the timothy in the meadows, the corn in the plowed field, the

young fruit trees in the nursery, and the strawberry beds in the garden; always lurking insidiously under ground, and only making its presence known to the impoverished agriculturist by the losses which it has already inflicted upon him. The Hop Plant-louse—a recent importation from Europe—has for the last three or four years diminished the value of the hop crop of New York by at least one-half. In 1867 it almost entirely ruined the Michigan hops. It has now pretty nearly taken possession of Wisconsin; and already the affrighted hoggrowers of the West are fleeing before its face into the remotest districts of Iowa. Almost every shade tree and fruit tree has one or more peculiar Borers, which if unchecked and uncontrolled by man, will often girdle, and eventually kill it; and even our squash and pumpkin vines are, especially in the Eastern States, infested by a distinct Borer, which perforates one of the main stems near the root, and finally destroys it. Under the popular name of "Potato-bug" at least five distinct insects are confounded together, each grievously destructive to the foliage of the potato, each confined at present within certain geographical limits, each with distinct habits and modes of propagation, and each to be fought and controlled by different and entirely distinct methods. Turn them which way they will, the agriculturists and horticulturists of the Northern States are met by Plant-lice, Bark-lice, May-bugs, Rose-bugs, Weevils, Cutworms, Caterpillars, Palmer-worms, Canker-worms, Slug-worms, and Leaf-rollers; and at periodic intervals the Army-worm marches over their fields like a destroying pestilence; while, in Kansas, Nebraska, and Minnesota, and the more westerly parts of Missouri and Iowa, the Hateful Grasshopper, in particular seasons, swoops down with the western breeze in devouring swarms from the Rocky Mountains, and, like its close ally, the Locust of Scripture and of Modern Europe, devours every green thing from off the face of the earth.

Nor are our Southern brethren any more exempt than we are from the depredations of these tiny foes. Not to weary the reader with endless details, it is notorious that the cotton crop is

often diminished at least one-third in value by a single insect—the Cotton-worm—thus at one fell swoop picking the pockets of the nation of some fifty millions of dollars.

On the whole we are certainly speaking within bounds when we assert that, taking one year with another, the United States suffer from the depredations of noxious insects to the annual amount of THREE HUNDRED MILLIONS OF DOLLARS. We by no means maintain that it is possible by preventive measures to save to the nation the whole of this gigantic sum; but we do contend and firmly believe that it is perfectly practicable, by long continued observation and careful experiment, to save a considerable percentage of this enormous sum total. It may, and probably will, take many, many years of hard work in the field, and anxious deliberation in the closet, to arrive at such a result; but in the mean time every step that is gained in advance will be so much money saved to the community. Suppose, for example, that during the next two or three years preventive measures should be discovered, by which the total annual damage inflicted by insects is diminished only to the amount of one-half of one per cent. Then, according to the data given above, the nation will gain annually for all time to the amount of ONE MILLION AND A HALF DOLLARS. Compared with such figures as these, the few thousand dollars annually voted by different States in the Union as salaries to their State Entomologists, are a mere flea-bite.

It has been, and doubtless will be, contended by many, that no practical benefit is ever likely to arise to the farmer, the gardener, or the fruit-grower from the researches of professional entomologists; and that any common farm laborer is as capable of discovering the best practical mode of counter-working some particular noxious insect, as the most experienced entomologist in the land. Let us look into this question a little closer. Two men go out trapping and hunting to the region of the Rocky Mountains, one of them familiar with the habits and haunts of the bear, the wolf, the fox, the martin, the fisher, the lynx, the beaver, the otter, the deer, the elk, the antelope, the buffalo, etc.; the other totally ignorant on all these points. Which of these two men is the most likely to come home with a good stock of poultry? Surely every one will agree that, in such an enterprise as this, it is only the experienced hunter and trapper that is likely to meet with success. Now let us take another case. Two men go out into the field to endeavor to discover some mode of de-

stroying wholesale a particular bug. One of the two has spent half a lifetime in studying the habits and the natural history of the thirty thousand distinct species of insects that are found within the limits of the United States; the other one knows nothing whatever of entomology—supposes that Bees change into Butterflies, Butterflies into Bugs, and Bugs into Beetles—and can not for the life of him tell the difference between a Snout-beetle and a Snout-moth. Which of these two men is the most likely to succeed in the work which he has undertaken? We pause for a reply.

It would be unbecoming in us to dwell upon what we have ourselves accomplished towards enabling the agriculturist to fight his insect foes with advantage. But we may, without fear of being accused of self-conceit and vanity, relate a single fact relative to what has been effected in this direction by others. For the last twenty years the great State of New York has employed Dr. Asa Fitch to act as its State Entomologist. During that period numerous Reports upon noxious and other insects have been published by this distinguished naturalist in the Transactions of the State Agricultural Society. Let us see, now, what is the opinion of the most enlightened agriculturists in the State of New York as to the practical benefits derived from these Reports. At a recent public meeting of their Agricultural Society, Senator A. B. Dickinson gave it as his deliberate opinion, that the writings of Dr. Fitch had saved annually to the single State of New York the large sum of fifty thousand dollars; and, so far as appears from the record, not a single dissenting voice was raised against this most remarkable assertion.

We shall only remark, to conclude this subject, that there is one especial mode in which a journal, such as we propose to publish, will become of great practical benefit to all that numerous class who are engaged in the cultivation of the soil. It is the common practice with almost all who belong to this class, whenever they discover that their plants have been injured by bugs, to slay indiscriminately every bug that they come across. Yet nothing is more certain than that, of the whole number of species of insects, at least one-fourth part are beneficial to us by preying upon other insects, while in all probability at least one-half of the whole number are neither beneficial nor injurious. We propose, by means of good wood-cuts and colored engravings, to familiarize the American eye with the different kinds of bugs, so that they

may be enabled, without much practical difficulty, to distinguish between friends, foes, and neutrals. For lack of this knowledge nothing is more common, than to see a cultivator of the soil overlooking the noxious insects that are preying upon his plants, and making fierce war upon the cannibal and parasitic insects, that a wise Providence has appointed to keep the injurious plant-feeders within due bounds.

HOGS vs. BUGS.

For some time back the best and most scientific fruit growers in the West have been agreed, that practically there are but two methods universally available for fighting the plum curculio; namely, either 1st, by jarring the trees continually, or 2d, by allowing hogs the run of the orchard all through the summer months. The first method produces an immediate effect, because the "Little Turk" is thus arrested at once in his mischievous career, and prevented from stinging any more fruit. The second method is prospective in its effects, and operates chiefly through the hogs picking up all the wormy fruit as fast as it falls, and thus preventing the larva of the curculio from going underground, and generating a new brood of curculio to sting the fruit at a subsequent period.

We propose in the following paragraphs, without at all undervaluing the first method, to demonstrate by plain, hard, practical facts, that the second of these two methods produces most gratifying results when systematically carried out for a series of years, even without any regular jarring of the trees. The only exception to be made is in the case of the cherry, which, unlike all other stone fruit, does not fall prematurely to the ground when bored up by the larva of the curculio. Hence, so far as regards the cherry, we must depend entirely upon the jarring process to subdue this insect.

But the plum curculio and its allies are not the only insects that we can successfully attack through the instrumentality of the hog; neither is stone fruit the only crop that can be protected in this manner. For the last fifteen years or so, pip fruit, namely, apples, pears, and quinces, have been annually more or less deteriorated by the apple worm or larva of the codling moth boring into their cores, and filling their flesh with its loathsome excrement. Unlike all the snout beetles that infest stone fruit in America, this is an imported insect, which was originally, about the beginning of the present century, introduced from Europe into the Eastern States, whence it has gradually spread west-

ward into the Valley of the Mississippi. The facts which we shall presently quote prove that hogs are death upon this insect, as well as upon the plum curculio, picking up the wormy apples as fast as they fall, and greedily devouring them without any squeamish misgivings as to the wholesomeness of their living inhabitants. It is not at all improbable, either, that hogs may pick up and devour the larva of the codling moth after it has left the fallen fruit, and while it is on its travels for the trunk of the apple tree. For instead of going underground, like the larva of the plum curculio, this larva spins a cocoon above ground, and usually in the chinks of the bark of the tree upon which the apple that nourished it grew. Hence, as the apple worm is of some considerable size, some specimens being almost an inch long, a hungry hog would scarcely consider it "too small business" to pick up and devour as many as could be found traveling along the surface of the earth.

HOGS VS. CURCULIOS.

[Extract from a letter by "RURAL," dated June 2, 1868, and published in the Chicago Tribune.]

At Duquoin the Messrs. Winter Brothers have a peach orchard of nearly eighty acres. For the past five years they have allowed a large drove of hogs to pasture in this orchard, that pick up all the fallen fruit. The second year a small share of the fruit was stung, but for the past three years there has been no loss on this account. It would appear that the time has been sufficiently extended to give great promise of success. In the garden, where the hogs are excluded, there are a few peach trees, but these are badly stung.

Mr. A. Mitchell placed hogs in his peach orchard last year, and his crop is but little affected. All other peach crops about Duquoin, and all that I saw at Centralia, have the fruit nearly all ruined by the insect. I did not see a single plum on any of the trees in this part of the State. Most certainly this fact is not only worth knowing, but to be acted upon without delay. We must bear in mind that, when hogs run in a small enclosure containing trees, they are very liable to kill them by rooting and tramping the ground; but this is not the case in large orchards where they live on the imperfect fruit.

David E. Brown, one of the largest fruit growers near Alton, South Illinois, has for about five years kept both hogs, and, at times, sheep, in his apple and peach orchards. His fruit is not infested by insects nearly as much as that of his neighbors, although he employs no other precaution whatever to guard against the depredations of fruit-boring insects. His peach trees are also free from borers, though he takes no pains to worm his trees. His hogs keep in good condition on the fallen fruit. These facts were confirmed both by Dr. E. S. Hull and by Mr. B. L. Kingsbury, of Alton.

Mr. Caughlin, in the Report of the Alton Horticultural Society for July 2, 1868, "gave

favorable experience in regard to hogs eating fallen peaches. His peaches were very free from worms this year. He attributes this to the fact, that the hogs in his orchard destroyed so many of the larvæ last year."

S. B. Johnson, of Alton, has this year, according to Dr. Hull, the fullest and cleanest crop of peaches out of forty peach orchards in the neighborhood. We personally examined his peach orchard in the middle of June, 1868, and can testify that at that period there were fully twice as many peaches on his trees as ought to have stood for a crop, so that already many of the limbs were beginning to break down and had to be propped up. We can also testify, that at that period there was but a very small sprinkling of stung peaches to be met with on his trees. In 1867, by the advice of Dr. Hull, he allowed a gang of hogs the range of his peach orchard all through the months of May and June and the remaining part of the summer, and this, it is altogether probable, is one main cause of the largeness of his present crop. It should, however, be stated, that Mr. Johnson himself attributes the largeness of his peach crop this season, principally to his having kept up a heavy smoke in his orchard during five frosty nights and two or three cold sleety days in the spring of 1868. No doubt, so far as it went, this had a very beneficial effect in preventing the radiation of heat from the earth, for the same reason that unseasonable frosts always occur on bright, clear nights, and never on cloudy nights. But still, however faithfully this plan may have been carried out, it does not in any way account for the paucity of cures in the summer of 1868.

We know a cultivator who had heavy crops of plums for seventeen years in succession—his swine for these seventeen years, without a season's interruption, being allowed the run of the yard.—*Country Gentleman*, 1868.

James Jones, of Manhattan, Will Co., Ill., has eight plum trees in his orchard which have been in bearing for seven years. During this whole time he has had a good crop of plums every year, which he attributes to a plan which he has all along followed, of sprinkling salt round the roots of every plum tree in the spring of the year. Manifestly, however, this plan could have no effect in killing the larva of the curenlio, when it goes underground; for it has been shown that this larva will breed even in pure salt. It came out incidentally in our con-

versation with Mr. Jones, that for this whole period of seven years he had had a herd of calves running in his orchard, and also a buck sheep. There can be little doubt that it is to the action of these animals, in picking up and devouring the wormy plums as fast as they fell, that the very great and unusual success of this gentleman in raising plums is to be really attributed. Strangely enough, he had never supposed himself that the calves and sheep had anything to do with his uniformly good crop of plums.

HOGS VS. APPLE WORMS.

W. C. Flagg, of Moro, near Alton, has for five years tried the plan of allowing hogs the range of his apple orchard, and finds it very beneficial by checking the depredations of fruit boring insects.

An apple grower in Southeast Michigan, whose name and residence we omitted to note down, has for many years back allowed hogs the range of his apple orchard. His apples have been but very little infested by the apple worm, even in years when those of his neighbors were swarming with this insect. In 1867, the worst year for the apple worm that was ever known in this country, he had but very few; while in 1866, a year in which this insect was not generally abundant, he had more of them.

Benjamin Bacon, of Niagara Co., N. Y., has an apple orchard of about ten or twelve acres. Fourteen years ago he turned his hogs into it, and has continued this practice ever since. Before he allowed hogs the range of his orchard, his crop of apples was always a very poor one; since he commenced this system he has raised good crops; ten or twelve of his neighbors have followed his example with equally good results. It is proper to add, however, that according to our informant, Dr. Bacon, of N. Ill., Mr. Bacon's orchard used to be in grass, and that since he adopted the plan of letting his hogs run in it, he has plowed it over every two years, and seeded it either to oats or to barley. It is possible, therefore, that in this particular case the difference in the modes of cultivation may have had some little to do with the difference in the crops of apples.

Jotham Bradbury, residing near Quincy, Ill., has an old apple orchard, which many years ago used invariably to produce nothing but wormy and gnarly fruit. A few years ago he

plowed up this orchard and seeded it to clover, by way of hog pasture. As soon as the clover had got a sufficient start, he turned in a gang of hogs, and has allowed them the range of his orchard ever since. Two years after the land was plowed the apple trees produced a good crop of fair, smooth fruit, and have continued to bear well ever since.

M. L. Dunlap, of Champaign Co. ("Rural"), keeps a few very fat, lazy-looking hogs, which he has allowed for some time back to range over a three acre lot of apple-trees, among which there also grow two plum trees and twenty cherry trees. But this lot is surrounded on all its four sides by extensive apple orchards not pastured by hogs; and, of course, the apple worm moths, that breed in the surrounding apple trees, have nothing to hinder them from flying at discretion into the three acre lot, and laying their eggs on the apples that grow therein. Yet, even under such unfavorable circumstances, Mr. Dunlap was of opinion, after a careful examination in the early part of July, 1868, that there were not so many wormy apples on those trees, that were situated in the middle of the three acre lot, as in the average of his other apple orchards.

Suel Foster, of Muscatine Iowa, reports as follows in the *Transactions Ill. State Hort. Society*, 1867, p. 213: "I have twenty-four acres of my orchards seeded to clover, and last year I turned the hogs in. I now observe that where the hogs ran last year, the apples have not one-fourth the worms that they have on other trees. This year turned the hogs into my oldest (home) orchard."

Mr. Huron Burt, of Williamsburg, Callaway county, Mo., writes us that hogs are highly valued in the orchards there, though they are not expected to entirely extirpate either the *Curculio* or the Codling moth; while Mr. T. R. Allen of Allenton, and Mr. Varnum of Sulphur Springs, Mo., have both testified to us as to the good effects obtained from allowing hogs the run of their orchards.

There are three practical difficulties in the way of carrying out this system of subduing fruit boring insects by hog power. 1st. The necessity of having all the orchard land under a separate fence, which, of course, in many cases involves a considerable extra outlay for fencing materials. 2d. The necessity of giving up a practice, which is conceded by the most

intelligent fruit growers to be otherwise objectionable; namely, growing other crops, such as small grain, corn, or small fruits, between the rows of trees in bearing fruit orchards. 3d. The necessity of giving up the modern fashionable theory of low-headed trees; for otherwise, if apple and peach trees are allowed to branch out like a currant bush from the very root, any hogs that range among them will manifestly be able to help themselves, not only to the wormy windfalls that lie on the ground, but also to the sound growing fruit upon all the lowermost boughs. It is this rage for low headed trees which has also been the chief impediment in the way of the general adoption of Dr. Hull's "Curculio catcher"—a machine which requires the trees operated upon by it to be clear of all branches for some three or four feet from the ground. Where trees are more low headed than this, fruit growers in South Illinois have been compelled to employ a modification of the "curculio catcher," carried about from tree to tree by two men, instead of being wheeled about from tree to tree, wheelbarrow fashion, by a single hand. Of course, where fruit growing is followed as a business, the wages of every additional hand that can in any such way be saved, are so much clear profit going into the pockets of the proprietor.

It is important, when hogs are employed for the purpose of picking up fallen fruit, that they should be kept moderately hungry, and not be gorged every day with corn so as to make them too lazy for work. Probably, for such a purpose as this, the old-fashioned, long-nosed, slab-sided prairie rooters would be more efficient than the short-nosed, well-barreled modern breeds; and by selecting such individuals as have the longest noses and the lankest sides, an improved breed might gradually be formed, which could pick up a wormy peach lying at a distance of ten yards, without stirring out of its tracks! So far as our own observation goes, there are excellent materials for the scientific elaboration of such blooded stock, running at large throughout the lanes and commons of Egypt.

Solon Robinson, in the *Transactions of the New York Farmers' Club*, has solemnly declared that, rather than allow hogs the range of his orchard, he would go without fruit for the remaining term of his natural life. But Mr. Robinson, though in the main very good authority, is on some few points strangely notional and crotchety. For example, not having the fear of Benjamin Franklin before his

eyes, he is altogether skeptical as to the practical utility of lightning rods; and although all astronomers, for the last century and upwards, have been unanimously of opinion that it is the moon that causes the tides; and although tables, based upon the changes of the moon, and giving the exact time of high and low water at different geographical points, are found to be within certain limits practically reliable, he yet is bold enough to declare that there is no proof at all that the tides have anything to do with the moon!

At present, nothing is a more frequent cause for disputes and quarrels among neighbors, than for Mr. Jones's breachy hogs to make an irruption by night into Mr. Brown's fields. Perhaps the time may be approaching when this state of things will be reversed; and instead of neighbor Brown coming to neighbor Jones with grievous complaints that Jones's hogs have broken into Brown's lot, neighbor Jones will be seen striding away in furious wrath and dudgeon to the house of neighbor Brown, swearing and cursing, and bawling out, that two or three nights ago that mean fellow Brown had sneaked over in the dark of the night to his (Jones's) place, let down his (Jones's) fence, and driven his (Jones's) hogs into his own (Brown's) peach orchard, where they have ever since been hard at work eating up that darned rascal's worny peaches.

INSECT CHANGES.

There are four stages in the life of every insect: 1st. The *egg*. 2nd. The *larva*, popularly known as the grub, maggot or caterpillar state. 3rd. The *pupa*, in which state most insects lie dormant, and are incapable of eating. 4th. The *imago*, or perfect winged state. In this last state almost all insects acquire wings, and it is then only that they become capable of engendering and propagating. After existing in the perfect or winged state for a period which varies, according to the species, from several days to several months, every insect dies. Neither does any insect grow after it has once reached the perfect winged state, except that in many female insects the abdomen after a time becomes considerably distended by eggs.

It is a mistake to suppose that bees can change into butterflies, butterflies into bugs, or bugs into beetles. Bees, butterflies, and bugs all of them have wings, and therefore they are incapable of any further changes.

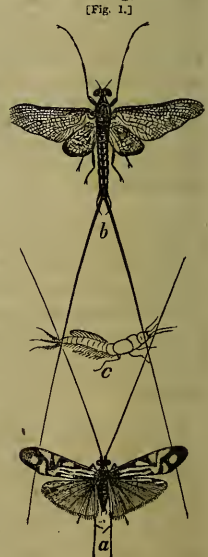
"Three blow-flies will devour the body of a dead horse as quickly as will a lion."—*Linnaeus*.

THE BUGHUNTER IN EGYPT.

A JOURNAL OF AN ENTOMOLOGICAL TOUR INTO SOUTH ILLINOIS BY THE SENIOR EDITOR.

Voyage down the Mississippi—The so-called Mormon Flies—Locusts.

On June 17th, 1868, I found myself on board the railroad train that connects Fort Madison, at the head of the Lower Rapids of the Mississippi river, with Keokuk at their foot. On the preceding morning I had left Rock Island on one of the regular packets from that city to Fort Madison. The railroad follows closely along the Iowa bank of the river, and as we traveled along it the air was alive with myriads of a pretty Caddis-worm fly (*Macronema zebraum*, Hagen, Fig. 1, *a*), about an inch long, and with its wings elegantly pieced with cream-color and brown. In one of the windows of the railroad car there must have been as much as a pint of them lying dead. This fly, as I learn from one of the natives, is popularly called here the "Mormon fly," and had been swarming in a similar manner for the preceding three weeks. On the Upper Rapids, which lie immediately above Rock Island, I have noticed it for a long time back to swarm every year, in the same way, but at a somewhat later period. The good folks there sometimes apply the name of "Mormon fly" to this insect, and sometimes



Colors—Of both *a* and *b*, cream color and brown.

to an entirely distinct insect (*Palingenia bilineata*, Say, Fig. 1, *b*), of about the same size, but with two enormously long tails, which occurs every July about the middle of the month, in prodigious numbers, not on the main channel of the river like the first species, but on that shallow and sluggish arm of the river which divides Rock Island proper, where the Government Arsenal is located, from the main shore of Illinois, whereon stands the city of Rock Island. This

last species is a true May-fly (*Ephemera*). I subsequently found it in the same profuse abundance at Lacon, on the Illinois river, on the 1st of July, and a single specimen flew on board the railroad train as we were coasting along the Illinois river, near Peru, July 11th. In the year 1861, I had met with it in great plenty on the Ohio river, near Mound City, Illinois, about the beginning of July. Hence it would appear that the species is very generally distributed through the West; and that it is essential that the waters in which the larva breeds should be more or less muddy. At figure 1, c, will be found a sketch of one of these May-fly larvæ.

Both of these two flies live in their earlier stages in the water, and the perfect flies are quite harmless; the latter, indeed, is so incapable of doing any mischief, that it actually, like all the rest of the family to which it belongs, has got no mouth at all. Why either of the two should be called the "Mormon fly," is an insoluble mystery. They must have swarmed in their special localities every year for indefinite ages, and the Mormons only settled on the banks of the Mississippi in 1840. There was somewhat more plausible ground for calling the Chinch bug the "Mormon louse;" for that little pest really did swarm for the first time in Illinois about the same year that the Mormons settled there. To scientific men, all these popular names for insects are an unbearable nuisance, because they mean some times one thing, some times another. But as the people will persist in using them, we shall compromise the matter by giving the commonest English name of every insect that we have occasion to talk about, and adding in a parenthesis, printed in *italics*, the long crack-jaw scientific names which are, to many, such a source of terror and bewilderment. The reader can then, whenever he pleases, skip over the parenthesis and avoid the scientific stumbling-block, as easily as he skips over a stile, or vaults over a mudhole.

On our arrival at Keokuk, Ia., the railroad passengers are rapidly transferred to one of the splendid line of packets that ply between that city and St. Louis, and we soon find ourselves gliding rapidly down the Mississippi river. Presently the boat puts into Alexandria, a small place on the Missouri shore. I am standing on the upper deck on the guards. A gigantic fly alights with a whizzing buzz on my neck. I seize it with my naked fingers. It proves to be a female of one of those remarkable species of Locusts (*Cicada*), which occur in vast swarms after an interval of many years. (Fig. 2.) Soon

there are scores of them flying about the boat in all directions, and in a few minutes I have a dozen of them securely pinned in my collecting-box.

The same scene is repeated on our subsequently putting into Canton and Lagrange, two other little river towns in the State of Missouri. I catch scores of the females with my fingers, and provoke them in every conceivable way to sting me; but in every case they positively refuse to do so. I even use considerable force in trying to push the ovipositor, (Fig. 2, b), or egg-laying apparatus, into the skin on the back of my hand. But it is too blunt; it will not go in. Yet there are several cases on record of persons supposed to have been stung by the common seventeen-year locust, who have suffered severely in consequence, and some of whom, if accounts may be believed, have actually died from the effects of the sting. Why then will not these locusts sting me, when I give them every chance, to do so, and even provoke them to it by irritating them as much as possible? Clearly there must be some error here. Besides, even if the ovipositor of the female locust were accidentally to pierce the human flesh, there is no poison-bag attached to it as there is to the sting of a wasp or a bee, and consequently it would produce no more irritation than the puncture of a pin. I have repeatedly, for example, had my fingers pierced by the ovipositor of a large black Ichneumon Fly (the *Ophion morio* of Fabricius); and always the puncture gave me no more pain, and produced no more inflammation, than the puncture of a common pin. Why? Because no poison was injected into the wound.

How then are we to account for all these stories about persons being nearly or quite killed by the sting of the seventeen-year locust? One such story I have heard this very day from a passenger on the very boat I am on. The facts as stated by him were as follows: A friend of his noticed a locust on the neck of his brother, and attempted to knock it off; upon which the locust stung the man in the neck, and in two minutes' time there was a lump raised there as big as a man's fist. There are too many such stories as these on record for them to be treated as simple lies. There must be some foundation for them. What is that foundation? Listen, and I will endeavor to explain what my hypothesis is.

[Fig. 2.]



Colors—Orange and black.

[Fig. 3.]



Colors—Yellow and black.

There is a very large digger-wasp, almost two inches long (the *Stizus grandis* of Say, Fig. 3), whose peculiar habit it is to provision its nest with the entire body of one of these locusts. It first, like most digger-wasps, digs a hole in the ground, by way of nest, then catches a locust, stings it just enough to stupefy it, but not enough to kill it, and drags it into the hole which has been already prepared to receive it. Having thus furnished a sufficiency of food for its future offspring, prepared in such an ingenious manner that it will keep fresh for a long time without a particle of salt or saltpetre, it deposits a single egg in the nest, closes up the nest with earth, and then flies off to repeat the above laborious process over and over again, till its stock of eggs is exhausted. Before many days the egg hatches out into a little soft, white, legless larva, which gradually devours the body of the living locust. At length, after having become full-fed, the larva spins a membranous cocoon, inside which it passes the winter, and the following spring develops into a perfect digger-wasp, to repeat the same wonderful cycle of operations year after year, and century after century.

To some, perhaps, all this may sound like a traveler's tale. But let any such incredulous person examine at this time of the year the common "mud-dabs" that may be found in any out-building, and he will find but another edition of the process recapitulated above; the only difference being that the mother wasp that constructs these mud-dabs makes its nest above ground instead of underground, and provisions it with some ten or a dozen spiders in place of a single locust.

The species of *Stizus* referred to above is rather an uncommon insect, but, as I happen to know, it occurs from Pennsylvania to the region west of the Mississippi. What is more likely, then, than that one of these wasps, with a squall-

ing locust in its grasp, should two or three times every year light upon a human being, and that, upon being brushed off, or otherwise harshly treated, it should retaliate after the fashion of all female wasps, by stinging the offender? Of course the effects of the sting of so gigantic a species of wasp would, in all probability, be very severe; for instance, a lump on the neck as big as a man's fist produced in two minutes. And of course, if the locust happened to be squalling loudly at the time of the sting, the wound inflicted would be pretty sure to be laid at its door.

If, on the other hand, we persist in believing that it is the female locust herself that stings in such cases as these, why do we not hear of thousands of persons being stung by locusts every year? There are millions upon millions of locusts in the woods this summer, butting madly up against men, women, and children every hour of the day. Surely, if the females were physically capable of stinging, instead of half a dozen such cases, we should hear of thousands upon thousands of them throughout the infested districts. Locusts must be to the full as numerous there as bees. If one insect can sting as well as the other, why are not locust stings as common as bee stings?

The Baghanter in Trouble—More about Locusts—Carpenter Bees and their Habits—Mason Bees and their Habits—The Precautions which the latter take against their Insect Foes.

JUNE 18TH.

Early in the morning we arrive at our destination, the beautiful city of Alton, in South Illinois. Finding, on inquiry at his office, that friend Flagg, the excellent Secretary of the Illinois State Horticultural Society, will not be in town to-day, I determine to hire a horse and buggy, and drive out to Dr. Hull's fruit farm. On applying for a team at the nearest livery stable, and offering to pay in advance, seeing that I am a stranger to them, I am told that I can get no team there, unless I can give satisfactory references to some responsible citizen of Alton. "They have had two hired teams stolen from them by strangers within the last two or three weeks, and they do not intend to lose another one in that way." Here is a pretty kettle of fish! The Acting State Entomologist of Illinois can not "run his face" for a horse and buggy, and is manifestly suspected of being a horse-thief! Luckily for my credit, I bethink me of friend Flagg's clerk; I rush to his office, and he agrees at once to become bail for my honesty.

In an hour's time afterwards I have threaded all the twistings and turnings of the four miles that intervene between Dr. Hull's house and the city of Alton; and I am warmly welcomed to his hospitable home. In five seconds we are, both of us, immersed up to the eyes in the great Bug Question.

On informing Dr. Hull of my new theory, as to the supposed wounds inflicted by the locusts that are swarming in all directions on his place, I am much gratified by hearing that he knows these gigantic wasps very well, and that he and his sons and his hired men see one or two of them every year, flying along with considerable difficulty with a locust in their grasp. Their sting, he says, is almost a quarter of an inch long, and they often, being overladen with their burden, butt up against people that stand in their way. The details as to their burying the locusts in holes in the ground were received by me some time ago from Benj. Borden, a respectable Quaker farmer in Pennsylvania, who witnessed them with his own eyes. Having preserved a specimen of one of these monster wasps, he was enabled to identify the species by communicating it to the Academy of Sciences at Philadelphia. Another species of the same genus (the *speciosus* of Drury) has long been known to have the same peculiar habits. In a future paper, we propose to illustrate at greater length the remarkable peculiarities of this and other digger-wasps, and also those of the true wasps, including the social species, such as the Yellow-Jacket and the Bald-faced Hornet.

[Fig. 4.]



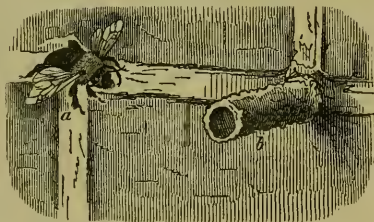
Colors—Black, yellow, and smoky brown.

There are scores of the gigantic Carpenter Bee (*Xylocopa carolina*, Linnaeus, Fig. 4, a), flying round Dr. Hull's house, and boring numerous round holes in such parts of the timbers as are neither whitewashed nor painted. At the bottom of one of these holes, which are often several inches deep, they deposit, by way of provision for their future larva, a mass of pollen, for the collection of which the first joint of the hind paws of the females (Fig. 4, e), is enormously lengthened and dilated and armed with stiff

hairs. This bee would be generally mistaken for a large Humble-bee, though it is solitary and not, like the Humble-bee, social; and though in other respects its habits differ so widely from those of the Humble-bees. But the two may be readily distinguished by the different structure of the hind legs. Fig. 4, e, shows the hind leg of the female Carpenter Bee highly magnified; Fig. 4, c, the same part in a female Humble-bee. Dr. Hull informs me that this Carpenter bee likewise infests the limbs of partially decayed or wounded cedars, making its holes wherever the wood is exposed by the removal of limbs for the decoration of churches, etc. Wherever the bark covers the wood, there it refuses to bore.

It has long been known that a certain solitary wasp in Europe (*Odynerus parietum*, Linnaeus), that bores holes in the clay mortar of walls wherein to construct its nest, employs the excavated particles in attaching a temporary tube of tempered earth to the exterior of each hole. Through this tube it passes and repasses during the progress of the work, pulling it to pieces when the work is completed, and using the materials of which it is composed in stopping up the mouth of its hole, after the fashion customary with digger-wasps. I discovered at Dr. Hull's place that a species of solitary Mason bee (*Anthophora sponsa*, Smith, Fig. 5, a), which greatly resembles

[Fig. 5.]



Colors—(a) black and pale yellow; (b) clay yellow.

a small Humble-bee, has the same singular habit, its tube being constructed of tempered clay, and being about two inches long and three quarters of an inch in diameter (Fig. 5, b). The way I came to make this interesting discovery was as follows: Dr. Hull, being addicted to all manner of new inventions for raising early vegetables upon the most gigantic scale, had constructed early in the season a vast system of underground flues, for warming up the earth on the entire side of a hill, wherein to grow early tomatoes. Going with him to view the mouths of the flues, which all of them opened out at the bottom of the hill, and were con-

structed of bricks laid up, not with lime mortar, but tempered clay, I observed many clay tubes projecting (as shown in Fig. 5, *b*), from the joints of the brick work. I had not looked at them long, before one of these Mason bees flew into one of the tubes, and disappeared in the hole it had constructed between the bricks. Watching my opportunity, as a second and a third bee performed the same process, I seized them, tube and all, in my pocket handkerchief, and soon had them safely pinned in my collecting-box. Having many years ago taken plenty of the same species in Central Illinois (where, however, they bored their holes, not in brick-work, but in the face of a precipitous clay bank, and where, by the way, I had not observed them to construct any clay tubes), I was not anxious to capture additional specimens of the insect itself, but contented myself with securing two perfect and unbroken specimens of their curious masonry, from one of which the illustration given above has been drawn.

As in the case of all nest-building solitary Bees, including the Carpenter bees, the Mason bee, after she has constructed her nest, provisions it with a sufficient supply of honey and pollen, and then having laid an egg thereon, closes the nest up. On the other hand, all the solitary wasps provision their nests, not with honey and pollen, but with one or more living insects; as we saw just now was done by the gigantic digger wasp that preys on locusts, and by the common mud wasp. In both groups of insects, the young larva that hatches out from the egg attains maturity within the nest, feeding exclusively upon the stores of food laid up for it with such provident care by its mother; and in the following year it comes forth a perfect bee or a perfect wasp, belonging to the same species as the mother that produced it.

It may be added that, of all the species of Mason bees found in the old world, but a single one (*Anthophora parietina*, Latreille) is recorded by authors as building these singular clay tubes at the mouth of its hole; while, in addition to the species mentioned above, a second North American species (*Anthophora taurea*, Say) has been described by our great Pennsylvanian entomologist, Thomas Say, as practising this remarkable style of architecture.* European authors have observed the fact, that both their tube-building Mason bee and their tube-building Mason wasp moisten from their mouths the

earth wherein they propose to excavate a hole, and then working up the moistened matter into a pellet, proceed to employ it in the construction of the tube. In every case, the exterior of the tube is always rough and uneven, so that the eye can distinguish at once where each pellet has been stuck on to that which precedes it; but the interior is sufficiently smoothed for the convenient passage of the bee or wasp. As is almost universally the case with insects, it is only the female Mason bee that labors, the males, as with the Red Indians, being idle gentlemen, who think it beneath their dignity to work, and spend their time partly in sipping honey and pollen, and partly in gallanting the ladies.

The curious reader may perhaps inquire: "Of what possible use can this clay tube be to the female Mason bee, constructed as it is with great pains and art upon one day, only to be torn to pieces and used in filling up the hole upon the next day?" The answer is obvious enough to every entomologist. There are hosts of insects, some of them Beetles (*Clerus* family), some of them four-winged flies (*Ichneumon* and *Chrysis* families), which are parasitic upon the larva of the Mason bee, and are always lying in wait to enter its nest and deposit an egg therein. When once this is effected, the future larva of the poor Mason bee is doomed. It will hatch out and attain a certain size, but then, alas! the ferocious parasite is disclosed from its egg, and seizing upon the soft and helpless larva, gradually and slowly eats out its vitals. There is also a small group of solitary bees, which not being themselves provided by nature with the organs proper for collecting pollen, sneak into the nests of pollen-collecting bees, and lay their eggs upon the pollen stored up therein by the industrious-builder of the nest, thus appropriating to their own future offspring the food that had been prepared with great labor for the offspring of another. These last may be conveniently called "Guest bees," though by some authors they have been somewhat ambiguously denominated "Cuckoo bees." What is a very curious fact, to every genus of "Guest bees," there is assigned one or more peculiar genera of pollen-collecting bees for its prey;* and the unfortunate Mason bees, of which we have been talking, are not left without an appropriate genus of unbidden Guests, to enter their houses on the

* See *Say's Works*, II, pp. 785, 6. On the habits of the European Mason bee and the European Mason wasp, see St. Fargeau's *Hymen*, II. pp. 24-5; p. 79; and II. pp. 549-552; p. 656.

* Thus the genus *Epeolus* preys upon *Colletes*; the genus *Nomada* upon *Halictus* and *Andrena*; the genus *Cathoxys* upon *Megachile* and *Sarcophaga*; the genus *Stelis* upon *Osmia*; and the genus *Melecta*, of which we have but a single described N. A. species, upon the very genus *Anthophora* referred to in the text. (Fred. Smith.)

sly, and take the meat out of the mouths of their future offspring. Hence, with all these enemies lying in wait for it, the particular species of Mason bee, whose biography we are discussing, has been taught by a wise Providence to baffle those enemies, to a very considerable extent, by constructing a kind of blind passage way into its house; and this passage way it leaves untouched, as long as it is obliged by circumstances to keep its entrance hall wide open, but so soon as it is able permanently to close up the entrance hall, it pulls the passage way down, and uses the material for blocking up the door way. Could human intelligence go any further? And yet many otherwise well educated people believe firmly, that "Bngs," as they are pleased to call them, have no more sense than so many stocks and stones!

The Curculio and its Habits—Five New Facts Respecting it—Dr. Hull's Curculio-catcher—Various Noxious Insects Infesting Fruit Trees—Two Beneficial Insects Commonly Found on Fruit Trees—Travels among the Fruit Growers.

JUNE 19TH.

Dr. Hull showed me a large lot of Snout beetles which he had jarred off his fruit trees at the very commencement of the season. On counting them carefully, I found that there were in the whole lot 254 Plum Curculios (*Conotrachelus nenuphar*, Herbst), and only 40 Plum Gougers (*Anthonomus prunicida*, Walsh), showing that the former were early in the season about six and a half times as numerous as the latter, in the neighborhood of Alton. In Central Illinois, according to Mr. Francis, of Springfield, and also in Northern Illinois, the Gougers are, in the early part of the season, about as numerous as the Curculios. But something must be attributed, in the case of the Alton experiment, to the fact of the gougers not jarring off the trees nearly as readily as the curculios. Later in the season, Dr. Hull assures me that the gougers become comparatively much scarcer; so that he considers that his original estimate, of the curculios being on the average in the proportion of fifty to one with regard to the gougers, is not far from the truth. According to him, the end of the curculio season near Alton is about July 1st; but along through July and August he meets with a few curculios upon jarring the trees—say about one to every ten trees in July, and one to every twenty in August. In the month of September they are very rare; and, according to him, no peaches are stung by them after the beginning of July.

Dr. Hull informs me of five facts, relative to the natural history of the Plum Curculio, with which I was previously unacquainted:

1st. Curculio eggs deposited in fruit early in the spring, during a warm spell which is followed by a cold spell of at least five days duration, always perish and fail to hatch out. The eggs require a temperature of about 70 degrees in order to hatch.

2d. In the part of Dr. Hull's orchard which adjoins the woods, he finds that, for about four rows of trees, it is almost impossible to subdue the curculio by jarring. The curculio here commences upon the fruit immediately upon its first appearance; in the other parts of the orchard not until several days after its first appearance. [Is not this owing to the fact that those curculios that have passed the winter under the bark of trees, etc., in the woods, stay where they hibernated, after coming out in the spring, until they are ready to lay their eggs, and then wing their way to the nearest stone-fruit and immediately lay eggs therein; while those curculios that pass the winter under the bark of trees, etc., in the orchard itself, pass the same interval between coming forth from hibernation and laying eggs in the fruit, in the orchard itself, and may consequently be fought by the method of jarring to much better advantage? B. D. W.]

3d. When peach trees are cut down to the root, and throw up very strong and vigorous shoots (say as thick as one's wrist) the same season, the well known crescent cuts, with eggs in them, are often to be seen in the bark in June. Such trees are haunted by the curculio fully as much as bearing plum trees; and late in the season they are better hunting ground for curculios than any plum trees. [It will be recollected by entomologists that fifty or sixty years ago Rev. F. V. Melsheimer, of Pennsylvania, stated that the larva of the curculio sometimes lived under the bark of the peach tree; but up to this day no confirmation of the statement of this most accurate naturalist has hitherto been published.* B. D. W.]

4th. Stone fruits stung by the curculio, and containing curculio larvæ, that fall upon naked ploughed ground where the sun can strike them, wither away, and the larvæ that are contained in them die. Dr. Hull informs me that he gives orders to the man that runs his "curculio-catcher" to lay stung peaches, when convenient, in such situations, instead of carrying them away to be scalded, or feeding them out to stock.

* See Fitch's *N. Y. Reports* II, §. 52, p. 83.

5th. All late varieties of the peach, although they are often stung by the curculio, fail to develop the egg; or else, if the egg hatches out, the larva perishes when very young.

I assured myself of the correctness of these last two statements by examining in each case many scores of specimens, not only at this period, and near Alton, but elsewhere and subsequently. I therefore have but little doubt that Dr. Hull is also right as regards the first three statements, although I had no opportunity to verify them. In fact I find him so thorough and accurate an observer, that I would rather take his opinion on any matter respecting the habits of fruit insects, than that of any other unprofessional man with whom I am acquainted.

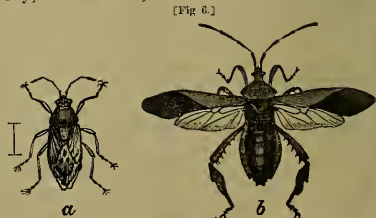
Immediately after breakfast, and while insects are still dull and sluggish in the cool of the morning, we go out to see the practical operations of the celebrated "Curculio-catcher," invented and for many years back used by Dr. Hull. As I have elsewhere explained, this is nothing but a gigantic white umbrella, turned bottom upwards, mounted upon an immense wheelbarrow, and split in front to receive the trunk of the tree which is to be operated upon. At the interior end of the split in front is a padded bumper, which strikes against the trunk as the operator wheels the barrow, first against one tree and then against another, and with two or three sudden jars fetches all the insects off the boughs into the white umbrella which gapes widely open to receive them. Really it is a most magnificent institution; but for its practical success three things are necessary: 1st, that the land should be decently clean and not overgrown with rank weeds, four or five feet high; 2d, that the orchard be a sufficiently large one to pay the interest on the prime cost of the machine—about \$30; 3d, that the trees have a clean trunk of some three or four feet, instead of belonging to the new-fangled, heretical, low-top, branch-out-of-the-ground persuasion.

Everywhere among Dr. Hull's pears, and cherries, and plums, and peaches, and nectarines, and apricots, the ground is nicely cultivated, and between every two rows of trees there is a straight, well worn track made by the wheel of the curculio catcher, with a side track, at right angles to the main track, leading to every tree. But the apple orchard has been sadly neglected and allowed to run to weeds. Mine host is proposing to set hands to work immediately to mow down these weeds, and is congratulating himself upon a discovery that he has just made, namely, that a tall hemp-like weed, about five

or six feet high, which grows in exuberant profusion among his apple trees, bears the local name of "horse weed," and makes excellent hay for horses! I hope that the discovery may prove to be what Mark Twain calls a "fructifying" one.

I find the "curculio catcher" an excellent mode of collecting insects by wholesale, seeing that it is nothing but what entomologists call "beating," carried out upon a gigantic scale. Besides a lot of the genuine plum curculio, we capture four specimens of a closely allied species of the same genus, which is pretty common in Northern Illinois (the *anaglypticus* of Say). Dr. Hull tells me that it operates upon plums like its ally, but thinks that it makes no "crescent cut" in puncturing the fruit. We take also very numerous specimens of a roundish leaf beetle, about one-eighth inch long, generally of a steel blue color, but occasionally verging upon brassy brown. (*Colaspis*, n. sp.?) Although this insect does not have its hind thighs thickened, and consequently cannot jump like the well-known steel-blue flea beetle of the grape vine, yet I find that it is very generally mistaken here for that insect. According to Dr. Hull, it occurs in the jarring process, near Alton, in about the same numbers as my plum gonger. Another insect belonging to the same genus, and of the same shape and make, but nearly twice as large and of a brassy brown color (the *Colaspis pratexta* of Say), we capture in very considerable numbers. Both are, no doubt, to a certain extent, injurious by feeding upon the leaves, and should therefore be devoted to destruction, if convenient, along with the snout beetles or curculios.

Noticing a specimen or two of a true bug belonging to the same group (*Coreus* family) as the large brown squash bug (*Coreus tristis*, DeGeer), and the notorious chinch bug (*Micropus leucopterus*, Say), I showed them to Dr. Hull, and he tells me that he is quite familiar with it, and that it is sometimes very abundant near Alton, and ruins the buds of pear trees that are late in starting, by repeatedly puncturing them with its beak. Near Rock Island, it is one of the commonest bugs that we have, and that our readers may know it when they see it, we annex a magnified figure, (Fig. 6, a). (It is a species of *Rhopalus* allied to the *lateralis* of Say, but distinct.)



Colors—(a) rust red; (b) chocolate brown and amber

Upon a cherry tree, with a fair sprinkling of fruit still remaining on it, I observe great numbers of a much larger bug belonging to the same family, (the *Metapodius [rhinuchus] nasutus* of Say—Fig. 6, b). Dr. Hull tells me that this insect ruins a great many cherries by puncturing them with its beak and sucking out their juices; but that it only attacks sweet cherries. Say describes it as inhabiting "Georgia, Florida, and Louisiana;" but I find it everywhere common enough in Illinois, and near Rock Island it is quite abundant. Like almost all the other species of the family to which it belongs, it stinks with a 40-bedbug power.

Among the cannibal insects which commonly fall into the "curculio catcher," and which should be carefully preserved from destruction, two deserve especial notice. The first is a large stinking bug (*Arma spinosa*, Dallas), which is peculiarly savage throughout the State of Illinois upon the larvæ of the Colorado potato bug, puncturing them with its beak and sucking out their juices. Most of the family, it may be observed, to which this bug belongs (*Scutellera* family), are sap-suckers; but a few genera (including *Arma* and *Stiretrus*), are blood-suckers, and prey indiscriminately upon other insects. This bug we shall subsequently figure and illustrate in an article upon the Potato Bugs and their Cannibal foes. The second insect is also a true bug (*Evagoras viridis*, Uhler MS.), but belongs to a very distinct family, which is pretty numerous in species, and all the species of which, without a single exception, are cannibals (*Reduvius* family). A figure of it will be found in the margin, (Fig. 7). Its larva, which is very common upon various forest trees, scarcely differs from the perfect winged bug, except in being smaller, in lacking wings, and in being covered with a glutinous substance, to which little pieces of dust and dirt are commonly seen to adhere. A species of the same family (*Reduvius personatus*), which, in Europe, has the very gratifying propensity of preying upon the bed bug, is characterized by the same peculiarity.



Color—Yellowish green, the male darker than the female

Even at this early date, I find many full-grown larvæ of the common curculio in peaches and apricots, often as many as three or four in a single fruit, and from about half a dozen of them the larva had already eaten its way out and gone under ground. On the other hand, many of these larvæ are still quite small.

I say nothing of the different insects found here and elsewhere upon the grape vine, because in a future article we propose to give a full account, copiously illustrated by figures, of the various species that infest this important plant.

Dr. Hull having kindly offered to drive me round in his buggy to see some of the neighboring fruit growers, we conclude to start before the morning is too far advanced. At Mr. Kingsbury's I am shown a pear tree pretty badly afflicted with the native or white bark louse, (*Aspidiotus Harrisi*). Here also we find numerous full grown larvæ of the curculio, often as many as two or three in a single fruit, in a sweet early apple known to Downing as "the Red and Green Sweet." Dr. Hull was previously of the opinion that the larva of the curculio never, under any circumstances, matured in the apple; but on comparing these larvæ with others taken from the peach, he was satisfied that they were genuine, full grown curculio larvæ, and candidly confessed that he had been mistaken. Indeed, Mr. Riley had previously published the fact, that he had actually bred curculios from the Early Harvest apple.* Probably the truth of the matter is, that both in early peaches and in early apples, and perhaps in early pears also, the curculio larva matures and thrives, while in late peaches and in late apples, and in late pears it fails to mature and perishes more or less prematurely.

Hence we drive to Mr. D. E. Brown's and Mr. S. B. Johnson's, at both of which places we are unanimously appointed a committee of two to pronounce on the merits of certain medicinal fluids extracted from the fruit of the grape vine. I pronounce them all exceedingly good; but the manuscript of my journal being here, from some unaccountable cause, strangely blurred and blotted, I have only an indistinct recollection that Dr. Hull thought one of the beverages to taste decidedly of the cask. Certainly this was a very safe verdict to bring in, and not so risky a one as that of the two Cincinnati wine tasters, one of whom was of opinion that a certain wine tasted of leather, while the other stoutly maintained that it tasted of iron; both verdicts being eventually justified by a single leather-headed carpet tack being discovered at the bottom of the cask from which the wine had been drawn.

Thence we drive to the fine place owned by the Messrs. Riehl, on the banks of the Mississippi, some little distance above Alton. Here, after taking dinner, we sally forth to hunt up

* See his paper in Trans. Ill. State Hort. Society, 1867, p. 114.

certain species of bugs, which Mr. Riehl has ascertained to prey upon the larva of the Colorado potato bug. One of these proves to be a species of true bug hitherto unknown to have this very commendable propensity (the *Stiretrus [tetyra] fimbriatus* of Say), which will be subsequently figured and illustrated in this journal. The other is the large stinking bug (*Arma spinosa*), already referred to as commonly throughout Illinois preying upon these obnoxious larvæ. But alas! at Mr. Riehl's one individual, at the very least, of this highly meritorious species seems to have become demoralized and to have acquired depraved tastes; for I actually found him with his beak immersed up to the hilt in the body of a poor innocent lady bird (*Coccinella*), which had probably only a few minutes before been making its customary dinner off a batch of potato bugs' eggs.

[CONTINUED IN OUR NEXT.]

A NEW BARK LOUSE ON THE OSAGE ORANGE.

[Fig. 8.]



Colors—(a) light brown and white; (b) blood brown and white.

At figure 8, b, we have represented a new species of bark louse (*Lecanium maclura*, n. sp.), which has recently appeared in considerable numbers on the twigs and leaves of the Osage orange at Wilmington, Will county, Ill., and also in the vicinity of Alton, in South Illinois. The dark part is the scale covering the insect, and this scale, as usual in the genus to which the insect belongs, is of a blood brown color. The pale part is snowy white, and is composed of a fine cottony down enveloping the eggs and

young larvæ. By the middle of July hosts of the young larvæ, which are remarkable for having a longitudinal dark line along the back, had strayed away from the parent scale, covering, not only the bark of the twigs, but also the very leaves. Fitch describes two closely allied bark lice, infesting respectively the grape vine and the pear (*Lec. vitis* and *Lec. pyri*), as having white cottony matter protruding from the tip of the scale, as in the species here figured. But, in all the specimens of these last two species which we have seen, there was nothing of the kind externally visible, though the eggs under the scale were partially enveloped in a delicate white floss.

At figure 8, a, we also give a view of another new species of this same genus, with similar cottony matter at its tail (*Lecanium acericola*, n. sp.) which infests the bark and the leaves of the common maple. It was received by us June 26th, 1867, from Mr. B. W. McLain, of Indiana, and in a few weeks afterwards the young bark lice commenced hatching out from the cottony matter. We have also received the same bark louse from Mr. Tiffany of Davenport, Iowa, who found them on his soft maples.

None of the species belonging to this particular genus of bark lice (*Lecanium*) have ever been known to swarm, for any length of time, in such numbers as to become permanently injurious to the plant upon which they feed. In the case of another genus of bark lice (*Aspidiotus*), to which the common imported oyster shell bark louse (*Asp. conchiformis*) and the native American white bark louse (*Asp. Harrisii*) belong, a very different rule prevails, as most fruit growers in Wisconsin and North Illinois know to their cost. This last genus, by the way, is readily distinguished from that now under consideration by the egg-bearing scale, instead of being in one single piece, being composed of three distinct little scales, each larger than the one that precedes it, counting from the head end.

Reasoning from analogy, therefore, we should infer that this Osage orange bark louse is not likely to become so abundant, or so generally distributed, as to cause any material damage. Hedge-growers will please to make a note of this, and govern themselves accordingly.

ENTOMOLOGICAL IGNORANCE IN THE SOUTH.

Suppose some ingenious person were to address some such letter as the following to any agricultural journal published in the United

States; what would the Editor say to it? Would he not fling it incontinently into the waste-basket? Would he not cry out: "This fellow is either a fool or a madman, or else he is trying to poke fun at me?" At all events, the idea of printing such a document in his journal would be the very last thing that could possibly enter his head:

HOW TO DESTROY RATS—A SUGGESTION.

Let any farmer examine those corn cribs where the greatest quantity of corn is stored, and he will always find there the greatest number of full-grown rats, and also quantities of young rats of all sizes. Now let him closely inspect the ears of corn in such a corn crib, and he will assuredly notice many kernels that are reduced to nothing but an empty shell, just as a hen's egg becomes empty after the young chicken has burst its way out of it.

I am no naturalist, consequently can not tell, but I ask: Is it not possible, nay probable, that all the young rats in the corn crib hatched out from these empty shells? If so, the destruction of the whole brood of rats throughout the length and breadth of the United States is easy. All that will be required will be to scald or kiln-dry the corn upon every farm, before it is finally cribbed. By this means every rat's egg in the whole country will be addled, and a final stop will be put to the future propagation of this pernicious animal.

In former years the old-fashioned Sucker farmers of Illinois used to let their corn stand out in the field all through the winter, and never think of gathering it till it was almost time to plant the land for a second crop. Then we heard little of the brown Wharf-rat or Norway rat. Now it has become a fixture with us. Doubtless this is because formerly all the rats' eggs on the corn that stood out in the open field through the winter froze so hard that they could never afterwards hatch out; while in these modern times the corn is usually gathered and cribbed early in the autumn, and by this means the rats' eggs are protected from the severity of the wintry blast, and hatch out with the utmost punctuality and precision.

It is well known, that several years ago, when corn was worth only ten cents a bushel and coal was as high as fifteen cents, many Illinois farmers commonly burnt corn in their stoves instead of coal. Ignorant men have often blamed them for so doing; but in reality they should have been highly commended for such conduct, instead of being, so to speak, hauled over the coals for it. Can any sane man believe that these patriotic farmers burnt corn instead of coal, for the sake of saving the paltry difference of five cents a bushel in their fuel? No such thing! **THEY WERE BURNING UP THE RATS' EGGS!**

Now let the reader observe the ridiculous nonsense which several agricultural journals in the South have recently printed and reprinted on the subject of the propagation of the Cotton worm—an insect which, on the average of years, destroys annually about fifty million dollars' worth of cotton in the South. The whole history of this species, be it observed, is as well known to entomologists as that of the Hog or the Sheep is to farmers, and has been repeatedly explained and illustrated by Mr. Glover, the Entomologist of the Agricultural Department at Washington, in official documents published by the Government for the benefit of the southern cotton planter. To condense the whole into a nutshell: The mother Moth lives through the winter. Early in the summer

she lays her eggs upon the leaves of the young and growing cotton plant. These eggs soon hatch out into young caterpillars, which devour the leaves with the greatest avidity till they get their full growth, when they form a cocoon among the leaves, and shortly afterwards transform into the winged moth. The same process is repeated twice over during the summer, thus originating three distinct broods of Cotton worms, each usually more numerous than the preceding, and the last the most destructive of the three. Finally, the last set of moths generated in this manner comes out late in the autumn, and such of them as are not destroyed by hungry insect-feeders in the dead of the year live through the winter, and renew the same old cycle of changes year after year and century after century.

One would think that, in consideration of the economic importance of knowing something about the habits of this same Cotton worm, every person connected in any way with the agriculture of the South would be familiar with its natural history. No such thing! Here is the balderdash that leading agricultural journals in Tennessee and Louisiana have just published on this most important of all subjects to them:

HOW TO DESTROY THE COTTON WORM—A SUGGESTION.

Let planters examine the cotton still remaining in the fields where the ravages of the caterpillar were greatest, and they will find the branches punctured in many places, resembling the orifice made by the passage of a very small shot. Let them break or split the limb near the puncture, and they will find a small maggot or egg imbedded in the pith, not exceeding an eighth of an inch in length, and not larger than a small needle. They are nearly equally pointed at the ends, and so hard as not to be easily broken, and when broken emit a yellow, glutinous substance. They are nearly white in color.

I am no naturalist, consequently can not tell, but I ask: Is it not possible, nay probable, that this is the larva of the fly? and if so, their destruction is easy. In former years it was customary with the planters to burn the stalks instead of threshing them, as has grown in use of late. Then we heard little of the caterpillar; now it has become a fixture with us. After the stalks are threshed the branches are plowed in the ground, where probably the process of incubation goes on until the fly comes forth to subsist on what it can find, until the cotton plant is in a condition to suit its rather fastidious taste.

The time is at hand for clearing the field for another crop, and certainly no harm will be done nor much time lost, if, instead of threshing the stalks, the planters would pull them up and burn them, thus in course of time ridding us of a vulture which has for the past two years been feeding on the vitals of our principal staple.

Now, what can be the reason that an absurd speculation on the generative economy of the common Brown Rat, such as has been printed above, would be laughed to scorn by every editor throughout the land; while an equally absurd speculation on the generative economy of the Cotton Worm, has been actually printed in

several of the leading agricultural journals in the South, and seems to meet with general attention and approval? The reason, we take it, is simply this: that the natural history of quadrupeds is pretty well understood everywhere, even by children, while the natural history of insects, which in reality do the farmer far more injury than all the quadrupeds in the country put together, is a sealed book to almost every one.

It is only necessary to add, that the "egg imbedded in the pith of the branches of the cotton plant" is manifestly, from the description of the writer, that of some grasshopper belonging to the Catydid family, or of some Flower cricket (Genus *Ecanthus*). Now the Cotton worm is generated by a Moth (or Miller), and not by a Grasshopper or Cricket. Consequently the mysterious egg, which has so powerfully exercised the imagination of this entomological quidnunc, can no more produce the Cotton Worm, *alias* Cotton Caterpillar, *alias* Army Worm of the South, than a lot of mud turtles' eggs can generate a brood of young chickens.

If any skeptical cotton planter doubts the truth of the above statements, he has but to enclose in any suitable vessel a lot of the wonderful eggs spoken of above as imbedded in the branches of the cotton plant; and, our word for it, he will find them to hatch out next spring into lively young Grasshoppers or Crickets, differing only from the full grown insect in size, and in having no wings at all.

So much for the dense ignorance on entomological matters that prevails in the South. We shall probably soon take occasion to show, that the North is not one whit behindhand in this respect. "*Par nobile fratrum!*" and this, when translated into the vulgar tongue, means that it is "which and 'tother between them" on the Great Bug Question.

Since the above was in type, we have been much pleased at seeing the following paragraph in the *Dixie Farmer* for July 23, 1868. As will be noticed, it completely confirms what we have asserted above, as to the parentage of the supposed "Cotton worm eggs:"

COTTON WORMS—AN ERROR CORRECTED.

I read an article in the *Dixie Farmer*, last week, on the preservation of the Cotton worm from one season to another. The writer seemed to think the eggs were deposited in the old cotton stalk, but that has been satisfactorily proven to be Grasshopper eggs. Mr. S. — says he has seen the Grasshoppers when they were depositing their eggs. Last fall Dr. Bernhard put the stalks up in glass jars, and in the spring there were hosts of Grasshoppers came out of them.

GRASSHOPPERS.

The grasshoppers, in 1868, are at least four or five times as numerous, near Rock Island, Ill., as they have ever been known to be; and they are eating there almost everything that is green. They consist in nearly equal numbers of three species common in that region, (*Caloptenus femur-rubrum*, Degeer, *Edipoda carolina*, Linn., and *Caloptenus differentialis*, Uhler, MS. Near Chicago the last species seems to be replaced by *Caloptenus bivittatus*, Say.) Not a specimen of the Hateful grasshopper from the Rocky Mountains (*Cal. spretus*, Uhler, Walsh), is to be met with among them.

To give some idea of the very serious amount of damage done by these insects in Iowa, we will now quote the following statement from the pen of Judge Grant of Davenport, Iowa:

On the 25th and 30th of June I cut a ten-acre clover field on my farm on Duck Creek; just then the hoppers were hatching; before the new buds had grown they attacked them and destroyed the ten acres; and they are at present working on a field of ten acres which was cut June 19th and is now in bloom.

While we were attending the meeting of the American Association for the Advancement of Science, held at Chicago in the first week of August, we noticed grasshoppers skipping about in great numbers in the public streets, even in the very heart of the city, and the ladies of the palatial residences in the suburbs complained bitterly of their flower gardens being ruined by these little pests. Nor is the phenomenon peculiar to Illinois and Iowa, for we have ourselves noticed the same state of things in Missouri, and the agricultural papers report it as almost universal throughout the West.

It is our intention to issue, each of us for his own State, an official proclamation some time in this present month of September, warning these rebellious armies of grasshoppers that are now ravaging the country, to disperse themselves and retire to their private homes on or before January 1st, 1869. We are willing to stake our scientific reputations upon the fact of these proclamations of ours being punctually obeyed. If, however, which we can not believe, these rebels should refuse to obey us, we intend to issue early in January, 1869, a second proclamation, authorizing all farmers who may have been aggrieved by grasshopper foragers or grasshopper "bummers," to sally forth upon the enemy, horse, foot, and artillery, and exterminate them without the least compunction from off the face of this earth.

THE OLD AND THE NEW PHILOSOPHY.

Prof. Agassiz, in his popular little book on the "Methods of Study in Natural History," p. 24, has made the astounding assertion, that "the man of science who follows his studies into their practical application is false to his calling." And yet nearly three hundred years ago Bacon laid it down as one of the chief characteristics of the new or Baconian philosophy, that, unlike the old philosophical systems, it is not a mere barren string of words, but is adapted and intended to promote the comforts and conveniences of human life; or, as he phrases it in his terse and energetic Latin, "*humanis commodis inservire.*"

Now mark how hard it is, even for a philosopher of such distinguished eminence as Prof. Agassiz, to be consistent in adopting the ideas of a bygone age. It is undoubtedly true that all the ancient philosophers of Greece and Rome thought without exception as Prof. Agassiz, in the passage which has just been quoted, professes to think. For example, the celebrated Grecian geometrician, Archimedes, being a resident of the city of Syracuse in Sicily when it was besieged by the Romans, employed his optical and mechanical knowledge in devising enormous burning glasses to burn up some of the ships of the enemy, and in constructing certain grappling hooks of such prodigious power, that they seized other vessels belonging to the besiegers, hoisted them up bodily in the air, and then, letting them drop suddenly into the water, sank them to the bottom and drowned every soul that was on board. Any American of the present day would be proud of such achievements as those, and would think science well employed in protecting his country from hostile invasion. But instead of being proud of what he had done, the old Greek philosopher, Archimedes, actually thought it necessary to apologize to the scientific world for having degraded the dignity of science to such base practical purposes! Let us see now if Prof. Agassiz, the man of the nineteenth century after Christ, can be consistent with himself throughout in holding the views of Archimedes, the man of the third century before Christ.

In the very work which we just now referred to, and only some 150 pages after the passage quoted above, this very same author, Prof. Agassiz, speaking of Prof. Bache, the late lamented Superintendent of the United States Coast Survey, allows himself to discourse as follows: "I can not deny myself the pleasure of paying a tribute here to the high scientific

character of the distinguished Superintendent of this Survey, who has known so well how to combine the most important scientific aims with the most valuable practical results in his direction of it." (p. 181.) Surely, now, if "the man of science that follows his studies into their practical application is false to his calling;" then Prof. Bache, instead of being so highly praised by Agassiz, ought to have been severely condemned by him; and if, on the other hand, Prof. Bache, in the opinion of Agassiz, deserved high commendation for the practical results which he deduced from his scientific discoveries, then Agassiz is grossly inconsistent with himself in making the sweeping assertion which has just been referred to.

For ourselves, we do not consider that the scientific entomologist either degrades his favorite science, or lowers his own scientific dignity, by employing his theoretical knowledge for the attainment of objects of plain, practical, every day utility. He may perhaps occupy a lower position in the scientific world than the ingenious artists, who are every day grinding up varieties into species, and flooding science with new genera and new families, as uncalled for and unnecessary as a fifth wheel in a coach. Still he may perhaps be properly admitted within the pale of the scientific hierarchy as a kind of subordinate and inferior officer, like the lay brothers in a Roman Catholic monastery; and certainly he ought not to be hounded forth into outer darkness as a *caput lupinum*, with the dreadful cry that he is "false to his calling," and has degraded the body of men to which he once had the honor of belonging.

 THE ANIMAL KINGDOM.

There are four grand branches of the Animal Kingdom: 1st. Backbone animals (*Vertebrata*), comprising the four respective classes of mammals, birds, reptiles, and fishes; normally all of these have four limbs. 2d. Jointed animals (*Articulata*), or such as have their bodies composed of a series of rings or joints, comprising the class of insects which have, all of them, in the perfect state, six legs; the class of spiders, etc. (*Arachnida*), which have almost all of them eight legs; the class of Crustaceans (crabs, lobsters, crawfish, etc.), which have from ten to fourteen legs; the class of thousand-legged worms (*Miriapoda*), which have very numerous legs, and the class of worms which have no legs at all. The 3d grand branch is the Mollusks (*Mollusca*), which have soft bodies, not composed of distinct rings or joints; of these

the oyster, clam, and snail may be taken as examples. The 4th grand branch is the Star animals (*Radiata*), represented by the sea-urchins and star fish found on the sea coasts, and having bodies arranged on the plan of an asterisk or (*).

Of these four grand branches, it is only with the two first that the American Agriculturist is brought into immediate contact. For, although in Europe many snails and slugs are very destructive in the garden and the field, yet none of them are materially injurious to man in the United States. As to the fourth branch, the Star animals, they are peculiar to the water; and with the exception of a few minute species that inhabit fresh water, they are peculiar to the salt waters of the ocean.

AD INTERIM COMMITTEES.

To the Ohio State Horticultural Society, we believe, is due the credit of initiating the appointment of an *ad interim* committee. The Illinois State Horticultural Society, however, has had the wisdom to follow her example, having had such a committee for the past two years, while the Missouri State Horticultural Society also appointed one at its last session. It is the duty of the gentlemen forming these committees to visit during the year the different fruit regions of the State, and report the result of their observations at the meeting of their Society. The committee is divided into sub-committees, and the time of meeting, in any given locality, is specified by printed programme. We have had the pleasure of meeting with these gentlemen on several occasions while on their travels, and the good that they are doing is incalculable. To discover the cause of disease in fruit trees is one of their special aims, and the present year has been a most favorable one to make investigations. Rot, mildew, parasitic fungus, and the work of insects have met them at every turn, and no doubt their reports will be fraught with good results and new discoveries. While it is the aim of our little journal to clear up the mysteries in which many diseases of an insect nature are involved, and to point out the remedy; we wish also particularly to impress upon our readers, that, in consideration of the intimate relation which the effect of insect work often bears to that of parasitic attacks of a vegetable nature, funguses, etc., we shall, with pleasure, publish any scientific discoveries or observations with regard to these rots or diseases, and also give any information upon this subject that may be within our power.

TO THE SUBSCRIBERS OF THE PRACTICAL ENTOMOLOGIST.

The present number of the *American Entomologist* will be sent to every subscriber, whose name was on the books of the old *Practical Entomologist* at the time of its demise. It is sent thus as a sample, and will be discontinued unless the subscription price, \$1.00, be remitted before the appearance of our second number. We hope that every one of the old subscribers will not only remit their own names, but will show the paper to any of their neighbors who are interested in this matter.

ON OUR TABLE.

A NEW WORK ON LEPIDOPTERA.—We acknowledge the receipt of the first number of "*The Butterflies of North America*," by Wm. H. Edwards. This work is to be issued in numbers, and each number will contain five plates, drawn on stone, life size, and carefully colored from nature. Twelve or more numbers will make a volume, and each volume will be complete in itself.

If the future numbers shall bear the same marks of care, correctness, and artistic skill, as does this first number, we shall, without hesitancy, declare it the finest work of the kind ever published in this or any other country. *Argynnis Diana*, *A. Cybele*, *A. Aphrodite*, *A. Atlantis*, and *A. Nokomis* are figured in this number. We regret that the author has been unable to give with them their preparatory stages. Price, \$2.00 per number. Address E. T. Cresson, No. 518 South Thirteenth street, Philadelphia.

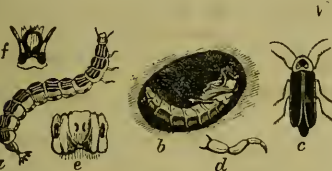
POPULAR AMERICAN ENTOMOLOGY, being a Guide to the Study of Insects; by A. S. Packard, Jr., M.D., of Salem, Mass.—Another work now being issued in parts, the second number of which has just been received from the author. Our space forbids a proper notice this month. It fills a gap in American Entomological literature, is well written and amply illustrated, and we hope will meet with the success it deserves. But why are the classifications of Kirby and Spence, Westwood, etc., omitted in the tabular views of the different systems? Subscriptions received by the author. Each number 50 cents.

THE "CANADIAN ENTOMOLOGIST."—A little eight page monthly, published at Toronto, and edited by the Rev. C. J. S. Bethune, of Credit, Ontario, Canada. The first number is just received. We wish it success, and hope that our Canadian friends are sufficiently awakened on the subject to properly support it. It is published at 50 cents per volume.

ANSWERS TO CORRESPONDENTS.

"Fire-Flies."—*Wm. McC., Mexico, Audrain county, Mo.*—You send a specimen of what is known as the "Fire-fly" in your neighborhood, and you desire to learn something of its natural history. The insect, which has brownish black wing-covers, margined with pale yellow, and a yellow thorax, with a central black spot, and a patch of rose color on each side of it, and which was received in good condition, is the *Photinus pyralis* of Linnaeus, and is known all over the West by the name of the "Fire-fly." It is not, strictly speaking, a fly, but a true beetle, belonging to the order COLEOPTERA, and the family LAMPYRIDÆ.

[Fig. 9.]



Every one is familiar with the appearance of these beetles, as their soft glow, which is ever and anon vanishing and re-appearing, illumines the pleasant evenings of July and August; but as their transformations are not so well known, we have prepared the accompanying Figure 9 in illustration of them. At *a* is represented the larva as it appears when full grown. It lives in the ground, where it feeds on other soft bodied insects. At times these "fire-fly" larvae subsist almost entirely on young earth-worms, for we have found them abundantly in soil, on which no vegetation had grown for at least one year, and where in consequence there was scarcely another animal to be found, besides these two—the "fire-fly" larva feeding upon the earth-worm, and the latter subsisting on the earth itself.

Each segment of the larva has a horny, brown plate above, with a straight white line running longitudinally through the middle, and another, somewhat curved one, on each side. The sides are soft and rose-colored, and the spiracles which are white, are placed on a somewhat elevated, and nearly oval, dark brown patch. On the under side it is of a cream color, with two brown spots in the center of each segment, as shown enlarged at *e*. The head (magnified at *f*) is thoroughly retractile within the first segment, which is semicircular and gradually narrowed in front. But the most characteristic feature is a retractile proleg (or "houpppe nerveuse," as the French have more graphically called it) at the extremity of the body, which not only assists in its locomotion, but serves to cleanse the head and fore part of the body from any impurities that may adhere to them after it has finished a meal. It is quite amusing to watch one, as it deftly curls its body and stretches this "houpppe" fan-like over its head, and literally washes itself.

When full grown, or during the latter part of June, it forms an oval cavity in the earth, throws off its larval skin, and becomes a pupa as represented at *b*. In this stage it is white, with a tinge of crimson along the back and at the sides, and after a rest of about ten days, it throws off its skin once more and becomes a beetle like the one you have sent. The light, which is of a phosphorescent nature, is emitted from the tip of the under side of the abdomen, two of the segments being of a sulphur yellow color, in contrast with the rest, which are dark brown. This light is emitted both by the larva and pupa, though not so strongly as in the perfect insect.

There are other species belonging to this family which inhabit North America, and which emit a light, and these are doubtless popularly known as Fire-flies in their several districts. In some of them the females are almost or quite wingless, with but very short wing-cases, but in this species both sexes are winged, and have full-sized wing-cases.

The Hellgramite Fly.—*Dr. Bowman, Andalusia, Ill.; Dr. J. Hook, Cordova, Ill.; and Mr. L. Bunce, DuBois, Ill.*—The gigantic Fly, which you have all three of you forwarded for examination, we propose to illustrate in all its stages in a future article, and at the same time to give a brief account of its natural history. Its scientific name is *Corydalis cornutus*, Linnaeus, and its larva is in some parts of the West called a "Crawler," and in other parts a "Hellgramite."

A New Grape-root Borer.—*W. D. F. Lummis, Nokonde, Ill.*—The gigantic borer, about two inches long, and six times as long as wide, which you find boring the roots of the grape vine a little below the surface, and which in the last two years has, as you say, already destroyed two vines for you, killing them suddenly, one of them with ten bunches of grapes on it, has been also received by us from other

parts of South Illinois, with the same account of its habits. The largest specimens are from two and a half to two and three-quarter inches long, of a yellowish white color, with a small horny reddish-brown head, and with the front joints of the body considerably wider than the rest, and the first joints greatly longer than any of the others. No such larva has hitherto been described as infesting the grape vine.

This larva is manifestly that of some long-horned boring beetle, but to what particular species it belongs, is not quite so certain. From a larva resembling it in every respect, so far as our description goes, and which we found in September, 1867, in decaying pine wood, we bred about the last of June, 1868, the Cylindrical Prionus, (*Orthosoma cylindricum*, Fabr.). We have also received a similar larva, which was found by Mr. O. B. Galtusha, of Kendall county, in Southern Illinois, boring in the root of an apple tree; and in several parts of the Western States what appears to be the same species is grievously infesting the roots of the Osage orange. It has also destroyed many vines, this year, in Dr. C. W. Spaulding's vineyard in St. Louis county, Mo. We hope to breed the perfect beetle from this grape-root borer, when we shall certainly furnish figures of the insect both in the larva and in the beetle state, with a complete account of its depredations.

Bugs on Grape Vines Mistaken for Chinch-Bugs.—*Col. Fred. Hecker, Lebanon, Ill.*—You are quite right in saying that the Chinch-bug has, in certain counties in Illinois, greatly damaged the wheat and the corn in this present year. But you are most probably mistaken in supposing that this same insect also attacks your grape vines. "As soon as the first leaflets," you observe, "have started, and the bud of the blossom is visible, this little demon [the Chinch-bug] begins its work, and not at the leaflets, but the bud of the blossom." This is the exact manner in which another small bug, (the *Piesma cinerea* of Say), that has a general resemblance to the Chinch-bug both in size and shape, attacks the grape vine; and as the true Chinch-bug has never hitherto been observed to attack woody plants, such as the grape vine, but confines itself exclusively to herbaceous plants, such as wheat, oats, Indian corn, &c., we conclude that you have condemned the two species together. The Chinch-bug may be recognized by the wings when folded on the back being white, with two small black spots arranged crossways on them; while the other species, which is also a true bug, but belongs to a very different group (*Tingis* family, instead of *Lygaeus* family), is of a greenish gray color, with a few irregularly distributed dark markings. The last may be found in great numbers passing the winter under the loose bark of standing and living trees, especially the shag-bark bickory.

Leaf-hopper of the Grape.—*Col. Fred. Hecker, Lebanon, Ill.*—"One of the worst enemies," as you observe, "of our vineyards, are the grape-hoppers; they bite off the clusters of grapes before they are ripe. Last year they ruined me the Concord grape." We suppose that you refer here to the dark brown Leaf-hopper (*Proconia undata*, Fabr.), a cylindrical jumping bug, nearly half an inch long, which is very common on the grape vine in South Illinois, and which lays its eggs in single rows in the wood of the canes. Unless we have been misinformed, this bug punctures with its beak the stems of the bunches of grapes, thus causing the stem to wither and the bunch to fall off. Having no jaws to eat with, but only a beak to suck sap with, it can not, of course, "bite off" the bunches of grapes, but the practical result is just the same as if it did so. This same species may often be observed pumping out the sap so voraciously from the canes, that it falls in a quick succession of drops from their tails. In a future article we propose to give a short account, copiously illustrated by figures, of all the different insect foes of the grape.

Leaf-Bugs.—*Chas. H. Peck, Albany, N. Y.*—"The very much flattened, oval, whitish bug, about one-eighth of an inch long, which you find in such swarms on the leaves of the basswood, in company with their larva and their moulted skins, are the Basswood Leaf-bug (*Tingis monanthia* tibia, Walsh). A similar species, the Sycamore Leaf-bug (*Tingis ciliata*, Say), occurs in equal profusion, everywhere, from Canada to Illinois, on the under surface of the leaves of the sycamore, or, as you Eastern folks call it, the buttonwood. When you take for a "fungus" on the leaves of the basswood sent by you, is nothing but the small, dead, dark brown spots upon them caused by the punctures of the beak of the insect. Many of the true bugs (orders *Heteroptera* and *Homoptera*, to the former of which groups your insect appertains), occasion similar brown spots on the leaves which they infest,—for example, the various species of small Leaf-hoppers (genus *Erythronewra*), which are so destructive throughout the Union to the leaves of the grape-vine.

Several answers to correspondents have been unavoidably crowded out of this number, and will have to lie over till our next. Our readers will bear in mind that all queries to be answered in time must be received by the 19th of the month, preceding publication.

PROSPECTUS OF THE AMERICAN ENTOMOLOGIST.

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POTATO BUGS.

We often see paragraphs in the papers, stating that "THE Potato Bug" has been very abundant and destructive in such a month and at such

[Fig. 10.]

place, "THE Potato Bug" may be checked and controlled by such and such remedies.

Do the worthy men, who indite these notable paragraphs, ever consider for one moment, that there are no less than ten distinct species of bugs, preying upon the potato plant within the limits of the United States? That many of these ten species are confined within certain geographical limits? That the habits and history of several of them differ as widely as those of a hog and a horse? That some attack the potato both in the larva state and in the perfect or winged state; others in the perfect or winged state alone; and others again in the larva state alone? That



Colors—(A) green and white; (B) mahogany brown; (C) black, gray and orange.

and such a place. Accompanying these statements, remarks are frequently added, that "THE Potato Bug" is preyed upon by such and such insects, so that we may soon expect to see it swept from off the face of the earth; and that, even if this desirable event should not take

in the case of seven of these insects there is but one single brood every year, while of the remaining three there are every year from two to three broods, each of them generated by females belonging to the preceding brood? That eight of the ten feed externally upon the leaves and

tenderer stems of the potato, while two of them burrow, like a borer, exclusively in the larger stalks? Finally that almost every one of these ten species has its peculiar insect enemies; and that a mode of attack, which will prove very successful against one, two, or three of them, will often turn out to be utterly worthless, when employed against the remainder?

We propose, in this article, in order to throw some light upon a subject which appears to be very generally enveloped in the dark clouds of entomological ignorance,—to give a short account, illustrated by figures, of the above ten foes of the potato. After this, if any Editor, whether of a political or an agricultural journal, shall persist in talking about “THE Potato Bug,” we shall have to turn him over to the grammarians for deserved castigation, as an inveterate and incorrigible abuser of the definite article.



Colors—(1) grayish brown; (2) livid brown and white.

THE STALK BORER (*Gortyna nitela*, Guenee).—This larva (Fig. 11, 2) commonly burrows in the large stalks of the potato; but is not peculiar to that plant, as it occurs also in the stalks of the tomato, and in those of the dahlia and aster and other garden flowers. We have likewise found it boring through the cob of growing Indian corn, and strangely confining itself to that portion of the ear; and we formerly received a single specimen embedded in the stem of Indian corn, from which we subsequently bred the winged insect. By way of compensation, we suppose, it is particularly partial to the stem of the common cocklebur (*Xanthium strumarium*); and if it would only confine itself to such noxious weeds as this, it might be considered as a friend instead of an enemy. In 1868 it has been more numerous than usual, and we noticed it to be particularly abundant along the Iron Mountain and Pacific roads in Missouri. In the fore part of July, 1868, we ascertained that a potato patch on land belonging to Mr. D. B. Wier of Lacon, Ill., had about every tenth stem occupied by this borer. The common Spindle worm (*Gortyna zea*, Harris), found burrowing in the heart of young Indian corn, is a distinct but allied species, producing an entirely different moth.

The larva of the Stalk Borer moth leaves the stalk in which it has burrowed about the latter part of July, and descends a little below the surface of the earth, where in about three days it changes into the pupa or chrysalis state. The winged insect (Fig. 11, 1), which belongs to the same extensive group of moths (*Noctua* family, or owlet moths) to which all the cut-worm moths appertain, emerges from under ground from the end of August to the middle of September. Hence it is evident that some few, at all events, of the female moths must live through the winter in obscure holes and corners, and lay their eggs upon the plants which they infest in the following spring. For otherwise, as there are no young potato or tomato plants, or Indian corn, or dahlias, or asters, or even cocklebur for them to lay their eggs upon in the autumn, the whole breed of them would die out in a single year.

This insect has long been known to entomologists in the moth state, although until the year 1867 nothing had been printed respecting its larval history. The junior editor of this journal was the first to publish an accurate history of the species in all the stages, together with a full description of the larva, which will be found in the *Prairie Farmer* for February 23d, 1867.



Colors—(a and b) white; (c) ash gray and black.

THE POTATO-STALK WEEVIL (*Baridius trinotatus*, Say).—This insect is more peculiarly a southern species, occurring abundantly in the Middle States and in the more southerly parts of Indiana and Illinois, and also in Missouri; but, according to Dr. Harris, being totally unknown in New England. The female beetle (Fig. 12, c) deposits a single egg in an oblong slit about one-eighth inch long, which it has previously formed with its beak in the stalk of the potato. The larva subsequently hatches out, and bores into the heart of the stalk, always, according to Miss Morris of Pennsylvania, who was the first to notice it, proceeding downwards towards the root. When full grown, it is a little over one-fourth inch long (Fig. 12, a), and is a soft whitish, legless grub, with a scaly head. Hence it can always be readily distinguished from the larva of the Stalk Borer, which has invaria-

bly sixteen legs, no matter how small it may be. Unlike this last insect, it becomes a pupa (Fig. 12, *b*) within the potato stalk which it inhabits; and it comes out in the beetle state about the last of August or the beginning of September. The stalk inhabited by the larva almost always wilts and dies. The perfect beetle, like many other snout-beetles, must of course live through the winter to reproduce its species in the following spring.

Miss Morris found that "in many potato fields in the neighborhood of Germantown, Penn., every stem was infested by these insects, causing the premature decay of the vines, and giving to them the appearance of having been scalded." In the fore part of July, 1868, we found a potato patch belonging to Mr. Holcomb of Cobden, Ill., utterly ruined by this snout-beetle, many vines having a dozen larvae in them; and in the same year we have met with it quite commonly in various parts of Missouri. So far as is at present known, it attacks no plant but the potato.

THE POTATO-WORM OR TOMATO-WORM, (*Sphinx* 5—*maculata*, Haworth).—This well known insect, the larva of which is illustrated on our front page (Fig. 10, A), is usually called the Potato-worm, but it is far commoner on the closely allied tomato, the foliage of which it often clears off very completely in particular spots in a single night. Many persons are afraid to handle this worm, from an absurd idea that it has the power of stinging with the horn on its tail. We have handled hundreds of them with perfect impunity, and for the small sum of one cent, will undertake to insure the whole population of the United States against being stung by this insect, either with the conspicuous horn on its tail or with any hidden weapon that it may have concealed about its person. In fact, this dreadful looking horn is not peculiar to the Potato-worm, but is met with in almost all the larvae of the large and beautiful group to which it belongs (*Sphinx* family). It seems to have no special use, but, like the bunch of hair on the breast of the turkey cock, to be a mere ornamental appendage.

When full-fed, which is usually about the last of August, the Potato-worm burrows under ground and shortly afterwards transforms into the pupa state (Fig. 10, B). The pupa is often dug up in the spring from ground where tomatoes or potatoes were grown in the preceding season; and most persons that meet with it suppose that the singular, jug-handled appendage at one end of it is its tail. In reality, however, it is the *tongue-case*, and contains the long pla-

ble tongue which the future moth will employ in lapping up the nectar of the flowers, before which, in the dusky gloom of some warm, balmy summer's evening, it hangs for a few moments suspended in the air, like the glorified ghost of some departed botanist.

The moth itself (Fig. 10, C) was formerly confounded with the Tobacco-worm moth (*Sphinx Carolina*, Linnæus), which indeed it very closely resembles, having the same series of orange colored spots on each side of the abdomen. The gray and black markings, however, of the wings differ perceptibly in the two species; and in the Tobacco-worm moth there is always a more or less faint white spot or dot near the centre of the front wing, which is never met with in the other species. In Connecticut and other northern States where tobacco is grown, the Potato-worm often feeds upon the leaves of the tobacco plant, the true Tobacco-worm being unknown in those latitudes. In the more southerly States, on the other hand, and in Mexico and in the West Indies, the true Potato-worm is unknown, and it is the Tobacco-worm that the tobacco growers have to fight. While in the intermediate country both species may frequently be captured on the wing in the same garden and upon the same evening. In other words, the Potato-worm is a northern species, the Tobacco-worm a southern species; but on the confines of the two districts exclusively inhabited by each, they intermingle in varying proportions, according to the latitude.

THE STRIPED BLISTER-BEETLE (*Lytta vittata*,) Fabr.—The three insects figured and described above infest the potato plant in the larva state only, the two first of them burrowing internally in the stalk or stem, the third feeding upon its leaves externally. Of these three the first and third are moths or scaly-winged insects (order *Lepidoptera*), so called because the wings of all the insects belonging to this large group are covered with minute variously-colored scales, which, on the slightest touch, rub off and rob the wing of all its brilliant coloring. The second of the three, as well as the next four foes of the potato, which we shall notice, are all of them beetles or shelly-winged insects (order *Coleoptera*), so called because what would normally be the front wing is transformed here into a more or less hard and shelly wing-case, which, instead of being used as an organ of flight, is employed merely to protect and cover the hind wings in repose. To look at any beetle, indeed, almost any inexperienced person would suppose that it has got no wings at all; but in reality nearly

all beetles have full-sized wings snugly folded up under their wing-cases, and, whenever they choose it, can fly with the greatest ease. This is the case with the four kinds of beetles infesting the potato, whose habits we are now about to relate. As these four species all agree with one another in living under ground and feeding upon various roots, during the larva state, and in emerging to attack the foliage of the potato, only when in the course of the summer they have passed into the perfect or beetle state; it will be quite unnecessary to repeat this statement under the head of each of the four. In fact, the four are so closely allied, that they all belong to the same family of beetles, the blister-beetles (*Lytta* family)—to which also the common imported Spanish-fly or blister-beetle of the druggists appertain—and all of them will raise just as good a blister as that does, and are equally poisonous when taken internally in large doses.

[Fig. 13.]



Colors—Yellow and black.

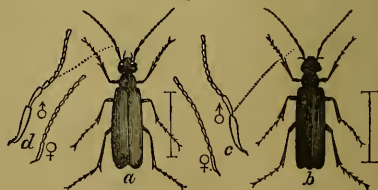
The Striped Blister-beetle (Fig. 13) is almost exclusively a southern species, occurring in particular years very abundantly on the potato vine in Central and Southern Illinois, and also in Missouri, but in North Illinois being usually so rare, that in the course of ten years collecting, we have scarcely met with half a dozen specimens of it there. In 1868, however, it is reported by Mr. Graham Lee, of Mercer county, N. Ill., and also by Capt. Beebe, of Galena, N. Ill., as occurring in very large numbers upon their potatoes. And, according to Dr. Harris, it is occasionally found even in New England. In some specimens, the broad outer black stripe on the wing-cases is divided lengthwise by a slender yellow line, so that instead of two there are three black stripes on each wing-case; and in the same field we have noticed, on two separate occasions, that all the intermediate grades between the two varieties may be met with; thus proving that the four-striped individuals do not form a distinct species, as was formerly supposed by the European entomologist, Fabricius, but are mere varieties of the same species to which the six-striped individuals appertain. In July, 1868, we found the insect very abundant on the potato in Champaign Co., Ill., and Mr. Merton Dunlap of Champaign told us, that he had succeeded in driving them with brush off his potato-patch on to some old hay which he had prepared to receive them, and then, setting fire to the hay, consumed them bodily. Many such cases may be found recorded in different agricultural journals.

Mr. M. S. Hill, of East Liverpool, Ohio,

states in the *Practical Entomologist* (vol. I, p. 197), that this species had swarmed on the potato vines in his neighborhood in 1866, and that "the most successful method of destroying them was by placing between the furrows or rows, dry hay or straw, and setting it on fire." "The bugs," he adds, "were thus nearly all destroyed, and the straw burning very quickly did not injure the vines. Might not this remedy be applied with success in the destruction of your new and highly-improved Colorado Potato-bug?" Perhaps it might; but the process would have to be repeated a great many times. For, although there is but one brood of any of these potato-feeding Blister-beetles in a year, and they consequently last comparatively but a short time upon the vines, yet there are about three successive generations of the Colorado Potato-bug in one season, and they may often be met with, in some one of their stages, upon the potato plant all through the growing season. As to driving Colorado potato-bugs with brush out of a potato patch, that is entirely out of the question. The larvæ have got no wings, and consequently can not fly at all; and even in the hottest time of the day and in the hottest season, the perfect beetles can not be forced to take wing and fly off, as can be done without much difficulty under such circumstances with any of the potato-feeding Blister-beetles. The Colorado bugs can fly, it is true, and they do fly when the sun shines hot upon them; but they are very independent bugs, and will only fly just when it suits them to do so.

Mr. S. P. Boardman ("Wool-grower") says that he has discovered that this striped Blister-beetle, like the Colorado bug, eats all other potato tops in preference to Peach-blows. (*N. Y. Sem. Tribune*, July 13, 1868.) This is certainly a new fact, so far as regards the former species, though it has long been ascertained to be true of the latter.

[Fig. 14.]



Colors—(a) ash gray; (b) black.

THE ASH-GRAY BLISTER-BEETLE,* (*Lytta cinerea*, Fabr.)—This species (Fig. 14 a, male) is the

* In the male of this species, but not in the female, the first two joints of the antennæ are greatly elongated and

one commonly found in the more northerly parts of the Northern States, where it usually takes the place of the Striped Blister-beetle figured above. It is of a uniform ash-gray color; but this color is given it by the presence upon its body of minute ash-gray scales or short hairs, and whenever these are rubbed off, which happens almost as readily as on the wings of a butterfly, the original black color of its hide appears. It attacks not only potato vines, but also honeylocusts, and especially the English or Windsor bean. In one particular year, we have known them, in conjunction with about equal numbers of the common Rose-bug (*Macrodactylus sub-spinosus*, Linn.), to swarm upon every apple tree in a small orchard in Northern Illinois, not only eating the foliage, but gnawing into the young apples. In 1868 they have been quite common in parts of Illinois, Missouri, Wisconsin, and Iowa; and the people there had got so habituated to the presence of the Colorado bug, that in many cases they thought the Ash-gray gentleman was a fresh invader from the region of the Rocky Mountains; whereas it has existed everywhere in the more northerly parts of the United States for time immemorial.

THE BLACK-RAT BLISTER-BEETLE (*Lytta murina*,* LeConte).—Of this species (Fig. 14 b), which is entirely black, we received numerous living specimens in July, 1867, from D. W. Kauffman, Esq., Pres. Iowa State Hort. Society, with an account of its swarming in that month upon the potato vines near Des Moines, Iowa. There is a very similar species, the Black Blister-beetle (*Lytta atrata*, Fabr.), from which the Black-rat Blister-beetle is distinguishable only by having four raised lines placed lengthways upon each wing-case, and by the

dilated; which is also the case with the species next to be referred to. (Fig. 14 d, represents the male antennae, above; that of female below.) Hence, in splitting up the extensive and unwieldy old genus (*Lytta*), these and certain allied species have been very properly placed in a genus by themselves (*Macrobasis*); while the Striped Blister-beetle and the Margined Blister-beetle, not possessing this peculiarity, are grouped together under a distinct genus (*Epicauta*). Practical men, however, who do not desire to trouble their heads with these niceties, will find it most convenient to class them all together under the old genus (*Lytta*); and this we have accordingly done.

*The Latin word "*murina*" properly means "mouse-colored;" and it is not easy to understand, why a black insect should receive the specific name of "mouse-colored." We have got over the difficulty by supposing that the author of the name referred to the color of the black rat—the *mus rattus* of Linnæus—formerly the only rat that troubled us in America, but now almost completely driven out by another imported species—the Brown or Norway rat—just as the imported white man is at the present day gradually extirpating the Red Indian, and the Red Indian formerly drove southwards his mound-building Aztec predecessors.

two first joints of the antennæ being greatly dilated and lengthened in the males, as above in Fig. 14 c. This latter species has been currently asserted by authors to infest the potato vine. We believe that in many cases, at all events, this is an error; and that the latter species has been mistaken for the former. The true Black Blister-beetle we have never met with, except quite late in the year, namely about the last of August or the fore part of September; and then always upon the flowers of the Golden-rod, the Thistle, etc. The experience of Mr. Ulke, of Washington, D. C., to whom we referred upon this subject, coincides with ours; and surely a beetle which does not make its appearance till so late a period in the year as the last of August can scarcely ever be injurious to the potato-crop. It would be very desirable that persons meeting with Blister-beetles, of a black color and without any pale markings whatever, upon potato vines, at any period of the year, should forward specimens to us. The question to be decided is certainly of no very great practical importance; but scientifically considered, it is a curious and interesting one, as tending to demonstrate that even the very best entomologists are not universally infallible.

THE MARGINED BLISTER-BEETLE* (*Lytta marginata*, Fabr.)—This species (Fig. 15)

may be at once recognized by its general black color, and the narrow ash-gray edging to its wing-cases. It usually feeds on certain wild plants; but Mr. Barber, of Wisconsin, found it, but only in small numbers, on his potato vines in 1866; and in 1868 we were shown three specimens taken on potato vines near Champaign, Central Illinois, in company with the Striped Blister-beetle. In the same year, 1868, it was more abundant than any other species in a potato field in Union county, Southern Illinois.

*This is the name formerly given by almost all entomologists to this species; and a most appropriate one it is, in view of the remarkable ash-gray margin of its black wing-cases (*elytra*). But of late years it has been discovered, that, as long ago as the middle of the last century, and several years before Fabricius named and described this insect as the "Margined Blister-beetle" (*Lytta marginata*), it was named and described as the "Ash-gray Blister-beetle" (*Lytta cinerea*), by Foerster. Hence, in accordance with the inexorable "law of priority," the obedient scientific world has been called upon to adopt Foerster's name for this species; and as two species belonging to the same genus can not, of course, have the same specific name, the true Ash-gray Blister-beetle of Fabricius (*Lytta cinerea*), which is really ash-gray all over, has been re-christened by the name of "Fabricius's Blister-beetle" (*Lytta Fabricii*). Positively, this continual chopping and changing in scientific



Colors—Black and ash-gray.

[Fig. 16.]



Colors—Dull white.

THE THREE-LINED LEAF-BEETLE (*Lema trilineata*, Olivier).—The three first insects, described and figured above as infesting the potato-plant, attack it only in the larva state. The four next, namely the four Blister-beetles, attack it exclusively in the perfect state. The three that remain to be considered attack it both in the larva and in the perfect state, but go underground to pass into the pupa state; in which state—like all other Beetles, without exception—they are quiescent, and eat nothing at all.

The larva of the Three-lined Leaf-beetle may be distinguished from all other insects that prey upon the potato by its habit of covering itself with its own excrement. In Figure 16 *a*, this larva is shown in profile, both full and half grown, covered with the soft, greenish excrementitious matter which from time to time it discharges. Fig. 16 *c* gives a somewhat magnified view of the pupa; and Fig. 16 *b* shows the last few joints

nomenclature is getting to be an unbearable nuisance, and must be put a stop to. Otherwise one-half of the time of every entomologist, which might be much better occupied in studying out scientific facts, will be frittered away in studying out scientific phrases. We propose, therefore, at the very next session of Congress, to procure the passage of a law, which shall inflict a fine of \$1000 upon every entomological writer who willfully, carelessly, maliciously, and without any practical benefit thereby redounding to science, shall disturb the established nomenclature of any insects, commonly called bugs; \$999 of the aforesaid \$1000 to be always paid into the fiscal chest of the AMERICAN ENTOMOLOGIST, and the remaining \$1, after deducting legal expenses and all the customary pickings and steel-filings, to be appropriated to the payment of the National debt.

Many writers, in giving the scientific designation of an insect, neglect to add the name of the author who first described it. This practice often leads to error, uncertainty, and confusion, as the preceding example will at once show. If, for instance, we write simply "*Lytta cinerea*," how can the reader tell whether we mean the species described under that name by Foerster, or the very distinct species described under the very same name "*cinerea*" by Fabricius? Whereas, if we add the author's name, all doubts upon the subject are at once removed; and we can snap our fingers at those wearisome and interminable disputes about the priority of names and the law of priority, which take up so much space in scientific papers, while they add absolutely nothing to our knowledge of the facts recorded by the finger of God in the great book of Nature.

of the abdomen of the larva, magnified, and viewed, not in profile, but from above. The vent of the larva, as will be seen from this last figure, is situated on the upper surface of the last joint, so that its excrement naturally falls upon its back, and by successive discharges is pushed forward towards its head, till the whole upper surface of the insect is covered with it. In other insects, which do not indulge in this singular practice, the vent is situated either at the extreme tip of the abdomen or on its lower surface.

There are several other larvæ, feeding upon other plants, which commonly wear cloaks of this strange material, among which may be mentioned one which is very common upon the Sumach, and which produces a jumping, oval Leaf-beetle (*Blepharida rhois*, Foerster), about a quarter of an inch long, and of a yellow color, speckled with brick-red. The larvæ of certain Tortoise-beetles (*Cassida*), some of which feed on the Morning Glory and the Sweet Potato vines, adopt the same practice, but in their case there is a forked process at the tail which curves over their backs and receives the requisite supply of excrement. The difference between the two modes adopted by these two groups of larvæ may be compared to the difference between two savages, one of whom struts about with an armful of manure on the top of his head, while the other one, having become more delicate and refined in his notions, holds up a forkful of manure, by way of parasol, over his head, as he displays his charms to the admiring world.

Many authors have supposed that the object of the larva, in all these cases, is to protect its soft and tender body from the heat of the sun. This can scarcely be the correct explanation, because then they would throw away their parasols in cold cloudy weather, which they do not do. In all probability, the real aim of Nature, in the case of all these larvæ, is to defend them from the attacks of birds and of cannibal and parasitic insects.

There are two broods of this species every year. The first brood of larvæ may be found on the potato vine towards the latter end of June, and the second in August. The first brood stays underground about a fortnight before it emerges in the perfect Beetle state; and the second brood stays there all winter, and only emerges at the beginning of the following June. The perfect

[Fig. 17.]



Colors—Pale yellow and black.

Beetle (Fig. 17.) is of a pale yellow color, with three black stripes on its back, and bears a general resemblance to the common Cucumber-bug (*Diabrotica vittata*, Fabr., Fig. 18.)

[Fig. 18.]



Colors—Yellow and black.

From this last species,

however, it may be readily distinguished by the remarkable pinching in of the sides of its thorax, so as to make quite a lady-like waist there, or what naturalists call a "constriction." It is also on the average a somewhat larger insect, and differs in other less obvious respects. As in the case of the Colorado Potato-bug, the female, after coupling in the usual manner, lays her yellow eggs (Fig. 16 *d*) on the under surface of the leaves of the Potato plant. The larvæ hatching from these require about the same time to develop, and when full grown descend in the same manner into the ground, where they transform to pupæ (Fig. 16 *c*) within a small oval chamber, from which in time the perfect beetle comes forth.

The Three-lined Leaf-beetle in certain seasons is a great pest in the Eastern States; but, so far as we are aware, it has never yet occurred in the Valley of the Mississippi in such numbers as to be materially injurious.

THE CUCUMBER FLEA-BEETLE (*Haltica cucumeris*,* Harris).—This minute Beetle (Fig. 19) belongs to the Flea-beetles (*Haltica* family), the same sub-group of the Leaf-beetles (*Phytophaga*) to which also appertains the notorious Steel-blue Flea-beetle (*Haltica chalybea*, Illiger), that is such a pest to the vineyardist. Like all the rest of the Flea-beetles, it has its hind thighs greatly enlarged, which enables it to jump with much agility. It is not peculiar to the Potato, but infests a great variety of plants, including the Cucumber, from which it derives its name. It operates by eating minute round holes into the substance of the leaf which it attacks, but often not so as to penetrate entirely through it. In 1868 the Potato leaves at Mr. Kinney's nursery, near Rock Island, Ills., were almost all of them badly attacked in this manner; but it did not appear to injure the vines so materially as might have been expected. In South Illinois whole fields of Potatoes may often be observed looking scared and yellow, and with their leaves riddled with the round holes made by this insect. The larva feeds internally upon the substance of the leaf, like that of the closely-allied European Flea-beetle of the Turnip (*Haltica nemorum*, Linn.); and, from its near relationship to that insect, we may infer that it goes underground to assume the pupa state, that it passes through

* Erroneously considered by some authors as identical with the *Haltica pubescens* of Illiger. In this last species, as we have been informed by Dr. J. L. LeConte, the thorax, instead of being shining, as in our insect, is opaque, with large dense punctures; and, if we have ourselves correctly identified it, the elytra are covered with a much longer and denser pubescence than is found in Harris's species.

all its stages in about a month, and that there are two or three broods of them in the course of the same season.

(TO BE CONCLUDED IN OUR NEXT.)

*** "GRASSHOPPERS."

Their Devastations in Western Iowa and the Good that has resulted from them.

Editors American Entomologist.

DEAR SIRS: I had the pleasure of meeting with the first number of your paper. For the general information of these into whose hands it may chance to fall, I will communicate the result of the visitation by the flying grasshoppers that infested our country last and this season. They first made their appearance about the last of August or first of September, 1867, but too late to do much damage, though they laid their eggs in the western tier of counties along the Missouri river, and extending into Nebraska. This spring they made their appearance in millions, destroying in many localities the entire wheat crop and the late planted corn. They commenced flying about the 12th of June, and traveled North. Many ploughed up their wheat and planted corn or sowed buckwheat. About the 1st of August they made their appearance again, and in two or three days destroyed whole fields of buckwheat of twenty or twenty-five acres, and seriously threatened the entire destruction of our corn crop; but after remaining for ten days or two weeks began moving South, and from present appearances we are relieved from them for this season. The whole of Western Iowa has suffered very seriously from their destructive ravages. But in return for damages done they have left behind them a grass hitherto unknown among us, a sample of which I send you. It is said, by those acquainted with the buffalo grass growing in the mountains, or contiguous to the Rocky Mountains, to be of that variety. The whole surface of the country as far South as the southern line of this State, and as far North as I have traveled, is thickly seeded with this valuable grass, more highly prized by stock than any of our native varieties. It is of quick growth, growing in little tufts or bunches, stooling thickly, and is heavily seeded. It promises to be a very great acquisition to our country, as our native grasses are fast giving way by close and continuous feeding. It has taken possession of all barren spots, and in many localities already covers the ground quite thickly. Let us give the hoppers credit for a new variety of grass that is destined to be worth millions of dollars to this section of country. Although I am among the heaviest losers in our section of country by this visitation, yet when I became acquainted with these facts by actual observation of this new grass, and of its extension to the southern boundary of our State, my heart was filled with gratitude to the all-wise disposer of our blessings for this great event.

With best wishes for the success of your valuable paper.

M. C. NICKERSON,

Little Sioux, Harrison Co., Iowa.

[We are well acquainted with the buffalo grass, having seen it growing on our western plains, and find that the specimen accompanying this communication is of a different species.

Having submitted it to Dr. T. C. Hilgard, of St. Louis, who has made the study of our grasses a specialty, he determined it to be the *Vilfa vaginiflora* (Torrey), a species which delights in barren and sandy fields, and is quite common westward and southward. "Grasshoppers" are voracious creatures, and pass their food very rapidly, and from the construction of their mandibles, would not be likely to masticate a minute hard seed such as this produces. It is therefore not impossible that the seed was brought by them from the barren plains west of the Missouri river, and passed with their excreta, which, covering the land, would form a rich manure, and give the grass a vigorous start.—Eds.]

AN APPLE GROWING ON A GRAPE VINE.

A VEGETABLE PHENOMENON.—In the garden of Capt. David E. Moore, Lexington, Va., there is growing on a grape vine a fully developed apple. On one side of the apple is an appearance of what might have been a grape bloom. This interesting *busus natura* is, as far as we know, without precedent, and of course has attracted marked attention and caused no little speculation in the circle learned in such matters about Lexington. The prevailing opinion, we learn, is that an apple bloom falling accidentally upon a grape bloom became incorporated with it and produced the result; but, if so, is it not singular that such an accident had never occurred before? And, if so, again, does it not teach that the grape and apple may be grafted on each other? We hope the pomologists of Lexington will note very carefully all the phenomena of this freak of nature, and that they will have the apple photographed, with a portion of the vine, before its removal, for engraving and publication in Horticultural journals.—*Richmond Whig*.

The above is finding its way into many of our agricultural papers, and various are the editorial surmises and explanations. We think that a little knowledge of Entomology will alone solve the mystery, and incline to believe that the so-called apple is simply a gall, caused by a little two-winged gnat belonging to the same family as the wheat midge; or what we technically call a cecidomyidous gall. We are well acquainted with several large galls of this character, which occur on the grape-vine, one of which bears a close resemblance to an apple, and we shall soon take occasion to figure and describe them. This is our explanation, without having seen the curiosity. Meanwhile, we await developments.

TICKS AND TEXAS FEVER.

There is a prevailing opinion amongst certain classes, that the ticks which are found on the cattle which die of Texas fever are actually the cause of the disease. In view of this fact, specimens of these ticks have been sent us for examination, from different localities in Illinois, and

they are identical with those we have ourselves examined upon diseased cattle in St. Louis, and are but the common cattle tick. It is exceedingly improbable that they have anything to do with the disease, although it is barely possible that they may communicate the infection from the Texas cattle to our native herds.

SCIENTIFIC SYMBOLS.

The sign ♂ is used in natural history as an abbreviation for the word male, the sign ♀ for female, and the sign ♀ for neuter. Since in insects the sexes of the same species are often quite dissimilar, we shall frequently use these signs with our illustrations, as an index to the sex of the insect figured. In astronomy the first sign denotes the planet Mars, and the second the planet Venus. The sign ♀ has been known for centuries by the name of "crux ansata," or the cross with the handle to it, and occurs profusely on old Egyptian monuments.

A SWARM OF BUTTERFLIES.

About the 1st of September we received from Mr. W. B. Davis, editor of the *Wisconsin Farmer*, two specimens of the butterfly, herewith illustrated. Accompanying the specimens was a description of their sudden appearance in vast swarms, in different parts of the city of Madison, Wisconsin. We subsequently received other specimens of the same species from Mr. Milo Barnard, of Manteno, Illinois, with similar accounts of its appearance in great multitudes.

[Fig. 20.]



Colors—Black, white and yellow.

[Fig. 21.]



Colors—Green, gold and black.

The butterfly is the *Danaus archippus* of Fabricius, and though one of our most common, is yet one of our most beautiful species. The caterpillar (Fig. 20) feeds upon the different kinds of milkweed (*Asclepias*), and attains its full growth about the end of August, when, after suspending itself by the hind legs to the under side of a leaf, it soon transforms to a

beautiful green chrysalis, ornamented with black and gold spots (Fig. 21.) Two weeks afterwards the butterfly (Fig. 22) emerges, leaving the transparent silvery chrysalis skin still attached to the leaf.

Vast flights of butterflies have often been noticed passing over the country in different parts of Europe, and as the following will show such flocks seem to appear almost every year in some part or other of the United States:

A flock of butterflies four miles long, recently passed over one of the inland towns of California, for the North.—*N. Y. Semi-weekly Tribune*, July 25, 1865.

A friend informed us that when traveling through a portion of the county of York last summer, he met with immense swarms of these butterflies, all proceeding westward, and forming a column of three or four miles in length. He estimated their number at some millions.—*Canada Farmer*, March 1st, 1866, speaking of *Cynthia cardui*, a species whose larva feeds on the common thistle.

On the 19th of September, 1868, P. B. Sibley, of St. Joseph, Mo., sent us a specimen of *Danaïd archippus*, with a statement that he saw millions of them filling the air to the height of

[Fig. 22.]



Colors—Orange, red and black.

three or four hundred feet, for several hours, flying from North to South, and quite as numerous as the locusts (grasshoppers) had been the year before.

The cause of their thus congregating in such numbers has hitherto remained, and probably ever will remain a mystery. Insects, otherwise solitary in their habits, sometimes congregate thus, for the purpose of emigration; but in the present instance, their being seen in such numbers may be accounted for by the weather of July and August being favorable to the well-being of the caterpillar.

No alarm need be felt at these hosts of butterflies, for they themselves are incapable of doing any injury, while their caterpillars cannot be considered injurious, feeding as they do on a useless weed. We found them plentiful last month on plants of the *Asclepias curassavica* that were being cultivated in a flower garden, but they were easily picked off.

THE BUGHUNTER IN EGYPT.

A JOURNAL OF AN ENTOMOLOGICAL TOUR INTO SOUTH ILLINOIS BY THE SENIOR EDITOR.

(CONCLUDED FROM NO. 1, PAGE 14.)

Ten Acres of Vineyard—Native Wines—More Vineyards and More Wines—The Bogus May-bug.

JUNE 20TH.

On the preceding evening, after missing our road through a perfect wilderness of heavy timber, we had at length reached the hospitable home of Mr. Jas. E. Starr, at Elsay, in Jersey county, and taken up our quarters there for the night. Early this morning we sally forth to see ten acres of the most splendid vineyard that I ever came across; and what is stranger still, this vineyard of Mr. Starr's is located upon old upland ground, which has been in cultivation for forty years, without a single forkful of manure ever having been put upon it. According to the proprietor, who has almost all the leading varieties of grape on trial here, Norton's Virginia is infested by the Leaf-hopper, or so-called "Thrip," worse than any other variety; and this insect does the most damage in those portions of the vineyard which adjoin the timber.

As to the other insects found here, and they were not many, they will be noticed hereafter.

This is certainly the land of the grape-vine. Mr. Starr has a large underground cellar, piled up with cask upon cask of the choicest vintages—Norton's Virginia, Delaware, Catawba, &c.—and every sample which the Committee on Wines tastes seems superior to that which preceded it. Finally the Committee, having taken leave of its kind host, mounts into its buggy, chairman Hull taking the reins; and, from some unaccountable cause, we lose our way once more in making for the residence of Messrs. A. and F. Starr, some five or six miles from Alton, where we propose to take dinner. Here we have to inspect more vineyards, and the Committee on Wines is again called into active service. We have now tasted in all some fifteen or sixteen different varieties of wine, including a sample of Dr. Hull's brewing before we left home; and, as junior member of the Committee, I can honestly say that there is but one out of the whole lot, that would not be pronounced a good light, dry wine by the best judges in Europe.

And now, after partaking of an impromptu dinner, kindly prepared for us at a few minutes' notice, we steer for home and the luxury of a clean shirt, after fifteen miles of dusty roads and other fifteen miles of primitive wilderness that never knew what dust was. In the evening we drive over to Alton to see Mr. Wm. E. Smith, one of the millionaires of Alton, and an enthusiastic horticulturist. His grounds are kept in the most beautiful order; and in passing through his vineyard with us he picked up and handed to me a species of Chafer (*Endrosa quercus*, Knoch), which is often mistaken for the common May-bug (*Lachnosterna quercina*, Knoch). This species I have never myself captured anywhere else in Illinois, though I had previously received two specimens from Mr. Wier, of Lacon, on the Illinois river.

Slandering the Locusts—Midge Work Mistaken for Locust Work—Jumping to Conclusions.

JUNE 22ND.

On Monday morning I find myself on the road to Alton, side by side with Dr. Hull, in his buggy. We call in to see a farmer, who has complained that the Locusts have been injuring his wheat. Upon inspecting specimens, I find that a portion of the kernels in many of the ears of wheat are blasted, and have shrunk up to nothing. The farmer says that the Locusts were upon his wheat in great numbers; hence he deduces the conclusion that it was these insects that did the mischief. There is no insect now to be found in the ears on the most careful inspection, and the mere fact of the Locusts having lit upon the wheat certainly does not prove anything against them; for, as the wheat field adjoined the timber, they would naturally do this in any case. Subsequently, in Macoupin county, I found just such ears in a field of wheat, growing upon natural prairie-land, distant at least two miles from the nearest timber, and where, consequently, no Locusts could have been present. Upon closer examination, I came to the conclusion that the damage in both these cases must have been done by the common Wheat-midge (*Cecidomyia tritici*, Kirby), otherwise known in the West as the "Weevil," or the "Red Weevil." In the latter case, indeed, I observed many ears where the blasted portion of the ear was roughed up in the very peculiar style, that is characteristic of the work of the Yellow-bird upon wheat infested by the Wheat-midge. Hence the Locusts would clearly be justified in suing the Alton farmer for defamation of character. This is a fair specimen of the

way in which persons, who are not conversant with insects, often jump to conclusions respecting their depredations. "Because the Locusts had been on the wheat in great numbers, therefore they must have caused the blasting of certain ears." "Because the cat was in the barn where the cow died, therefore the cat must have killed the cow."

Calling at the office, in Alton, of W. C. Flagg, Esq., the popular Secretary of the State Horticultural Society, I have a long and interesting conversation with him on sundry Entomological matters. In the afternoon he drives me over to his splendid and extensive property at Moro, some ten miles east of Alton, where I pass a most agreeable evening.

Mocking-birds at Moro—Drive to Jonathan Huggins's—Some of his Apple-trees dying from unknown causes—"None of my funeral"—A Bug-forsaken country—The Robin.

JUNE 23RD.

On awaking early in the morning, my ears are saluted from the surrounding shrubbery by the weird notes of the mocking-bird, imitating with the most perfect exactness the cry of the whip-poor-will, and then suddenly breaking away into its natural melody. After breakfast, Mr. Flagg drives me over to the residence of Mr. Jonathan Huggins, at Woodburn in Macoupin Co., a distance of some fifteen miles. Here we all adjourn to the orchards, to inspect certain apple-trees that have been dying in the most exasperating manner from certain unknown causes. It is not the work of borers; for there are no signs of borers anywhere in these trees. Neither is it the common fire-blight; for we are all of us familiar with the very remarkable diagnostics of that scourge of the Pear-growers. And yet the trees are certainly dying, first the topmost boughs, then the centre of the head of the tree, then the upper part of the trunk, then the lower part of the trunk along with the sprouts growing out of it. Can it be the work of the Apple-root Plant-louse? Certainly the trees near Cobden, killed by the Root-louse, that I had myself seen, presented a very different appearance: they had evidently died all at once, and not piecemeal and by degrees like these trees. Still it is possible that the same insect may work differently in different latitudes. So I determine to solve the problem by ocular demonstration, and request friend Huggins to lend me a sharp spade. It is the middle of the afternoon and a broiling hot day—the thermometer in the region of three figures—but I pull

off my coat and set to work with a will. After digging among the roots of some eight or ten trees, dead, dying, and about to die, I finally come to the conclusion, that there is absolutely no Root-lice work there at all—that is, no clubbed and knotted roots such as we always see where these Root-lice have been operating—neither is there the least sign of the very peculiar mouldy-looking flossiness emitted from the bodies of these subterranean little foes of the fruit-growers. What, then, can have caused the death of all these trees? That is a nut for the Botanists and the Vegetable Physiologists to crack among themselves. It may be a simple disease of the tree; or it may be a disease of the tree caused by some parasitic fungus; or it may be caused by the climate, or by the soil, or by electricity. In any event, the death of these unfortunate trees is most certainly not the work of my little friends the Bugs; and therefore “it is none of my funeral.”

After roaming over friend Huggins's place for several hours with my fly-net, and capturing absolutely nothing at all that was worth a red cent, I finally come to the conclusion that this is the most bug-forsaken country I was ever in. So I adjourn to the house, to examine mine host's collection of insects, where, amongst other rarities, I find a specimen of the bogus Colorado Potato-bug (*Doryphora juncta*, Germar), which so strikingly resembles the true Colorado Potato-bug (*Doryphora 10-lineata*, Say), that even Dr. Fitch, the State Entomologist of New York, confounded the two species together. Mr. Huggins is quite sure that he captured it in this vicinity, but upon what plant it was found, he has no recollection.

In justice to a bird, whose character for honesty I fear that I have been somewhat instrumental in injuring, I ought to add here, that Mr. Huggins declares that, during the height of the locust season, when these insects were swarming everywhere in his orchard, he once saw a robin catch a single locust!

The Rascal Leaf-crumpler—In the South half of Illinois the Oyster-shell Bark-lice dies out when imported.

JUNE 24TH.

I find that the Rascal Leaf-crumpler (*Phycita nebulo*, Walsh), which certainly does not exist in the neighborhood of Cobden, in South Illinois, occurs here in small numbers upon Mr. Huggins's apple-trees. I had previously noticed it near Alton; and subsequently I met with a few near Champaign. Hence we may set it

down as found in Northern and Central Illinois, but not in South Illinois. In the Eastern States, so far as is known, this insect does not occur at all.

After breakfast, Mr. Huggins drives me over to Shipman, a distance of some six miles, to inspect two apple-trees, imported eight years ago from the State of New York, which had become almost entirely covered by the scales of the common Oyster-shell Bark-lice (*Aspidiotus conchiformis*, Gmelin). He had several months before sent me specimens of Bark-lice taken from these trees. These I had carefully examined and found to be very extensively depredated on by the microscopic cannibal Mite, which I have shown to prey upon this insect more or less extensively throughout the Northern States. On our arrival at the orchard where the infested trees had grown, we ascertained from the owner that he had some little time before followed Mr. Huggins's advice, and cut them down and burnt them. The practical question to be now ascertained was: “Had the Bark-lice spread from the two trees imported from New York on to the adjoining trees, and if so, was it still alive and likely to spread still further?” To solve this problem satisfactorily, would evidently require very careful search and examination. Mr. Huggins and myself, therefore, spent two or three hours in inspecting with the most minute diligence all the trees surrounding the two infested trees, which had formerly stood wide apart from each other on the two opposite sides of the orchard. The result was, that we found some few Bark-lice scales, but only on a single apple-tree—a dwarf—and only on three boughs of that tree. The question now occurred: “Are these scales all of them old, dead and dry scales, two or three years old, or are they, some or all of them, last year's scales, from which young Bark-lice hatched out this very spring, so that the breed is likely to be propagated by them?” In the former contingency, there would evidently be no young larval Bark-lice on the infested boughs; in the latter contingency, there would be sure to be plenty of them. For every one that is familiar with this insect knows, that where the egg-bearing scales are not very abundant, the young larvæ that hatch out from them do not stray far before they establish a permanent lodgment on the bark. Having brought a good lens with me for the express purpose of solving such questions as these, I now examine the three boughs that we had ascertained to have a few scales upon them. I turn them in all directions, and scrutinize under the lens every speck

that has the least appearance of being a larval Bark-louse. Positively there is no such thing to be found on them; and I am perfectly satisfied, so far as any one can be satisfied of a negative fact, that in this entire orchard there does not exist a single living Oyster-shell Bark-louse.

Subsequently, at Mr. Menzo Dunlap's, near Champaign, I carefully examined four apple-trees, which had been received eleven years ago from a nursery in Cook Co., North Illinois, and three of which were pretty thickly covered with the scales of the Oyster-shell Bark-louse, the other one not so thickly. After an hour's search, I failed to find a single larval Bark-louse upon any of these four trees. On some of the adjoining trees there were a few scales to be found, but no larvæ. Mr. Dunlap told me that all these four trees looked quite yellow in 1867, while this year their foliage was of a healthy, dark-green color. It was quite evident, too, upon inspection, that the growth made in 1868 was already twice as long as that made in 1867. Hence I conclude that this whole generation of Bark-lice imported from the North had, in this Southern region, died out and wasted away to nothing. I have elsewhere shown that, upon the authority of the Cobden fruit-growers, this Bark-louse can not live in South Illinois when introduced there from more northerly regions. Hence we may lay it down as a general law, that IN THE SOUTHERN HALF OF ILLINOIS THE OYSTER-SHELL BARK-LOUSE CAN NOT PERMANENTLY EXIST. The practical importance of this law to the fruit-growers of Illinois can scarcely be over-estimated.

Cobden alias South Pass—The "Masonic Bug"—
Freaks of the Curculio—A Defect in its Instinct
—The Melancholy Chafer attacks Pears—Fruit
spoiled by Honey Bees.

JUNE 25TH.

I reach Cobden alias South Pass (the first is the railroad name for this headquarters of the fruit growers, the second is the Post-office name) in the small hours of the morning, but in time to get a good night's rest at the hotel. In the course of the forenoon my headquarters are agreeably established at the hospitable mansion of Parker Earle, the President of the South Illinois Fruit Growers' Association. On going out with my net collecting, I capture sundry rarities in the insect line, and especially six specimens of a beautiful little Chafer (*Trichius delta*, Forster), with a distinct white triangle on its thorax, which, so far as I am aware, has never hitherto been met with further north than Louisiana. In allusion to the triangle on its thorax, I have

christened it "The Masonic Bug." It occurred on the flowers of the New Jersey Tea-plant or Red-root (*Ceanothus Americanus*). Certainly this region of country is the Bug-hunters' paradise, as Macoupin county is the Bug-hunters' pandemonium.

Mr. Earle informs me that in 1868 he had pears and peaches growing side by side, and that the pears were stung by the curculio as badly as the peaches. Now, Dr. Hull of Alton has found that, by intermixing plums and peaches in alternate rows, the peaches are thereby protected from the attacks of the curculio. Hence it would seem to follow that, although the curculio prefers the plum to the peach, yet it does not prefer the peach to the pear. This, if correct, is a clear case of defective instinct in the little world of bugs, showing that the mother curculio can not tell the difference between one fruit—the peach—in which her future larva will thrive, and another fruit—the pear—in which her future larva is almost certain to die in infancy. For, although the curculio larva thrives about as well in early peaches as in plums, yet it has never yet been proved to reach maturity in the pear; eggs deposited in that fruit either failing to hatch out, or the larva that hatches out from them perishing prematurely. All the pear growers, however, tell me that the spot in the pear where the curculio has deposited its eggs, even when the egg does not hatch out at all, forms a hard woody depression in the fruit, in which all further vegetable growth ceases. Consequently, although the stung pear does not fall from the tree, it becomes gnarled, deformed, and unsaleable.

Mr. Earle has detected the Melancholy Chafer (Fig. 23.) (*Euryomia melancholica*, G. and P., Fig. 23)—a rather rare beetle, which however occurs both in North and South Illinois—eating into the blossom end of his pears, and causing a clammy exudation therefrom.

We find quite a number of pears upon his trees, that have been operated upon in this manner; and as he has deposited a specimen caught in the very act in friend Holcomb's collection, the species can be identified with certainty. If all farmers, gardeners, and fruit growers would adopt the same wise plan—i. e., preserve and label insects whose habits they have personally observed—what a valuable mass of materials for delineating the history and habits of our noxious insects might soon be gathered together! This Chafer, however, so far as can be seen at present, does not



Colors—Black-brown and whitish.

appear to injure the fruit very materially; but at some future day, it may perhaps swarm in such numbers as to become a great pest.

Mrs. Earle, whom I find to be a very good entomological observer, and who has also paid considerable attention to Botany, informs me that honey-bees often gnaw holes, the size of half a pea, into peaches and quinces; and that she has seen them actually commence the holes. The honey-bee, therefore, can not defend itself before a jury of fruit growers, on the plea that it only works upon fruit already spoilt by other insects, and that "a slice off a cut loaf is never missed."

Fencing out the Curculio—Meeting of the Southern Fruit-Growers' Association—Hot Water vs. The Apple-tree Root-louse.

JUNE 26TH.

A joyous company of us, including some of the Cobden ladies, drive over in friend Holcomb's treble-seated carriage, which like an omnibus can carry any assignable number of persons, from six up to twenty, to the fruit farm of H. C. Freeman, four miles west of Cobden. On the road we pass a large peach orchard, and I notice that every peach tree there has got a band of wool carefully wrapped round the trunk. "What on earth are these bands of wool for?" "Well, the owner of this orchard has got a notion into his head that curculios can not fly; and so he proposes to fence them out from his peaches by means of the wool-bands. He claims that, in consequence of this contrivance, his peaches are less infested by curculios than those of his neighbors, but his neighbors are entirely of a different opinion." "I wonder that he does not build a tight board-fence round his corn-field, to fence out the crows and the blackbirds; or wrap a band of cotton wool round his stove pipe to keep the flies out of his house."

On reaching Mr. H. C. Freeman's, we sally forth among his fruit trees, where I should like to wander all day; but we are soon summoned to dinner, and after dinner we have to drive back almost immediately to Cobden, to attend a meeting of the Fruit Growers' Association.

At the meeting Mr. C. T. Farrell informs me, that he has tried pouring hot water round the roots of apple trees infested by the Root plant-louse, but the plan is a failure, as it only answers for a short time. Upon further inquiry, however, I ascertain that he merely used a single teakettleful of hot water to a particular tree, the butt of which was about one inch in diameter. As the roots of such a tree probably

extend four feet in every direction from the butt, it must be manifest that, to destroy all the rootlice upon the roots, a sufficient quantity of hot water should be applied to scald all the roots for a circle eight feet in diameter. To effect this, would probably require a whole barrelful of hot water. Consequently, the experiment has not been tried by Mr. Farrell upon a sufficiently large scale.

E. Leming's splendid Peach Crop—Seven different Cannibal Bugs preying upon the Grub of the Curculio—Figures and Descriptions of them—"Pitch into your Foes, but spare your Friends"—Conclusion.

JUNE 27TH.

We have another pleasant drive in friend Holcomb's carry-all carriage to the splendid fruit farm of E. Leming, a few miles west of Cobden. Here we find the only full crop of peaches that has been raised this year anywhere in the neighborhood, and some of the earliest varieties are already going to market. Mr. Leming is an accurate observer of the habits of insects, and he shows me the larva of a Lacewing fly (*Chrysopa*), inside a peach which has been badly bored up by the Curculio, actually preying upon a Curculio larva, one half of which it has already sucked dry. He has since, as he writes me word, found over a hundred of these Lacewing larvæ occupied in the same good work. This is entirely a new fact; and that our readers may recognize their benefactor when they see him, and cherish him as the very apple of their eye, we give herewith figures, first of

(Fig. 24.)



a Lacewing larva (Fig. 24 b), and second of the Lacewing fly itself, with its left wings omitted to save space (Fig. 24 d). Figure 24 c shows the singularly small cocoon which is spun by the larva wherein to pass into the pupa state, and also the empty cocoon, with the smoothly cut lid, and the hole out of which this large fly comes; although, to use Dr. Fitch's graphic illustration, this is just as if a full-sized hen were to hatch out of a common-sized hen's egg. In Figure 24 a may be seen the curious eggs, mounted upon long, slender, thread-like stems, which are laid by the

female fly. The particular species of Lacewing fly that preys in this savage manner upon the Curculio larva I was not able to ascertain, as I failed to breed the larva to maturity. But there is such a strong general resemblance between all the different species of this genus, both in the larva and in the perfect state, that scarcely any one but a professional entomologist could distinguish one from another when placed side by side. All the Lacewing flies, it may be remarked here, are cannibals, and they prey upon a great variety of noxious insects, including both Plant-lice and Bark-lice.

But wonders will never cease. It has hitherto been currently supposed that no insect, whether cannibal or parasite, preys upon the Curculio; and, so far as regards the parasites, I believe that this theory is correct. But now I discover a second species, and this time not a Neuropterous insect like the Lacewing fly, but a true Beetle (order of *Coleoptera*), which has apparently been engaged in the same good work as his remotely-allied cousin. Inside a peach, which has been completely excavated by Curculio larvæ, friend Holcomb shows me the rare little Ground-beetle (*Carabus* family) figured in the

[Fig. 26.]



Color—Shiny black.

margin (*Aspidoglossa subangulata*, Chaud., Fig. 25). What is he doing there? Clearly he has no taste for vegetable food, for all the North American species of the very extensive family to which he belongs are, so far as is known, cannibals. In all probability he has been eating up the mischievous grubs that had honeycombed this peach! At all events, he is to be strongly suspected of so doing. To adopt Shakspeare's mode of reasoning:

"Who finds the heifer dead, and bleeding fresh,
And sees fast by a butcher with an axe,
But will suspect 'twas he that made the slaughter?"

So far we have discovered two distinct insects depredating upon the Curculio larvæ above ground, and while it is still inside the fruit which it attacks. Perhaps, when it has left the fruit and gone underground, it is safe from its cannibal foes. No such thing! Friend Leming, after digging with a hoe for some time among the loose earth under a peach tree, finds at length for me a certain larva, which he has long observed to prey upon the Curculio larvæ underground. It is now comparatively rare, as he informs me, but in the spring he had found thousands of them in the earth under his peach trees, and had tried in vain to breed them to the

perfect state. For, although they seemed to relish Curculio larvæ that he had dug up underground, yet he could not, he says, get them to feed freely upon such as he took out of the fruit. Annexed will be found a correct sketch of this

[Fig. 26.]



Colors—Brown and whitish.

insect (Fig. 26 A). B represents the under side of the head, showing at c the upper jaw (*mandible*), at g the lower jaw (*maxill*), with its four-jointed feelers (*palpi*), at f the lower lip (*labium*), with its two-jointed feelers (*palpi*), and at e the *antenna*.*

Clearly this is the larva of some Ground-beetle. But of what particular species? That can only be satisfactorily proved by breeding the larva to the perfect beetle state, which I hope to do, although all these cannibal larvæ are more or less hard to breed. In the meantime, while Mr. Leming has been digging under his peach trees, I have discovered among the loose earth four different kinds of Ground-beetles, two of which are

[Fig. 27.]



Colors—Dull black and brown.

[Fig. 28.]



Color—Shiny black.

represented in Figures 27 and 28, and to any one of which four my larva may possibly belong.

* Here follows the technical description of this larva, taken from the living insect: Shining brown-black and horny above; thorax immaculate above; sutures and sides of the abdominal dorsum, and all beneath, except the head, pale dull greenish white; a narrow, horny, elongate, abbreviated lateral dark stripe on the dorsum of each of the abdominal joints (4-12); joints 4-10 beneath, each with seven pale-brown horny spots, namely a large subquadrate spot followed by two small dots in the middle, an elongate spot on each side, and between that and the two medial small dots a second elongate spot, only half the length and breadth of the lateral one (Fig. 26, j); joint 11 beneath has only the medial subquadrate spot and the lateral elongate one (Fig. 26, i); and joint 12 beneath has nothing but the subquadrate spot (Fig. 26, h); legs six, of a pale rufous color; the usual elongate carabidous proleg on joint 12, and on each side of its tip an elongate exarticulate cercus, garnished with a few hairs; antennæ four-jointed; labial palpi two-jointed; maxillary palpi four-jointed. Length 1.25 inch.

But as the first one of the four (Fig. 27) is by far the most numerous, absolutely swarming in all directions under ground, and as I met with this species in the perfect beetle state among the roots of peach trees seven years ago in South Illinois, I rather guess it to be the one that appertains to my larva. There can be but little doubt, however, that any one of the four,* whether in the larva or beetle state, would have greedily devoured any curculio grubs that they came across in the course of their travels under ground. For most of these Ground-beetles are pretty general feeders; and when I got my larva home, I discovered that he would feed upon grasshoppers just as readily as upon curculio-larvæ, though he was so dainty that he would not touch either house-flies or apple-worms. It may be as well to add, that the species shown in Fig. 27 swarms everywhere in the Northern States, and that it very frequently, as well as many other Ground-beetles, flies into houses by night, attracted by the lights. Spare their lives, ye ruthless haters of everything that you lump together under the general term of "Bugs;" for they are your best friends, and even the old heathen philosophers, though they upheld the practice of doing as much harm as possible to one's foes, pronounced it to be a base and mean thing to injure one's own friends.

Here, then, we have no less than six different species of insects, two of which demonstrably feed upon Curculio larvæ, while the remaining four may be strongly suspected of so doing. After I had got home, Mr. Leming was kind enough to send me six specimens of the larva of another, and a very distinct Beetle, all six of them taken on the ground under one and the same peach tree. "Four of them," he wrote to me, "were taken out of peaches that had contained the larva of the Curculio, the other two were lurking under a peach. They take the grub, I think, before it enters the earth. I had the satisfaction of seeing one of them fasten his jaws upon the larva of the Little Turk. The larva squirmed dreadfully, but in vain, for his remorseless foe held him tight, and he soon gave up the ghost. My acquaintance with this cannibal is but very slight, as it is only two or three days since I first discovered him." I may add here that I saw with my own eyes one of these same larvæ, that Mr. Leming had sent me, fasten upon a small Curculio grub, with which I had sup-

* These four beetles are *Harpalus pennsylvanicus*, DeGeer (Fig. 27), *Harpalus faunus*, Say, very closely allied to the preceding; *Evarthrus orbatus*, Newman (Fig. 28), and a small species of *Evarthrus* that I had never hitherto met with, the *obsoletus* of LeConte.

plied him, and kill it in a very short time. Apple worms and a variety of other insects, with which I tried to tempt him, he would not touch.

[Fig. 29.]



Color—Rich reddish brown.

Figure 29 *a* gives a view of this seventh benefactor of the peach-grower drawn from the living insect; *b* showing a magnified figure of the head and its members, *h* the left upper jaw (*mandible*), *f* the left lower jaw (*maxil*), *c* the under lip (*labium*), *d* the upper lip (*labrum*), *g* the antenna, and *e* one of the legs.* Adding this species to the six referred to above, we get no less than three cannibal larvæ that are actually known to devour Curculio grubs, and four other species that we may reasonably believe to do so. But for the beneficent operations of these little insignificant creatures, which most people, whenever they got a chance, would pitilessly crush under their feet, there can be but little doubt that not a single bushel of peaches would have been grown in Egypt for the last five years.

We may be quite sure, from its structural peculiarities, that the first larva figured above (Fig. 26) is that of some ground-beetle or other. But to what group of Beetles does this second larva belong? That is a far more difficult question to answer. The study of the larvæ of almost all insects, except Moths and Butterflies, has been so very generally neglected by the entomologists of the United States, that we know comparatively but little about them. I think, however, from the close analogy which this larva bears to certain European ones, that it will prove to be that of some species or other of a group of soft-shelled beetles (*Telephorus* family), which is common everywhere in the Northern States. But this point can only be clearly proved by breeding the larva itself to maturity.

* I subjoin the technical description of this larva, drawn up from the living specimen: Head shining rufous, with two black patches behind, transversely arranged; labrum retractile, dark colored, horny and deeply emarginate with a central tooth; maxillary palpi 4-jointed; labial palpi 2-jointed; antenna 3-jointed, the last joint very small; body rather flattened, of an opaque velvety-brown color above, with a somewhat darker subdorsal line, which is widened on the three thoracic segments; a very distinct lateral spiracle to every segment of the body except the anal one, making altogether eleven pairs of spiracles, all of them exactly alike, and in range with each other. [See on this mooted point my paper in Proc. Ent. Soc. Phil. iii., pp. 558-9.] Body beneath suddenly very pale brown, the dividing line between the darker and the paler shades of brown upon each segment being a semicircular curve, with its concavity upwards; legs six; a moderate anal proleg; length 0.65 inch.

Unfortunately, out of the six larvæ captured by friend Leming, only two reached me alive, he having packed three together in one box, and three in another. The consequence was that, when they reached me, there was but a single one remaining in each box, the survivor in either case having devoured his unfortunate comrades. The old poets tell us, that lion will not prey upon lion, nor tiger upon tiger; but, for the credit of the Bugs, I am sorry to be obliged to confess, that almost all the cannibal species will, whenever they get a chance, eat one another up alive. This, however, though certainly not a very amiable propensity of theirs, we must, I suppose, overlook and pardon, in consideration of the great practical benefits which they confer upon the human race, by keeping within some reasonable bounds the multitudinous tribes of plant-feeding insects.

This journal has already been extended to such an exorbitant length, that I will only say in conclusion that I left the pleasant regions of South Illinois on June 30th, and on July 2d met the *ad interim* Committee of the State Horticultural Society at the house of Mr. D. B. Wier at Lacon on the Illinois river. I subsequently passed some very agreeable days at Champaign with "Rural," and reached Rock Island July 11th, having been absent from home 25 days, and traveled altogether, by railroad and steamboat, about 1500 miles.

Nothing, in the course of this Southern tour, surprised me more, than the wholesale manner in which pip-fruit in the South is punctured and ruined by various kinds of snout-beetles. In the North it is quite unusual to see an apple bearing the well-known crescent-cut of the common Curculio; but in the South I estimated that, upon an average, every apple bore three such cuts; and Dr. Hull, whom I consulted on the subject, told me that he did not consider this by any means an extravagant estimate. When I got to Lacon, which lies but little to the south of Rock Island, the comparative immunity of the apple-crop from this grievous pest became apparent at once; but in Madison Co., in Jersey Co., in Macoupin Co., in Union Co., in Pulaski Co., and in Champaign Co., the apples seemed to be almost universally crumpled and gnarled by the punctures of fruit-borers. Nor must we lay all the damage by any means at the door of the Curculio; for, from about a quart of punctured apples gathered principally at Champaign, I have bred since I returned home, within the space of a month, no less than seven specimens of the four-humped curculio (*Anthonomus 4-gibbus*, Say), and only two specimens of the genuine Plum Curculio.

THE STING OF THE 17-YEAR CICADA. ✓

Our remarks on page 8 of No. 1, attributing the reputed stinging of the 17-year cicada (locust) to the Digger wasp, *Stizus grandis* of Say, have elicited communications from two of our correspondents. Mr. F. W. Collins, of Rochester, N. Y., has witnessed four periodical returns of the "locust," and on each occasion has heard of individuals (generally boys) being injured by them. After giving a description of the method of ovipositing he says:

In every case of locust stinging that has come to my knowledge it has been where they occupied the position long enough to drill a hole with their long ovipositor.

If the locust can drill a hole in the limb of an oak tree, it follows that if undisturbed, it might make a hole in a boy's scalp, or through the flesh of a man, or any other animal. Though this rarely occurs, it is not impossible, and I am led to believe it more probable than the hornet theory.

The second communication is from Richard Richardson, of 522 Arch street, Philadelphia. He says:

I have received the first number of the *American Entomologist*, and enclose one dollar, the subscription for one year. I am pleased that you have taken in hand the subject of entomology in a popular form, and hope you may succeed in the enterprise. I have been much interested in looking over "No. 1," and am much pleased with the contents in general, but wish to make the following criticism on the article entitled "The Bug Hunter in Egypt." It attributes the reported stinging of persons by the Cicada Septendecim of Lin., as being done by the *Stizus grandis*, or Digger wasp. But the Cicada Septendecim appears in its perfect state from the last of May to the beginning of July, and the *Stizus grandis* not until the beginning of August, consequently they are not contemporary insects. The locust used by the *Stizus grandis* is the common annual one, which is contemporary with the wasp.

I suspect the Cicada Septendecim may, under certain circumstances, inflict a wound with the ovipositor, as upon being confined in a boy's hat on his head, with the natural propensity strong to deposit the egg, and nothing offering but the boys scalp, for instance; or under other similar circumstances. Certainly an instrument that can penetrate hard wood, could easily puncture the flesh, if so disposed.

I have known persons to be stung by the wasp with no dangerous result, though more severe than from other stinging insects.

I have been acquainted with the Digger wasp (called here "ground hornet") since boyhood, and have frequently seen them dragging locusts into their holes in the ground.

The following extract from a letter received in 1867 from Mr. Benj. Borden, of Norristown, Montgomery county, Pa., also touches on this point. Though he has heard of severe suffering being produced by their sting, he has never been able to satisfactorily trace up a case:

In the summer of 1866 my attention was called to a colony of large wasps or hornets near this town. A company of us armed with pick and shovel paid them a visit. They were located on the side of a stone pile; they burrowed in towards the centre of the road. Hard ground appeared to be no obstacle; when they encountered a stone, they turned and went around it. The burrows were about three feet long, with two or three galleries about one foot long. Each gallery terminated in a chamber considerably enlarged. In each of these chambers, they appeared to have reared one young.

We found no larvæ but found several in the pupa state. Also in each chamber we found the remains of one of our common summer locusts (cicada). This locust is considerably larger than the 17-year species. The burrows were just large enough to admit it. One person witnessed the operation of taking in a locust. The wasp had it on the top of a fence; he flew off with it but came to the ground before reaching the burrow; then by means of a hook on each of his hind feet, he dragged it in on its back. We captured a few of the wasps. I endeavored to get its name. A friend furnished the following: Locust Stinger—*Stizus grandis*, of Say; communicated to Wm. J. Buck, March 5th, 1861, by Isaac Lea, President of the Academy of Natural Sciences, Philadelphia.

We reserve our own opinion till our next number, in which we contemplate publishing a thorough article on the 17-year cicada. If any of our readers in the different parts of the country have reliable dates of its appearance in their section, we shall be glad to receive them.

OUR CLUB RATES.

To all persons interesting themselves in the *American Entomologist* we will allow twenty-five cents on every dollar, on all over five names which they send. This can either be retained as a cash premium, when the names are sent, or its equivalent be had in horticultural books at publishers' rates.

To those Horticultural and Agricultural journals that will offer the *Entomologist* in club with theirs, our price is seventy-five cents per copy.

We have already made arrangements to club the *Entomologist* with the following periodicals, for the prices mentioned:

American Naturalist, Salem, Mass., (\$3 00)	for.....\$3 00
and the Entomologist, (\$1)	.....
Amer. Journal of Horticulture, Boston, (\$3 00)	for \$3 00
and the Entomologist, (\$1)	.....
American Agriculturist, New York, (\$1 50)	for....\$1 75
and the Entomologist, (\$1)	.....
St. Louis Medical and Surgical Journal, (\$3 00)	for...\$3 00
and the Entomologist (\$1)	.....
The Horticulturist, New York, (\$2 50)	for..... \$2 75
and the Entomologist, (\$1)	.....
Journal of Agriculture, St. Louis, (\$2 00)	for.....\$2 25
and the Entomologist, (\$1)	.....
Prairie Farmer, Chicago, (\$2 00)	for.....\$2 25
and the Entomologist, (\$1)	.....
American Farmer, Baltimore, (\$2 00)	for.....\$2 25
and the Entomologist, (\$1)	.....
Gardeners' Monthly, Philadelphia, (\$2 00)	for.....\$2 25
and the Entomologist, (\$1)	.....
Wisconsin Farmer, Madison, (\$2 00)	for.....\$2 25
and the Entomologist, (\$1)	.....
Colman's Rural World, St. Louis, (\$2 00)	for.....\$2 25
and the Entomologist, (\$1)	.....

WE heartily tender our thanks to the subscribers to the old *Practical Entomologist* for the manner in which they are sending in their subscriptions, and for their kind words of encouragement. Also to the Agricultural and Horticultural press for the many commendatory notices they have given us. We hope that our exchanges will call the attention of their readers to this second number, as a proof of our intention to improve with age.

ON OUR TABLE.

The publishers, D. Appleton & Co., of New York, have sent us "The Insect World," from the French of Louis Figuier, author of "The World before the Deluge," "The Vegetable World," "The Ocean World," etc., etc., being a popular account of insect life, illustrated by 564 wood cuts. Although this work will not bear very strict criticism in a scientific sense, it is exactly what it claims to be, namely, a popular work. It will be found most interesting to the general reader, and should have a place in every good library. The engravings, though of a high order, are not so perfect as those in "The Vegetable World."

ANSWERS TO CORRESPONDENTS.

Squash-bug; its Change of Color.—*J. Perian, Champaign, Ills.*—The bugs you send for determination, and which you found on the Squash vines, are the larval and pupal states of the common Squash-bug (*Coreus triolitis*, DeGeer). The true bugs (HEMIPTERA) though they undergo but slight changes in form from the time of leaving the egg till they are full grown, yet generally undergo great changes in color. The Squash-bug is no exception to the rule, and the colors of the young differ so much from those of the full grown bug, that the former have often been sent to us for determination by parties who were well acquainted with the sober brown appearance of the latter. Our readers will therefore bear in mind that the young bugs, when first they hatch from the eggs, have the body green, with the head, thorax, legs and antennæ of a delicate pink color. In about two days from the time of hatching, and before the 1st moult, the pink parts become black, and the green body ash-gray. These colors are retained through the 2d moult, the head and thorax becoming somewhat lighter. After the 3d moult, or while the insect is in the pupa state, the wing-sheaths, which have become considerably developed, together with the head and thorax, are bluish-gray, and the body of a lighter yellowish-gray, while the legs and antennæ have a tinge of brown. After a 4th moult it acquires its wings and its characteristic size and color. Throughout its growth this bug is finely speckled with black, the speckled appearance becoming the more obvious as it matures.

White Grub; immunity from it next year in Clinton County, Mo.—*John P. McCurtney, Cameron, Mo.*—You wish to know if the white grubs will remain in the ground next year, in your section of the country; and fear that, if they do, there will be little use in trying to raise a crop of any kind, as they have already ruined a great deal of meadow. From the fact that the beetles swarmed there during the last of May, 1866, making a noise on the trees "like the coming up of a storm of wind and rain;" from the grubs having been small and not having done much damage in 1867, and from the fact that they are now "full-grown, fine fat fellows," we can confidently assure you that the grubs will not trouble you next year. In accordance with their natural habit, they will transform to pupæ late this fall, or early next spring, and issue in May as beetles, as they did in 1866; and the grubs will not be really troublesome again till the summer of 1871.

Insect Enemies of the Colorado Potato Beetle.—*Dr. S. H. Kriedelbaugh, Clarinda, Page Co., Iowa.*—The three insects which you send, and which have saved your potatoes the present season, by preying unmercifully on the larvæ of the Colorado beetle, are (1) *Arma spinosa*, Dallas; (2) *Reduvius raptatorius*, Say; (3) *Hippodamia convergens*, Guerin. As we shall figure these three in our next issue we will not speak further of them at present. You have our sincere thanks for the interest you manifest in our undertaking and for the good words in the "National Platform."

"Harvest-bugs" in America, misnamed "Jiggers."—Dr. M. McKenzie, Centerville, Mo.—The "microscopic, dingy, brick-red insects, which," as you say, "cause a troublesome eruption on the human skin in this country, but do not burrow under it like the minute Mite (*Acarus scabiei*, Linn.) that produces the common itch," are not true insects, but mites, and belong to the same class (*Arachnida*) as the spiders. They differ, however, from almost all the genera of this class by having, not eight, but only six legs, like a true insect. We have now before us specimens of what is apparently the same species as yours, received some time ago from Dr. Carpenter, of Kelley Island, Ohio, with a statement that it "causes there inflamed itching blotches on children in the summer, burying itself under the skin in a few hours;" and we were informed last year, by Dr. Hull, of Alton, Ills., that a currant patch of his swarmed so prodigiously with what, from his description, must be the same species, that it was more than the fruit was worth to gather it. The correct English name of this little creature is "the American Harvest-bug." A very closely allied species, called in Europe the "Harvest-bug," (*Leptus autumnalis*, Linn.) has long been known there to attack the legs of the laborers in harvest time, "burying itself in the flesh at the root of the hairs, and producing thereby an intolerable itching and inflammation." (*Kirby and Spence*.) Like our American Harvest-bug, this little pest is invisible, or nearly so, to the naked eye; but it differs from ours in being of a most brilliant scarlet color, instead of dull brick-red or dull orange color. In South Illinois, in Kentucky, and in several of the Southern States, our American Harvest-bugs are popularly known as "Jiggers." The true "Jigger," however—or, more correctly speaking, the true "Chigoe," (*Sarcophylla penetrans*, Linn.)—is not a Mite but a genuine Flea, and consequently a genuine Insect. Moreover, it is never found within the present limits of the United States, but is peculiar to such tropical or sub-tropical countries as Cuba, Central America, Hayti, &c., where it is an awful pest, burrowing under the toe-nails and in other tender parts of the body, and raising there a whole family of young Chigoes, at the expense of us great Lords of the Creation. Hence, it is as incorrect to call our United States Harvest-bugs "Jiggers," as it would be to call our United States Wild-cat a "Lion."

Insects named—J. T. Smith, St. Paul, Minn.—1st. The Plant-lice are the common species (*Aphis mali*, Linn.), that infests the leaves of the apple-tree in all the northern States. 2d. The round mass of cottony matter, about the size of a hickory nut, found on the leaf of a garden plant, contains numerous cocoons of a small parasitic ichneumon fly (genus *Microgaster*), from most of which the flies actually developed on the road. In the larva state these flies had fed upon the living body of some leaf-feeding caterpillar, after destroying which they emerged simultaneously, and spun up to pass into the pupa state. 3d. What you consider as three pupae, arranged side by side on an apple leaf, are the dried up bodies of three young larvae of a light brown moth known as *Notodontia concinna*, Sm. & Abbott. The moth is figured in Pl. vi. Fig. 11, and the caterpillar on p. 425 of Harris's "Injurious Insects." Inside of each of these is the young of some 4-winged parasite belonging to the Ichneumon family. From the young larva of *Euchetes agle*, Harris, which feed on the milkweed, and which may often be found fastened tightly to the leaf and contracted in a similar manner, we have bred the *Campoplex fugitivus* of Say.

Magnifying Glasses.—J. G. Fleck, Dixon, Ills.—For ordinary purposes we would recommend the common treble lens, mounted in a horn case, convenient for carrying in the pocket. With this instrument, you may use either one, two, or all three lenses together, according to the magnifying power required. If a still higher power is required, a Stanhope lens will be found very useful; the only objection to it being that the focus is so very short, that it requires to be used very carefully with dried specimens, for fear of breaking their legs and antennae. The Coddington lens has a longer focus than the Stanhope, and magnifies very nearly as much, but the price of it is very high—about \$10. All kinds of lenses may be procured from Jas. W. Queen & Co., 924 Chestnut street, Philadelphia.

Grapes cut off by the Tree Cricket—J. H. Tree, St. Louis, Mo.—You are quite right in supposing that the tree cricket (*Eoanthus niveus*) severs your grapes from the bunches and sometimes cuts off an entire bunch. We have ourselves caught the little rascals at it, and have received specimens from B. L. Kingsbury of Alton, Ill., accompanied with the same accusation. Other "hoppers," such as the so-called Grasshoppers, and probably some of the Leaf-hoppers, no doubt, share in this mischievous work, but until we catch them in the act we must lay all the blame to the Tree-cricket. The accompanying illustrations, Fig. 30, representing the female, and Fig. 31 the male, will enable the grape grower to recognize this grape pruner.—



and thus to some extent redeem their character, we believe the mischief greatly out-balances the good which they do, and therefore advise their destruction. They deposit their eggs in grape canes; in raspberry and blackberry canes; and in the twigs of a number of trees and shrubs, almost always causing the death of the twig or cane above the punctures. We received during the summer, numerous twigs of the white willow, which were most thoroughly punctured by them, from Uriah Bruner, of Omaha, Nebraska, with a statement that they had done much damage to this tree.

The Buffalo Tree-hopper.—Phil. Rickert, Milwaukee, Wis.—The jumping grass-green insects, about one-third of an inch long, and shaped a good deal like a hock-nut, save that they have a sharp thorn, or horn, projecting laterally on each side of the thorax, like the horn of an ox or a buffalo, are the Buffalo Tree-hopper (*Ceresa bubalus*, Fabr.) This Tree-hopper is very common on a variety of trees, the sap of which it sucks with its pointed beak; but, like all the other true bugs, (orders *Heteroptera* and *Homoptera*, to the latter of which the "Tree-hopper," or *Membracis* family, belongs,) it has no jaws to eat with. You say that it "injures your grape vines and Japan lilies, by ringing the leaves, so that the wind will break them off, many lilies being actually killed in this manner." Dr. Fitch mentions that this insect attacks the leaves of the locust in the same manner, "stationing itself in the angle where the leaf-stalk arises from the limb." You will find it figured by this writer in the second volume of *Reports on Noxious Insects*, plate ii. fig. 4. The best remedy against the depredations of this little foe of yours is to catch him and kill him. Something, however, may be effected by destroying their eggs, which are laid in a short, curved row, in a series of punctures made by the ovipositor of the female in the bark and sapwood.

A Scavenger mistaken for a Foe—Simmons & Tillson, Vineyardists, Sulphur Springs, Mo.—The large balls of earth and dung, measuring one and a half inches in diameter, and containing a large white grub with six legs and a humped and swollen back, are the dung-balls of a large black dung-beetle known as *Copris carolina*. During the months of July and August these beetles frequently fly into our rooms of an evening, with a heavy buzzing flight. You say, "the specimens were found ten inches below the surface, imbedded in the hard clay. They were five in number, in a row about two inches apart. From its resemblance to the grape-vine borer which has lately made its appearance, we think it may be that larva in the pupa state." The pupae of beetles may always be distinguished from larvae by their incapacity to move any other part but the abdomen and by their having wing-sheaths. The balls were placed where you found them by the parent beetle, and similar ones are often to be found in the clay ditches and clay banks around St. Louis. These beetles are to be considered as beneficial rather than injurious, as they simply clear away and bury offensive excrement.

Insect Foes of the Bark-louse.—*Dr. Jas. Weed, Muscatine, Ia.*—The insect which you found preying upon Harris's Bark-louse (*Aspidiotus Harrisii*, Walsh), and which you think has effectually cleaned your trees of that little pest, is the larva of the Twice-stabbed Ladybird (*Chilocorus bivulverus*, Muls.). The middle figure below gives a rough sketch of this very useful larva, and the right hand figure an accurate drawing, considerably magnified, of the beetle into which it

[Fig. 32.]



changes. The left hand figure is the Northern Ladybird (*Epilachna borealis*, Titub.), the larva of which closely resembles that of your insect; but, instead of preying upon other insects, as that does, is very injurious in the Eastern States to the fruit and foliage of the squash. This last is the only N. A. Ladybird, so far as is at present known, which is a vegetable feeder, although several European Ladybirds are known to have this habit. In the Western States, however, so far as we are aware, the Northern Ladybird has never yet been met with, and perhaps never will be, as it is more particularly a Northern species. In the spring of the year 1867, by way of experiment, we placed about a dozen living specimens of the Twice-stabbed Ladybird upon an apple tree badly infested by the Oyster-shell Bark-louse (*Aspidiotus cochifolius*, Gmelin); and in June, 1868, we had the pleasure of seeing that they had increased fifty-fold, and were preying upon the newly hatched young Bark-lice in a most savage manner. In November, 1867, we saw great numbers of this same Ladybird preying upon the Pine-leaf Scale-insect (*Aspidiotus pinifolii*, Fitch), in the garden of Mr. Paul Wright, at South Pass, Illinois; so that it appears to make war upon at least three distinct kinds of Bark-lice. Hence, wherever it is met with, it should be cherished and protected. "Pitch into your enemies, but stand up for your friends."

Best Works on Entomology.—*B. M. Reynolds, Madison, Wis., and others.*—Beginners who desire to acquire, without much trouble, a general knowledge of our North American insects, and especially of those which are of economic importance, are recommended to procure Dr. Harris's work on *Injurious Insects*. (Boston, 1862, one large octavo; price, with colored plates, \$6.) Those who require, in addition, to familiarize themselves with the natural history of the insects of the whole world, should get Kirby & Spence's *Introduction*. (London, 1857, one stout duodecimo, no plates; price about \$2.) For any one who desires to lay the rudiments of a thorough scientific knowledge of Entomology, the very best work is Westwood's *Introduction*. (London, 1838-40, two large octavos, with 133 blocks of outline woodcuts, and colored plate.) This last work is, we believe, now out of print, but may be occasionally met with at second-hand book-stores. It would be cheap at \$10 or \$15. After proceeding so far as this, the student had best take up some special order of insects, instead of frittering away his time on the immense field of all the orders. The Beetles (order *Coleoptera*) have always been the favorite order for this purpose; and the best work upon North American Beetles, to begin with, is LeConte's *Introduction*. (Smithsonian Institution, Washington, D. C., 1861; one thin octavo with a few woodcuts, price \$-.)

Larva in Plum-gum.—*Phil. Rickert, Milwaukee, Wis.*—The small larva found by you in the gum oozing out of the bark of your plum trees are most probably those of some two-winged fly (order *Diptera*), and have nothing to do with the Curculio, which is a beetle (order *Coleoptera*). Since, however, you send no specimens, we can give you no more definite information. From small, white, thread-like worms, feeding upon the gum and detritus of the peach tree, we have bred a small two-winged fly, belonging to the genus *Mycetophila*, an account of which was given in the *Prærie Farmer* of June 15th, 1867. Yours is possibly the same.

Insect Foes of the Hop Vine.—*Mrs. H. C. Freeman, South Pass, Ills.*—The pale green caterpillar, about one inch and a half long, with bunches of diverging green prickles on its back, which sting the tenderer parts of the human body like a nettle, is the larva of the lo-moth (*Saturnia Jo*, Fabr.), a large and handsome insect, with a great round eye in the middle of the hind wing. You found it, as you say, on the hop vine, but it feeds on a variety of other plants as well, though it never occurs in such numbers as to be materially injurious. The smaller caterpillar, about one inch and a quarter long when full grown, with its body variegated with brown and yellow, and with long sprangling prickles of a dark color on its back, which you also found on the hop vine, is the larva of the Semicolon Butterfly (*Vanessa interrogatio*, Fabr.), a large insect, mostly of a brick-red color, and with a silvery mark in the middle of the lower surface of the hind wing shaped much like a semicolon (;). In the Greek language the modern semicolon (;) is used in the place of our note of interrogation (?); hence the scientific name and the English name of this Butterfly both of them refer to the same peculiar mark, which nature has imprinted upon this insect. Unlike the preceding, this larva often occurs in great numbers upon the hop plant, so as to ruin the crop if not attended to; and it likewise occurs not unfrequently on elm and basswood. The roundish-flat Bug, about one-third of an inch long, and of a yellowish color, with some dark markings, which you also found on the hop plant, is the pupa of some species of Soldier-bug (*Arma*). Cherish him carefully, for he is your friend, though he has the misfortune to possess the same peculiarly unsavory odor as the Bed-bug and Chinch-bug.

Insect Foe of the Apple-tree Borer.—*J. E. Walker, Hillsboro, Mo.*—The larva bearing a strong general resemblance to the one which we figure in this number of the AMERICAN ENTOMOLOGIST (fig. 26), is undoubtedly that of some ground Beetle or other (*Curabus* family, order *Coleoptera*), but the particular species to which it belongs cannot be determined. All the known North American species of this family are cannibals, and your insect no doubt forms no exception to the general rule. "While worming some apple trees," as you observe, "I found the enclosed larva, and noticed that the borers in its vicinity were dead and partly eaten, and, as I suppose, by this grub or worm. I must say that it is fully able to assert its rights, for it fought nobly upon being captured." Your supposition is, beyond all doubt, a correct one; and larvae of this general character, when found above ground, or in the earth, which they usually inhabit, should always be carefully spared and protected. They form the chief protection of the Agriculturist against those most insidious and unmanagable of all his insect foes—the subterranean root-feeding larva;—and they also prey upon vegetable-feeding larvae, such as those of the common Curculio, and of the Colorado Potato-bug, which go underground to pass into the pupa state. Like almost all cannibals, they run with prodigious velocity; whereas vegetable-feeding insects are, as a general rule, dull and sluggish in their motions. In common with most cannibal larvae, those of the Ground Beetles are far more difficult to rear to the perfect state than are those larvae that live upon vegetable matter; which accounts for the fact that but very few of the former are known to science in all their stages.

Oak Tree Caterpillars.—*W. W. Daniels, University, Madison, Wis.*—The caterpillars of a bluish white ground-color, marked longitudinally with yellow bands and fine black lines, with the head and a lump on the 11th segment either of a light coral or dark flesh color; and which generally carry the hinder portion of the body elevated in the air, are the larvae of *Edema albifrons*, Packard, a gray moth characterized principally, as its name implies, by a broad white mark on the outer half of the anterior margin of the front wings. You say "these caterpillars have been quite destructive to the leaves of the white and burr oaks on our grounds." They have long been known to attack the oak. Some that we reared the present season entered the ground and changed to chrysalids during the last days of September, and came out as moths about the middle of April.

Bark-lice on Apple Trees.—*J. G. Fleck, Dixon, Ills.*—The bark-lice you send are the common imported or oyster-shell species; and there is not, so far as we can see, a single living egg under any of the scales on the twigs received. Some of these scales are the old last year's ones, formed in August, 1867, only about five per cent. of which you found, as you say, to contain eggs in March, 1868; but many of them are apparently this year's scales, perfected in August, 1868, and which then must have contained, each of them, scores of minute oval white eggs. The question now recurs, "What has killed 95 per cent. of last year's eggs in March, 1868, and almost the entire crop of this year's eggs in September, 1868?" We answer, judging from the peculiar appearance of many of the scales sent, that this must have been done by a minute microscopic Mite, which preys upon these eggs everywhere in the Northern States from New York to Illinois, and the natural history of which has been given in detail by the senior editor of this journal, in his annual report, printed in the Transactions of the Illinois State Horticultural Society for 1867. It certainly cannot have been done, as you suggest, by the cold winter of 1867-8; for, near Rock Island, Ills., the thermometer was, during that winter, once as low as 27° below zero, and yet no effect was thereby produced upon the Bark-lice eggs in that neighborhood. In a future article we propose to illustrate the natural history of the different kinds of Bark-lice that trouble the farmer and the fruit grower.

The "Saddle-back" Caterpillar.—*Emil Baxter, Nauvoo, Ill.*—The brown flattish caterpillar, armed with prickly horns, and with a bright green saddle-shaped patch over the middle of the body, which contains a round brown mark on its back, is the larva of *Empressia stimulea*, Clemens. You say that you "found similar ones three years ago on a common Morello cherry tree, and having just touched the back of my hand with one soon found their dangerous quality, but stopped the pain by dipping my hand in lye water. These I send were found to the number of ten on a wild frost grapevine, and the finder's hand soon swelled up with watery pustules, accompanied with intolerable itching and a kind of fainting of heart; happily a doctor was at hand, and in four hours the patient was better." Their prickles have long been known to have this stinging quality. They feed on various fruit trees, and have also been found on the rose and on Indian corn. They belong to an anomalous family of moths, and as you may have observed, they have no legs, but glide along with a snail-like motion.

O. A. Kenyon, McGregor, Iowa.—The caterpillar taken from an apple tree, "of a mud-turtle shape and appearance," which you send, is of the same "Saddle-back" species spoken of above.

The Regal Walnut Caterpillar.—*M. Copley, Copley House, Brighton, Ills.*—The immense green caterpillar, measuring five inches, partly covered with long prickly horns, and having cream-colored patches along the sides, reached us in fine condition. You say you found it on a black walnut tree in your door yard, and that it was kept for some time in a bird cage, where it appeared contented, and was noticed at times to drink water. It is the larva of the Regal Walnut moth (*Githeronia regalis*, Packard), a moth which sometimes expands over six inches, and whose colors are rust-red, slate-color and yellow. The caterpillar enters the ground and becomes a black chrysalis during the month of September, and the moth makes its appearance during the fore part of the following July. We have found it feeding on the persimmon and hickory, and it also occurs on the butternut and sumach.

The Hessian Fly.—*Fred. D. Carson, "Northern Farmer," Fond du Lac, Wis.*—The specimens of wheat straw which you sent contained the "flax seed" or pupa state of the Hessian fly. You say that upon careful search and inquiry you are convinced that much of the wheat crop has been damaged by it the present season in your section. The fly appears during the fore part of September, and generally disappears by the end of the month. Wheat sown so late that it does not come up till after its disappearance generally escapes its ravages. We bred nothing but parasites from the specimens you sent, and they will probably be less troublesome next year.

Red Cedar Caterpillar.—*Robt. Peter, Lexington, Ky.*—The troublesome caterpillar which has been spoiling your red cedar trees, and which clothes itself with a case made of the leaves of the cedar stuck together with a kind of silk, and carries its case with it on its predatory travels till it is full grown, when it hangs itself up by a silk string to a twig to pass the winter; is the larva of *Thyridopteryx ephemeriformis*—a moth, the male of which is black, with glassy wings, and the female of which is perfectly wingless and legless, and never quits her case. The male escapes from his case during the month of September. The eggs pass the winter protected by and contained within the female case. The nature of the insect forbids its spreading to any great extent, and it can be readily checked by destroying the cases in winter time.

Wheat-midge Winter killed.—*J. P. Alexander, Independence, Mo.*—You say that this fly has heretofore been the greatest enemy to wheat culture in your neighborhood, but that you could not find a single infested stalk during this year's harvest; and you ask if it was not the open, snowless winter that killed them. The sudden increase or decrease of a particular insect is something which is observed every year, and depends on so very many contingencies, that it is always difficult to ascertain the true cause. It is asserted that the Chinch-bug is frequently killed by hard, bleak winters, when there is but little snow on the ground, and we think it quite possible that the Midge is susceptible to the same severe weather.

Grape-vine Borer.—*Alfred Barter, Virgil City, Mo.* The "grubs" which cut off your grapevines three or four inches below ground, are half grown specimens of the same borer spoken of under the head of "A new Grape-root Borer," on page 19 of our first number. Since you set your vines last spring, "using green oak stakes," these grubs are doubtless not yet a year old. During the session of the "Mississippi Valley Wine Growers' Association," we ascertained that this insect is far more common than we had supposed, and that Mr. Husmann of Hermann, Mo., has been acquainted with it since 1850.

Col. Jno. H. Logan.—The root-borers which you send, and which have destroyed a great number of your vines, are the same as the above.

HAIR LINES.—Our readers will bear in mind that all our illustrations which are enlarged for the purpose of making their characters more apparent, will have a hair-line accompanying them to indicate the natural size. When no such line appears, the illustration is supposed to be of the true size, unless otherwise stated.

TO OUR SUBSCRIBERS IN CANADA.—Parties in Canada, who wish to subscribe for the *American Entomologist*, can obtain it, postage free, by remitting one dollar to the *Rev. C. J. S. Bethune, Secretary to the Entomological Society of Canada, Credit, C. W.*

ERRATUM.—In Number 1, on page 19, column 2, line six, for "joints" read "joint."

NOTICE.

All letters, desiring information respecting noxious or other insects, should be accompanied by specimens, the more in number the better. Such specimens should always be packed along with a little cotton, wool, or some such substance, in any little paste-board box that is of convenient size, and never enclosed loose in the letter. Botanists like their specimens pressed as flat as a pancake, but entomologists do not. Whenever possible, larva (i. e. grubs, caterpillars, maggots, etc.) should be packed alive in some tight tin box—the tighter the better—along with a supply of their appropriate food sufficient to last them on their journey; otherwise they generally die on the road and shrivel up to nothing. Along with the specimens send as full an account as possible of the habits of the insect, respecting which you desire information; for example, what plant or plants it infests; whether it destroys the leaves, the buds, the twigs, or the stem; how long it has been known to you; what amount of damage it has done, etc. Such particulars are often not only of high scientific interest, but of great practical importance.

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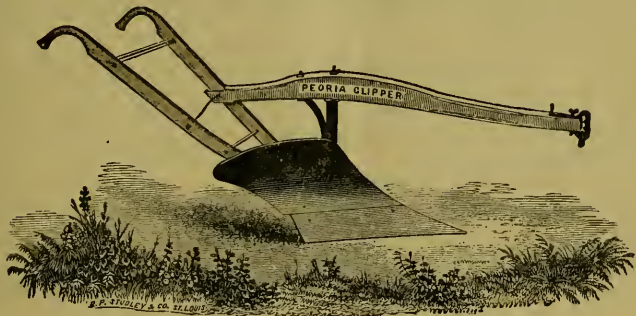
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	Interest.	Principal.
Cash Payment.....	\$15 00	\$50 00
Payment in one year.....	10 00	50 00
" two years.....	5 00	50 00
" three years.....		50 00

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POTATO BUGS.

[CONTINUED FROM PAGE TWENTY-SEVEN.]

The Colorado Potato-bug—Its past history and future progress.

(*Doryphora 10-lineata*, Say).—Up to the autumn of 1865, it was generally supposed by Economic Entomologists, that this destructive insect had existed for time immemorial in the Northwestern States, feeding upon some worthless weed or other;

and that of late years, from some unexplained cause, it had all of a sudden taken to attacking the Potato-plant. In October, 1865, the senior editor of this journal published a paper, showing that originally its exclusive home was in the Rocky Mountains, where it

had been known to exist for at least forty-five years feeding upon a wild species of potato peculiar to that region (*Solanum rostratum*, Dunal); that when civilization marched up to the Rocky Mountains and potatoes began to be grown in that region, it gradually acquired the habit of feeding upon the cultivated potato; that in 1859, spreading eastward from potato patch to potato patch, it had reached a point

one hundred miles to the west of Omaha city, in Nebraska; that in 1861, it invaded Iowa, gradually in the next three or four years spreading eastward over that State; that in 1864 and 1865, it crossed the Mississippi, invading Illinois on the western borders of that State, from the eastern borders of North Missouri and Iowa, upon at least five different points on a line of two hundred miles; and that in all probability it would in future years "travel onwards to the Atlantic, establishing a permanent colony wherever it goes, and pushing eastward at the rate of about fifty miles a year." (*Practical Entomologist*, Vol. I, No. 1.) A remarkable peculiarity in the eastern progress of this insect was subsequently pointed out by the same writer in 1866, namely, that "in marching through Illinois in many separate columns, just as Sherman marched to the sea, the southern columns of the grand army lagged far behind the northern columns." (*Ibid*, II, p. 14.)

Now, let us see how far the predictions above, have been verified. By the autumn of 1866, the Colorado Potato bug, which appears to have invaded the south-west corner of Wisconsin at as early a date as 1862 (*Ibid*, II, p. 101), had already occupied and possessed a large part of the cultivated or southern parts of that State; and in Illinois, if we draw a straight line to connect Chicago with St. Louis, nearly all the region that lies to the north-west of that line was overrun by it. It subsequently invaded parts of South Illinois, occurring in Union, Marion, and Effingham counties, in 1868; and already in 1867 it had passed through the eastern borders of north and central Illinois into western Indiana,



Colors—(a) deep orange; (b and c) venetian red inclining to cream color; (d and e) cream color and black.

and the south-west corner of Michigan; and finally, in 1868, it has reached Danville, Ind., a point which lies nearly in the centre of that State, as we learned some time ago from Mr. A. Furnas, of that city; and the agricultural papers have since recorded its appearance in Marion county, which lies in the geographical centre of the State. Thus it appears that its average annual progress towards the east has been about sixty-two miles. At the same rate of progression it will touch the Atlantic ocean in ten years from now, or A. D. 1878.

"But," it will be asked, "how could any entomologists make the mistake of supposing that the Colorado Potato-bug had always existed in the Northwestern States?" The answer is, that, as was proved three years ago in the article already referred to, they inadvertently confounded together two entirely distinct, but very closely allied species, the Bogus Colorado Potato-bug (*Doryphora juncta*, Germar), and the True Colorado Potato-bug (*Doryphora 10-lineata*, Say). The former of these has existed in Illinois from time immemorial; and, as we have recently ascertained, through the kindness of Mrs. H. C. Freeman, of Cobden, South Illinois, feeds there in the larva state upon the horse-nettle (*Solanum carolinense*, Linn.), a wild species of potato, which grows, according to Dr. Asa Gray, "from Connecticut to Illinois and southward."* The latter species, as has been already stated, only emigrated into Illinois in 1864, and in its native home, the Rocky Mountains, feeds naturally upon another wild species of potato, which is quite distinct from the horse-nettle, and is peculiar to the Rocky Mountain region. Again, the former species has never yet been known to attack the cultivated potato, and in all likelihood never will do so; for, as it has existed in Illinois for at least 14 years, and in Georgia for at least 44 years, without ever having been known to attack this plant, which has been growing all

that time in these two States, it is not at all probable that it will do so at any future time. The latter species, on the other hand, acquired this habit, as was shown before, in the region of the Rocky Mountains, when for the first time the potato was introduced there, some twenty years ago; and from that region the potato-feeding race of this insect has since been spreading further and further every year towards the east. Finally the bogus Colorado Potato-bug is more peculiarly a southern species, occurring in the more southerly portion of Illinois, and in Missouri, Kentucky, Georgia, and probably Alabama, while the true Colorado Potato-bug is originally an Alpine species, its native home being the canons (kanyons) of the Rocky Mountains, and it therefore thrives best and spreads fastest in the more northerly regions, such as Nebraska, Iowa, Minnesota, Wisconsin and North Illinois; while in South Illinois, Missouri, and Kansas, it neither thrives so well nor spreads so rapidly.

The question whether the true Colorado Potato-bug has existed for an indefinitely long time in the country that lies to the east of the Mississippi river, or whether it is not the bogus Colorado Potato-bug that has there been mistaken for it, while the true Colorado Potato-bug has in reality emigrated into that country from the Rocky Mountain region within the last four or five years, may seem to some of merely theoretical interest. It is, however, of great practical importance. On the first supposition it is not probable that this bitter enemy of the potato will travel onwards and onwards towards the Atlantic; on the second supposition it will most likely invade Ohio within a year or two, spread like a devouring flame through the great potato-growing State of Michigan, and finally pass eastwards into Pennsylvania, New York, and New England. We make no apology, therefore, to our readers for presenting them with the complete history of these two insects, copiously illustrated by figures, and for pointing out the minute but invariable characters which distinguish them, both in the larva and in the perfect beetle state. This is the first time that the larva of the bogus Colorado Potato-bug has ever been figured and scientifically described; and our readers have to thank Mrs. Freeman for the opportunity of becoming acquainted with the points in which it differs from the larva of the true Colorado Potato-bug.

The True and the Bogus Colorado Potato-bug.

Figure 33 *b, b, b*, gives a view of the larva of the true Colorado Potato-bug, in various posi-

* In 1863 Mr. Glover stated that he "had found an insect similar to the Ten-striped Spearman [or true Colorado Potato-bug] on the common horse-nettle in Georgia." (*Agr. Department Rep.*, p. 579). In 1867 he assured us that this insect, found by him on the horse-nettle in Georgia four years before, was the bogus Colorado Potato-bug (*D. juncta*), and that "a Mr. Walter had also found it feeding upon the Egg-plant in Montgomery, Alabama." We ourselves discovered this same species in Kentucky in 1864, feeding in conjunction with its larvæ upon a plant, which we are now satisfied could have been nothing else but the horse-nettle; and in 1868 we have met with it in Missouri in great numbers, feeding upon the same plant, in company with its larvæ; and in one instance the larvæ of both the true and the bogus species occurred in company. Thus it appears to inhabit at least five southerly regions, namely South Illinois, Missouri, Kentucky, Georgia and Alabama.

[Fig. 34.]



Colors—(a) between cream and flesh colors; (b) flesh color; (c and d) cream color, black and brown.

tions and stages of its existence; Figure 34 *b*, *b*, of that of the bogus Colorado Potato-bug. It will be seen at once that the head of the former is black, that the first joint behind the head is pale and edged with black behind only, that there is a double row of black spots along the side of the body, and that the legs are black. In the other larva (Fig. 34 *b*), on the contrary, the head is of a pale color, the first joint behind the head is tinged with dusky and edged all round with black, there is but a single row of black spots along the side of the body, and the legs are pale. Take a hundred full-grown specimens of the former larva, and you will find them all to present the above characters. Take a hundred full grown specimens of the latter larva, and precisely the same rule will hold good.*

* We subjoin a technical description of the larva of *Doryphora juncta*. That of the larva of *Doryphora 10-lineata* will be found in Dr. Fitch's *N. Y. Reports*, Vol. III, pp. 231-2. According to Dr. Fitch, the ground-color of this last larva is "pale yellow" in the mature state; according to Dr. Shiner, in his excellent article on the preparatory stages of this insect, it is "orange." We ourselves should prefer to designate it as cream-color, more or less tinged with Venetian red; and we think we have observed that the mature larvae of the earlier broods are more strongly tinged with this color than the mature larvae of the later broods. In the immature state the ground-color of the larva is a dull Venetian red.

DORYPHORA JUNCTA, Germar; mature larva.—General color a pale yellowish flesh-color. *Head*, with the antennae placed behind the base of the mandibles, short and very robustly conical, three-jointed, joints 2 and 3 black. Precisely as in *10-lineata*, there are six small simple black eyes upon each side, one pair longitudinally arranged and placed below the antenna, the other two pairs arranged in a square and placed a little above and behind the antenna; tip of the mandibles dusky. *Dorsum*, with the dorsum of joint 1 composed of a separate transverse horny plate, rounded at the sides, tinged more or less with dusky, and broadly edged all round with black. Joints 1-3 each with a lateral horny black tubercle, that of joint 1 placed below and behind the horny prothoracic plate, and enclosing a spiracle. Joints 4-11 each with a similar lateral tubercle enclosing a spiracle; but the row composed of these eight tubercles is placed a little above the row of three tubercles on joints 1-3, and the last four of the eight are gradually smaller and smaller, until that on joint 8 is reduced to a simple black spiracle; dorsum of joints 8 and 9 dusky. Legs pale yellow; coxae exteriorly a little dusky, the two hinder pairs each more and more so, with a geminate horny plate above each, which is

Now let us see what are the differences in the perfect beetle state of these two insects, in which state even a practised entomologist would, at first sight, be apt to confound them together. Indeed, so minute are the differences, that in a drawing of the natural size it is scarcely possible to exhibit them, and in order to do so we have been compelled to greatly magnify the wing-case and the leg of each species. Figure 33 *d*, *d* exhibits the True Colorado Potato-bug; Fig. 34 *c* the Bogus Colorado Potato-bug, each of its natural size. Fig. 33 *e* shows the *left* wing-case enlarged, and Fig. 33 *f* an enlarged leg of the former; Fig. 34 *a* the *left* wing-case enlarged, and Fig. 34 *e* an enlarged leg of the latter. On a close inspection it will be perceived that in the former (Fig. 33 *e*) the boundary of each dark stripe on the wing-cases, especially towards the middle, is studded with confused and irregular punctures, partly inside and partly outside the edge of the dark stripe; that it is the third and fourth dark stripes, counting from the outside, that are united behind; and that in the leg both the knees and the feet are black. In the latter (Fig. 34 *d*), on the contrary, the dark stripes are accurately edged by a single regular row of punctures placed in a groove (*stria*); it is the second and third stripes—not the third and fourth—counting from the outside, that are united behind, the space between them being almost always brown; and the leg is entirely pale, except a black spot on the middle of the front of the thigh.

The spots on the thorax, in either of the above two species, are normally eighteen in number, arranged in the same very peculiar pattern which may be seen both in Fig. 33 *d*, *d* and in Fig. 34 *e*; and precisely the same variations in this complicated pattern occur in either species. These are certainly very remarkable and suggestive facts; and the reader who desires to see them more fully discussed is referred to a passage in a scientific paper, published in 1865, by the senior editor.*

After all these statements, it will not be wondered at that several otherwise well qualified observers have imagined that they had captured the true Colorado Potato-bug in Illinois long previously to the year 1864. Many such cases have been carefully investigated, and in every one of them it has turned out, upon examining

more and more dusky in each successive pair. An exterior dusky dot, or small spot, on the tip of the femur and of the tibia. Tarsus small, one-jointed, dusky, and with a black claw.

* *Proceedings of the Entomological Society of Philadelphia*, Vol. VI, pp. 207-8.

the specimens, that the supposed true Colorado Potato-bugs simply belonged to the bogus species. Hence it is but reasonable to infer that in other cases, where it was not practicable to examine the specimens, the same very natural error had been inadvertently committed.

Habits of the Colorado Potato-bug.

The Colorado Potato-bug, though it has acquired a prescriptive title to the appellation of "bug," is not, entomologically speaking, a Bug (order *Heteroptera*), but a Beetle (order *Coleoptera*). It might perhaps be desirable, if it were possible, to get people to call it a "Potato-beetle;" but as long as we all of us continue to talk every day of "shipping" goods by a railroad car, as well as by a ship, and as long as everybody, including the Almanac-makers, writes about "sunrise" and "sunset," while in reality it is the earth, and not the sun, that rises and sets every day, we must be content to smother our partiality for entomological purism, and talk with the vulgar though we think with the wise.

The wings of this insect, like those of several allied species, are of a bright rose-color, and with its cream-colored body, and the five black stripes upon each wing-case, it presents a beautiful appearance as it flies abroad in the clear light of the sun. The junior editor of this paper was the first person in the United States to breed this species from the egg to the beetle state, and to ascertain that it required less than a month to pass through all its changes. In the *Prairie Farmer* for August 8, 1863, will be found the full account, by this writer, of the whole process, illustrated by a figure of the larva. Subsequently, in 1866, Dr. Shimer added some very interesting particulars bearing upon this subject, in a paper which he published in the *Practical Entomologist* (Vol. I, pp. 84-5). There are about three broods of larvae every year in North Illinois and Central Missouri, each of which goes underground to pass into the pupa state, the two first broods coming out of the ground in the beetle state about ten or twelve days afterwards, while the last one stays underground all winter, and only emerges in the beetle state in the following spring, just in time to lay its eggs upon the young potato leaves. The eggs, it may be added, are of a yellow color, and are always laid upon the under side of the leaves in patches of 20 or 30. At Fig. 33 *a a* the eggs are shown, and at Fig. 34 *d d* those of the Bogus Colorado Potato-bug, which are of a lighter color, are also shown, all of the natural size.

Unlike many other noxious insects, this larva is not a general feeder, but is confined to plants belonging to the potato family (*Solanaceae*), and especially to the genus to which the potato belongs (*Solanum*). Occasionally it feeds on the tomato, and a few specimens have been noticed by us on the ground-cherry (*Physalis*), and on the imported Jamestown-weed, or gypson-weed (*Datura*). According to Mr. Terry, of Iowa, it also occurred in that State, several years ago, on the horse-nettle (*Solanum*), upon which plant we have ourselves noticed it in great numbers in Missouri; and it is certainly far more destructive to the egg-plant than even to the potato. Now, the egg-plant, the horse-nettle, and the potato, all three of them belong to the same genus (*Solanum*), as the wild plant upon which the larva originally fed in the Rocky Mountain region; but the egg-plant and the horse-nettle are botanically more closely related to the last than is the potato; being, like the Rocky Mountain potato, covered with thorny prickles, while the cultivated potato is perfectly smooth. On the other hand, the cultivated potato is much more nearly related to the Rocky Mountain species than is the tomato; which last has, by modern botanists, been removed from the genus to which the other two appertain, and placed in a genus by itself. It would seem, therefore, that the closer a plant comes to the natural food-plant of the insect, the better the insect likes it.

It is undoubtedly a most singular and noteworthy fact that, out of two such very closely allied species as the bogus and the true Colorado Potato-bugs, feeding respectively in in the first instance upon very closely allied species of wild potato (*Solanum rostratum* and *S. carolinense*), the former should have pertinaciously refused, for about half a century, to acquire a taste for the cultivated potato, with which it was all the time in the closest and most immediate contact, while the latter acquired that taste as soon as ever it was brought into contact with that plant. But, after all, this is not so anomalous and inexplicable as the fact that the Apple-maggot Fly (*Trypeta pomonella*, Walsh), which exists both in Illinois, New York, and New England, and the larva of which feeds in Illinois upon the native haws, and has never once been noticed to attack the imported apple there, should, within the last few years, have suddenly fallen upon the apple, both in New York and New England, and in many localities there, have become a more grievous foe to that fruit than even the imported Apple-worm

(*Carpocapsa pomonella*, Linn.)* Thinking that it might be possible that, although the bogus Colorado Potato-bug has for about half a century refused to feed upon the potato in a state of nature, it might yet be compelled by starvation to feed upon that plant in a state of confinement, we placed two of the larvæ received from Mrs. Freeman in a vessel along with some potato leaves; but, instead of feeding voraciously upon them, as the larvæ of the true Potato-bug would certainly have done, they only nibbled a few small holes in them about the size of a pin's head, and then in a week's time died of starvation. This, however, can scarcely be quoted as a decisive experiment, because these larvæ had fasted for about a day before they reached us, owing to the leaves in which they were packed having dried up; and because no vegetable-feeding animals can stand long fasting as well as flesh-feeding animals do. But even if they had actually fed upon potato leaves quite freely in a state of confinement, it by no means follows that the mother Beetle would deposit her eggs upon the potato in a state of nature, and thereby compel her future progeny to feed upon that plant. That she will do so upon her natural food-plant, the horse-nettle, we know; and, according to Mr. Walter of Alabama, she will also do so upon the egg-plant, which is thorny like the horse-nettle. But apparently she is naturally indisposed to go one step further, and lay her eggs upon a smooth species of the same botanical genus, namely the potato.

We have experimentally ascertained that neither ducks, geese, turkeys nor barn-door fowls will touch the larva of the Colorado Potato-bug when it is offered to them; and there are numerous authentic cases on record, where persons who have scalded to death quantities of these larvæ, and inhaled the fumes from their bodies, have been taken seriously ill, and even been confined to their beds for many days in consequence. Still, these larvæ are not near so poisonous as the old-fashioned Blister-beetles already referred to as infesting the potato; for these last are, even in small doses, one of the most powerful medicines, and therefore in larger quantities one of the most virulent poisons known to the medical profession.

Foes of the Colorado Potato-bug.

Persons not familiar with the economy of insects are continually broaching the idea that, because the Colorado Potato-bug is in certain

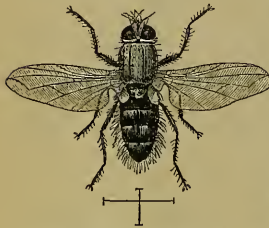
seasons comparatively quite scarce, therefore it is about to disappear and trouble them no more. This is a very fallacious mode of reasoning. There are many insects—for instance, the notorious Army-worm of the North (*Leucania unipuncta*, Haworth)—which only appear in noticeable numbers in particular years, though there are enough of them left over from the crop of every year to keep up the breed for the succeeding year. There are other insects—for instance the Cankerworm (*Anisopteryx vernata*, Peck)—which ordinarily occur in about the same numbers for a series of years, and then, in a particular season and in a particular locality, seem to be all at once swept from off the face of the earth. These phenomena are due to several different causes, but principally to the variation and irregularity in the action of cannibal and parasitic insects. We are apt to forget that the system of Nature is a very complicated one—parasite preying upon parasite, cannibal upon cannibal, parasite upon cannibal, and cannibal upon parasite—till there are often so many links in the chain that an occasional irregularity becomes almost inevitable. Every collector of insects knows, that scarcely a single season elapses in which several insects, that are ordinarily quite rare, are not met with in prodigious abundance; and this remark applies, not only to the plant-feeding species, but also to the cannibals and the parasites. Now, it must be quite evident that if, in a particular season, the enemies of a particular plant-feeder are unusually abundant the plant-feeder will be greatly diminished in numbers, and will not be able to expand to its ordinary proportions until the check that has hitherto controlled it is weakened in force. The same rule will hold with the enemies that prey upon the plant-feeder, and also with the enemies that prey upon those enemies, and so on *ad infinitum*. The real wonder is, not that there should be occasional irregularities in the numbers of particular species of insects from year to year, but that upon the whole the scheme of creation should be so admirably dove-tailed and fitted together, that tens of thousands of distinct species of animals and plants are able permanently to hold their ground, year after year, upon a tract of land no larger than an ordinary State.

To afford some practical idea of the number of enemies that often prey upon a single insect, we will now give a brief account, illustrated by figures, of a few of the various cannibal insects that attack the Colorado Potato-bug, either in the egg, larva or perfect state. The list might be easily swelled to over a score, but to avoid

* See on this subject the *First Annual Report on the Noxious Insects of Illinois*, by Benj. D. Walsh, pp. 29-30, in the *Transactions of the Illinois State Horticultural Society for 1867*.

entering upon a multiplicity of details we shall enumerate only ten distinct species. Hitherto it has been supposed that there was no parasitic insect whatever, that preyed internally upon the larva of this Potato-bug; but we have ourselves bred from these larvæ a parasitic two-winged fly (*Tachina* family, Fig. 35), the peculiar habit

[Fig. 35.]



Colors—Gray, black, and silvery white.

of which is to attach its egg externally to the body of its living victim; which egg subsequently hatches out, burrows into the body of the infested larva, and eventually destroys it, but not until it has gone under ground in the usual manner. The important and extensive family to which this two-winged fly belongs has hitherto been so little attended to by North American Entomologists, that we can not satisfactorily identify it with any of the few described species, and for the same reason we prefer not to name and describe it as a new species.*

In the egg state the Colorado Potato-bug is preyed upon by no less than four distinct species of Ladybirds—the spotted Ladybird (*Hippodamia maculata*, DeGeer, Fig. 36), the nine-

[Fig. 36.]



Colors—Pink and black.

[Fig. 37.]



Colors—Brick red, black and white.

[Fig. 38.]



Colors—Brick red, black and white.

marked Ladybird (*Coccinella 9-notata*, Herbst, Fig. 37), the thirteen-dotted Ladybird (*Hippodamia 13-punctata*, Linn., Fig. 38), and the convergent Ladybird (*Hippodamia convergens*, Guer.) This last species, the three stages of which are represented of the natural size, in Fig. 39 (a the larva, b the pupa, and c the beetle), is rather a rare insect in North Illinois, though

[Fig. 39.]



Colors—(a) blue, orange and black; (b) venetian red and black; (c) orange red, black and white.

* Dr. Wm. LeBaron, of Geneva, Ill., who has made the study of this order a speciality, kindly informs us, that this fly belongs to the genus (or sub-genus) *Lydezza*, Macquart. He says "it is very closely allied to *Tachina* proper, and could properly be united with it, did not the great number of species require a division as a matter of necessity."

it is common enough in South Illinois and Missouri. Its pupa (Fig. 39 b), which is attached to the leaves of the plant upon which the larva has lived, might be readily mistaken for that of the Potato-bug larva. The larvæ of all these Ladybirds are far more bloodthirsty in their habits than the perfect beetles; and as they all have a strong general resemblance, Figs. 39 a and 40 will give a sufficiently good idea of them all. They run with considerable speed, and

[Fig. 40.]



Colors—Black and orange.

may be found in great numbers upon almost all kinds of herbage. The larvæ of certain species that prey upon the Hop Plant-louse in the East are well known to the hop-pickers as "black niggers" or "serpents," and are carefully preserved by them as some of their most efficient friends.

The eggs of Ladybirds greatly resemble those of the Colorado Potato-bug, and are scarcely distinguishable except by their smaller size and by a much smaller number being usually collected together in a single group. As these eggs are often laid in the same situation as those of the potato-feeding insect, care must be taken by persons who undertake to destroy the latter, not to confound those of their best friends with those of their bitterest enemies.

In the larva state the Colorado Potato-bug is extensively depredated on, both in Illinois, Missouri and Iowa, by the Spined Soldier-bug

[Fig. 41.]



Colors—Dull olive with yellow markings.

[Fig. 42.]



Colors—Sober brown and speckled with ochre and yellow.

(*Arma spinosa*, Dallas, Fig. 41 b). Thrusting forwards his long and stout beak, he sticks it into his victim, and in a short time pumps out all the juices of its body and throws away the empty skin. He belongs to a rather extensive group (*Scutellera* family) of the true bugs (*Heteroptera*), distinguishable from all others by the very large scutel, which in this genus is triangular, and covers nearly half his back. Most of the genera belonging to this group are plant-feeders, but there is a sub-group (*Spissirostres*) to which our cannibal friend belongs, characterized by the robustness of their beaks, and all of these, so far as our experience extends, are cannibals. To illustrate to the eye

the difference between the beaks of the cannibal sub-group and the plant-feeding sub-groups of this family, Fig. 41 *a* gives a magnified view of the beak of our insect seen from below, and Fig. 41 *c* a similarly magnified view of that of a plant-feeder belonging to the same family (*Euschistus punctipes*, Say), which is so nearly of the same size, shape and color as our cannibal friend, that at first sight many persons would mistake one for the other. The Spined Soldier-bug, however, may be at once distinguished from all allied bugs, whether plant-feeders or cannibals, by the opaque brown streak at the transparent and glassy tip of its wing-cases.

Two years ago we were informed by our ornithological friend, Dr. Velie, that a good observer in Henry county, Ill., had discovered that the large brown Squash-bug (*Coreus tristis*, DeGeer), depredated extensively upon the larva of the Colorado Potato-bug. We said at the time that this must be a mistake, because not a single species of this group (*Coreus* family) is known to be cannibal. We can now understand how the mistake arose. No less than five persons in South Illinois, to whom we showed a specimen of the Spined Soldier-bug, said at once: "Why, that is nothing but a Squash-bug." And yet in the eyes of an entomologist the Squash-bug looks as different from the Spined Soldier-bug as a cow does from a horse! That our readers may see the wide difference between the two insects, we give by the side of the wood-cut of the Spined Soldier-bug (Fig. 41 *b*) a correct drawing of the Squash-bug (Fig. 42 *a*), and of its beak (Fig. 42 *b*).

The Spined Soldier-bug by no means preys exclusively upon Potato-bugs. We have caught him in the spring of the year sucking the juices of a wild bee (*Andrena*) half an inch long, and carefully holding it out at arm's length all the time, so as to avoid its sting. He also attacks the green larvæ of the native-American Goose-berry Saw-fly (*Pristiphora grossularia*, Walsh), as we learn from a very good observer, Miss Marian Hobart, of Port Byron, Ill. And both Dr. Hull and Mr. Jonathan Huggins saw the little hero with his beak plunged into the body of a full sized Locust (*Cicada*), and draining away its life-blood in spite of all its kickings and strugglings. We are sorry, however, to be obliged to confess that in Mr. Riehl's potato field near Alton, a single individual was seen in June, 1868, bayoneting a poor Nine-marked Ladybird (Fig. 37) with his blood-thirsty beak. Perhaps, however, he was under the circum-

stances excusable; for he and his comrades had almost completely cleared the potatoes of the Colorado gentlemen, and he probably concluded that the services of the Ladybird were no longer required there. The Spined Soldier-bug is very common everywhere in Illinois, Iowa and Missouri, but occurs more frequently on trees than on herbaceous plants. We caught eight or nine of them in about half an hour off Dr. Hull's fruit trees with his Curculio-catcher. Another species of the same genus (*Arma*, near *modesta*, Dallas) inhabits, in the larva and pupa states, the nests of the Fall Web-worm (*Hyphantria textor*, Harris), and slaughters the defenceless inhabitants without mercy. We have bred it from the larva to the perfect state, feeding it upon caterpillars.

Another true Bug, that has been repeatedly seen by Mr. Riehl, of Alton, preying upon the Colorado larva, is the Bordered Soldier-bug

(Fig. 43.) (*Stiretus fimbriatus*, Say, Fig. 43). Unlike the Spined Soldier-bug, this species is so conspicuously and prettily marked that it cannot easily be confounded with any other. We once met with seven or eight individuals in the web-nest of a small social caterpillar, that occurred on a weed; and we have seen it more than once with its beak immersed in the body of the larva of the *Asterias* butterfly. It belongs to the same sub-group, and has the same short, robust beak, as the Spined Soldier-bug; but, unlike that species, it is by no means common.

Another true Bug, still more elegantly marked than the preceding, the Many-banded Robber (*Harpactor cinctus*, Fabr., Fig. 44 *a*), was observed by Dr. Shimer, of Mt. Carroll, Ill., to attack the Colorado larvæ, and we have ourselves found it attacking the same larva in Missouri the present year. Like the Spined Soldier-bug, this species is common, and inhabits trees more commonly than herbaceous plants. But it belongs to an entirely different group of the true Bugs (*Reduvius* family), all of which, without exception, are cannibals, and are characterized by a very short, robust, curved beak (Fig. 44 *b*, profile view, magnified). We have noticed this species to prey upon a great variety of different insects.



Colors—Dark bottle-green and cream-color.



Colors—Yellow, white, and black.

The above three insects are all of them true Bugs, and attack the larvæ of the Colorado Potato-bug with the only offensive weapon that they have—their beak. The four following (Figs. 45 to 48) are all Beetles, and are conse-

[Fig. 45.]



Colors—Dark metallic green with brown legs.

[Fig. 46.]



Colors—Black, with coppery dots.

quently provided with jaws, so that they are able to eat up their victims bodily; and all of them, except the first which is confined to southerly latitudes, are common throughout the Western States. Most, if not all, of them prey indifferently upon the Colorado larva and the perfect insect produced from it; but, as this article has already been extended to an undue length, we shall not dilate upon the habits of each of them, but shall content ourselves with giving figures, by which

[Fig. 47.]



Colors—Black, edged with blue.

[Fig. 48.]



Color—Dull black.

they may for the future be recognized without much difficulty.* There are ten or twelve other Beetles, mostly of small size, which have the same habits as the above; but, as they would not be readily identified from an uncolored drawing, we omit them for the present.

Remedies against the Colorado Potato-bug.

It only remains to say something on the most approved method of fighting the Colorado Potato-bug. A great deal may be effected by raising your potatoes at a point as remote as possible from any ground, where potatoes were raised in the

* Fig. 45 is the Virginian Tiger-beetle (*Tetracha virginica* Hope), Fig. 46 is the Fiery Ground-beetle (*Calosoma calidum*, Fabr.), Fig. 47 is the Elongate Ground-beetle (*Pasimachus elongatus*, Lec.), and Fig. 48 the Murky Ground-beetle (*Harpalus caliginosus*, Say).

preceding year. A great deal may also be accomplished, where there are no other potato patches in the immediate neighborhood, by killing every bug found upon the vines in the spring, as fast as they emerge from the ground. By this means the evil is nipped in the bud, and a pretty effectual stop is put to the further propagation of the insect. But if there are potato patches near by, where no attention is paid to destroying the bugs, the bugs will keep perpetually flying in upon you in spite of all you can do. In such a case the old remedy was hand-picking and shaking the vines into a pan. It costs much less to dust the vines over, when the dew is on them, with White Hellebore powder, which Mr. Graham Lee, of Mercer county, Ills., found to be an effectual remedy, and not to cost over \$2 or \$3 per acre (*Prairie Farmer*, March 14, 1868). This is the article which is sold all over the country under various names, as "Potato-bug Poison," &c. Care, however, should be taken in using it not to allow any of it to get into the eyes or nose, as it is a virulent poison. Perhaps as good a mode as any, where the bugs have not been permitted to get too great a start on the vines, would be to introduce among them a number of the Spined Soldier-bug described and figured above (Fig. 41). By beating forest trees into an inverted umbrella, large numbers of these cannibal bugs may be obtained in a short time, and temporarily deposited in any convenient vessel, along with a quantity of leaves, to prevent them from fighting and destroying one another. It must be recollected, however, that many plant-feeding Bugs, very much resembling our Soldier friend, occur on trees along with him; and that, unless care is taken to discriminate between your friends and your foes, your experience may be as unfortunate as that of the London cockney, who bought a wolf, instead of a sheep-dog, to take care of his sheep.

POSTSCRIPT.

While we were attending the Illinois State Fair at the end of September, 1868, numerous specimens of the true Black Blister-beetle (*Lytta atrata*, Fabr.), which had been captured on the potato not far from Quincy, were handed to us alive by two separate parties. It was, however, stated that they did not occur in such swarms as to do any material damage, though we were told that even at this advanced period in the season, if in sufficiently large numbers, they would greatly injure late, but not early potatoes. Hence it results that the Black Blister-beetle may be added, without fear of contra-

diction, to our list of Potato-bugs, thus swelling the whole number from ten up to eleven. Whenever Blister-beetles of a jet-black color are found eating potato vines in the latter part of August or in September, they probably belong to this species; but whenever such insects occur in July, or early in August, they will in all likelihood be found to be the same Black-rat Blister-beetle which we have illustrated on page 24 of No. 2, Fig. 14 b.

We have heard from so many sources that both the Striped and the Ash-gray Blister-beetles prey not unfrequently upon the larvæ of the Colorado Potato-bug, that the fact may now be considered as indisputable. As authorities for these statements we would quote, among many others, Abel Proctor of Jo Davies county, Ill., and T. D. Plumb of Madison, Wis.

“When dog eats dog, then comes the tug of war;”

when rogues fall out, honest men come by their own. And now that certain potato-bugs have taken to feeding upon other potato bugs, the American farmer may justly lift up his voice and shout for joy.

POPULAR NAMES AND SCIENTIFIC NAMES.

While, to suit the taste of the general reader, we have adopted the plan of always giving the popular name of an insect, as well as the scientific name, we are not insensible to the great uncertainty in the application of the former, especially when unaccompanied by the corresponding

[Fig. 49.]



Color—Livid brown.

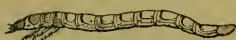
technical term. If, for instance, a person tells us that his garden is ruined by “Wire-worms,” how are we to know whether he means a snake-like kind of thousand-legged worm (class *Myriapoda*), belonging to the genus *Julus* (Fig. 49),

[Fig. 50.]



or the larva of a Click-beetle (*Elatér* family, Fig. 50), such as is represented in Figure 51? For both

[Fig. 51.]



Color—Honey yellow.

these kinds of animals—the second

Color—Pitchy black.

of which is a true insect, while the first is not—are popularly known in America as “Wire-worms.” To give a second example of the wide difference in the meaning of the same popular name: In the United States, a genus

belonging to the class of Spiders (*Arachnida*), with a small oval body and enormously long and slender legs (*Phalangium*), is popularly called “Father Longlegs;” or “Daddy Longlegs;” while everywhere in England the very same name is applied to a genus of large long-legged Gnats (*Tipula*), which are properly called in English “Crane-flies;” but which are sometimes in the United States dubbed “Gallinipers;” and absurdly supposed to have the same power of drawing blood as the common Mosquito.

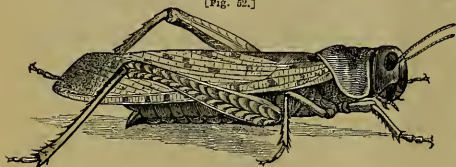
Among animals more highly organized than insects, we meet with the very same uncertainty in the use of popular names. If, for example, a sportsman chooses to tell us that he has shot ten “partridges;” before we can find out what particular bird he has killed, we have to enquire in what State he was raised. If he learned the English language in one of the Northern States, he means that he has killed ten Ruffed Grouse or Pheasants (*Tetrao umbellus*); if in one of the Middle or Western States, he means that he has killed ten Quails (*Ortyx virginiana*). As to the popular term “Gopher,” it is absolutely impossible even to guess, when we hear that a hundred “Gophers” have been trapped on a particular farm, whether the Thirteen-striped Ground-squirrel (*Spermophilus 13-lineatus*), or the Pouched Gopher (*Geomys bursarius*) is referred to; for these two widely distinct animals are both of them, in popular American parlance, called indiscriminately “Gophers.”

The modern fashion of christening every organic being by two different and often very distinct names—the one scientific, the other popular—often leads to such inconveniences and anomalies as these, not only in Zoology, but also in Botany. For example, the Dyer’s Oak of botanists (*Quercus tinctoria*) is popularly called “the Black Oak;” while the true Black Oak of botanists (*Quercus nigra*) is known to woodsmen under the name of “the Black Jack Oak.” Again, two entirely distinct plants (*Lachnanthes tinctoria* and *Ceanothus americanus*) are both called by the English name of “Red-root;” and two quite different trees, the one a true Poplar (*Populus*), the other a Tulip-tree (*Liriodendron*), go by the popular name of Poplar, the one in the East the other in the West; while everywhere in the United States another of the true Poplars is popularly dubbed, not Poplar, but Cottonwood. On the whole, popular names, from the uncertainty and looseness with which they are applied, are a far greater nuisance to the priesthood of science, than the most crabbed and crack-jaw scientific names can possibly be to the laity.

ENTOMOLOGICAL IGNORANCE IN THE NORTH.

The following paragraph, with a few alterations or additions to suit the local market, is now (June, '68) throughout the Northern States going the rounds of the political and of the agricultural press. We propose to show that it contains the very quintessence of ignorance and folly; and that what it asserts to have actually taken place is simply a physical impossibility:

[Fig. 52.]



Colors—Brown and green.

The seventeen year locusts have within a few days past made their appearance on Long Island, N. Y. The trees in the woods at White Park, about a mile west of Jamaica, are being literally covered with them, and more are coming out of the ground. Advices from the east end of Long Island state that there are millions of them in the vicinity of Ratchaven and Faringdale. They devour every thing green that comes in their way, and great fear is entertained that the growing crops will be destroyed.

There is scarcely an entomologist in America that has not at least once, and often for scores of times, busied himself in explaining to the people the wide and fundamental difference between the so-called "Locusts" of the United States and the "True Locusts" of Scripture and

[Fig. 53.]



Colors—Blk, brown and orange.

of modern Europe. The latter (Fig. 52) really do often "devour every green thing upon the face of the earth;" while the former (Fig. 53)* having no jaws at all to eat with, and only a beak (Fig. 53 a) to suck sap with, are physically incapable of eating anything at all. The two kinds of insects do not even belong to the same order, or to the same grand group of orders. The former are "Suckers" (*Haustellata*); the latter are "Biters" (*Mandibulata*). The former belong to the order Homoptera; the latter to the order Orthoptera. The former have their front wings glassy and transparent; the latter have them more or less leathery and opaque. The former have a mere apology for antennæ, which the general observer would entirely overlook; the latter have

*In this figure the left wing is cropped off close to its base, to show the shape of the body.

quite conspicuous and rather long antennæ. In one word, what we call "Locusts" in America are called "Cicalas" or "Cicadas" in Europe; and what in the old world are known as "Locusts" are dubbed "Grasshoppers" in the United States. Yet, in spite of all that we poor despised bughunters can do and say on the subject, the people of America will probably, many of them, persist until the end of time, in believing that a Locust is nothing but a Locust, no matter what the local difference in the meaning of the term may be; and that an (American) Locust without any jaws at all can and often does ravage the vegetable kingdom as terribly as the (European) Locust, that has got good stout serviceable jaws of its own.

Shakspeare has poetically remarked, that "a rose by any other name would smell as sweet;" but there is a great deal more in a name than Shakspeare seems to have imagined. Suppose that roses were popularly called "Skunk-cabbages" in America. What lover would dare to present to his mistress a bouquet composed of flowers bearing such an unsavory appellation? Or what lady, if she had such a bouquet actually presented to her, would trust her nostrils within a foot of it? It is just the same thing with insects. For example: Because the group of bugs, which ancient Scripture and modern European writers call "Locusts," are rechristened as "Grasshoppers" with us, people think comparatively but little about them; although in parts of the wide region of country that intervenes between the Rocky Mountains and the Mississippi river, they have in particular seasons, for instance in 1866-7 and 1867-8, done fully as much damage to the crops as the true "Locusts" of Europe sometimes do in particular regions of the Old World. If, on the other hand, these same bugs were called "Locusts," people would be scared to death when they heard of clouds of them so prodigiously numerous, that they absolutely obscured the light of the sun.

Conversely, because we in America have chosen to call what are properly speaking "Cicadas" or "Cicalas" by the ominous name of "Locusts," people have thoughtlessly jumped to the conclusion, that they must necessarily have the same voracious appetite as the "Locusts," that as Scripture tells us formerly devoured every green thing throughout the land of Egypt. About a hundred years ago Morton in New England described them as "eating up the green things, and making such a constant yelling noise as made the woods ring of them."

And even in these more enlightened modern days, the periodical press, as we saw just now, asserts that they "devour every green thing that comes in their way!!"

In reality, almost the whole amount of damage that our American so-called "Locusts" do to vegetation, is by the females depositing their eggs in a double row in longitudinally arranged holes, which they bore for that very purpose with their long ovipositors (Fig. 53 *b*) in the twigs of various fruit trees and forest trees, as in Fig. 54. Such twigs, in consequence of the mechanical excavation of their substance, very generally die, and eventually break off and fall to the ground. When the trees are of any considerable size, this does not produce any injurious results, and may probably enough in many cases be even beneficial to them by operating after the fashion of a summer pruning. But small trees, of only an inch or two diameter at their butts, are not unfrequently much damaged by losing so many of their twigs through the persevering industry of the female "Locusts" or Cicadas. As to the "growing crops" of anything else but young fruit trees or young forest trees being ever "destroyed" by these insects, that is a pure fiction, due partly to the popular ignorance on the subject of the Natural History of Insects, and partly to the inextricable confusion between our bogus "Locusts" and the true genuine "Locusts" of the Old World.

If the AMERICAN ENTOMOLOGIST did no other good, than merely to disentangle the popular jumble between the bogus Locusts of the United States and the veritable Locusts of the ancient continents, it surely ought to be well worth the subscription price to every one of its readers. Suppose that a hostile army was every year invading a certain district in the Union, sometimes marching against one State, sometimes against another; surely in that case the citizens of every State would be willing to pay one dollar apiece, for the sake of being reliably guaranteed that the invading army would never do them or their neighbors any damage of any consequence. Now, every region in the Union is in certain years—the particular year varying according to the particular region—invaded by prodigious swarms of our so-called "Locusts;" and the popular belief is that these terrible little creatures, whenever they appear, are likely enough to devour bodily all the crops. Surely then every citizen in this whole country can afford to pay a trifle, to have his mind disabused of such ridiculous and unfounded terrors, and to learn that a single swarm of Hæte-

ful Grasshoppers, swooping down from the Rocky Mountains on the wings of the west wind upon the fertile plains of Kansas and Nebraska, and the western parts of Missouri and Iowa, is more to be dreaded by the farmer, than all the "Locusts" or Cicadas that have ever existed in America since the days of Christopher Columbus.

A FRIEND UNMASKED.

BY THE SENIOR EDITOR.

In No. 2 of the AMERICAN ENTOMOLOGIST I took occasion to figure and describe a very interesting larva, which had been found by Mr. E. Leming, in South Illinois, preying in great numbers on the larva of the Curculio. I there stated that I thought that this larva would prove to be that of some species or other of a group of soft-shelled beetles (*Telephorus* family), which is common everywhere in the Northern States. I have since been fortunate enough to breed the larva itself to maturity; and it proves to be the Pennsylvania Soldier-beetle (*Chauliognathus pennsylvanicus*, DeGeer; Fig. 55 *z*), a species belonging to the very same family to which I had supposed that our larva rightfully appertained.



Colors—(a) Rich reddish brown; (i) yellow and black.

That our readers may catch at a glance this good friend of theirs, both in the preparatory larval state and in the perfect beetle state, and thus be prepared to protect and cherish him in whatever dress they may find him, we repeat above the drawing (Fig. 55 *a*) of the larva given in No. 2, page 35. The scientific description of it will be found in the second foot-note appended to that page. Letters *b* to *h* in Fig. 2 show the parts magnified.

The Soldier-beetles (*Telephorus* family) all of them have a strong general resemblance to the Pennsylvania Soldier-beetle, and all of them differ from the great mass of the order of Beetles (*Coleoptera*), with the exception of the Blister-beetles (*Lytta* family), and the Lightning-bugs (*Lampyrus* family), in being of a soft and parchment-like, instead of a hard and shelly consistence. According to LeConte's latest revision, there are 98 species of them found in North America, only 7 of which belong to the same genus as our little hero, the remaining 90 being

distributed among 10 other genera, but being most of them comprehended under the great genus (*Telephorus*), which gives its name to the family. A large species of this latter genus (*T. carolina*, Fabr.) I know to prey in the larva state upon wood-feeding larvæ. The transformations and larval habits of all the other genera are, I believe, unpublished, as indeed were those of the genus to which our Curculio-eating friend belongs, until through the indefatigable exertions of Mr. Leming they are now revealed to the scientific world.

Although there is good reason to think that, in the larva state, all, or almost all, the Soldier-beetles are ferocious cannibals, yet in the perfect state our American species seem to feed almost exclusively on the pollen and honey of flowers. European authors, indeed, of undoubted authority, state that many Transatlantic species feed, in the beetle state, voraciously upon other insects; but, although I was familiar with several kinds of these insects in England, from the time that I was seven years old up to the age of thirty, yet I never saw any such thing myself, either in England or in the United States. Hence, I infer that, with this group of beetles, cannibal propensities form the exception and not the rule; and I am the rather confirmed in this opinion, because the distinguished British entomologist, John Curtis, asserts (*Farm Insects*, p. 46, note) that the Soldier-beetles are preyed upon by several species of Sawflies (*Tenthredo* family)—insects which, in the larva state, are universally vegetable-feeders, and in the fly state almost universally so—whereas, if the Soldier-beetles were normally and habitually insect-eaters in the perfect state, we should rather expect to see a Soldier-beetle devouring a Sawfly than a Sawfly devouring a Soldier-beetle. It may appear strange to some that a group of organisms, which in the larva state feed exclusively upon animal matter, should in the perfect or beetle state feed exclusively, or almost exclusively, upon vegetable substances; but we have many such cases in the little world of Insects. For example, all the known *Ichneumon*-flies are, in the larva state, parasitic in or on the bodies of other insects, or occasionally on those of spiders, &c., while in the fly state they notoriously feed upon nothing but honey and pollen.

The genus of beetles to which our little friend belongs is distinguished at once from all the others comprised in the family, by the lower jaws (*maxills*) being each of them prolonged into a long, slender, extensible tongue, the use of which is evidently to lap up the honey of flowers. Two other genera of Beetles (*Nemognatha* and

Macrosiagon) are remarkable] for the same anomalous peculiarity, and all these three genera are found upon flowers. It is by means of these three genera—all of which belong to different and distinct families, the other genera of which have lower jaws of the ordinary structure—that we may form some faint idea of how Nature slowly and gradually, in the course of indefinite ages, developed a Beetle into a Bee. The fact that the larva of our genus has lower jaws of the structure usually found in the order of Beetles tends, so far as it goes, to confirm the accepted theory that larvæ are less highly developed than their imagos. The Pennsylvania Soldier-beetle usually makes its appearance upon such flowers as golden-rod, thistle, &c., in the months of August, September and October, and is a very common and abundant species in North, and also in South Illinois.

A very closely allied species, the Margined Soldier-beetle (*Ch. marginatus*, Fabr.) swarms everywhere in South Illinois, in June and July, on the flowers of the blackberry, the redroot, &c., but is not met with in the more northerly parts of the State. It might be readily mistaken at first sight for the other one, but is distinguishable by being several sizes smaller, and by usually having its entire wing case, except a very narrow yellow margin all round*, occupied by the black color, which in the other species forms a mere black patch near the tip. The habits of the two are doubtless the same, or nearly the same, in the larva state; and both should therefore be considered as among our best friends. Spare their lives, I beg and pray of you for your own sakes, ye pitiless haters of everything that ye have chosen to label with the three ominous letters—B U G! Ye may not, perhaps, care for Bugs, but I know that ye dearly love peaches.

*Hence comes the specific name, "The Margined Soldier-beetle." The other species was called by the Swedish entomologist, DeGeer, "The Pennsylvania Soldier-beetle," because, although it is common everywhere in the Northern States, his specimens originally came from Pennsylvania. Many other common insects have, for similar reasons, received local names from foreign naturalists.

TIT FOR TAT.

It is a notorious fact with all entomologists, that one grasshopper is capable of producing thousands of eggs, which in turn produce the farmer's scourge—the cut-worm.—*Agricultural Paper*.

It is an equally notorious fact with all stock-raisers, that whenever a cow produces twin calves, one of the calves is a lamb, and the other is a roasted sucking pig.

☞ The article on the 17-year Cicada, which was promised in our last, is deferred, for want of space, till our next issue.

GRASSHOPPERS.

We recently took occasion to state (p. 16), that several species of our common Grasshoppers have been unusually abundant this year in various parts of Illinois, Missouri, and Iowa. We have since received, from a correspondent, the same statement with regard to Kentucky; and the public papers record the same fact with regard to most of the Northwestern States. In common with the Black Crickets (*Acheta abbreviata*, Harris), which have swarmed this year throughout the same region in similar profusion, these insects have done a considerable amount of damage, devouring indiscriminately all kinds of vegetable food; while the crickets, whenever they gained admission into houses, after eating into apples and any other vegetable matter that they found there, often concluded their repast by gnawing holes into boots, shoes, and woolen clothes.

It is very remarkable that in the State of New York, as we learn from our ornithological friend, Dr. Velie of that State, the Grasshoppers, instead of being more numerous than usual, have actually been so scarce in 1868 that it was almost impossible to find a few individuals for fish-bait. The following remarks by Mr. Jas. H. Parsons, of Franklin, N. Y., point in the same direction:

I have not seen half a dozen grasshoppers this season. I have never known a year when hens could not live without feeding, from the middle of July till October, until the present. I have been obliged to feed daily; for there has been nothing of the insect kind for the hens to eat but a few black crickets; and to find them it was necessary for the hens to get into the wake of a horse or a cow, as it was feeding in the pasture. During the months of August and September it is usual to see a great many large brown grasshoppers (*Eliopoda carolina*, Linn.) flying along dusty roads. I have not seen one of this kind this summer.

TO KEEP SEED PEAS FROM BUGS.

A correspondent of the *Rural World* puts them, as soon as dry, in bottles, and corks them perfectly tight. A better way is to grow a second crop of peas in a season from the seed obtained from the first crop, and there will be no buggy peas, no matter where or how kept.

In this paragraph the good is sadly mixed with the bad. The method proposed in the *first* sentence, viz., corking the peas perfectly tight as soon as they are dry, would avail nothing; for the Pea-weevil (*Bruchus pisi*, Linn.) breeds in the pea while it is green, and, passing the winter in the ripened seed, does not leave it till the following spring. Thus it would be like locking the stable door to keep the horse out when he was already in. The advice in the second sentence is good and thorough; for, as the weevil in question is single-brooded, a second crop of peas will be entirely exempt from its attacks.

ELEPHANT BEETLES IN UTAH.

Utah is not only plagued with Locusts, but with an insect called the "Elephant Beetle." A credible person, who returned from the neighborhood of Salt Lake recently, saw myriads of them covering the earth with their shining brownish-black bodies, and destroying everything which they met in their path. Even small animals, he was informed by the ill-fated residents, did not escape the voracity of these hordes. Their bodies were crowded upon, and worried, and wounded cruelly by the powerful antennae (???) until they fell down exhausted by their struggles and loss of blood, when they were fastened upon by thousands and devoured. The entire carcass of a sheep was eaten, and the bones picked clean, in 2-4 minutes, and it is said that a dead ox would be gobbled up by them in a quarter of an hour. So ferocious are these giant beetles that mothers are afraid to let their little children go out of the house unattended by a grown person. In their frequent bloody contests, the wounded are devoured on the instant.—*N. Y. Tribune*, Oct. 6, '68.

[We should like much to receive specimens of this miraculous beetle from the land of the Saints.—Eds.] *Anabus?*

THE RAVAGES OF INSECTS.

[From the Proceedings of the American Institute Farmers' Club, *New York Tribune*, Aug. 25, 1868.]

We may say positively that destructive insects are increasing every year, and that they destroy as great an amount of food as is saved. To meet these scourges will require our best efforts. The science of Entomology, by which insects are classified and their nature studied, is becoming of national importance, and we are sure that without its help little will be done. The first step in every pursuit is analysis, by which we separate a whole into parts, upon each of which attention is to be fixed. Here progress commences. One of the first results in this study is to make distinction between insects which are useful and injurious, for unless this be done one will be as likely to destroy his friends as his enemies. At present this study is so far from being popular, that the greater part of educated men, so-called, are as ignorant as the unlettered. It is manifest that the elements of this science should be taught in our common schools, if it is to become of much use; for the transmission of learning directly from the learned few to the common people, without the intervention of a teacher, is impossible. In fitting teachers for their duties, a knowledge of this science should be included among their qualifications, as much as of arithmetic or grammar. At present, however, we have no colleges where studies of this practical nature are pursued, except incidentally; but when the agricultural universities shall be fairly established, we may expect that the need indicated will be fairly supplied.—*N. C. Meeker*.

ENTOMOLOGICAL ITEMS.

[From a Letter to the Senior Editor from Isaac Hicks, of North Hempstead, L. I., N. Y.]

I have not seen a nest of the Tent Caterpillar (*Clisiocampa americana*) this year, and only one or two egg nests; at which we all rejoice greatly. But the Apple-maggot (*Trypeta pomonella*), the Codling Moth (*Carpocapsa pomonella*), and the Curculio, are as abundant as ever. In your recent article, "Birds vs. Insects," in the *Prairie Farmer*, you expressed the opinion that the Oriole, which I had seen last year destroying hundreds of Tent Caterpillars, by picking something out of their bellies, was simply picking the smooth, fat, white *Ichneumon* larvæ out of these hairy fellows; and that, consequently, as he was destroying the enemy of our enemy, he was doing harm instead of good. I have no doubt now that he was really eating the parasites in the Tent Caterpillars. My brother tells me that the Oriole is the worst enemy that he has in his vineyard—not, like the Catbird, eating a whole grape and flying off as soon as he has satiated his appetite, but slyly pecking holes in a large number of grapes, and spoiling both the appearance and the sale of the fruit.

We planted some dozen kinds of potatoes this year, the Early Rose among them, and we found that the Early Goodrich were nearly eaten up by the Three-lined Leaf-beetle, which is so common here [see AMER. ENTOMOLOGIST, I. p. 26], while the other varieties were scarcely hurt by it. In consequence of the vines of the Early Goodrich being so badly eaten, this variety was not as good as formerly, and its value was greatly impaired. Other men that grew the Goodrich noticed the same thing. It is curious that this kind should swarm with the Beetles, while the other kinds were nearly exempt.

The Apple-maggot (*Trypeta pomonella*, Walsh) prevails with us in certain kinds of apples only. Jersey Sweet and Porter are their favorites; Gravenstein and Fall Pippin are so far exempt. In one of our orchards the hogs run, and the fruit is but little infested; the other one, where no hogs are allowed to run, is full of Apple-worms, Apple-maggots, &c.

As some of our exchanges may wish to illustrate any article they may copy from the AMERICAN ENTOMOLOGIST, we have decided to furnish electrotypes of our wood cuts, at one half the cost of engraving.

The Ants ascend the trees simply in order to milk their cows, the Plant-lice (*Aphis*).—*Linnaeus*.

MIND HOW YOU PACK INSECTS.

Irreparable damage is sometimes done by carelessness in handling, packing or otherwise disposing of noxious insects. There is an owl moth (*Hypogymna dispar*) common on the continent of Europe, the larvæ of which in particular years, for example in 1731 and in 1826, swarmed there so prodigiously as to strip almost entirely bare both fruit trees and forest trees, especially the oak. A Massachusetts entomologist, Mr. Trouvelot, recently procured some of the eggs of this moth from Europe, for the purpose of studying the natural history of the insect in all its stages; and having accidentally allowed some of the winged moths to escape from him, he has thus introduced this most pernicious pest into New England, where it is spreading rapidly, and whence it will no doubt gradually make its way into all the more northerly States of the Union. We find it stated that specimens of the Colorado Potato-bug were recently received by mail, at the office of the *American Agriculturist*, in New York, packed in a very insecure manner. Had but a single impregnated female contrived to escape from such a package, it might have been the means of prematurely introducing this mischievous pest into the State of New York. We have ourselves received by Express several scores of the living females of the Canker-worm moth, packed in a quinine bottle, without any external wrapper whatever. Had the Express Agent accidentally broken the bottle on the road, the moths would in all probability have escaped, and might likely enough have introduced the breed into somebody's orchard where they had previously been entirely unknown. We repeat, therefore, to all our readers, "mind how you pack insects."

THE APPLE GROWING ON A GRAPE VINE.

The "vegetable phenomenon" in the shape of an apple growing on a grape vine, in the garden of Capt. D. E. Moore, of Lexington, Va., and which excited the curiosity of the *savans* in that vicinity, turns out to be the very thing which we surmised it would, namely, a *Cecidomyidous* gall. (See p. 28 of No. 2.)

Mr. Jacob Fuller, of Lexington, Va., in a communication to the *Southern Planter and Farmer* for October, demonstrates that it is too high on the cane, and on the wrong side of the stem for fruit; and, after being taken from the vine, it proved to be no fruit at all, but only a *woody eversion*, which upon dissection, was found to contain orange maggots.

This gall has never been described, and, as we intimated in our last, we shall soon take occasion to figure it.

THE LATE EXHIBITION OF USEFUL AND DESTRUCTIVE INSECTS AT PARIS.

An association under the name of the "*Société d'Insectologie Agricole*," was established in Paris in 1867, for the special study of those branches of entomology which are of practical importance to the agricultural and industrial portions of the community. Its affairs are conducted by a committee of thirteen, with the usual officers, and all persons desirous of joining, are eligible for membership without distinction of nationality or residence.

The Society held an exhibition in 1867, and a second one in August of the present year. From an account published in the *Journal d'Agriculture Pratique*, of Paris, and from a communication received on the subject from Mr. Chas. Dadant, of Hamilton, Ills., we learn that this last exhibition far excelled the first. The very existence of a society of this kind, shows how thoroughly the French people are alive to the great importance of the insect question; and it is to be hoped that the day is not far distant when we shall have a similar organization in this country. By association and by combination, we can always accomplish more than by individual effort.

That our readers may get some idea of the character of this exhibition, we make the following extract from a report published by Mr. R. T. Lewis, in the October number of *Hardwicke's* (London) *Science Gossip*:

"The second division of the exhibition (*insectes nuisibles*) was subdivided into ten classes, in which the insects were arranged according to their habits, instead of in the scientific order of their genera; a plan admirably designed for practically useful purposes. Here, at a glance, a person interested in the cultivation of a particular plant might see specimens of every insect known to attack it, and not only were they shown in their perfect form and of both sexes, but also in the larva and the pupa states, with specimens of their eggs, and of dried portions of plants which had suffered from them. To each series labels were affixed, upon which were written the names of the insects, in Latin and in French, with brief notices of their ravages, and in some instances also the means of their extermination. One exhibitor in this department showed a collection so remarkable for its completeness and the care bestowed upon it that I cannot pass it by without a special reference; it consisted, in all, of eighteen glass-covered trays, the first five of which contained the destroyers of various kinds of fruit, arranged

as described above. In the next three were those injurious to potherbs and edible fungi, and in the three following were ravagers of meadow and field produce, and of the leaves of forest trees. Two more were filled with insects which make havoc in different kinds of dry or growing timber, and another contained such as trouble animals and men. Those persons who are interested in the mosquito question may, perhaps, be glad to know that of the two species shown here, one was the common *Culex pipiens*, the other, a somewhat larger insect, being designated *Culex maculipennis*. For the destruction of hurtful insects an extraordinary number of devices were exhibited; such as bottles, fly-papers, poisons, and insecticide powders, together with a variety of apparatus for their effectual application.

"In the third division (*Insectivora*) there was an excellent collection of stuffed birds, with their nests and eggs, and many contrivances for the fostering and preservation of their young. The value to the agriculturist of these feathered allies, especially in a country teeming with insect life, was demonstrated by carefully tabulated statements, and by the exhibition of upwards of 300 glass tubes, each of which contained the *debris* of cockchafer and other destructive insects taken from the creeps of little birds. In the same class were also a number of live tortoises, lizards, and other insect-feeders, as well as of ichneumons, and such insects as prey upon their fellows."

DESTROYING BLACK ANTS IN GARDENS.

Mr. W. S. Patten, of Providence, R. I., writes:

I should be willing to pay a good many years subscription to your paper if it would tell me how to exterminate *black ants* from my garden, without destroying the shrubs, box edging, etc., under which they burrow. I have waged a ten years' unsuccessful war against them.

There are but two methods which we can advise: the one is to pour copiously *hot* water down their burrows and over their hills; the other, to entrap them by narrow sheets of stiff paper or strips of board, covered with some sweet, sticky substance. In the first operation the water should be hot, well nigh to the boiling point, and often applied. In the latter the refuse skinmings of sorghum would be found effectual and economical. The ants are attracted to these strips by their fondness for sweets, and sticking fast, can be destroyed whenever a sufficient number are entrapped.

☞ If God takes pains to create an insect, man may take pains to study it, without lowering his dignity.

ENTOMOLOGICAL QUACKERY.

We clip the following paragraph from the *Iowa Homestead* of July 22, 1868:

THE CURCULIO.—A correspondent of the *Canada Farmer* writing from Sarnia, says that he saved his plums from the curculio in the following manner: He put woolen rags around the base of the trunks of his trees, having first steeped them in tanner's oil, renewing the application of oil after every heavy shower. He put chloride of lime in a saucer in the fork of the tree. He spread white cloths on the ground under the trees, poured sulphuric acid on the lime, and the fumes brought down all insects from the trees. He also tried jarring the trees, and by these means he succeeded in raising a large crop of plums.

This reminds us of a letter to a noted quack which we once came across, and which read as follows:—"Dr. CUREALL, Dear Sir, I had a pain in my stomach yesterday; so first of all I took a dose of your never-failing electric oil; then I tried a dose of Dr. Humbug's infallible elixir of lime; and lastly I swallowed a dose of cold-drawn castor oil. In three hours' time my stomach was all right again. Please let me know whether it was the electric oil, or the elixir of lime, or the castor oil that cured me. Yours truly, SAMUEL SIMPLETON."

We incline to believe that it was the "jarring the trees" that saved the plums; and that the "tanner's oil" and the "chloride of lime" might just as well have been daubed on to the roof of the house, for any effect that they had towards keeping off the curculio. Will people never find out that curculios can fly, and that attempting to head them off from crawling up the trunks of plum trees by oily bandages is all a matter of moonshine!

THE CRUEL BUGHUNTERS.

Entomologists are often accused of cruelty, for sticking a pin through a living insect, and allowing the insect to remain impaled alive till they are ready to dispose of it. "See how it struggles!" some humane person exclaims, who has just been swallowing a few dozen raw oysters in the agonies of death; "what dreadful tortures it must endure!"

In reality, however, it is the confinement, and not the wound made by the pin, that the insect objects to. You may take any night-flying moth, and slyly transfix it by a pin to the object on which it is sitting in the daytime. It will neither flutter nor struggle. Now watch it as evening approaches. It begins to struggle most violently, and most persons would believe it to be in extreme agony. The truth of the matter, however, is that it now wants to be flying abroad, and is fluttering to get free from the pin. If it is the pin that is hurting it, why did

it not flutter by daylight, when the pin was first stuck into its body?

The British entomologist, Stephens, tells a story of a dragon-fly that he once caught, which upon his directing its tail to its mouth by way of experiment, actually bit off and ate four joints of its own abdomen, and then having accidentally escaped from him, flew away as briskly as ever. Many such facts as these are known to every field entomologist, and they are utterly inconsistent with the hypothesis that insects have any nervous system, susceptible of the feelings of pain and pleasure, such as man and the other higher animals are provided with.

HONEY BEES EATING GRAPES.

It will have been observed that we adduced satisfactory evidence in our last number (p. 33), that the Honey-bees habitually gnaw holes into peaches and quinces. The following letter, which we copy from the *Ohio Farmer*, seems to prove that they also destroy grapes. We are sorry to impeach the character of an insect whose reputation for honesty and industry has been blazoned forth, from the days of Solomon to those of Dr. Watts; but truth is truth, and must not be smothered up:

I have been much annoyed this fall by the Honey-bees taking my grapes. They commenced about two weeks ago on my Concord, and to save them from complete destruction I was obliged to pick before fully ripe. When the injury was first discovered, I thought the robins and blue jays were the guilty parties, but have since learned that we had a worse foe than the birds to deal with. The bees will puncture the skin of the grape and extract the sugar, when the fruit immediately shrinks up, and soon rots unless used at once. My Dianas, Israelias, Delawares, and Rogers' Hybrids have suffered the most; the Ionas and Catawbas, being later, are not much disturbed yet, although I have noticed several places where the bees are at work on them. I think, without doubt, they have destroyed one bushel of Dianas, that grew upon three thrifty vines, and probably as many Delawares. Several of my neighbors have suffered in the same way. I would like to hear from those more extensively engaged in grape culture, as this is the first time I ever heard of bees taking grapes.

Respectfully yours,
Richmond, Ind., Sept. 12th, 1868.

T. W.

☞ We shall feel much obliged to our subscribers, if, when sending their own or the names of others, they will mention what numbers have already been received. Our forms were not stereotyped, and we supposed we had printed a sufficiently large edition of our first issue to enable us to send back numbers, for at least a year to come, to all subscribers who should want them. The demand, however, has been beyond our highest expectations, and we find it necessary to be sparing. In ordering the *ENTOMOLOGIST*, therefore, please state whether or not back numbers have already been received.

ANSWERS TO CORRESPONDENTS.

Twigs amputated by some unknown animal.—*Geo. Burnside, South Pass, Ill.*—It is a perfect mystery to us what animal has girdled the twigs which you send, so for what they break entirely off and fall to the ground, or for what purpose it should operate in this singular manner. We had heard a good deal from various fruit-growers in the South about twigs being amputated in this way, and had always hitherto supposed it was done by some larva allied to the well-known Oak-pruner, (*Elaphidion putator*, Peck), which cuts off the twig in which it resides below the part which it inhabits, and thereby falls eventually, twig and all, to the ground, like the Irishman that sawed off close to the trunk the limb on which he was sitting. But your twigs are evidently, as you remark, girdled from the outside, and not cut off inside the bark, which is the manner in which the Oak-pruner operates. And besides, one of the two twigs sent manifestly grew above the point where the girdling took place, and yet it contains no larva and no borings, as it ought to do on the Oak-pruner theory. In numerous apple-twigs, cut off in the same manner as your specimens, which we ourselves saw at South Pass, there is an egg every here and there inserted under the bark in every amputated portion. Hence it would seem that some insect first deposits its egg in the twig and then cuts it off. It would be very desirable to detect the culprit in the act of girdling the twig, and if it really is an insect, to forward it for our inspection. If really an insect, it is not improbably some kind of large beetle, and in that event we can only guess that it amputates the twig, in order to afford a more suitable hatching place for its eggs. But guessing is not knowing, and faith is not science. Apple twigs, apparently amputated upon the same principle as your hickory twigs, were sent to us two years ago from the State of Mississippi, by M. W. Philips.

Twigs girdled by some animal.—*Judge Brown, Villa Ridge, Ill.*—The pear twigs you send, which have been amputated by some animal or other, and most probably by some insect, are similar to the hickory twig sent by Mr. Burnside and noticed in the preceding answer. You say that you have noticed much larger branches on the persimmon tree amputated in the same manner, and that you have supposed that this was done by the opossum, in order to get at the fruit, of which it is very fond. (In almost all the specimens, of which we have examined great numbers, whether on the pear, hickory, or persimmon, we find on the amputated portion one or more whitish eggs, about 0.10 inch long, of an oval shape, and about $\frac{3}{4}$ times as long as wide, imbedded between the bark and the wood. Usually these eggs are inserted close to a bud, and on some specimens almost every bud for a considerable length is thus furnished. On the other hand, on the portion of the twig that remains on the tree, we find no such eggs. Hence we infer that, whether the work be done on the persimmon, the hickory, or the pear, it is in every case done by some large insect, and that the object of that insect in amputating the twig or branch containing its eggs is to keep them moist through the winter, by causing the twig that contains them to lie on the ground. We expect to hatch out some of the eggs next spring, when we shall be able to speak more positively as to the species that performs this extraordinary work. The eggs themselves have the character of those of certain *Cutepids* (genus *Orchelimum*), some of which we know to be deposited in the autumn, by the mother insect, in the stems of woody weeds. But the character of the amputation is rather such as we should expect from some large beetle.)

Parker Earle, South Pass, Ill.—Your pear twigs are amputated by the same insect as are those sent by Mr. Burnside, and by Judge Brown.

Hop-vine Caterpillar.—*H. J. Dunlap, Champagn, Ills.*—The worms which you send, and which are eating the foliage of the hop-vines, are the larvae of the Semicolon butterfly. It is spoken of under the head of "Insect foes of the Hop-vine," in answer to Mrs. H. C. Freeman, in number 2 of this journal, page 39.

"Galls" on leaves of Soft Maple.—*Dr. A. L. Child, Glendale, Cass Co., Neb.*—The roundish, peduncled, wart-like, green excrescences, mostly on the upper surface of the leaf of the soft maple, and the largest of them only 0.15 inch long, are galls produced by a minute and almost microscopic species of Mite, (*Acarus* family). There is a much more elongate, but otherwise very similar gall, that is commonly found on the leaf of the sugar maple, and is generated by a distinct species of mite. To the former gall we have given the manuscript name of Maple Pouch (*Aceris loculus*); to the latter that of Maple Purse (*Aceris crumena*). A very similar one growing on the leaf of the Wild Plum has been illustrated and described by the senior editor of this journal, in his *First Annual Report* (p. 43). If you open your maple gall about the end of July or the fore part of August, and examine it under a high magnifying power, you will find in it scores of minute, whitish, or pale-rosy young Mites, very dull and sluggish in their movements when small, but always of an oblong-oval shape, and with three pairs of legs on the fore part of their body, and one pair widely removed from the others and placed on the hind part of their body. It is by this characteristic arrangement of the hind pair of legs, that the larvae of Mites—no matter whether they have eight legs, or whether, as is sometimes the case, they have only six legs—may be always distinguished at once from the larvæ of Barklice and Plantlice; which otherwise often resemble them very closely.

All these leaf-galls originated by Mites, are formed by the mother Mite stationing herself early in the season on one surface of the leaf, and gradually irritating with her mouth the vegetable matter beneath her, until it swells out and develops into a hollow gall on the opposite side of the leaf, inside which gall the Mite finds herself eventually enveloped, as if in a bag with the bag's mouth loosely closed. She then, after laying a sufficient number of eggs, from which the young mites subsequently to be found in the gall take their origin, either wanders away through the half-open mouth of the bag to found new galls, or perishes of old age where she has laid her eggs. The rough and often woolly scar, where these white galls have originated, may always be plainly seen on the opposite side of the leaf to that from which the gall itself projects. The subject is a very curious one, but has hitherto been illustrated by no other North American entomologists; and but for the fact of our having ourselves paid particular attention to it, we could not solve the enigma.

Unsightly galls on the Cottonwood.—*Dr. A. L. Child, Glendale, Neb.*—The large scraggy coxcomb-like galls on your cottonwood trees which have so increased of late years, that the trees begin to languish and die from their influence, and which remain on the trees as unsightly black objects during the winter, may be known as the Vagabond gall, and they are produced by a plant-louse belonging to the genus *Pemphigus*, and which has been described as *Pemphigus (Hyrocrypta) vagabondus* by the senior editor of this paper. The imperfectly globular gall at the junction of the leaf with its stem, is the Poplar-stem gall. It is caused by a louse (*Pemphigus populicaulis*, Fitch), belonging to the same genus, and of much the same appearance as the former. The best mode of ridding your trees of these galls is to pluck and burn them upon their first appearance in the summer.

Insects named.—*E. Baxter, Navoo, Ill.*—What you call a "green cicada" is the Slender meadow Katydid (*Orchelimum gracile*, Harris), and the strange snake-like animal which came out of its abdomen is the common Horse-hair or Hair-snake (*Gordius aquaticus*). This Hair-snake has nothing whatever to do with the true Snakes, which are Back-bone Animals (*Vertebrata*), but belong to the Intestinal Worms (*Entozoa*) which are Ringed Animals (*Articulata*). It breeds within the bodies of many other ORTHOPTEROUS insects, and we have often obtained it from different species of grasshoppers. The "new bug found on the grape vine" is the Indian Cetonina (*Cetonina Inda*, Harris). It is found, at the present time of year, on a number of plants, and is quite partial to sweet fruits. Dr. Warder mentions it as being very destructive to the peach in Ohio.

The Stick-bug.—*Edw. F. Welch, Janesville, Wis.*—The long-bodied, long-legged, slender, slow-moving, greenish-brown insects, about three inches in length, exclusive of their long, slender legs, which measure each of them nearly as many inches more, are the common *Stick-bug* (*Spectrum femoratum*, Say). This is the best and most appropriate English name for them; for they have the remarkable habit of stretching forward their two front legs and their two antennæ, in such a manner that the four form apparently but a single elongate limb projecting from the forepart of their bodies, and the whole insect, which remains all the while perfectly motionless, looks exactly like a dead stick growing from the tree on which the creature happens to be living. There are, however, a variety of other local names for them: 1st, Prairie Alligators; 2nd, Devil's Horses; 3rd, Devil's Darning-needles; and, 4th, Wood Horses. The first of these four names is very inappropriate, because their home is, not the prairie but the woods. The second is more properly given to the Rear-horse, or Camel-cricket (*Mantis carolina*, Linn.), found so abundantly in South Illinois, Missouri, and other southern regions, and which is a beast of prey peculiar to the South, while our *Stick-bug* is common everywhere in the Western States, and is not a cannibal but a leaf-eater. The third name is more peculiarly appropriated by the little Dragon-flies or Mosquito-hawks, with bodies only the size of a stout pin, and often colored with the most brilliant ultramarine blue (*Agriion* family), that flit slyly among aquatic herbage in search of the various small flies and gnats upon which they prey. The fourth name, "Wood-horse," is only objectionable, because it might be just as appropriately given to dozens of other large insects that are exclusively found in the woods—the common *Catydid*, for example. As to the habits of the "*Stick-bug*," we have already said that he is a vegetable-feeder, and, therefore, to a certain extent injurious, by devouring the leaves of the trees and shrubs which he inhabits; still, as he never occurs in any considerable numbers, and as all perennial plants are benefited by a little judicious summer-pruning, we are loth to set down the poor "*Stick-bug*" as a foe, to be pitilessly exterminated, and, if he is not to be treated as a friend, would prefer to classify him as a neutral. Entomologically speaking, he is of peculiar interest, because he is one of the very few true Insects which never acquire wings, or even the merest rudiments of wings. Thousands upon thousands of them have passed through our hands in the course of eleven years' experience in collecting insects; and, although we always ruthlessly destroy every *Cucumber-bug*, *Chinch-bug*, and *Rose-bug* that lies in our way, never yet did we wantonly maim or kill this interesting and anomalous little creature. As to the popular superstition that he is poisonous, and can sting like a rattle-snake, that is simply a vulgar error. He cannot even bite; or, at all events, out of the thousands that we have handled with our naked fingers, not one even attempted to bite us. Of course, if they had been really poisonous, as is commonly believed, we should have been in our graves long ago. The sexes of this insect differ so widely, that at first sight they might be readily mistaken for distinct species. The female—to which sex all the specimens sent by you belong—is of a dull brown color when mature, though when immature and young she is grass-green, and on her tail she has only two small conical inconspicuous appendages. The mature male, on the other hand, has at the tip of his tail a very conspicuous, horizontally-working, curved forceps, which is used to embrace the abdomen of the female during copulation; and moreover his general color is a shining, pale olive-green, instead of an opaque dull brown color. When very young, however, as is generally the case among insects, the males are indistinguishable in color from the females.

Woolly lice on the Beech.—*F. H. Guivits, Clinton, Mich.*—The curious woolly lice which are infesting the terminal twigs of the beech, and which, as you remark "have a strange habit of continually wagging their tails up and down" while in the wingless state, belong to the genus *Templiquus*. This species was very briefly and imperfectly described in 1851 by Dr. Fitch, as the Beech-tree Blight (*Eriosoma imbricator*). It occurs both on the twigs and leaves of the Beech-tree.

The Sheep-bot or Head-maggot.—*Rob. W. Scott, Frankfort, Ky.*—You send us papers, in which, as you remark, "the opinion is expressed by a veteran observer, that the Sheep-bot (*Extrus ovis*, Linn.) produces its young alive;" and, thinking that this is not the normal habit of the insect, you ask our opinion on the subject. European entomologists, including Kollar, who wrote specially upon injurious insects, assert positively that the female Sheep-botfly "lays her eggs in the nostrils of the sheep, whence the larvæ creep up into the frontal sinus." (Kollar, p. 62.) On the other hand, we have been personally assured by Mr. Dan Kelly, of Wheaton, DuPage co., Ills., that he reared these flies from the grub under a tumbler, and that, when opened, the fly had, not eggs, but living larvæ in her body. Moreover, Mr. Cokerill, in the very excellent article on wool-growing, which you have cut out for us from the *Dicis Farmer*, asserts that he "has opened these flies, when after the sheep, and found over 300 live, moving worms in ONE of them." And we have also been assured by several intelligent sheep-growers in the West, that all the female flies that they had examined contained not eggs, but living larvæ. We think that these apparently contradictory statements may be easily reconciled. Many flesh-flies, or blow-flies, as they are commonly called, if they can not find any suitable meat or carrion of any kind to lay their eggs on, retain those eggs so long in their bodies that they actually hatch them out into living larvæ, as we have ourselves repeatedly remarked. Yet the normal habit of these same flies is to lay eggs. In the same way we conceive that the normal habit of the Sheep-botfly is to lay eggs, and that it is only when she can not find any sheep at all to prey on, or when by any means she is prevented from reaching their nostrils, or when she is confined in a close vessel for an undue time—as was probably the case in Mr. Kelly's experiments—that the eggs hatch out prematurely inside her body, and are sometimes deposited afterwards in the form of living larvæ, or maggots, in the nostrils of any unfortunate sheep that she can come across.

Leaf-miners of the Locust.—*Robt. W. Scott, Frankfort, Ky.*—The tawny orange beetles, about a quarter of an inch long, with dark heads and a broad black stripe along the hinder part of their bodies above, while below they are of a uniform black color, are the *Locust Hispa* or *Leaf-mining Beetle* (*Hispa scutellaris* Oliv., mistaken by Harris for the *Hispa eutawalis* of Fabr.). In the larva state, as was first observed by Dr. Harris, these insects burrow in the leaves of the locust, making their appearance, as he tells us, in the latitude of Massachusetts in July, and transforming to beetles in August. With you the period would probably be somewhat earlier, and it is not at all improbable that, as in the case of other insects, for example the *Poplar Spinner*, (*Clostera Americana*, Harris), you may have two successive broods of them every year down South, while in more northerly regions there is but a single brood. You say that these beetles have eaten the leaves of the black locust in your section so severely as to kill the trees in some cases, and generally to injure their growth and appearance; and you add that "they seem this year to have increased greatly." In all probability, although no doubt the beetles feed to a considerable extent upon locust leaves, yet the principal damage done in your vicinity to the foliage of the locust was through the minings of their insidious little larvæ in the pulpy internal substance of the locust leaf. These larvæ are described as being whitish grubs, with their front end dark-colored, and with six legs in front; the entire body being somewhat flattened to adapt them to the singular place which they are to fill in nature. We can suggest no remedy for the depredations of this insect, other than beating the beetles off the trees and killing them.

Leaf-hoppers on Celery.—*Rich. Parnell, Queens Co., N. Y.*—There are two distinct species belonging to two distinct genera, mixed up together in the lot of Leaf-hoppers which you send as infesting early celery. Of one species you send four specimens, and of the other three; and you may readily distinguish the two by the very different markings of the head. Both, so far as we are aware, are undescribed; as indeed are a great many other small species belonging to this group, (*Tettigonia* family, order *Homoptera*).

Parsnip Caterpillars—Scorpions—*F. Brewer, Waynesville, Mo.*—The green black and yellow caterpillars found on your parsnip plants, are the larvæ of our common black Swallow-tail butterfly (*Papilio Asterias*, Cramer). They occur on the parsnip and carrot, as well as on other umbellate plants, but seldom become sufficiently numerous to get beyond our control. The butterflies are fond of hovering over and obtaining honey from the flowers of the Ptilox, and in extricating their tongues, they generally pull off the petal and thus mar their beauty. The "crablike looking fellows" that were "under a stone on a high dry hill" are true scorpions. The species is the *Buthus carolinianus* of Beauvois, and you will find an account of it by Dr. G. Linecunn, accompanied with a figure, on page 203 of the first volume of the AMERICAN NATURALIST. It is described as a Texan species, but besides the four you have sent, we have ourselves obtained two, the past summer, from the Iron Mountain region in Missouri. We were not a little surprised on opening the box to find four of these "crablike looking fellows" alive and coolly twisting their armed tails about, and it required some steadiness of nerve to capture them without getting stung. Their sting, however, is not so venomous as that of certain tropical species, being scarcely so bad as the sting of a bee.

Noxious Insects named.—*James H. Parsons, Franklin, N. Y.*—1st. The web-spinning caterpillars that make their appearance on apple trees in midsummer and remain till frost, and which as you say are so numerous with you this year that almost every apple tree contains half a dozen of their nests, must be the common Fall Webworm (*Hyphantria testor*, Harris). It occurs also on various forest-trees, and especially on the Pignut Hickory. Its moth is of a milk-white color, while that of the common Tent Caterpillar is brownish ochre-yellow. 2d. The other worm infesting apple-trees, with a red head and a red hump on its back, must be the Red-humped Prominent (*Notodontia concinna*, Sm. Abb.). 3d. The white hairy caterpillar on the same tree is probably the common Woolly Bear (*Arctia virginica*, Fabr.) which we have observed to swarm occasionally on the apple. 4th. The large worm in the core of your apples must be the common Apple Worm or Codling Moth Worm (*Carpocapsa pomonella*, L.). 5th. The small worm which "lives in the pulp of the apple, makes long winding roads through it, and appears to come out through the skin," is in all probability the Apple-maggot (*Trypetis pomonella*, Walsh) which is such a pest in the Hudson River country and in New England. Hence this pernicious insect appears to be gradually working its way westward.

Cut-worms destroying recently sown Wheat.—*T. R. Allen, Alenton, Mo.*—The dingy brown worms, with a conspicuous yellowish gray band along their sides, came safely to hand. They are a species of cut-worm; but though we have descriptions of at least a dozen worms of this class, and have bred many to the moth state, yet these which you send differ from them all. They are in all probability the larvæ of some owl moth or other (Family *Noctuidæ*), but the species can not be determined until we breed them. You say that they are destroying the wheat recently sown on oats stubble, both in your own vicinity and in Franklin county, and that they do not seem to attack any but that which is sown on oats stubble. We can give no reason for this singular partiality, but if it proves to be general, it may serve you as a weapon against this enemy, for you will be able to evade it by not planting on oats stubble. In the present state of things, lime or salt sown on the land would be apt to check them.

The Spined Soldier Eng.—*Isaac Hicks, Long Island, N. Y.*—The insect that was attacking the Fall Webworm, (*Hyphantria testor*, Harris) on one of your apple trees, was the same Spined Soldier Eng. illustrated by figure 41 in this number of the A. E. It was, however, not in the perfect winged state, when you saw it attack the worm, but in the pupa state. By the time it had reached us it had moulted into the perfect state, and by its side there lay the cast skin or shell of the pupa. The worm that you had so providently supplied it with, by way of provision on the long journey, was dead and sucked as dry as a chip by the beak of the ferocious cannibal.

The Preying Mantis, alias Devil's Riding Horse, etc.—*Amelie Pettit, Jefferson City, Mo.*—The insect, which "the children call Devil's riding-horse," and which you would like to know the scientific name of, is the *Mantis Carolina*, of Linnæus. Its food consists mainly of flies, though it is a most voracious animal and will devour its own kind as well as any other living insect that comes within its grasp. It disdains all dead food, and never makes chase for the living, but warily, patiently, and motionless, it watches till its victim is within the reach of its fore-arms, and then clutches it with a sudden and rapid motion. Its appearance is really formidable, and its attitude while watching for its prey, quite menacous, and on this account it is held in very general and superstitious dread. It is, however, utterly incapable of harming any one; and, as one of our best friends, should be cherished and protected. The female attaches her eggs, in a solid compact mass, to the twigs of trees. This egg-mass is deposited whole, and the operation of depositing requires well nigh an hour. Though soft at first, the mass soon hardens, and is readily transferred and introduced into our gardens.

The Pigeon Tremex—*F. Brewer, Waynesville, Mo.*—The two four-winged flies, each measuring about one and a half inches in length, and each with a black and rust-colored, cylindrical body of the size of a common lead pencil, which has a stout piercer at the extremity; are both of them females of the Pigeon Tremex (*Tremex columba*, Linn.) You say they have at least one suspicious habit, and that you found them securely attached to an oak tree, apparently in the act of depositing an egg, and you wish to know whether or not they are ever injurious to fruit trees, or whether they are confined to forest trees. They may be considered as injurious, for the larvæ which hatch from the eggs, frequently cause the death of the tree they infest. Though they breed in several different kinds of forest trees, we believe they have never been found in any other fruit tree but the pear. Hidden, as this insect is, in the heart of a tree, it is yet subject to the attacks of two large Ichneumon flies (*Pimpla atrata* and *lanator* of Fabricius) which prevent its becoming unduly numerous. The females of both these Ichneumon flies are furnished with extremely long ovipositors, by aid of which they are enabled to reach and oviposit in the larvæ of the Pigeon Tremex.

Flesh-worms—*Dr. W. J. Stuart, Houston, Texas.*—You say that eighteen months ago, you placed a canker in a bottle of alcohol, where it has remained undisturbed ever since; but the cork being porous, the alcohol evaporated, and last week, when about all the alcohol had left the bottle, "the canker began to be converted into worms," and that now it is "a living mass of worms." Those which you send are evidently the larvæ of one of the numerous species of two-winged flies, belonging to the great MUSCA family. The parent fly, attracted to the bottle by the odor, deposited her eggs on the cork, and the young maggots which hatched from them, finding no difficulty in penetrating the porous cork, immediately commenced to fulfil their mission and clear away the putrid flesh. If undisturbed they would soon have become full fed and have contracted to brown, shiny, hardened pupæ, and in due time you would have had a bottle full of living flies with no offensive smell. These maggots bear a great resemblance to the Texas Screw-worm which breeds in the wounds of cattle and sheep, specimens of which had been previously sent to us by Mr. Thos. Ailcock of Brenham, in your State.

Fall Web-worm on Hickory—*Prof. W. W. Daniels, Madison, Wis.*—The brown hairy caterpillars, rather more than an inch long, which are covering the hickories with their webs in your vicinity, are popularly known as the Fall Web-worm. They are the larvæ of a small moth (*Hyphantria testor*, Harris) which is of a snow white color, without marks of any other color whatever. During the months of September and October the worms descend from the trees, and either work themselves a short distance under the surface of the earth or creep under some shelter above ground, where they form slight cocoons by interweaving the hairs of their own bodies with a few silken threads. In these they are soon transformed to shiny mahogany-colored chrysalids, and become moths the following June.

Butterflies named—*Dr. W. W. Butterfield, Indianapolis, Ind.*—No. 1, (the sulphur-yellow insect with a black border to its wings) is the male of the Philodice Butterfly (*Colias Philodice*, Godart); and No. 2, with a broader black border to its front wings and some yellow spots enclosed in that border, is the female of the same species. It is our commonest yellow butterfly everywhere in the Northern States. No. 3, the coppery red insect with many black spots and a slight powdering of sky-blue on the outer edge of its wings, is the Comma Butterfly (*Vanessa comma*, Harris), so called because it has a silvery mark like a comma on the middle of the lower surface of its hind wings. No. 4 (the very large red insect with coarse black veins to its wings) is, as you suppose, the Archippus butterfly (*Danaus Archippus*, Fabr.), the same species which we figured in all its three stages in our last number (pp. 28-9), and stated to have occurred in immense swarms on three different occasions and in three different localities in the United States.

Museum Pest—*T. W. Hoit, Jr., St. Louis, Mo.*—The insect which eats your cabinet specimens, we should judge from your description, to be the larva of the common museum pest (*Anthrenus muscorum*, Linn.). It is the dread of entomologists in this country as well as in Europe, and has utterly destroyed a fine collection of beetles belonging to Mr. Maurice Schuster, of your city. The greatest precaution is necessary to keep these pests out of a collection, and none but thoroughly tight boxes should be used for the cabinet. Camphor should always be kept in the boxes, and the insects thoroughly examined from time to time. When a collection is once attacked by them, a weak solution of corrosive sublimate in alcohol, poured over the bottom of the boxes, will kill all that it touches. This little beetle is aided in its destructive work by several others that are closely allied to it, and especially by the Larder beetle (*Dermestes lardarius*, Linn.).

Insects named—*Dr. Jas. Weed, Muscatine, Iowa.*—1st, The plant-lice are the Apple-root Plant-louse, respecting which species we shall, before long, furnish a short illustrated article. Ladybirds prey upon various kinds of Plant-lice and Bark-lice, not only in the larva, but also in the perfect state. 2nd, The large insect is the Hellgrammite Fly (*Corydalus cornutus*, Linn.), respecting which see an article in our next issue. 3rd, The green worm found on an apple tree, with a figure ten (10) imprinted in a circular label upon each shoulder, is the larva of the Great Swallow-tail Yellow Butterfly (*Papilio Turnerus*, Linn.) If the W on the wings of the Locust (*Cicada*) predicted war, the 10 on the shoulder of this insect probably predicted that the war would last for ten years.

Grapes spoiled by something—*Jas. Wood, Marietta, Ohio.*—You say that a good many of your Diana grapes are spoiled by something or other, and inquire what is the cause of the damage. As you do not send specimens, and have observed no insect actually at work on the berries, we can offer no opinion on the subject. The "light-colored moth," which you have noticed hidden in the bunches, might probably enough suck the sugary juice from wounded grapes by night, especially if it belonged to the great family of Owllet Moths (*Noctua*); but, as no moths whatever have any jaws to bite with, it could not possibly break the skin of a sound grape. Thanks for the article from the *Ohio Farmer*, which we shall duly make use of.

White Pine Worms—*Jos. T. Little, Dixon, Ill.*—The worms which in October, and sometimes even as late as November, you find on your White Pines, devouring the foliage, but, as usual, never on any other kind of evergreen, whether Scotch Pine, Austrian Pine, Norway Spruce, Arbor Vite or Balsam Fir, are the White Pine worm (*Lophyrus Abbottii*, Leach). Late in the autumn they attach to the twigs a tough brown pod-like cocoon, inside which they repose through the winter, changing into the pupa in the middle of the following May; and about two weeks afterwards the perfect Saw-fly emerges from one end of the cocoon.

Insects named—*Stephen Blanchard, Oregon, Holt Co., Mo.*—The "grasshopper rather beyond the usual size" is the American Acridium (*Acridium americanum*, Drury). The large gray moth is the very same species (*Sphinx 5-maculata*, Haworth), which we figured on the first page of No. 2.

The Tarantula of Texas—*Jas. Bell, Eureka, Mo.*—The immense spider-like animal which you left at the office of the publishers, and which was captured in Missouri, is the Tarantula of Texas (*Megale Hentzi*, Marcy). It excited no little curiosity amongst those who saw it for the first time. If you have access to the AMERICAN NATURALIST you will find it figured on page 139 of the first volume. Formidable as this animal appears, yet it is attacked by a large species of Dauber wasp (*Pompilus formosus*, Say), known by the name of the "Tarantula Killer." The female of this wasp stings and instantly paralyzes the Tarantula, in the same manner as our smaller Mud-daubers paralyze our common spiders. She then excavates a hole in the earth, places the Tarantula in it, deposits an egg under its body, and then covers up the hole very securely. In due time the larva of the great wasp hatches from the egg and commences to feed on its benumbed victim. The sting of all the Mud-daubers has a most wonderful effect on the caterpillars, spiders, and other insects which are to serve as food for their young. It does not kill, but paralyzing and suspending all animation, renders them capable of resisting decomposition for a long time.

Insect foes of the Apple-tree—*G. C. Brackett, Lawrence, Kansas.*—The worm with a black head and neck, which you traced from the calyx to the seed of a Rambo apple, is the common Apple-worm or larva of the Codling moth (*Carpocapsa pomonella*, Linn.). The head and neck of this worm are usually jet black when young, though they are brown when it is full grown. The caterpillar feeding upon the leaves of the apple tree, is the larva of the Hand-maid moth (*Datana ministra*, Drury). These worms, if left alone, sometimes prove quite injurious; but, as it is their nature to congregate together, they are readily destroyed. The woolly lice on the roots of the apple tree, are the common Apple-root lice (*Pemphigus pyri*, Fitch). They may be killed by pouring a sufficient amount of hot water on the roots.

Grape-leaf Folders eaten by Spiders—*A. A. Jillaard, Brighton, Ill.*—The "small spiderish-looking, lively fellow" which you found in the fold of a grape-leaf, and which you suspect to be the Grape-leaf folder, is in reality a spider. This spider had evidently destroyed the true occupant, which we judge from the shape of the fold, to have been the Grape-leaf folder (*Desmia maculalis*, West.) This last is a little glass-green, active, wriggling worm, and bears no resemblance to a spider. All spiders are more or less beneficial to the fruit-grower, and instead of crushing them as you have been doing, you should cherish them.

Caterpillar of the Troilus Butterfly—*A. S. Fuller, Kidgewood, N. J.*—The caterpillar which crawled into your office and fixed himself there for winter quarters, is the larva of the large Black Swallow-tail butterfly (*Pupilio troilus*, Linn.). It feeds on sassafras, and we have this summer found it on the prickly ash; but we have never known it to become sufficiently numerous to do any damage.

Potato Beetles—*P. H. Foster, Babylon, N. Y.*—The two kinds of blister beetles that were infesting your potatoes of the Harrison variety, are the Striped and the Black blister-beetles. The former was illustrated in No. 2 (Fig. 13), and the latter much resembles the Black Rat blister-beetle, figured on the same page, (Fig. 14 b), the differences between the two being explained in the foot-note.

Holes round the roots of young Ash Trees in the Nursery—*Isaac Hicks, Long Island, N. Y.*—These are probably made by the large black Rhinoceros Beetle (*Xylorhynchus Satyrus*, Fabr.), which you sometimes find near them. Its larva, which only differs from the common White Grub by being much bigger and by having a black head instead of a red one, lives underground and feeds upon roots.

Locust Borers—*Uriah Bruner, Omaha, Neb.*—The beetles which you found on the trunks of locust trees, are the common Locust borer (*Clytus robiniae*, Forster.) You say you found them in great numbers. They may be found on the trunks of the Locust during the month of September, and should invariably be destroyed. Their larva have pretty nearly ruined the Locusts throughout the country.

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Oct--1t

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THE PRINCIPAL PRODUCTIONS

Are Corn, Wheat, Rye, Barley, Oats, Hemp, Flax, Tobacco, Vegetables and Fruit, and to some extent Cotton. Wheat is a crop that never fails, and it is conceded by all that the winter wheat raised in Missouri makes the finest flour in the country. Corn, Oats, Rye, and Barley are also crops that can be depended upon. Apples, Peaches, Pears, Plums, and Grapes grow luxuriantly; to the cultivation of the latter considerable attention has been given and with an unprecedented amount of success.

SOIL AND CLIMATE.

The climate is agreeable and healthy; the summers long and temperate, while the winters are short and mild. The air being pure and salubrious, no section of country could be better adapted to secure a luxurious growth of the staple production of the temperate zone. The soil undoubtedly surpasses any other equal portion of our continent in fertility and variety, and its adaptation to stock raising or grain growing.

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The law for the support, organization, and the government of Free Schools, in operation in Missouri, is a liberal one, and our entire educational system will bear comparison with any of the Eastern States. One thirty-sixth part of the land in every Township throughout the State is reserved for School purposes.

MINERALS AND TIMBER.

The mineral wealth of Missouri is inexhaustible, and only needs labor and capital to develop it. Iron ore, in large quantities, has been found in Franklin, Crawford, Phelps, Green, and several other counties. Lead, next to Iron, is the most abundant of the valuable metals in the State, and is found in Newton, Jasper, Christian, Crawford, Franklin, and other counties, in all of which the Company have large bodies of land for sale.

There is scarcely a stream on the line of the road which is not bordered by forests of excellent timber of all the useful varieties, laurel, pine, walnut, ash, elm, birch, locust, hickory, white and black walnut, white oak, and chestnut.

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Persons of small means, emigrants and capitalists, are particular invited to these lands. The farms are sold in tracts of forty acres and upwards, at low prices, and on easy terms. Parties who intend forming colonies to emigrate to these lands can make superior arrangements with the Company. With cheap and speedy means of transportation across the Atlantic which Missouri will enjoy in a few years, when we will be enabled to ship our grain IN BULK to Europe, *via* the Mississippi and New Orleans, the natural route, and by far the cheapest—our advantages in regard to prices and importance will be unequalled. We would particularly call the attention of the farmer, mechanic, and capitalist to the advantages to be derived from growing up with and developing the country; increasing their own wealth as well as that of the State.

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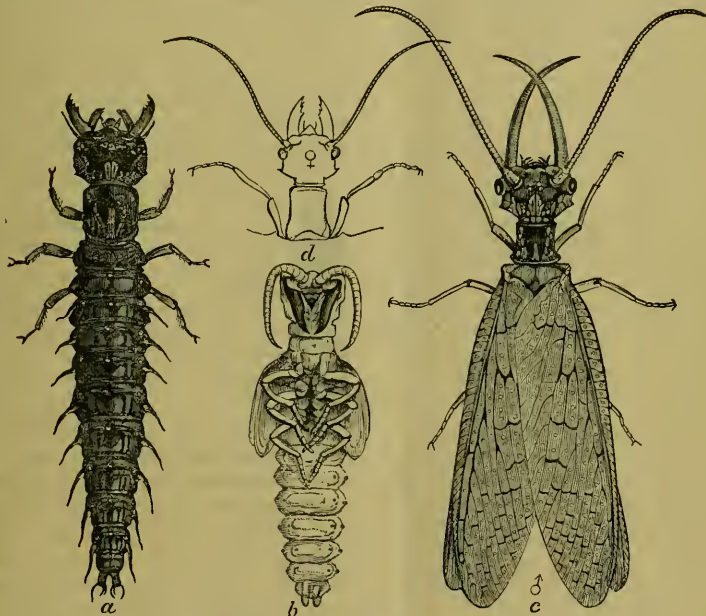
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existence in large, rapidly-flowing rivers, and generally in such as have a more or less rocky bottom. Here it crawls and swims about upon the bottom, preying upon the various aquatic larvæ found in great numbers in such situations, such as May-flies (*Ephemera* family), Shad-flies (*Perla* family), and the singular Caddis-worms (*Phryganea* family). These last inhabit moveable cases, constructed, according to the particular species, either of little bits of sticks and

[Fig. 56.]



Colors—(a) dark brown, (b) whitish, (c and d) light brown.

THE HELLGRAMMITE FLY. ✓ (*Corydalid cornutus*, Linn.)

The gigantic larva (Fig. 56 a) of this gigantic fly (Fig. 56 c) spends the earlier periods of its

straw, of grains of sand, or in some instances of living water-snails, which, along with other materials, they weave, by means of the silk which they spin from their tails, into a comfort-

able tenement, to the great discomfort, as we may readily imagine, of the poor water-snails.

Most aquatic larvæ spend the pupal period in the water, and only emerge therefrom when they are ready to pass into the perfect or winged state. But the group to which our larva belongs forms an exception to the general rule; they leave the water while they are still in the larva state, and do not usually become pupæ for several days, or even weeks, thereafter. Nature, therefore, to meet the necessities of their varied habitats, has given them a double system of respiration—a set of gills to breathe with in the water, and a set of breathing-holes, or spiracles, to breathe with upon land. In our larva the spiracles are placed in the usual manner along the sides of the body, and the gills, which assume the form of a pair of paddle-like appendages, are placed one pair upon each of the seven front joints of the belly. After it first leaves the water, the larva crawls rapidly about in the night time to find a suitable place for its pupal transformation, usually selecting for this purpose the under surface of a flat board or log, or burrowing under some large stone. In pursuit of this object they sometimes wander almost a hundred feet from the water's edge; and we have known them to crawl up the walls, and on to the roof of a low one-story frame building, and then tumble accidentally down the chimney, to the great dismay of the good woman of the house. At this period of their existence they are much sought after as fish-bait, having a very tough integument, so that one larva suffices to catch several fish; and they are called by fishermen sometimes "crawlers" and sometimes "hellgrammites." They can pinch pretty sharply with their strong jaws, though not sufficiently hard to draw blood; and they also use the processes at their tail as prehensile organs to aid them in climbing.

After it has selected a suitable hiding place, the larva forms a rude cell in the earth, within which it transforms into an inactive pupa (Fig. 56 b), with no mouth to receive food, and no anus to discharge feces. It usually leaves the water about the beginning of June, and by the end of that month or the forepart of July the winged fly bursts from the shell of the pupa. It should be remarked that, in Figure 56 b, the wing-cases of the pupa are slightly spread apart from its body to show their shape and structure, but that in nature they are closely appressed, though not agglutinated, as is the case with the pupæ of all butterflies and moths, to the side of the body.

The perfect Flies hide themselves in obscure

holes and corners during the day, and fly only by night, which is the reason that, though by no means uncommon, they are so seldom noticed. The male Fly (Fig. 56 c), is remarkable for having its jaws enormously prolonged, in the form of the finger of a cradle, and devoid of any teeth or sharp knobbed excrescences, whereas both the female fly (Fig. 56 d) and the larva (Fig. 56 a) have short robust jaws, armed with the customary teeth, and suited for offensive or defensive measures. In the well-known Buck-bug or Stag-beetle (*Lucanus elaphus*, Linn.), on the contrary, the elongate jaws of the male are armed with sharp thorns and prongs. In both insects one use of these enormously long jaws, exclusively found in the male sex, is to seize the body of the female and thereby facilitate the reproduction of the species. But the body of the Hellgrammite Fly being in both sexes of a very soft consistence, Nature saw that it was necessary that the male should have his jaws whittled off perfectly smooth, so as not to give pain to the female he was seeking to embrace; whereas, in the case of the Buck-bug, where both sexes are of a very hard and shelly consistence, the elongate jaws of the male were allowed to retain the normal teeth, one of which teeth will be noticed, in this species, to be strangely lengthened and beveled in such a manner as to fit in exactly under the thorax of the female and hold her as if in a vice. In so elaborate and diversified a manner does Nature adapt her plans and patterns to the ever-varying conditions of animated existence, and with such consummate care has she provided that the great fundamental Law shall everywhere be efficiently carried out—"Increase and multiply and replenish the earth."



The eggs of the Hellgrammite Fly (Fig. 57) are oval, about the size of a radish seed, and of a pale color, with some dark markings. They are usually deposited in a squarish patch upon reeds or other aquatic plants overhanging the water, whence, having hatched out, the young larva finds a ready passage into the element which it is destined to inhabit until the end of the following spring. We have known patches of eggs to be deposited upon the windows of a floating daguerreotype gallery on the Mississippi river.

There are probably ten times as many species of insects in the whole world, as of all other animals put together. Hence the Entomologist has no sinecure office.

THE PERIODICAL CICADA.

Seventeen and Thirteen Year Broods.

There is probably no one American insect more intimately connected with the history of the United States, and of which more has been written, than the 17-year Cicada (*Cicada septemdecim*, Linn.)* It is scarcely necessary to tell Americans that, as the name implies, this insect generally requires 17 years to undergo its transformations; remaining, with the exception of about three months, the whole of this time under ground. There is not a parallel case, that we know of, within the whole range of Natural History; but though so much has been written about this Cicada, yet some of the most interesting facts relative to its history were unknown till the present year.

We have discovered that besides the 17-year broods, the appearance of one of which was recorded as long ago as 1633, there are also 13-year broods; and that, though both sometimes occur in the same States, yet in general terms, the 17-year broods may be said to belong to the Northern, and the 13-year broods to the Southern States. It so happened that one of the largest 17-year broods, together with one of the largest 13-year broods, appeared simultaneously in the summer of 1868. Such an event, so far as regards these two particular broods, has not taken place since the year 1647, nor will it take place again till the year 2089.

There are absolutely no perceptible specific differences between the 17-year and the 13-year broods, other than in the time of maturing; but whether or not, scientifically speaking, they are to be considered as specifically distinct, we shall, for convenience sake, name the 13-year brood *Cicada tredecim*, in contradistinction to *Cicada septemdecim*, the 17-year brood.

It is not a little singular, however, that

Two distinct forms

occur in both broods—a large one and a small one—the former, by far more numerous than the latter. This fact has been observed in past years, and was noticed the present year by independent observers in different parts of the country.† Indeed, it was observed by Dr. Hil-

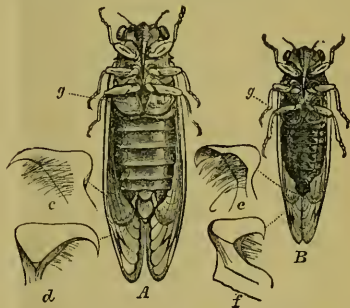
* On page 56 of our last number, we have explained how this insect is popularly but erroneously called the 17-year locust.

† Mr. V. T. Chambers, in the August number of the "American Naturalist," p. 332, is said to point out some variation in color from those described by Dr. Fitch.

2. Mr. S. S. Rathvon favored us with specimens of both species from Lancaster county, Pa., accompanied with the following: "I am justified, I think, in concluding these are two distinct species. They are different in size and coloration, produce entirely different stridulation, do not cohabit indiscriminately," etc.

dreth, of Marietta, Ohio, as far back as 1830 (Vide Silliman's Journal, XVIII, p. 47). The true *Cicada septemdecim* of Linnæus (Fig. 57 A, ventral view of male), as described by Harris and Fitch, as well as that which we have called *C. tredecim*, will measure on an average one and a half inches from the head to tip of the closed wings, and almost always expands over three inches. The whole underside of the abdomen

[Fig. 58.]



Colors—(A) black, orange and orange-brown; (B) black and orange.

is more or less of a dull orange-brown color, and in the male more especially, four or five of the segments are edged with the same color on the back.

The other form (Fig. 58 B, ventral view of male) is not, on an average, much more than two-thirds as large, and usually lacks entirely the dull orange abdominal marks, though there is sometimes a faint trace of them on the edge of the segments beneath. This small form was described in 1851, by Dr. J. C. Fisher, in the Proceedings of the "Philadelphia Academy of Natural Sciences," Vol. V, pp. 272—3, as a new species of Cicada, hitherto confounded with *septemdecim*, and was named *Cicada cassinii*. His description was followed by a note from Mr. John Cassin, in which he states that the two forms show no disposition to associate together, and produce very different cries. The fact of the very great difference in the song of the males has been fully confirmed by the observations of our esteemed correspondent, M. C. Hill of Northeast Ohio, who likewise assures us that the small form is very much less numerous than the large one.

Before we were aware that the small black form had been described as a new species, we had submitted specimens of both kinds to Dr.

3. The correspondent to the Department of Agriculture (July Rep.) from Hematite, Mo., says, "there are two species, one (both male and female) about twice the size of the other, and differing greatly also in their cries and actions."

H. Hagen, of Cambridge, Mass., who very kindly furnished us with the drawings, *c*, *d*, *e*, and *f*, in Fig. 58, which show the male genital hooks of both. That of *septemdecim* is represented on the outside at *c*, on the inside at *d*; and that of *cassini* on the outside at *e*, and on the inside at *f*.

By these figures, it will be seen that there are sufficient differences to separate the two forms as distinct; but we have since ascertained—and the fact had been previously remarked by Mr. P. R. Uhler, of Baltimore—that while the hooks of the large kind (*septemdecim*) are quite constant in their appearance, those of the smaller kind (*cassini*) are quite variable, and in some few specimens are undistinguishable from those of the large kind. This circumstance, coupled with the fact that the small kind regularly occurs with both the 17 and 13-year broods, would indicate it to be but a dimorphous form of the larger, or true periodical species; especially when we consider that dimorphism and heteromorphism are not uncommon among the true Bugs. We also learn from Mr. Uhler, who has given this order particular attention, that he is not fully satisfied of the specific distinctness of *C. cassini*; but as the consideration of this subject would involve the general problem of specific character, and as the opposite sexes of the two forms have never been seen in copulation, we shall, for convenience sake, regard them as distinct.

The large species has been observed to make its appearance from eight to ten days earlier than the small species (*cassini*), and there is not a single specimen of the latter, among a number of the 13-year brood (*tredecim*) that we captured in May, though we took a few specimens afterwards.

The Season of their Appearance and Disappearance

differs somewhat with the latitude, though not so materially as one might suppose. According to the records, they appeared the past season earlier in the South than in the North; but the last half of May can be set down as the period during which they emerge from the ground, in any part of the country, while they generally leave by the 4th of July. As is the case with a great many other insects, the males make their appearance several days before the females, and also disappear sooner. Hence in the latter part of the Cicada season, though the woods are still full of females, the song of but very few males will be heard.

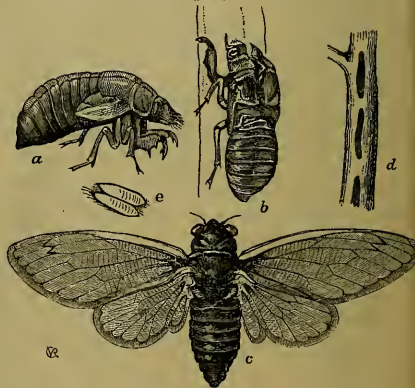
That circumstances favorable or otherwise

may accelerate or retard their development, was accidentally proven, the past season, by Dr. E. S. Hull, of Alton, Ills.; as by constructing the underground flues, spoked of on page 9 of our first number, for the purpose of forcing vegetables, he also caused the Cicadas to issue as early as the 20th of March, and at consecutive periods afterwards, till May, though strange to say these premature individuals did not sing. They frequently appear in small numbers, and more rarely in large numbers, the year before or the year after their proper period. This is more especially the case with the 13-year brood. Thus in Madison county in Illinois, and in Daviess and Luray counties in Missouri, there were in 1854 a few precursors to the true 1855 brood. They were also observed in Madison county, Illinois, in 1867; while "L. W.," writing from Guntersville, Ala., to the *Country Gentleman* of June 25, 1868, says, "some call them 14-year locusts." Other such cases will be noticed hereafter.

Their Natural History and Transformations

have been sufficiently described in the standard works of both Harris and Fitch, and we shall simply mention a few facts not recorded by them.

[Fig. 59.]

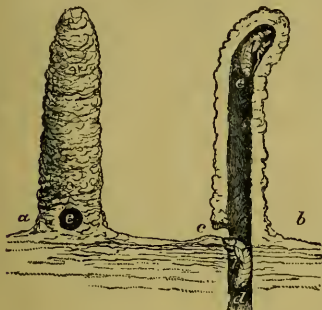


Colors—(a and b) shiny, honey-yellow; (c) orange, black and brown; (e) white.

Mr. S. S. Rathvon, of Lancaster, Pa., who has himself witnessed four of their periodical visits, at intervals of 17 years, has communicated to us the following very ingenious provision, which the pupa (Fig. 59 *a*) made the past season, in localities that were low or flat, and in which the drainage was imperfect. He says: "We had a series of heavy rains here about the time of their first appearance, and in such places

and under such circumstances, the pupas would continue their galleries from four to six inches above ground (Fig. 60, *a* full view, *b* sectional view), leaving an orifice of egress even with the

[Fig. 60.]



Colors—Clay-yellow.

surface (Fig. 60, *c*). In the upper end of these chambers the pupas would be found awaiting their approaching time of change (Fig. 60 *c*). They would then back down to below the level of the earth, as at *d*, and issuing forth from the orifice, would attach themselves to the first object at hand and undergo their transformations in the usual manner." Mr. Rathvon kindly furnished us with one of these elevated chambers, from which the above drawings were taken. It measured about four inches in length, with a diameter on the inside of five-eighths of an inch, and on the outside of about one and a quarter inches. It was slightly bent at the top and sufficiently hard to carry through the mail without breaking. It bore a great resemblance to the tube of the Mason bee, figured on p. 9 of our first number, but the inside was less smooth and covered with the imprints of the spines with which the fore legs of the builder are armed. In a field that was being ploughed, about the time of their ascent, we found that single, straight or bent chambers were the most common, though there were sometimes several branching near the surface from a main chamber below, each of the branches containing a pupa. The same observations have been made by other parties.

When ready to transform they invariably attach themselves to some object, and, after the fly has evolved, the pupa skin is left still adhering, as shown at Fig. 59 *b*. The operation of emerging from the pupa most generally takes place between the hours of 6 and 9 p. m.; and ten minutes after the pupa skin bursts on the back the Cicada will have entirely freed itself from it.

Immediately after leaving the pupa skin, the body is soft and white, with the exception of a black patch on the prothorax. The wings are developed in less than an hour, but the natural colors of the body are not acquired till several hours have elapsed. These recently developed Cicadas are somewhat dull for a day or so after transforming, but soon become more active, both in flight and song, as their muscles harden. For those who are not informed of the fact, we will state that the males alone are capable of "singing," and that they are true ventriloquists, their rattling noise being produced by a system of muscles in the lower part of the body, which work on the drums under the wings, shown in Fig. 58 at *g g*, by alternately tightening and loosening them.

After pairing, the females deposit their eggs in the twigs of different trees; and though for this purpose they seem to prefer the oaks and the hickories, they oviposit in almost every kind of deciduous tree, and even in herbaceous plants, but never in evergreens. We have seen their eggs in the Chestnut, Locust, Willow and Cottonwood, in peach twigs of not more than 1-8 inch diameter, and also in the stems of the common Aromatic Eupatorium.

Dr. Harris (*Inj. Ins.* p. 212) has well described the mode of depositing, and it is only necessary to add that the female always saws with her head upwards, *i. e.* towards the terminal part of the branch, except when she comes in contact with a side shoot, when, instead of shifting a little to one side, she reverses her position, and makes two punctures in an opposite direction to the rest, and thus fills up the straight row close to the base of the side shoot. The eggs (Fig. 59 *e*) are of a pearl white color, one-twelfth of an inch long, and taper to an obtuse point at each end. They are deposited in pairs, but separated by a strip of wood, which is wider—and thus causes the eggs to be further apart—at the bottom of the grooves than at their commencement. The

[Fig. 61.] punctured twigs bear the ap- [Fig. 62.]

pearance of Fig. 61, and frequently break off and die, though the great majority remain green and recover from their wounds. Indeed, our experience of the past summer would indicate that the eggs seldom hatch in those twigs which break off and become dry; but that the life and moisture of the twig is essential to the life and development of the egg. We are strengthened in this belief from the fact that the eggs are noticeably larger just before hatching than when first deposited, showing that the eggs are, to a certain extent, nourished by the living wood, as is the case



with those of many Saw-flies. Mr. Rathvon has also recorded the fact that the Cicada eggs are always shriveled in twigs that are amputated by the Oak-pruner (*Stenocorus villosus*, Fabr.) In the healing of the punctured parts a knot usually forms over each puncture, and we represent, at Fig. 62, a portion of an apple twig, sent to us by Mr. Jno. P. McCartney, of Cameron, Clinton county, Mo., and which was punctured in the year 1862. Though the wounds had so well healed on the outside, the grooves inside were not filled up, but still contained the minute glistening egg-shells, from which the young larvæ had escaped six years before.

The eggs hatch between the 20th of July and the 1st of August, or in about six weeks after being deposited.

[Fig. 63.]

The newly hatched larva (Fig. 63) differs considerably from the full grown larva,



Color—Pearly white.

but principally in having much longer and distinctly 8-jointed antennæ.* It is quite active, and moves its antennæ as dexterously and as rapidly as does an ant. As soon as it has extricated itself from an exceedingly fine membrane, which still envelops it after it has left the egg,† our little Cicada drops deliberately to the ground; its specific gravity being so insignificant, that it falls through the air as gently and as softly as does a feather.

Enemies of the Cicada.

Upon leaving the ground to transform, the pupæ are attacked by different quadrupeds, by birds, by cannibal insects, such as Ground-beetles, Dragon-flies, Soldier-bugs, etc.; while hogs and poultry of all kinds greedily feast upon them. In the perfect fly state they are attacked by at least one insect parasite; for dipterous maggots (the larvæ, probably, of some Tachina fly—see Fig. 35, in No. 3) may occasionally be found in their bodies. In this state they are also often attacked by a peculiar fungus, which was first described by Dr. Leidy, in the Proceedings of the Philadelphia Academy of Natural Sciences for 1851. One of our correspondents, Dr. W. D. Hartman, of Westchester, Pa., speaking of the occurrence of this fungus in 1851, says: "The posterior part of the abdomen, in a

large number of male Locusts, was filled by a greenish fungus. * * * The abdomen of the infected males was unusually inflated, dry and brittle, and totally dead while the insect was yet flying about. Upon breaking off the hind part of the abdomen, the dust-like spores would fly as from a small puff-ball." One male specimen which we received the present year from Pennsylvania was affected by the same, or a similar fungus, the internal parts of the abdomen being converted into what appeared to be a brown mould.

The Sting of the Periodical Cicada.

We shall dismiss this subject with as few words as possible, for the reason that, from our own experience, we can give nothing definite or positive. There is scarcely a paper in the United States but published some account of a "Locust" sting last summer, while unpublished accounts were equally numerous. We have endeavored to trace up a number of these reports, but have invariably found that they were either false or greatly exaggerated; and we are convinced that the great majority of such accounts owe their origin to the fertile imaginations of newspaper reporters, who are ever ready to create a sensation. Yet, to use a common metaphor, it is strange there should be so much smoke and no fire; and we will therefore briefly review the only three methods by which such stinging can possibly be produced.

By HORNETS.—On page 8 of No. 1 the senior editor gave it as his opinion that these stings were perhaps caused by a large Digger wasp (the *Stizus grandis* of Say), and described the probable method. An allied species of Digger wasp (the *Stizus speciosus* of Say) has been actually observed, by Mr. Rathvon, to carry off a few belated individuals of the Periodical Cicada, though its usual prey is the larger annual species (*C. pruinosa*, Say). It is not unlikely, therefore that the large Digger wasp (*S. grandis*) also attacks the Periodical Cicada in the same manner; though we have since become satisfied that both of these species appear too late in the season to be the cause of all the stinging we hear of.

By THE OVIPOSITOR.—The ovipositor of the female (Fig. 64, b) is certainly capable of in-

[Fig. 64.]



Colors—Black, brown and orange.

flicting a wound, but the Cicada is anything but pugnacious, and when not in the act of ovipositing, this instrument is securely enclosed in its sheath. On page 36 of No. 2, the views of two of our correspondents are given, and they tend to show that the ovipositor is really the stinging instrument. But we doubt it, for the following reasons. 1st. All the stinging we hear of has been done suddenly, while the insertion of the ovipositor would necessarily be a gradual operation, requiring at least one minute. 2nd. The real

* There is frequently a 9th joint partly developed.

† All young Grasshoppers and Katydidæ that we have ever hatched were invariably enveloped in a like membrane after leaving the egg, and until this is thrown off the young insect is awkward in its motions. In the case of the young Cicada, these fine membranes are usually left attached to the roughened orifice of their nidus, and thus form, together, a white glistening bunch.

function of the ovipositor is to convey an egg into the wound which it makes, and we have been unable to trace a single case where eggs were found in the flesh. All such accounts have proved to be fabrications, and Mr. V. T. Chambers, of Covington, Ky., writes to us, that the straightforward account which he gave in the August number of the *American Naturalist*, of a negro being stung on the foot by a Cicada, proved, after all, to be a mistake, for "Mr. Winston did not see the insect with its instrument *in situ*." 3rd. The three following facts, which are reliable, prove that stinging, in the usual sense of the term, by this instrument is almost impossible: First, Mr. Wm. Muir, associate editor of Colman's *Rural World*, carefully lifted a female from off a tree, while she was yet in the act of ovipositing, and as carefully placed her on his little finger, holding it as near as possible in the same direction and position as the branch grew from which she was taken. She instinctively endeavored to continue ovipositing, and, holding firmly to his finger, tried again and again to insert the ovipositor, but without the least success, for it could not make the least impression on the soft and yielding flesh, but continually slipped from one side to the other. Second. It is recorded that Mr. Peter A. Brown, of Philadelphia, Pa., himself inflicted a puncture with the ovipositor, several times, upon his hand, without experiencing any more pain than that produced by the prick of a pin or any other pointed instrument, and that no swelling ensued. Third, Dr. Hartmann, of Pennsylvania, introduced some of the moisture from the ovipositor into an open wound, and it caused no inflammation whatever.

BY THE BEAK, OR HAUSTELLUM.—The beak (Fig. 64, *a*) is an organ which both sexes of the Cicada possess, and by which they take their nourishment. We have ourselves seen them insert it into and extricate it from the branches of different trees, and know that the operation is quite rapid, and that the instrument must be quite sharp and strong. All the authentic cases of stinging that we know of, indicate this to be the instrument,* and we incline to believe that,

*Mr. D. B. Wier, of Lacon, Ills., who well knows the difference between the male and female Cicada, recollects distinctly, that when they were there in 1854, he was stung in the finger by the male, the sting not causing very severe pain.

Mr. R. T. Parker, of St. James, Phelps county, Mo., an intelligent fruit grower, who has given some time to the study of insects, informed us that he was stung on the neck by a male Cicada, evidently with the beak, and that the sting was not so painful as that of a bee.

Dr. M. M. Kenzie, of Centreville, Reynolds county, Mo., has communicated to us the fact that Frank Smith, aged 14 years, living on Henpeck, in the lower part of Reynolds county, was stung by a Cicada on the back of the left hand. The wound healed by first intention, and the next morning there was only a black clot, *about the size of a pin's head*, to mark its place, with scarcely any swelling.

just as the sting of a bee will affect some persons nigh unto death, and have no effect whatever on others, so the puncture of the beak of a Cicada will be more serious with some than with others. That there is no poison gland attached to this beak, is no argument against its stinging power, for several true Bugs are known to produce severe stings by their beaks, while the hairs and spines of some caterpillars have a similar power.

The Injury to Fruit Trees,

which the female causes by her punctures, is often quite serious. This is especially the case in a young orchard or in a nursery. When the wind is high the Cicadas may, with its aid, be driven to some extent, but without the aid of the wind they can not be driven at all, as when you start them they are just as likely to fly behind as before you. Indeed, when they are once in the fly state, and as numerous as we have seen them the past season, we are obliged to confess, after experiments involving about \$200, that there is no available way of preventing their ruinous work. While in their feeble and helpless condition, however, as they leave the ground, they can be destroyed with but little trouble. Hence the importance of knowing beforehand when to expect them, and the practical value of the following chronological table.

Their chronological history, with Predictions of the future Appearance of all well ascertained Broods throughout the Country.

As nothing had been published up to A. D. 1868, as to the regular appearance of any 13-year broods of Cicadas, it is not at all surprising that errors were committed by former writers on the subject. In the following chronology of this insect's periodical visits, we have endeavored to revise everything heretofore published, and, as far as possible, to complete our knowledge of all known broods. The mass of facts from which our generalizations are made, partly collected from correspondents and partly from personal observation, would fill the present number of the ENTOMOLOGIST, if given in detail, and we therefore for the most part omit them. Fully aware that this chronology is far from being complete, and that it may even contain errors, we yet believe that it will remain as a foundation for future work; and that before another 17 years shall have passed away, we shall probably have this part of the history of our curious Cicadas completed and perfected.

In order to make the subject as clear as possi-

ble, and to facilitate references, we have numbered the different broods of this insect in accordance with the date of their future appearance from and after the present year. We shall ever be glad to receive from any source reliable dates of their past visits in any locality, and gladly correct any errors that may be pointed out in the following table. In writing to us on this subject, it should, whenever possible, be stated whether the insect appeared at intervals of 13 or 17 years.

BROOD I.—*Septemdecim*—1852, 1869.

In the year 1869, and at intervals of 17 years thereafter, they will probably appear in the valley of the Connecticut river. According to Dr. Asa Fitch (N. Y. Rep. I, p. 40), they appeared there in 1818 and 1835; although, strange to say, there seems to be no record of their having appeared there in 1852. Hence this may be considered as a somewhat problematical brood.

BROOD II.—*Septemdecim*—1853, 1870.

In the year 1870, and at intervals of 17 years thereafter, they will in all probability appear in what is known as the "Kreitz Creek Valley" in York county, Pa. This brood appears to be quite local. Mr. S. S. Rathvon, of Lancaster, Pa.,—our informant,—says: "Lancaster county is bounded on the Southwest by the Susquehanna river, dividing it from the county of York, along the northeastern margin of which there is a mountain range, sloping down to the river. Along that slope Cicadas were abundant the present season (1868—our Brood XVI). But on the southwest side of the range, in what is known as the Kreitz Creek Valley, there were none. They appeared last in this valley in 1853, and previous to that year at intervals of 17 years from time immemorial."

BROOD III.—*Septemdecim*—1854, 1871.

In the year 1871, and at intervals of 17 years thereafter, they will in all probability appear around the head of Lake Michigan, extending as far east as the middle of the State of Michigan, and west an unknown distance into Iowa. Also in Walworth county and other portions of Southern Wisconsin, and southward into Illinois. This brood is equal to Dr. Fitch's 6th. It extends all over Northern Illinois, and as far south as Edgar county, and its appearance in 1837 and 1854 is well and thoroughly recorded. In Champaign county, Ills., it overlaps our Brood XIII, or the Southern Illinois *tredecim* brood, while it also interlocks with Brood IX (*septemdecim*) in the same county.

They will also appear in the same years in the southeast by eastern part of Lancaster county,

Pa., in what is called the "Pequea Valley," having appeared there in vast numbers in 1854.

The earliest known record we have of the appearance of periodical Cicadas, is in Morton's "Memorial," in which it is stated that they appeared at Plymouth, Plymouth county, Mass., in the year 1633. Now, according to that date, one might be led to suppose that this recorded brood of Morton's belonged to our Brood III, as exactly 14 periods of 17 years will have elapsed between 1633 and 1871; but, strange to say, we have no other records of this brood than that in the "Memorial," whereas there are abundant records of their appearing one year later in the same locality, ever since 1787. We therefore strongly incline to believe that the visit recorded by Morton was a premature one, and that it was properly due in 1634. We have therefore placed it in Brood VI, and have little doubt but that if records could be found, these would prove the Cicadas to have appeared in 1651, 1668, 1685, 1702, 1719, 1736, 1753, and 1770, as they did in 1787, 1804, 1821, 1838, and 1855.

BROOD IV.—*Tredecim*—1858, 1871.

In the year 1871, being the same year as the preceding, and at intervals of 13 years thereafter, they will in all probability appear in the extreme southwestern corner of Mississippi, and in the adjoining part of Louisiana. Dr. D. L. Phares of Newtonia (near Woodville) Miss., who informs us of this brood, says that in 1858 it extended over most of Wilkinson and part of Amite counties, Mississippi, and East and West Feliciana, La. He has himself witnessed the appearance of this brood during the years 1832, 1845 and 1858, while it is distinctly remembered by aged people in his neighborhood as having also appeared there in the years 1806 and 1819.

BROOD V.—*Tredecim*—1859, 1872.

In the year 1872, and at intervals of 13 years thereafter, they will in all probability appear in Jackson county and around Cobden and Jonesboro, in Union county, South Illinois.

According to Mr. Paul Frick of Jonesboro, they were in Union county, Ills., in 1858, and he also thinks it was a great year for them *about* 1832. Those of 1858 were probably premature stragglers of the 1859 brood, while Mr. Frick is most likely mistaken as to the year 1832, since the Rev. George W. Ferrell of Cobden, Union county, witnessed their appearance at that place in 1833, and also in 1846 and 1859; and Cyrus Thomas has also recorded their appearance in 1859 in the 5th Rep. of the Ills. State Agr. Soc., p. 458.* This brood not improbably extends

* If Mr. Paul Frick is correct, the brood he has witnessed may possibly be a detachment of the Mississippi and Louisi-

westward into Missouri, for several of the old settlers around Eureka, in St. Louis county, Mo., recollect it being "locust year" about the time of its last appearance, while Mr. L. D. Votaw of Eureka, and Wm. Muir of Fox Creek, Mo., both believe it was exactly 9 years ago, or in the year 1859.

By referring to our Brood XI, it will be seen that in 1846 or during the first year of the Mexican war, this 13-year brood appeared in South Illinois simultaneously with a 17-year brood in Western Pennsylvania and Ohio.

BROOD VI.—*Septemdecim*—1835, 1872.

In the year 1872, being the same year as the preceding, and at intervals of 17 years thereafter, they will in all probability appear in the southeastern part of Massachusetts; across Long Island; along the Atlantic coast to Chesapeake Bay, and up the Susquehanna at least as far as to Carlisle in Pennsylvania. Also at Kanawha in Virginia, and Gallipolis, Ohio, on the Ohio river. This is the brood which we referred to in Brood III, and which there is every reason to believe is the one recorded by Morton in his "Memorial," as occurring in 1633.

Dr. Fitch in the account of his 3d brood (N. Y. Rep. I, p. 39), says: "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 Kanawha 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 South Illinois, and the Creek Indian country west of Arkansas," etc.

There is every reason to believe that Dr. Fitch, in this account, has confounded this *septemdecim* Brood VI with our great *tredecim* Brood XII, for it so happened that they both occurred simultaneously in 1855, but the exact dividing line of these two broods is not so easily ascertained. Certainly, after reaching the Ohio river, the *septemdecim* brood extends as far south as Gallipolis, Ohio; for Prof. Potter, in his "Notes on the Cicada decem septima," records their appearance at that place in 1821.

and Brood IV; in which case the Cicadas appear for two consecutive years in Union county, Ills., as they do (See Broods IX and X) in Central Ohio, and portions of North-western Missouri.

But we incline to believe that well nigh the rest of the territory mentioned by Dr. Fitch was occupied by the *tredecim* brood, and our reasons for this belief are given in the account of our Brood XIII.

BROOD VII.—*Septemdecim*—1874, 1874.

In the year 1874, and at intervals of 17 years thereafter, they will probably occur in southeast Nebraska.

Mr. Clarke Irvine, of Oregon, Holt county, Missouri, has communicated to us the fact that they appeared in Nebraska in 1857. The brood is most probably confined to the eastern, or timbered part of the State. We have no means of ascertaining whether it be *septemdecim* or *tredecim*; but, from the fact that the latitude is rather more northerly than *tredecim* is known to occur, we strongly suspect it to be *septemdecim*, and have placed it accordingly.

BROOD VIII.—*Septemdecim*—1863, 1877.

In the year 1877, and at intervals of 17 years thereafter, they will, in all probability, appear in the vicinity of Schuylerville and Fort Miller, in New York. From thence along both sides of the Hudson to its mouth, where they extend, at least, to New Haven in Connecticut, and west across the north part of New Jersey and into Pennsylvania.

This brood is recorded by Prof. Potter as having occurred at North Haven, Conn., in 1724, 1741, 1758, 1792, 1809, and 1826. It was also recorded by the same writer as having occurred in 1826 in Middlesex county, N. J., and by Dr. Fitch as having occurred in 1843 throughout the whole country mentioned above. In 1860, again, it was spoken of in the old series of the *Prairie Farmer* (Vol. 22, p. 119) as having occurred that year in New Jersey, and our correspondent, Jas. Angus, of West Farms, Westchester county, N. Y., has himself witnessed its recurrence in the years 1843 and 1860. It probably extends but a short distance into Pennsylvania, as Mr. S. S. Rathvon found but a few straggling specimens in Lancaster county in 1860.

BROOD IX.—*Septemdecim*—1861, 1878.

In the year 1878, and at intervals of 17 years thereafter, they will, in all probability, appear along the centre of the State of Illinois, all along the southern part of Iowa, and around St. Joseph, in Buchanan county, in north Missouri.

We have good records of their appearance in 1844 and 1861 all along the southern border of Iowa, and in Mason, Fulton, McDonough, and Champaign counties, in Central Illinois. In 1861 they also occurred in Champaign county, central Ohio, and in Buchanan county, northwest Mis-

souri; and this brood not unlikely occupies, more or less, the whole strip of country between these two points. The facts which we have gleaned as to its appearance in 1861 we deem reliable, as the date was associated with the first year of the rebellion.

BROOD X.—*Septemdecim*—1862, 1879.

In the year 1879, and at intervals of 17 years thereafter, they will, in all probability, appear in the whole of northwestern Missouri, commencing south about the line of Henry and Johnson counties, and extending in a northwesterly direction to Lawrence and above, in Kansas; also, in central Ohio.

The occurrence of this brood in 1845 and 1862 is well remembered by several of our correspondents. At St. Joseph, in Buchanan county, Mo., Cicadas were not so thick in 1862 as in 1861. Had it been the reverse, or, in other words, had they been more numerous in 1862 than in 1861, we should have been inclined to record the visit of 1861 as but a precursor to this Brood X; but as it is, we believe the two broods are distinct, and that they occur for two consecutive years both in central Ohio and in portions of northwest Missouri.

We cannot trace this brood further east, in Missouri, than Grand River, and yet a detachment of it certainly occurs in Ohio, for Mr. Clarke Irvine, of Oregon, Holt county, Mo., well remembers their occurrence in central Ohio in 1845 and 1862. Though we have no knowledge of the appearance of this Brood X in Illinois, yet the fact of its occurring both in Ohio and in north Missouri, and that, too, but one year after Brood IX, would indicate that there may have been in times past, at all events, if not at the present day, a geographical connection between these two broods.

BROOD XI.—*Septemdecim*—1863, 1880.

In the year 1880, and at intervals of 17 years thereafter, they will, in all probability, appear in Central Ohio; also, from western Pennsylvania down the valley of the Ohio river, and possibly an undetermined distance down the Mississippi.

This brood is recorded in Ohio as far back as the year 1812, by "A. M. B.," writing to the *Chicago Tribune*, under date of June 22, 1868. Harris also records its appearance in Ohio in 1829, and we have been informed that they were quite numerous in Coles county, in the centre of the same State, in 1846, or during the first year of the Mexican war. As we have before remarked, this brood occurred in Ohio in 1846, simultaneously with our *tredecim* brood V in

south Illinois. Dr. Fitch, in his account of his 5th brood, also records its appearance, and states that it reached to Louisiana. But just as our *septemdecim* Brood VI was confounded with the great *tredecim* Brood XIII in 1855, so we believe that this *septemdecim* Brood XI was also confounded with it in 1829, for they both occurred that year. Had the Western country been as thickly settled in 1829 as it was in 1855, the *tredecim* Brood XIII could undoubtedly have been traced in southern Illinois and Missouri, etc., in the former as it was in the latter year. We are further borne out in this belief from having no other record of the appearance of this *septemdecim* brood, in Louisiana, than Prof. Potter's statement that they appeared there in 1829, whereas they have occurred there since 1829 at intervals, not of 17, but of 13 years; and were there the present year, 1868, as we shall show in Brood XIII. The dividing line of these two broods (XI and XIII) is probably the same as with broods VI and XIII.

BROOD XII.—*Septemdecim*—1864, 1881.

In 1881, and at intervals of 17 years thereafter, they will, in all probability, appear in Marquette and Green Lake counties, in Wisconsin, and may also appear in the western part of North Carolina, in northeast Ohio, and a few in Lancaster county, Pa., and Westchester county, New York.

There is abundant evidence that they appeared in the counties named in Wisconsin in 1864, and fair evidence that they appeared that year in Summit county, northeast Ohio, while straggling specimens were found in the same year, by Mr. S. S. Rathvon, in Lancaster county, Pa., and by Mr. James Angus, in Westchester county, N. Y. Dr. Fitch also records their appearance in 1847, or 17 years previously, in the western part of North Carolina. The distance between the localities given is very great, and we consider this as a *very doubtful* brood, and one which requires more working up.

BROOD XIII.—*Tredecim*—1868, 1881.

In the year 1881, and at intervals of 13 years thereafter, they will, in all probability, appear in southern Illinois, throughout Missouri, with the exception of the northwestern corner, in Louisiana, Arkansas, Indian Territory, Kentucky, Tennessee, Mississippi, Alabama, and Georgia.

The junior editor of this paper published the first account ever given of the existence of a 13-year brood*, and yet this brood has been thoroughly traced since, as having occurred in the years 1816, 1829, 1842, 1855, and 1868; and

* See *Journal of Agriculture*, St. Louis, June 13, 1868.

Mr. L. W. Lyon, at the July (1868) meeting of the Alton (Ills.) Horticultural Society, even mentioned its appearance in 1803.

In Illinois it occurs more or less throughout the whole southern half of the State, but more especially occupies the counties from the south part of Adams county along the Mississippi to the Ohio, up the Ohio and Wabash rivers to Edgar county, and then across the center of the State, leaving some of the central counties in south Illinois unoccupied. To be more explicit, we enumerate all the counties in which it undoubtedly occurred during the present year (1868): Adams (south part, back of Quincy), Clinton (northwest corner, adjacent to Madison), Champaign, Coles, Crawford, Cumberland, Clay, Clark, Edwards, Edgar* (especially in the eastern part), Franklin, Gallatin, Hardin, Hamilton, Johnson, Jasper, Jersey, Jefferson, Lawrence, McLean (east end), Macon, Madison, Marion, Massac, Pike, Perry, Piatt, Pope, Richland, Sangamon, Saline, St. Clair, Union (northeast corner), Washington, Wayne, Wabash, Williamson, and White. There were none the present year, either at Decatur in Macon county, at Centralia in Marion county, or at Pana in Christian county; nor were there any at Bloomington or Normal in McLean; nor in Dewitt county, which lies south of McLean; nor in Spring Creek, Iroquois county, which is northeast of Champaign.

In Missouri it occurs more or less throughout the whole State, with the exception of the northwest part, extending east to Grand river and south to a little below the Missouri river. We enumerate those counties in which we have undoubted evidence of their appearance during the present year (1868) viz.: Audrain, Bollinger, Benton, Clark, Chariton, Callaway, Cooper, Cole, Franklin, Gasconade, Iron, Jefferson, Knox, Lewis, Marion, Macon, Morgan, Moniteau, Pike, Phelps, Pulaski, Polk, Pettis, Schuyler, St. Charles, St. Louis, St. Francois, St. Clair, Warren, and Washington.

It is not improbable that this brood overlaps some of the territory occupied by the *septemdecim* Brood X. Whether it extends into Kansas or not, we have not ascertained; but, east of the Mississippi, it occupies more or less territory in the States of Kentucky, Tennessee, Mississippi, Alabama and Georgia; while, west of that river, it occurs in Louisiana, Arkansas, and Indian Territory. In the country west of the Mississippi, and in Louisiana, Tennessee, Mis-

issippi, Alabama, and Kentucky, we have good evidence of the *tredecim* character of the brood which has appeared in those States the present year, while we have nothing to prove that a *septemdecim* brood ever occurs in those States. But it is quite different in Ohio, Indiana, and Georgia. In Ohio alone they have no less than six undoubted broods of *septemdecim*, namely, our Broods VI, IX, X, XI, XIV, and XVI; while, as we shall show in Brood XVI there is no evidence of a *tredecim* brood there. So in Indiana there is no evidence of a *tredecim* brood, though one may be discovered in future. In Georgia, on the other hand, they in all probability have both our *tredecim* Brood XIII, and our *septemdecim* Brood XVI; for, while Fitch records their appearance there in 1851, the correspondent to the Department of Agriculture from Atlanta, in the monthly report for July, 1868, says of their appearance there the present year: "The 13-year locust appeared in May, and disappeared the first week in June."

BROOD XIV.—*Septemdecim*—1866, 1883.

In the year 1883, and at intervals of 17 years thereafter, they will, in all probability, appear in western New York, western Pennsylvania, and eastern Ohio.

This is the 2nd brood of Dr. Fitch, and has been recorded in 1832, 1849, and 1866; and we have ourselves many records of its appearance in 1866. In some parts of New York there must have been precursors to this, as there have been to other broods, for T. T. Southwick, of Manlius, Livingston county, in western New York, records their appearance there in 1865; while they appeared during the same year near Cayuga Lake, New York, as will be seen by referring to the *Prairie Farmer*, vol. 16, p. 2.

BROOD XV.—*Septemdecim*—1867, 1884

In the year 1884, and at intervals of 17 years thereafter, they will in all probability appear in certain parts of North Carolina and Central Virginia. In 1850 and 1867 they appeared near Wilkesboro, N. C., and were also in Central Virginia during the last mentioned year.

Dr. Harris (*Inj. Insects*, p. 210) records their appearance at Martha's Vineyard, Massachusetts, in 1833. We have made some inquiry, but have not yet learned that they were there either in 1850 or in 1867. Hence we should rather infer that Dr. Harris's informant must have been mistaken.

BROOD XVI.—*Septemdecim*—1868, 1885.

In the year 1885, and at intervals of 17 years thereafter, they will in all probability appear on

* Edgar county also has our *septemdecim* Brood III.

† Though they occurred in large numbers in Davidson county and other portions of Tennessee in 1855, and also the present year, yet in Lawrence county they appeared in 1856, instead of 1855—another instance of a belated brood.

Long Island; at Brooklyn in Kings county, and at Rochester in Monroe county, New York; at Fall River, and in the southeastern portion of Massachusetts; at Oakiand, (Rutland?) Vt.; from Pennsylvania and Maryland to South Carolina and Georgia; in northwestern Ohio; in southern Michigan, and in Indiana.

This brood has been well recorded in the East in 1715, 1732, 1749, 1766, 1783, 1800, 1817, 1834, 1851, and 1868. It is spoken of in "Hazard's Register" for 1834, published in Philadelphia, while Mr. Rathvon has himself witnessed its occurrence during the four latter years in Lancaster county, Pa.

It is the 4th brood of Dr. Fitch, who only says that it "reaches from Pennsylvania and Maryland to South Carolina and Georgia, and what appears to be a detached branch of it occurs in the southeastern part of Massachusetts." It is strange that he does not mention its appearance in New York, for Mr. F. W. Collins of Rochester, in that State, informs us that he has witnessed four returns of it there, namely, in 1817, '34, '51 and '68, while the Brooklyn papers record its appearance there the present season. As these two points in the State are about as far apart as they well can be, the intervening country is probably more or less occupied with this brood.

Mr. II. Rutherford of Oakland,* Vermont, records their appearance in that neighborhood in 1851 and 1868. (N. Y. Semi-Weekly *Tribune*, June 27). He also witnessed them in the same place in 1855, and as will be seen by referring to Brood XIII, they also occurred on Long Island and in southeastern Massachusetts in that same year, 1855. Exactly 13 years intervening between 1855 and 1868, one might be led to suppose that they had a *tredecim* brood in the East. But did such a brood exist, it would certainly have been discovered ere this, in such old settled parts of the country, and we are forced to conclude that they have nothing but *septemdecim* there. By referring to Brood VI, the mystery is readily solved, for we find that in that part of the country there are two *septemdecim* broods—the one having last appeared in 1855—the other the present year, 1868.

In Ohio, this brood occurred more or less throughout the whole western portion of the State, for our correspondents record them as having appeared in 1868 in Lucas and Hamilton and several intervening counties; and all the evidence we can get tends to prove that they

belong to this Brood XVI. Mr. Franklin C. Hill of Yellow Springs, in Green county, southwest Ohio, has witnessed their appearance in 1834, 1851 and 1868, and they occurred in the northwestern part of the State during the three same years; while the correspondent to the Department of Agriculture, from Toledo, northwest Ohio (July, 1868, Monthly Rep.), says it is their 9th recorded visit there.

In Indiana we have reliable evidence of their appearance in 1868 in the southern part of the State; in Tippecanoe, Delaware, Vigo, Switzerland, Hendricks, Marion, Dearborn, Wayne and Richmond counties. The evidence seems to show that, as in Ohio, throughout the State they belong to this *septemdecim* Brood XVI, for Mr. F. Guy of Sulphur Springs, Mo., has personally informed us that they were in southern Indiana in 1851, and even in Tippecanoe county, on the Wabash river, where from their proximity to Brood XIII, we should have inferred them to be *tredecim*, they are recorded as appearing in 1851.

In Pennsylvania they were to be seen the present year from Pittsburg to Harrisburg, and from Lancaster to Philadelphia. They swarmed in the Cumberland valley, and occurred very generally throughout the State in belts of from two to five miles wide, running north to south.

From the above synoptical view it results that there will, during the next 17 years, be broods of the Periodical Cicada somewhere or other in the United States in A. D. '69, '70, '71, '72, '74, '77, '78, '79, '80, '81, '83, '84 and '85, but none, so far as we are at present advised, in A. D. '73, '75, '76, or '82. It further appears that the number of distinct broods appearing in distinct years within the following geographical districts, are as follows: In southern New England 4 broods, years '69, '72, '77 and '85; in New York 4 broods, years '72, '77, '83 and '85; in New Jersey 2 broods, years '72 and '77; in Pennsylvania 7 broods, years '70, '71, '72, '77, '80, '83 and '85; in Ohio 7 broods, years '72, '78, '79, '80, '81, '83 and '85; in Indiana 2 broods, years '71 and '85; in Illinois 4 broods, years '71, '72*, '78 and '81*; in Wisconsin 2 broods, years '71 and '82; in Michigan 2 broods, years '71 and '85; in Iowa 2 broods, years '71 and '78; in Nebraska 1 brood, year '74; in Kansas 1 brood, year '79; in Missouri 4 broods, years '72*, '78, '79 and '81*; in Louisiana and Mississippi 2 broods, years '71* and '81*; in Arkansas, Indian Territory, Alabama, Tennessee and Kentucky 1 brood, year '81*; in Georgia 2 broods, years '81* and '85; in South Carolina 1 brood, year '85; in North Carolina 3 broods, years '81*, '84 and '85; in East and West Virginia 3 broods, years '72, '80 and 84; in Maryland 2 broods, years '72 and '85; and in Delaware 1 brood, year '72.

* We can find no such post office as Oakland in Vermont, and incline to believe that the *Tribune* compositor made Oakland out of Rutland, and more especially as Rutland is on the New York border.

The broods marked () belong to the 13-year or *tredecim* race of the Periodical Cicada.

THE HATEFUL OR COLORADO GRASSHOPPER.

(Caloptenus spretus, Uhler and Walsh.) ✓

We have frequent enquiries from correspondents, whether the Grasshoppers that have, for the last three years, done so much damage in Kansas and Nebraska, in western Missouri, and in western Iowa, are not likely to spread gradually eastward, just as the Colorado Potato-bug has done. In the following paragraphs we shall give, as briefly as possible, our views upon this most important subject. Those who desire to see the subject discussed at full length, in all its bearings, are referred to the 14th chapter of the Annual Report upon Noxious Insects, by the senior editor of this journal.

At first sight the Hateful Grasshopper (Fig. 65, a) may be

readily confounded with the common Red-legged Grasshopper, (*Caloptenus femurrubrum* DeGeer, Fig. 65, b), which swarms every-

where from Maine to Minnesota, and from Pennsylvania to Kansas and Nebraska. In reality the two species only differ by the wings of the former being from a fourth to a fifth longer, so as to enable it to fly miles at a stretch, while our Eastern species cannot fly more than a rod or two at a single flight. Trivial and unimportant as this difference may seem to some, it is yet sufficient to separate the two forms as distinct species, seeing that, so far as regards this character, the two forms do not graduate imperceptibly the one into the other.

As is also the case with the Colorado Potato-bug, the native home of the Colorado Grasshopper is in the cañons (kanyons) of the Rocky Mountains. But the two insects differ in one most important particular. The former can, and does, breed freely, generation after generation, in the lowland country into which circumstances have, within the last ten or twelve years, allowed it to effect an entrance. The former can not, and does not, so breed; but, on the contrary, the very first generation that hatches out there in the spring, from eggs laid in the preceding autumn, by an invading swarm from the Rocky Mountains, commences to waste away and die out from the very first day of their

batching. Even the comparatively few individuals of this brood that attain the perfect or winged state, never lay any eggs at all, but rise up in the air and fly off in a southeast, east, northeast, or northerly direction, after which they gradually die out and perish from off the face of the earth, without reproducing their species.

"But," it will be objected, "surely these winged individuals can not fly for ever; they *must* light down somewhere for food, and whenever they light down the females will doubtless lay eggs, from which, in the succeeding season, a fresh generation of Colorado Grasshoppers will take its origin." Strange as it may appear, this is not the case. They *do* light down occasionally for food, but their systems are so diseased that even then they eat comparatively but very little—certainly not a thousandth part of what an equally numerous swarm of the same species, fresh from the alpine regions of the Rocky Mountains, would eat—and in no one instance have they ever been known to lay any eggs at all. Neither do they stay any length of time in the particular spot upon which they light down; but, after a few hours' stay, rise up again into the air, and leave for parts unknown. In all these particulars they differ most remarkably from the swarms that are raised in the Rocky Mountains, and wing their way thence, by one almost continuous flight, into the fertile valley of the Mississippi. For, wherever these last light down, they soon make a clear sweep of every green thing, occupying and possessing the whole country as they slowly proceed from point to point; and all accounts agree that, as they progress, they fill the earth full of their eggs.

As the history of these lowland-bred Grasshoppers, after they take flight and disappear from the place of their nativity, has never hitherto been published, we shall make no apology for presenting it in some detail to our readers. We must first observe, however, that, owing to the influence of the comparatively hot climate of the valley of the Mississippi, as contrasted with that of the cold and bleak regions of the Rocky Mountains, the Hateful Grasshopper attains maturity a full month sooner in the former than in the latter region. For example, in Kansas, Nebraska, west Missouri, and west Iowa, all that reach maturity of the spring hatch of Grasshoppers take wing and disappear from the 24th of June to the 14th of July; whereas the usual period for the Rocky Mountain swarms to invade that region of country ranges from the 27th of August to the forepart of October, as ascer-

[Fig. 65.]



Colors—(a and b) dull olive, varied with brown-black; hind shanks blood-red.

tained from the records of the numerous invasions which have taken place from A. D. 1820 up to A. D. 1867. In the year 1868, however, probably in consequence of the unusually hot summer, the Hateful Grasshopper must have matured in the Rocky Mountains about half a month sooner than usual; for in that year it invaded Kansas in the forepart of August.

Dry as these details may appear to some, it is important to attend to them; because it is chiefly by the date of their appearance, that we are enabled to distinguish accurately between a swarm of healthy and vigorous Grasshoppers, freshly arrived from the Rocky Mountains, and another swarm of diseased and barren Grasshoppers, reared in the lowlands of the Mississippi valley. And now, without further preface, we shall proceed to show what becomes of these last, after they have taken wing and disappeared from the land of their nativity during the latter part of June and the forepart of July.

Mr. D. W. Kauffman, of Des Moines, Iowa, President of the Iowa State Horticultural Society, who certainly ought to know something about the spring hatch of 1867-8, as it damaged his nursery stock in 1868 to the extent of \$10,000, informs us that it took wing and disappeared from his neighborhood from the 3d to the 5th of July. Some of them, he says, flew through the air as far as Davenport, Iowa, a place on the Mississippi river, lying about 150 miles to the east of Des Moines, *but did no material amount of damage there.*

"On July 9th, 1868, the people of Jackson county, Minnesota, were surprised to see the sun nearly darkened by immense clouds of Grasshoppers (probably *Caloptenus spretus*) passing over that country. Some of the farmers report that they lit on their wheat fields, and completely loaded the straw to the ground; but they soon raised again, and passed by in a northerly direction with the wind, *doing little or no damage.* They continued to pass over occasionally for several days afterwards—all going north, as the wind was south."—H. A. Munger, in *Farmers' Union* (Minn.), August, 1868.

Mr. Henry Hilvers, of Lafayette county, in the southwest corner of Wisconsin, personally informed us, at Galena, Ills., that in the middle of August, 1868, he witnessed the migration southwards of what, from his description, must have been a vast swarm of these same barren and diseased Grasshoppers, wandering wildly from region to region, and destined to perish eventually, without reproducing their species. According to his account, millions upon millions

of them flew high in the air over his farm, traveling from north to south, and presenting the same resemblance to a heavy snow-storm, which has been remarked by so many in the case of the true Hateful Grasshopper, when it descends from the Rocky Mountains upon the lowlands of the Mississippi valley. Only a few of them, as he told us, descended to the earth, and these only for a short time, after which they rose up again in the air, and rejoined their companions. These few were examined, both by Mr. Hilvers and by his daughter, and, in the opinion of both these two parties, they corresponded in size with specimens of the true Hateful Grasshopper, which we had on exhibition at Galena.

It may be asked, "How can we tell that this swarm of Grasshoppers seen by Mr. Hilvers was not a fresh arrival from the Rocky Mountains?" We answer: First, that, upon such a supposition (inasmuch as, when seen by Mr. Hilvers, they were flying southwards), we should certainly have heard of them afterwards descending somewhere in north Illinois, and commencing their usual course of devastation and egg-laying, whereas nobody near Galena seems to have heard of any such thing; and, Secondly, that the date of their arrival in southwest Wisconsin will not correspond with any such hypothesis. It is very true that, in 1868, the Hateful Grasshopper invaded the cultivated, or eastern, parts of Kansas at the unusually early date of August 12th; but, at the customary rate at which these insects progress, after they reach a fertile country (from five to ten miles a day, according to Mr. Goble of Kansas), they could not possibly have reached the southwest corner of Wisconsin in less than a month and a quarter after their arrival in Kansas, or say from the middle to the last of September; whereas, the actual date of their arrival in southwest Wisconsin was the middle of August.

One more such case and we have done. In 1867, about the last of July or the first of August, an immense swarm of night-flying insects—as we were informed by Capt. Beebe, of Galena—lit upon Souldard's place, which lies upon the Mississippi river, west of Galena, and stripped the forest trees there of their foliage, for a space about a quarter to half a mile long and about twenty rods wide. They were heard in the night, by several observers, to come through the air with a roaring and rushing noise, such as has been commonly noticed to be produced by flights of the true Hateful Grasshopper; but in the morning nothing was to be seen of them but the devastation they had caused, neither had

they laid any eggs, so far as could be seen at the time or ascertained from subsequent observations. Their next lighting place was in Dubuque county, Iowa, seven miles to the north-west of Souldard's farm. There they stripped the woods of their foliage to about the same extent, and disappeared in the same hurried manner. Although there is no direct proof of the identity of this insect with the Hateful Grasshopper, yet it is difficult to refer it satisfactorily to any other species. None of the Grasshoppers indigenous to Iowa, Wisconsin, and Illinois, are physically capable of flying great distances through the air, and the only other insect that ever preys in large swarms upon the leaves of trees in that region is the common May-bug (*Lachnosterna quercina*, Knoch), which occurs in May and June, and not in July and August.

The above facts, and others which it would be tedious to particularize, sufficiently show that the Hateful Grasshopper, when suddenly transferred from its native alpine home in the Rocky Mountains, some eight thousand feet above the level of the sea, to the warm regions of the valley of the Mississippi, less than a thousand feet above the sea level, gradually becomes diseased, and barren, and loses more or less its natural appetites and instincts. Why we do not observe the same phenomena in the case of the Colorado Potato-bug, which was originally a denizen of the same cold, alpine country, is not difficult to explain. The former insect reaches the Mississippi lowlands at one sudden flight, and in one season; it has therefore no opportunity to become gradually acclimatized and inured to the new "conditions of life" under which it is called upon to exist. Consequently, it becomes diseased and barren, and finally perishes. The latter insect, on the other hand, has reached the Mississippi lowlands only by slow and gradual approaches, breeding at every way-station on the road, and thus becoming—generation after generation—more and more acclimatized to a higher temperature, as indicated by the thermometer, and to a greater atmospheric pressure, as indicated by the barometer. Consequently, it may now be considered as a permanently acclimatized resident of our great Western valley; though even here it thrives much better, and extends eastward much faster, in a cold northerly than in a warm southerly latitude. If the good people of Missouri and Illinois are particularly anxious that the Colorado Grasshopper should, like the Colorado Potato-bug, be permanently colonized among them, we think that this might probably be effected by gradually acclimatizing the insect at various points along the road that

leads from Colorado to these States. But, as this would be a very slow, expensive, and laborious process, we do not intend to try the experiment, until a few thousand dollars have been appropriated for this express object by the legislatures of those two great and enterprising States.

"But," it may be objected, "allowing that the Colorado Grasshopper cannot breed in the Mississippi valley, what security have we that, at some future time, it may not fly all the way from the Rocky Mountains to the eastern borders of Missouri and Iowa?" We answer, that we have traced back the history of this insect as far as the year 1820; that in all these forty-eight years, although no less than seven invasions of the country to the east of the Rocky Mountains have taken place, namely in 1820, 1856*, 1857†, 1864‡, 1866, 1867, and 1868, it has never yet got within 112 miles of the Mississippi river; and that there is no reason to suppose that it will ever do so for the future. There must necessarily be some limit or other to the powers of flight of this insect. It would be absurd, for example, to suppose that it could fly in one season as far eastward as England or France, or even as far as the Atlantic ocean. Consequently, as it can be proved by historical records that it has never, within the last half century, reached within 112 miles of the Mississippi, the fair and reasonable inference is that it never will do so in the future. Because an insect can fly 550 miles, it would be ridiculous to argue that, therefore, it can fly 700 miles. We might as well argue that, because a man can jump a ditch twenty feet wide, therefore he can jump another ditch which is thirty feet wide; or that, because a man can easily carry a young calf upon his back, therefore, if he practises daily, he will be able to carry the same calf upon his back when it has grown up to be a cow.

It will be seen at once, from what has been stated above, that we do not consider the Colorado Grasshopper as a permanent denizen either of Kansas, Nebraska, western Missouri, or western Iowa. It is certainly a very remarkable fact that it has invaded these countries from the Rocky Mountain region for three successive autumns, namely those of 1866, 1867, and 1868; and no doubt the young larvae that hatch out in the spring of 1869, from eggs laid in the autumn

* In 1856, according to Mr. J. S. Merrill, of Onawa City, Iowa, it invaded west and northwest Iowa.

† In 1857, according to the same gentleman, it invaded west and central Iowa about the last of August. "S. H. K." of Page county, in the southwest corner of Iowa, says that it invaded that county "very late in the fall of 1857."—*Prairie Farmer*, April 25, 1868.

‡ In 1864, according to Mr. Merrill, it extended as far as Sioux City, in western Iowa.

of 1868, will do the usual amount of damage. But, as in the last fifteen years there have been only six Grasshopper invasions, the chances are three to two against any fresh invasion occurring in the autumn of 1869; and the same mode of reasoning will equally apply to any subsequent autumn.

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THE TWIG-GIRDLER,

(*Oncideres cingulatus*, Say.)

We have been puzzled for a long time, as our readers may see from the Answers to Correspondents on page 57 of our last number, to know what insect it is that girdles and occasionally amputates the twigs of various trees in the manner shown in the following engraving (Fig. 66 c). The mystery has at length been solved by one of our correspondents, Mr. Geo. Burnside of South Pass, Ill., detecting the culprit in the very act. Upon examining two specimens kindly sent to us by that gentleman, the girdling insect proves to be one of the rarest of our Capricorn or Long-horn Beetles, (the *Oncideres cingulatus* of Say, Fig. 66 a). And now that we have been thus enabled

[Fig. 66.]



Color, (a) grayish brown.

to recognize the species, we find that, so far as regards the girdling of hickory twigs by this beetle, the discovery was made and published more than thirty years ago by Prof. Haldeman*. Possibly the amputation of pear-twigs, and especially of persimmon-twigs, which we have ourselves noticed to be so very common in South Illinois, in consequence of such girdling, may be effected by a distinct species; but, as Mr. Burnside says, that he discovered the very same insect, which he had seen actually girdling hickory-twigs, "under very suspicious circumstances" upon a pear-tree, the probability is that it is the same species that operates upon all these three trees.

The Twig-girdler, according to Prof. Haldeman, "may be seen in Pennsylvania during the two last weeks in August and the first week in September, feeding upon the bark of the tender branches of the young hickories. Both sexes are rather rare, particularly the male, which is rather smaller than the female, but with longer

antennae. The female makes perforations (Fig. 66 b) in the branches of the tree upon which she lives, which are from half an inch to a quarter of an inch thick, in which she deposits her eggs, (one of which is represented of the natural size at Fig. 66 e). She then proceeds to gnaw a groove, of about a tenth of an inch wide and deep, around the branch and below the place where the eggs are deposited, so that the exterior portion dies and the larva feeds upon the dead wood."

In all the cases noticed by Prof. Haldeman, the tree attacked was the Shagbark Hickory (*Carya alba*) and the twig was girdled so shallowly, as not to fall off until after the larva had matured within it, or nearly a year after the girdling. "Then", as he subjoins, "the decaying portion which is not eaten by the larva is apt from its tender attachment and the rapidity of decay to drop off." The evidence of Mr. Benj. H. Smith, of Upper Darby, Penn., who has kindly sent us specimens both of the insect and of its work, is to the same effect. For he says that it does not attack any tree but the hickory, and that it never cuts deep enough to cause the limbs to fall off. But in most of the cases which we have ourselves noticed upon pear and persimmon trees, the twig was girdled so deeply that it broke off and fell to the ground with the first wind, and while the eggs that had been laid in it by the mother-beetle were still unhatched. Even in a girdled hickory twig thirty-five hundredths of an inch in diameter, which we have now lying before us, but a third part of its diameter is left in the middle ungnawed away; so that in spite of the superior toughness of this timber the twig could scarcely have stood a high wind without breaking off and falling to the ground.

It is worthy of remark that a European species belonging to the same genus (*Oncideres amputator*) has the same remarkable habit of amputating small branches; although European observers failed to discover the eggs in the amputated parts, and were thus unable to explain the object of the proceeding.

Nothing surprises us more in the natural history of the American Twig-girdler than the great number of eggs that may sometimes be found in one amputated branch. In a persimmon branch not more than two feet long, we have counted as many as eight eggs, placed one under each successive side-shoot; and we have found seven eggs all crowded together in a small hickory branch only three inches long. Now, judging from the amount of timber consumed by the larvæ of other boring beetles before they

* See his articles on the History of the Longicorn beetles in the *Amer. Philos. Transactions* for 1837, p. 52, and in the *Farm Journal* for 1851, p. 34.

Mr. Parker Earle, of South Pass, Ill., has since informed us that he found the same beetle on an amputated pear twig.

arrive at maturity, such a branch could scarcely nourish seven larvæ. How then can we account for such a phenomenon? Is it an exceptional case of mistaken instinct? Or does the mother-beetle, in order to guarantee the success of her handiwork, habitually lay a superabundance of eggs, just as the Tachina-fly (*Exorista militaris*, Walsh), that is parasitic upon our northern Army-worm (*Leucania unipuncta*, Haw.), lays upon an average three eggs upon each worm, although each worm is only large enough to feed a single Tachina-fly? Upon either hypothesis some of the young larvæ that hatch out must, either occasionally or normally, be starved out or destroyed by their more robust or fortunate brethren, just as many kinds of spiders, when they first hatch out from the egg, prey mercilessly upon one another, until only a few overgrown individuals are left from the original brood.

After the above article was in type, we received a communication on this subject from our esteemed correspondent, Mr. S. S. Rathvon, of Lancaster, Pa. After mentioning some of the facts already given above, Mr. R. says:

"*O. cingulatus* has hitherto been regarded as a rare insect in this locality, and indeed I have not taken a half dozen specimens in three that number of years; but my entomological friends, Messrs. S. Auxer and H. G. Bruckart, succeeded in capturing, during the past season, some seventy-five or eighty specimens in a single day, at Silver Springs, about six miles west of this city. These insects appear here in the *imago* state from the middle of August to the middle of September, the females outnumbering the males five or six to one.

The girdling of the apple, the pear, and the persimmon, spoken of by your correspondents, may be by the same insect, or by an allied species. I believe I have never seen these latter trees girdled in this manner in this locality; but in the case of the hickory, very frequently."

* See a paper by the senior editor, in *Trans. Ills. State Agricultural Society*, vol. 4, p. 362.

AN ICHNEUMON FLY MISTAKEN FOR A WASP.

Some time ago, as we learn from Dr. D. L. Phares, of the State of Mississippi, there appeared in the New Orleans *Christian Advocate* an article entitled "The Stiletto Wasp." The article was from the pen of the editor, who with several professors in the College in Jackson, La., had examined two of these insects. It states that "the wasp was about about one and a half inches long, black and yellow, with a sting three and a half inches long, and as large as a small needle; there were also two hair-like appendages of similar length. One of the insects had struck at a boy several times. Finally, making

a desperate effort, the boy dodged behind a tree just at the moment that the insect, throwing up its tail to strike, lost sight of him and thus plunged the sting a full inch into a sweet gum tree, from which it could not withdraw it. The father of the boy being near with an axe, cut out a chip, and the sting was found to have gone through it to the depth already stated."

From the three-fold structure of the supposed "sting," this insect was clearly not a Wasp but an Ichneumon-fly, and in all probability the *Pimpla atrata* of Fabricius. This species is well known to penetrate the timber of growing trees to a considerable depth with its long ovipositor, in order to reach the larvæ of the Horn-tails (*Urocerus*) that burrow therein and deposit an egg in them. In performing this operation it often gets stuck fast, and is unable to withdraw its ovipositor. The story of its "striking at a boy," is all moonshine. All Ichneumon-flies are parasitic insects, and have no stings; although some few of them will, when roughly handled, occasionally penetrate the human flesh with their ovipositor. This however produces no more pain than the puncture of a pin, as they have no poison-bag at their tails, like the Wasps and Bees.

A PLANT GROWING OUT OF AN INSECT.

W. B. Porter, of this county, has left at our office a specimen of the White Grub, so formidable as a corn, potato, and grass destroyer. There are two sprouts of green, vegetable growth, growing out of the head of the grub, one on either side, of nearly half an inch in length, resembling a bog's *tusk* in shape. Mr. Porter informs us that the one presented is by no means an isolated example, but that myriads of them can be found which present the same anomalous combination of animal and vegetable life. Who will explain this aberration from the well settled laws of organic life?—*Sedalia* (Petts Co., Mo.) *Press*.

In the second volume of the late *Practical Entomologist*, page 16, an account was given of a plant growing from the head of the "White Grub." Great numbers of the grubs on Mr. Paulding's place at Tipton, Iowa, were affected in this peculiar manner, and the "aberration from the well settled laws of organic life" spoken of above, is very likely the same thing. It can be explained, either on the supposition that some peculiar kind of seed is poisonous to the grub, although its instinct does not prompt it to reject such seed as food; or that the plant is a vegetable parasite peculiar to the grub. On the former supposition, if we could ascertain what plant the sprouts were produced from, we might turn such knowledge to practical account by sowing the seed of that plant, in places infested by the White Grub. We should be glad to receive specimens of this vegetative larva.

PLAGIARISM.

Since the AM. ENTOMOLOGIST was started, the *Northwestern Farmer* of Indianapolis, Ind., has editorially treated its readers to a deal of useful entomological matter. By some strange coincidence, however, these editorials are stolen piecemeal from the ENTOMOLOGIST, and patched together with such inferior material that the cheat is seen through at once. The Doctor is so very Bland also as not to send us his monthly concern in exchange, in the hope, doubtless, that his plagiarisms will be unnoticed. Such wholesale pilfering usually brings its due reward, and will not be noticed by us in future. Men who lack brains themselves are very apt to use the brains of others.

Now is the time to form clubs for the ENTOMOLOGIST. We tender our thanks to the numerous friends who are getting up clubs, and are thus interesting themselves in our behalf, and we hope that before the 1st of January every one of our present readers will send us at least one name. Present the claims of the ENTOMOLOGIST to your neighbors.

TO OUR SUBSCRIBERS IN CANADA.—Parties in Canada, who wish to subscribe for the *American Entomologist*, should bear in mind, that they can obtain it, postage free, by remitting one dollar to the *Rev. C. J. S. Bethune, Secretary to the Entomological Society of Canada, Credit, C. W.*

The greater part of our present number is occupied with an article on the "Periodical Cicada." We trust that the very general interest manifested in this subject will serve as a plea for its unusual length.

Our subscribers will bear in mind that we do not send receipts for subscriptions, except where they are specially requested. The receipt of the paper is a guarantee that the subscription money has been received.

Should a number of the ENTOMOLOGIST, through whatever cause, fail to reach any of our subscribers, we will cheerfully send another one upon being informed of the fact.

In ordering the ENTOMOLOGIST, don't forget to state whether or not back numbers have been sent.

ERRATA.—On page 59, column 2, line 14, for "menaccous" read "menacing." On page 60, column 2, line 9, for "Dauber" read "Digger."

ON OUR TABLE.

THE BUTTERFLIES OF NORTH AMERICA, by Wm. H. Edwards, published by the American Entomological Society of Philadelphia. Part 2 of this most excellent work has been received. In beauty, correctness, and artistic skill, it is fully equal to Part 1, which we have already noticed. We congratulate the author on being able to procure such a faithful delineator as Mary Peart, and such skillful lithographers and colorists as Bowen & Co., of Philadelphia. The part before us contains figures and descriptions of *Argynnis Callippe*, *A. Hesperis*, *Colias Alexandra*, *C. Helena*, *C. Christina*, *C. Behrii*, and *Apatura alicia*. This work is being published in parts; 12 or more parts to form a volume, and each volume to be complete in itself. With Part 3 will commence a synopsis of North American species, to be completed with the volume. The price of each part is \$2.00, and orders should be addressed to E. T. Cresson, 518 South 13th street, Philadelphia, Pa.

THE CANADIAN ENTOMOLOGIST.—The September and October numbers of this little neighbor of ours, came duly to hand. It is an excellent medium of intercommunication between entomologists, and these two numbers are full of interesting notes. In the last number, Mr. Wm. Saunders, of London, Ont., gives the description of a larva which is found to infest the seed of the grape, and to cause the berry to shrivel up. It appears to be the larva of some *Curculio*, and has considerably damaged the grapes at London, Paris, and Hamilton, in Canada. It seems partial to the Clinton, and also infests the Delaware, but the Concord and Hartford Prolific are exempt from it. May the *Canadian Entomologist* succeed, is our hearty wish!

POPULAR AMERICAN ENTOMOLOGY; being a Guide to the Study of Insects, by A. S. Packard, Jr., M.D., Salem, Mass. Parts II and III of this work have been received. In Part II a valuable catalogue of entomological works was given, and Part III gives interesting accounts of our bees, wasps, ants, and other Hymenoptera. The work increases in interest with each number, and will be found an invaluable guide to the study of insects. Subscriptions received by the author. Each part 50 cents.

We have endeavored for this present number to get a better sizing on the paper used, and we hope in the future to present still better impressions of our wood-cuts than we have done in the past, and thus to do greater justice to the artists.

ANSWERS TO CORRESPONDENTS.

Eggs of the White-Marked Tussock Moth—J. M. Hannah, Salem, N. J.—The egg mass which you find glued fast to your fruit trees, and which is composed of numerous perfectly round, cream-colored eggs, partly covered with glistening white, froth-like matter, and attached to a gray cocoon, are the product of the above named moth. They produce very pretty cater-

[Fig. 67.]



Colors—Black, white, yellow, and red.

pillars, the most striking features being a vermilion red head and neck; four cream-colored brushes on the back, and two long plumes at the head and one at the tail. Fig. 67 is a correct likeness of the full grown female worm. It is not often that we can guess the sex of an insect in the larval state, but with this caterpillar we can invariably do so after the 3d moult. We bred a great number of these worms during the past summer, and discovered that the male never gets to be more than half the size of the female, and that he undergoes but three moults before spinning up, while she goes through her fourth before making her cocoon. This insect seems to have a wide range, but it is mostly confined to particular orchards or localities. Indeed, since the female is wingless and invariably attaches her eggs to the outside of her own cocoon, it follows that this insect can only travel in the caterpillar state, and that it is scattered through the country, principally by being carried in the egg state on nursery stock. It multiplies rapidly, for there are two broods a year; but, luckily for us, it is checked in its increase by numerous parasites. We have ourselves bred numerous *Chalcis* flies from it, and also an undescribed four-winged fly, belonging to the genus *Pimpla*. In gathering the cocoons in the winter time, all those which have no eggs on the outside should be left untouched, as they either contain the empty chrysalis skin of the male, or else some parasite which will help to diminish their numbers another year.

Currant Borers—B. N. McKinstry, East Sumner, Ill.—The borers in the currant stems, which were first noticed in your neighborhood in 1867, and which are causing the death of the bushes, are, we have little doubt, the common Imported Currant-bush Borer—the larva of a little moth (*Trochilium tipuliforme*, Linn.), which has transparent wings and a blue-black body. We have in this country a native currant-borer, belonging to the very same genus (*Trochilium caudatum*, Harr.) the larva of which could scarcely be distinguished from those you have sent. But this native species seems to be confined to the indigenous or native currant. The real American currant-borer, which attacks our cultivated currant bushes, is the larva of a beetle (*Psenocerus supernotatus*, Say), and may always be distinguished from the other two by having no legs whatsoever. As is the case with many other imported insects, the European currant-borer is far more destructive than the natives. All dead branches, and all such as contain borers, should be cut down to the ground in early spring and burnt. In answer to your query as to whether the currant worm has ever done any damage in the Western States, we will state that there are three distinct worms which attack the currant in this country, and that we shall shortly publish an illustrated article on these insects.

Beech-twig Plant-lice—Geo. Burnside and J. T. Whelpley, South Pass, Ill.—The woolly Plant-lice from the twigs of a beech, are the same species spoken of in the answer to F. H. Guiwits, on page 58 of the last number of the ENTOMOLOGIST. They belong not only to a different species, but to a different genus from the Woolly Root-lice that infest your apple-trees. Owing to your excellent packing, the specimens reached us in first-rate order.

Insect infesting Grape Seed—A. S. Fuller, Ridgewood, N. J.—The grapes which you received from Canada came safely to hand. The maggot which infests most of the seeds, and causes the berry to shrivel up, was first described by Mr. W. Saunders, of London, Ont. The head is of the same translucent, milk-white color as the body, but the jaws, which are finely pointed, are light brown, and there is a patch of brown at their base. It has exactly thirteen segments exclusive of the head, and every segment has a few white, fleshy hairs, these hairs being thickest near the head and longest on the under part of the first three segments, thus imitating feet, as is often the case with footless larvae of this character. Fig. 68 gives a magnified view

[Fig. 68.]



Color, milk-white.

of this larva. It is evidently the young of some species of the Curculio family. We have often taken a minute dark brown curculio on the blossoms of the grape vine in the spring of the year, and have, at several different times, received it from correspondents who found it in the same situation. It is the *Anthonomus suturalis* of Le Conte (*erythropterus* of Say), and it may possibly be the parent of this seed-larva. You say truly that this will prove a formidable enemy to those who are endeavoring to raise new varieties from the seed, and we advise the burning of all the shriveled berries. In order to make sure of breeding this larva to the perfect state, we should be glad to receive further specimens of the infested grapes.

Museum Pests, again—Jonathan Haggins, Woodburn, Ill.—You say: "During the appearance of the locusts (Cieadas), I collected some half dozen specimens, and set them away in a close paper box. In the multiplicity of cares, they were neglected till to-day (Nov. 2d). On examining them I discover insects in the worm state, which have evidently been feeding on the locusts. I send them for your edification," etc. The insects are in all probability the larvae of the Museum pest (*Anthrenus museorum*, Linn). They are not peculiar to the Cieada, but attack alike, all dried insects. We noticed this pest in your collection while at your house last June. On page 60 of No. 3, in answer to T. W. Hoit, Jr., of St. Louis, Mo., we have suggested the means of preserving a collection from its ravages. When a collection is badly attacked we should advise the use of benzine with carbolic acid in it, for although we have had no occasion to use it ourselves, we have the authority of Mr. G. C. Rye, of Park Field, London. Mr. R. is the leading coleopterist in England, and in a private letter he strongly recommends this mixture, and further states that, if a box is very badly infested with these marauders, he pours benzine into it bodily, so as to cover the bottom, and then shuts it up quickly. It soon evaporates and leaves no stain. There is another species (*A. varius*, Fabr.), with the same habit, and so closely resembling the one we have been speaking of, that we doubt whether it could be distinguished in the larva state. The hairs on these larvae are of very singular forms, and make interesting objects for the microscope.

Grape-Vine Leaf-hoppers—P. C. Holmes, Gardiner, Maine.—There are eight or nine distinct species of the small Leaf-hoppers, that have for a long time been popularly known as the "Thrip," common on the grape-vine in various parts of Canada and the United States. All of them belong to the same genus (*Erythronera*) and are of nearly the same size, but differ from one another by marked and constant peculiarities of coloration. The species which you send, of a pale yellow color, with transverse blood-brown bands, is the Grape-killing Leaf-hopper (*Erythronera vitifex*, Fitch). You say that these insects entirely destroy the foliage of your grape-vines, thereby preventing the fruit from ripening, and that they will always attack the Delaware before any other variety. A torch carried through the vineyard at night has been found to be the most efficient means of destroying the common Grape-vine Leaf-hopper (*Tettigonia Erythronera vitis*, Harris), and would undoubtedly prove as effectual for the species under consideration. The operation should be repeated several times through the summer.

Apple-twig Borer—*J. T. Zimmerman, Cameron, Mo.*—The insect which bores into the branches of your fruit trees just above a bud or fork, and thus causes many of them to break and fall, is the Apple-twig Borer (*Bostrichus bicaudatus*, Say). The annexed figure



[Fig. 69.] represents the male of this beetle, the hair line at the side showing the natural size. He is distinguished from the female by having two little thorns projecting backwards from the posterior part of the body. Tho' you do not mention what kind of fruit tree it attacks, with you, we presume it to be the apple tree, for this beetle has long been known to have the peculiar habit of thus boring into the twigs of that tree. It bores in the perfect beetle state, and not in the larval state as do the other borers which attack the apple tree. The holes seen to be made for food and protection, for they are made by both sexes alike, and we have found the beetles in them, head downwards, in the middle of winter.

C. H. Roberts, Poughkeepsie, N. Y.—We should judge from your description that the holes near the buds of the present year's growth of your peach trees, were made by the same insect. We have never before heard of its work in New York, however, and can not speak definitely without receiving specimens. Try and send us a few.

C. R. Bahhitt, Carroll City, Iowa.—The drilled apple twig contained the very same species of beetle spoken of above.

The murky ground Beetle—*E. T. Dale, Jasper, Mo.*—The three large black beetles are, as you rightly conclude, the Murky Ground Beetle (*Harpalus caliginosus*, Say) which we illustrated at Fig. 48. Mr. Say states that, when irritated, this beetle emits a very strong vinegar-like odor; but as your observations are interesting, we quote your own words for the benefit of our readers. Speaking of this beetle, you say: "I have observed that it is a vegetable feeder to some extent. I have taken three specimens in the act of feeding upon the seeds of some wild plant, the name of which I do not know. I also discovered accidentally that they have the power of ejecting from their body some kind of an acid substance, which has an effect similar to that of sulphuric acid. One of the beetles I send you ejected from some part of its body, making at the time a sort of cracking noise, some of this acid upon my face. It continued to burn for two hours afterwards, although I washed the part in cold water immediately."

Circulios and Barklice—*D. A. Compton, Hawley, Pa.*—The Circulio does not pass the winter under ground in the larva state, but above ground in the perfect beetle state. You say that you "applied soft soap early last spring to every twig of several apple trees, but it had no effect upon the Barklice." Just so; you probably applied it before the eggs hatched out, when it does no good. If you had applied a solution of soap—say one part soap and six parts water—after the eggs hatched out, i. e. towards the end of May, it would have killed all the young larvae that it touched. We shall before long give exhaustive articles on both the above subjects. In the mean time read "Hogs vs. Bugs" in our first number.

Insects to be named—*E. B. Beach, Brooklyn, N. Y.*—It is very difficult to identify larvae from descriptions and figures with the requisite degree of certainty. Of the three which you figure and the three which you describe, we can only name one, that with recurved horns on the second segment, which is evidently a *Dryocampa*, and either *Dr. stigma*, or *Dr. pellucida*, most probably the former. Both these insects occur on the oak. It is possible that the first larva which you figure may be that of *Limacodes scapka*, Harris, but without a profile view it is difficult to speak with any certainty. As to the last larva which you describe, it may not improbably be that of *Lagoa opercularis*, Sm. Abb.

Young Pecan trees girdled—*Mann & Redmond, Arcola, La.*—You say that in a young nursery of pecans many of the trees are girdled and broken off by some insect. If, as you state, the work corresponds with that described on page 57 of our last number, you will find further light on the subject on page 76 of our present number, under the head of "Twig Girdler." The best thing you can do, is to pick up the severed twigs and burn them.

Insects named—*E. T. Dale, Jasper, Jasper county, Mo.*—The insects which you sent us for identification reached us in excellent condition. They are as follows: (1) Not ♀ *Lytta atrata* as you suppose, but both ♂ and ♀ of *Illeus confertus*, Say. (2), which you think an oak borer, is *Tragidion fulvipes*, Say. (3) *Cicindela scutellata*, Fabr.; (4) *Cicindela purpurea*, Oliv.; (5) *Cicindela punctulata*, Oliv.; (6) *Chrysomela auripennis*, Say. The immense mass of white, cotton-like cocoons found wrapped around a tomato stalk, is formed by the parasites that infested some unlucky potato worms such as we figured at a, on the first page of No. 2. The flies that issue from these cocoons belong to the genus *Microgaster*, but we do not know that they have ever been described specifically. There are two kinds, much resembling each other, which infest the common potato or tomato worm; the one spinning a smooth cocoon which is generally attached by one end to the body of the worm, the other spinning a loose cocoon, in company, and thus forming the masses which you send. The soldier beetles are, as you suppose, the *Chaubionopsis pennsylvanicus*, DeGeer, figured on page 51 of our last number.

Eggs of true Bugs—*S. C. Thornton, Moorestown, N. J.*—The mass of eggs of a dark purple color, with a buff-colored fringe at the upper end of each egg, and all of them fastened together and attached endwise to the bark of a horsechestnut tree, thereby forcibly recalling a lot of ninepins, was deposited by some true bug (order Heteroptera). The eggs are larger than any we have before seen, and belong most likely to some large cannibal bug of the *Reduvius* family. These eggs are very subject to the attacks of minute four-winged ichneumon flies, which eventually issue from them in the place of the young bugs. Do not destroy them; they will produce friends. The water containing the animalcules arrived safely. It contains several different species, but we have not sufficiently studied these microscopic animals, to be able to identify them. The larger species—that which can even be seen with the naked eye—belongs to the genus *Oyclops*.

Museum pest once more—*G. M. L., Indianapolis, Ind.*—The small hairy larva which you find boring into whalebone, and also infesting woolen goods, are those of the Museum Pest (*Anikrenus museorum*), a beetle belonging to the same family as the Bacon-beetle (*Dermestes lardarius*), and like that insect a terrible pest in all collections of Natural History. You say that you have also found it on the cocoons which you have hung up in your office for hatching, but that, so far as we have observed, the flies hatch just as well as when not disturbed. You will find out your mistake when these larvae have become a little more numerous with you. We referred to this subject in the last number of the AMERICAN ENTOMOLOGIST, p. 60, and again in our answer to J. Huggins, on p. 79 of this number.

The Tarantula of Texas again—*Chas. Peabody, Glenwood, Mo.*—The specimen which you send, and which is called a Tarantula in your neighborhood though it does not look like that which is found in Italy, is really a Tarantula and the very same species (*Mylalea hentzau*, Matcy), which we spoke of in our last number on page 60, in answer to James Bell of Eureka, Mo. At the November meeting of the Meramec Horticultural Society we learned that this species had in past years been found in your State, but it must be more common than usual the present year, for Dr. C. W. Spalding, of Kirkwood, Mo., has also sent us a specimen that was captured this fall.

The Hessian Fly on Seed Wheat—*U. Scott, 34 Gilmore street, Baltimore.*—You say that you believe that the Hessian Fly lays its eggs upon the seed wheat, and that it can therefore be destroyed by a pickle. There are two broods of this insect every year, one coming out in the fly state in May, the other late in August, and neither brood of flies living more than a few weeks. How then is it possible for the female fly to lay her eggs upon seed wheat in harvest time, when there are no Hessian flies about in harvest time? You might as well suppose that your corn-crib had been robbed by swallows in the middle of the winter!

The Cecropia Moth—*D. B. Waite, Springwater, N. Y.*—The cocoon sent is that of the Cecropia Moth—the largest and handsomest insect in the U. S. The larva, however, had died after spinning up, without changing into the pupa state. You will find figures of this species, in all its stages, in Harris's *Inj. Ins.*, pp. 387-9.

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All letters, desiring information respecting noxious or other insects, should be accompanied by specimens, the more in number the better. Such specimens should always be packed along with a little cotton, wool, or some such substance, in any little paste-board box that is of convenient size, and never enclosed loose in the letter. Botanists like their specimens pressed as flat as a pancake, but entomologists do not. Whenever possible, larvæ (i. e. grubs, caterpillars, maggots, etc.) should be packed alive in some tight tin box—the tighter the better—along with a supply of their appropriate food sufficient to last them on their journey; otherwise they generally die on the road and shrivel up to nothing. Along with the specimens send as full an account as possible of the habits of the insect, respecting which you desire information; for example, what plant or plants it feeds; whether it destroys the leaves, the buds, the twigs, or the stem; how long it has been known to you; what amount of damage it has done, etc. Such particulars are often not only of high scientific interest, but of great practical importance.

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" " three years.....		50 00

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THE APPLE-ROOT PLANT-LOUSE.

(*Eriosoma [pemphigus] pyri*. Fitch.) ✓

For the last twenty years a Woolly Plant-louse has been known to infest the roots of the apple-tree, causing thereon swellings and deformations of almost every possible shape, and when very numerous killing the tree. In the more northerly parts of the Northern States this insect is comparatively rare, but in southerly latitudes, and especially in South Illinois, it is exceedingly destructive in apple orchards. We have ourselves seen as many as nine trees, all in one square patch, that had apparently been killed by it near Cobden, Ills.; and according to Dr. Hull, "it is one of the worst enemies against which our apple-trees have to contend, and is much more common in our region than is generally supposed." (*Agr. Rep. Mo. Append.*, p. 451.) As long ago as 1848 Mr. Fulton, of Chester county, Pennsylvania, found this root-louse and the knotty swellings produced by it to be so abundant on nursery-trees in his neighborhood, that thousands of young trees had to be thrown away, and it became difficult to supply the market. (*Downing's Horticulturist*, III, p. 394.) And in August, 1858, M. L. Dnnlap, (*Rural*) stated in the *Chicago Tribune*, that in an orchard near Alton "the Woolly Aphis infests the roots in immense numbers, and by sucking up the sap destroys the trees, which in its effect has much the appearance of dry rot."

It must not be supposed, however, that every apple-tree that dies, without any appearance of borers or other noxious insects working upon it above ground, is killed by the Root-louse. Dr.

Hull has recently ascertained that healthy apple-trees are sometimes destroyed by a fungoid growth, of a white color and almost $\frac{1}{2}$ inch thick, overspreading their roots. And we have ourselves examined several trees in Macoupin Co., Ill., which were perishing piecemeal, from some unknown cause, without the least appearance of any louse-work upon their roots. (See *AMER. ENTOM.*, I, p. 30.) In all such cases, it is tolerably easy to ascertain whether or not the Root-louse is the author of the mischief. Take a spade and uncover the roots, either shortly before or as soon as may be after the death of the tree. If they are clubbed, knotted and distorted to a considerable extent, as represented at Fig. 70, *a*, and probably many of them rotten, we may know that this phenomenon could only have been caused by Root-lice, and if there is no such fungoid growth as was described above, we shall be pretty safe in bringing in a verdict of "Died of Root-lice." If, on the other hand, the roots are all of them of their natural shape and size, we shall have to look in some other direction for the origin of the mischief.

Although this insect usually confines itself to the roots of the tree, yet a few may occasionally be found on the suckers that spring up round the but of the trunk, and even on the trunk and limbs, especially in places where a branch has been formerly amputated, and nature is closing up the old wound by a circle of new bark. Where it works upon the naked trunk, it often causes a mass of little granulations to sprout out, about the size of cabbage-seeds, thus producing on a small scale, the same effects that it does upon the roots. Wherever the insect works, small as it is, it may be easily recognized by the peculiar bluish-white cottony matter which it secretes from its body, and which is never met with in the case of the common Apple-tree Plant-louse that inhabits the leaves and the tips of the twigs.

We have ourselves found winged Plant-lice, very closely allied to our species, upon the twigs of the Elm and the Ash in June, and upon the lower side of the leaves of the Red Osier Dogwood in September; and Dr. Fitch has described

two other such species that infest respectively the Hickory and the Oak. Whether any or all of these species likewise infest the roots of the trees upon which they occur, remains to be ascertained. But certainly they can never emigrate on to the Apple; for the Apple, the Elm, the Ash, the Dogwood, the Hickory, and the Oak, all belong to different botanical families; and no Plant-louse that lives upon a plant belonging to one botanical family, can live when transferred to a plant that belongs to a different botanical family. Even when two plants belong to different genera of the same botanical family, it is not often that the same Plant-louse will live indifferently upon either; and frequently the same Plant-louse will not even live indifferently upon two plants that belong to the very same botanical genus. We have a remarkable example of this last fact in the common Currant Plant-louse, which swarms in almost every garden upon the Currant, and yet was never known to shift its quarters on to the Gooseberry—a species that belongs to the very same genus (*Ribes*) as the Currant. Indeed so far is this from being the case, that nobody ever saw Plant-lice of any kind whatever infesting the Gooseberry.

[Fig. 70.]



Colors—(b) dull lead color; (c) black.

Fig. 70, *b*, shows the Apple-root Plant-louse in the larva state, with the usual woolly matter attached to its back. Fig. 70, *c*, shows the same insect in the perfect or winged state, with the woolly matter all removed.* On comparing

* We annex the technical description of this Plant-louse, drawn up from the recent specimen.

THE APPLE-ROOT PLANT-LOUSE (*Eriosoma pyri*, Fitch.) Black. Antennæ 2-5ths as long as the body, joints 1 and 2 almost confluent, short and robust; joint 3 fully $\frac{1}{2}$ the entire length of the antenna; joints 4-6 subequal, 5 a little the longest, 6 a little the shortest. (Fig. 70, *f*, that of the Winged-louse; *g*, that of larva, both highly magnified.) Meso-thorax polished. Abdomen opaque with more or less pruinescence. Legs (see Fig. 70, *d*), opaque black, immaculate. Wings hyaline; costal and subcostal veins robust and black; stigma pale brown, $2\frac{1}{2}$ to 3 times as long as wide, pointed at both ends, but more acutely so on the basal end, the vein bounding it behind robust and black. Discoidal veins and stigmal vein slender and black, the 3d or forked

this last with Fig. 71, which represents a Plant-louse that inhabits a large gall on the Cottonwood, it will be observed at once that the vein-

[Fig. 71.]



Color—Black.

ing of the front wing is very different. In Fig. 70, *c*, the third branch-vein is very distinctly forked; in Fig. 71 it is simple. Nor is this a mere accidental variation, but a peculiarity of the genus to which either insect belongs. (Fig. 70, *c*, genus *Eriosoma*; Fig. 71, genus *Pemphigus*). Now Dr. Fitch describes and names the Apple-root Plant-louse as belonging to the latter genus (*Pemphigus*); whereas out of 10 winged specimens obtained by ourselves at Duquoin, S. Ill., in the middle of October, 1868, upon apple roots and suckers swarming with larvæ, and 3 other winged specimens actually bred October 21 and 22 from larvæ obtained from Dr. Weed, Muscatine, Iowa, all without exception belong to the former genus (*Eriosoma*). And moreover, Dr. Fitch's insect is described as being nearly twice as large as ours. How does this come about? We can only account for it in the following way: Dr. Fitch's winged specimens were but two in number, and they were found by him, the one living the other dead, upon the roots of an infested young apple-tree, which had been brought him from an adjoining county. Hence he very naturally, but as we think erroneously, inferred that these two winged Plant-lice belonged to the same species as the minute wingless larvæ with which the infested roots were swarming. The truth of the matter probably was, that the two winged plant-lice got upon the infested apple-root by accident, on their road from the nursery to Dr. Fitch's orchard. Indeed we can almost say with certainty to what species they belonged; for on comparing Dr. Fitch's very minute and elaborate description with the Beech-twig Plant-louse (*Pemphigus imbricator*, Fitch), which comes out in the winged state in the very same time of the year as he met with his two specimens, it agrees sufficiently well to apply to that species. If, on the other hand, we compare

discoidal hyaline and subobsolete on its basal $\frac{1}{2}$. Length to tip of closed wings 0.13-0.14 inch.

Nine specimens, 3 recent ones from Iowa bred October 21-22, 6 dried ones from S. Illinois, captured at Duquoin October 16. In one wing of a single specimen there are two stigmal veins, one inclosed by the other, and the inner one springing from near the tip of the stigma. No apparent variation whatever in the structure of the 3d or forked discoidal in any of the 18 wings.

his description with our specimens, it not only disagrees generically, as already explained, but neither the size nor the markings will correspond at all.

We consider it, therefore, to be sufficiently certain that the Apple-root Plant-lice does not belong to the genus (*Pemphigus*), to which all subsequent authors, in deference to Dr. Fitch's authority, have hitherto referred it, but to the very distinct genus (*Eriosoma*) to which the notorious Woolly Plant-lice of Europe belongs (*Eriosoma lanigera*, Hausm.) And here arises a very interesting question: Is our American Apple-root Plant-lice identical with the European Woolly Plant-lice? We think that it is not, for the three following reasons: 1st, The descriptions of the latter do not agree very well with our insect. 2d, The European species can not stand a hot climate, but is confined to Belgium, the north of France, Germany and England; whereas our species thrives and flourishes best in a hot southern latitude. 3d, The European species exclusively infests the trunk and branches of the apple-tree, and it is recorded that Sir Joseph Banks "long ago extirpated it from his own apple-trees by the simple method of taking off all the rugged and dead old bark, and then scrubbing the trunk and branches with a hard brush" (Kirby and Spence, letter 6); whereas our American Root-lice normally inhabits the roots, and is only occasionally and in small numbers found upon the trunk and branches, so that scrubbing and scraping the bark would have little or no effect towards extirpating it.

It has been said by several authors that the true Woolly Plant-lice of Europe exists in the Eastern States. We incline to believe that this is a mistake, and that in every such case the few individuals of our American Root-lice, that are often found upon the trunk and branches and suckers, have been mistaken for the transatlantic species. Mr. Buel, upon whose statements Dr. Harris chiefly relied to prove the existence of the Woolly Plant-lice in New England, expressly says that "numbers of the insects harbored on the roots." (Harris, *Inj. Ins.*, p. 244.) Dr. Fitch describes the Woolly Plant-lice as "situated near the root, particularly around the base of twigs and suckers growing from the trunk, and where any wound in the bark is healing;" which are the precise localities preferred by our Root-lice whenever it lives above ground. (Fitch, *N. Y. Rep.*, II, § 17.) And finally Prof. Haldeman, in an article upon this insect, asserts that it not only attacks "suckers and small branches," but also "descends to the

roots." (*Farm Journal*, 1851, Vol. I, p. 130.) As to the winged specimens, which Mr. A. E. Verrill discovered upon apple-twigs in Connecticut in the month of October, they might possibly have belonged to the exotic species. (*Pract. Entom.*, I, p. 21.) But as that species is described as swarming in Europe in such prodigious numbers as to cover whole trees like a coat of cotton, it seems incredible that, if it had been really introduced into such a suitable climate as that of New England, it should not have become a great pest there. Instead of this, however, all authors describe it as occurring above ground in comparatively quite small numbers, wherever it was supposed to exist in the Eastern States.

From the enormous rate at which all Plant-lice multiply, it is plain that, if there were no check upon the increase of the Apple-root Plant-lice, it would in a few years' time sweep away whole orchards, especially in southern latitudes. Luckily for the fruit-growers and fruit-lovers, there exist one at all events, and probably two such checks. The first is a very minute parasitic fly, which Prof. Haldeman figured and described in 1851 as infesting in the larva state his supposed Woolly Plant-lice.* The second is a

[Fig. 73.]



Colors—(a) yellowish; (b) dull ash-grey; (c) br. wn.-black.

footless maggot (Fig. 72 a), about $\frac{1}{2}$ an inch long, which preys upon the Root-lice under ground, and changes in the autumn into the pupa state (Fig. 72 b), from which in the following spring there emerges the perfect Fly (Fig. 72 c), which we may call the Root-lice Syrphus-fly.† We have

* This fly belongs to the *Chalcid* family in the Order *Hymenoptera*, and was named *Eriophilus mali* by Prof. Haldeman. The figure and description will be found in the *Farm Journal* for 1851, pp. 130-1.

† This is the same insect referred to in the *Annual Report* of the Senior Editor (p. 62), and there supposed to prey on the Root-lice and to belong to the *Syrphus* family, though the perfect fly which he subsequently bred from it was not then known. We subjoin descriptions of this insect in all its stages.

THE ROOT-LICE SYRPHUS-FLY (*Piptiza radicum*, n. sp.) ♀
Shining brown black. Head clothed with short, rather sparse, white hairs, especially the lower part of the anterior orbits and the entire space below the antennae. Mouth dark rufous. Antennae compressed, with the joints proportioned as 2, 2, 5; joint 2 twice as wide as 1, and 3 twice as wide as 2; of a dull rufous color, edged above, narrowly on the inside, widely on the outside, with brown black. Thorax very finely rugoso-punctate, with some short sparse white hairs, especially laterally. Abdomen finely punctate, with longer white hairs, info-piceous above of the middle $\frac{1}{2}$ of joint 1; venter with joint 1 piceous. Legs with all the 6 knees, and in the 4 front legs the entire tibia except a spot on the extre-

found this cannibal larva pretty commonly among the roots of apple trees infested by the Root-louse, not only near Cobden, but also at Duquoin, S. Ill. Wonderful indeed must be that instinct, which enables the mother-fly to perceive which particular trees in an orchard have their roots swarming with lice, so as to know exactly where to deposit her eggs!

The best mode to get rid of the Apple-root Plant-louse is to drench the roots of the infested tree with hot water. But to render this process effectual, the water must be applied in quantities large enough to penetrate to every part of the infested roots. There need be no fear of any injurious result from such an application of hot water; for it is a very general rule that vegetable organisms can, for a short time, stand a much higher temperature than animal organisms, without any injury to their tissues. For example, hot water has been from time immemorial employed to scald the borer in peaches; and there is good evidence that it will kill the onion-maggot without injuring the young growing onions.

rior middle, and also all the 6 tarsi except their extreme tips, and except in the hind legs the base $\frac{1}{2}$ of the first tarsal joint, all dull pale rufous. Wings hyaline; veins black. Length \varnothing 0.25 inch; alar expanse 0.48 inch.

One \varnothing ; σ unknown. Bred May 23 from a single puparium found in the November preceding. On May 2 this puparium, which in the preceding autumn had been lightly covered with moist sand and deposited in a cellar, had crawled up out of the sand a distance of two inches, and attached itself to the stopper of the bottle in which it was inclosed. Upon being replaced under the moist sand, it was found two days afterwards to have again crawled about an inch up the side of the bottle. We have observed the same locomotive powers in the puparia of several other Syrphid insects, though, so far as we are aware, this very anomalous faculty has not hitherto been commented on by authors.

We are indebted to Dr. LeBaron of Geneva, Ills., who has paid special attention to the Order (*Diptera*) to which this insect belongs, for determining the genus to which it is properly referable. According to him, "the genus *Pipiza* differs from *Syrphus* in the absence of the prominence in the middle of the face, in the comparatively greater development of the posterior legs, and in the want of the little spurious longitudinal vein in the middle of the wing." "The only species discovered by Macquart," he adds, "is from Carolina, and very different from yours."

LARVA.—Dull pale flesh-color, tinged with yellow. Attenuated and somewhat depressed anteriorly; more blunt posteriorly, the anal segment being furnished with an elevated tube, which is of a light polished brown at extremity. Wrinkled transversely, with a prominent fold at anterior and posterior edge of each segment. The larger segments well defined; the smaller ones less so. First segment thoroughly retractile, and sufficiently translucent when extended, to show the dark triple-jointed mouth. A few soft, fleshy spines, of the same color as the body, and especially distinct on anal segments. Generally covered and disguised by the soil which it inhabits. Length when not extended, 0.23 of an inch. Described from two specimens taken in 1866 and three in 1865.

PUPEA.—Dull dirty yellow. Gradually formed by the contraction of the larva, during which time the wrinkles are obliterated, and it at last becomes quite smooth. Length 0.18.

ANTS' NESTS IN GARDENS.

A correspondent informs us that by burying a few sliced onions in ants' nests he has caused them to abandon their quarters. We learn from an experienced horticulturist, that two or three tablespoonsfuls of kerosene poured into the holes in their nests will produce the same effect.

THE PARASITES OF THE HUMAN ANIMAL.

We have had frequent occasion to dwell upon the fact, that one kind of insect is often parasitic upon another, either living within the body of the species which it infests, or attaching itself to that body externally. But insects are not the only animals which operate or are operated upon in this manner. Throughout the great group of the backbone animals (*Vertebrata*) scarcely a single species can be named, that is not attacked by one or more parasites; and although no known mammal, or bird, or reptile is, strictly speaking, parasitic, we yet find certain genera of lowly-organized fishes, *Ophidium* and *Echeneis*, that are so. It is, however, among the ringed animals (*Articulata*) that the greatest number of parasitic species are found; while, on the other hand, such species of them as are not themselves parasitic are very generally infested by others that are so. In the great class of Insects, for example, almost every known species is inhabited by one or more parasites; and even among the parasitic insects many species are themselves inhabited by other parasitic insects, thus presenting the singular spectacle of three living animals, each located inside another one, and only the third and last emerging alive and victorious from the two-fold living envelope, in which nature has appointed it to take up its dwelling.

Some naturalists have supposed that man forms a group in the Animal Kingdom entirely distinct and isolated from all the rest. But the more generally received opinion now is, that he is more or less closely allied through the tailless or "anthropoid" apes, such as the gorilla, the chimpanzee, and the orang-outang, to the short-tailed baboons and the long-tailed monkeys. We propose, in the following paragraphs to show that, so far as regards any fancied immunity from parasitic enemies, the human animal forms no exception to the general rule, but that, on the contrary, an unusually large number of parasites mark him out for their exclusive prey. Up to a very recent date it was almost universally believed, that the whole animal kingdom was created for the sole benefit and pleasure of man. No doubt each of the various parasitic species that prey upon man thinks—if he ever thinks at all with the ganglions that serve him instead of a brain—that the human animal was created for his special behoof, and that any attempt to get rid of him on the part of that animal is a grievous violation of the great fundamental laws of nature.

This subject will perhaps be considered by

some fastidious persons as offensive and disgusting, and beneath the dignity of us great Lords of the Creation. But, as the all-wise Author of nature has taken the pains to create these little animals, and organized them in so perfect a manner, that life is to them as much a source of happiness as it is to us, we can see no good reason why it should be degrading to the Creature to study even these, the humblest and lowliest works of the great Creator.

Among the vast and extensive class of insects there are no less than eight distinct species that prey exclusively, or almost exclusively, upon man. Of each of these—which come more immediately within the scope of this journal—we shall now give a short account, and we shall then briefly refer to some ten or twelve other species which are known to inhabit the human body. These last are not true insects, though they belong to the same great group of ringed animals as insects do, and we shall therefore pass them over with comparative brevity. On the whole, we may safely affirm that man is infested by nearly a score of different parasites.

The Eight True Insects that are Parasitic on Man.

THE HEAD-LOUSE (*Pediculus humanus*, Linn.) is seldom found upon adults, but inhabits almost exclusively the heads of children. Its eggs, which are popularly known as “nits,” are glued to the hairs among which it dwells, and it is solely by means of these eggs that the species is propagated. The vulgar belief that dirt and filth breed lice is a vulgar error; although, of course, these creatures increase with greater rapidity on a dirty head than on a clean one, because, on the former they meet with a more abundant supply of their appropriate food.

Stephens, a British entomologist of no very high standing, has classified the louse of the negro (*Pediculus nigrifarum*) as a distinct species from that of the white man; whence it might be reasonably inferred that the negro and the white man sprang from a different origin. But we are informed by a gentleman who formerly owned slaves in Kentucky, that the little negro boys in that State used commonly to communicate the vermin in their heads to their white playmates, and that when thus communicated, the race increased and multiplied with great rapidity, which fact pretty effectually demolishes Stephens's hypothesis. For it is a very general law, that the same species of louse cannot thrive upon the bodies of two distinct species of animals.

THE BODY-LOUSE (*Pediculus cervicalis*, Linn.)

inhabits more peculiarly the nape of the human neck, whence is derived its scientific appellation, which, when translated, means “neck-louse.” It very commonly, however, is found upon any part of the body which is not covered with a dense growth of hair, attaching its “nits” or eggs to the short scattering hairs which grow upon such parts. This is the species, which, during the late war, infested so grievously both Union and Rebel soldiers, from whom it received the characteristic name of “gray-back.” It differs from the Head-louse in having a distinct blackish stripe, commencing between the hind legs and reaching about two-thirds of the way to the tip of the abdomen. The male is distinguishable at once from the female by having at the tip of the front shank (*tibia*) a very robust blunt-pointed spur, which is almost as long as the shank itself. As this species attaches itself very commonly to the linen of the individual man whom it inhabits, it is manifest that those who change their linen with reasonable frequency, and have that linen washed in scalding hot water, cannot be long infested by it. The reason that it was so prevalent in the late war was, that the soldiers, from the necessities of the service, were unable to wash their clothing as often as they would have done at home, and nineteen times out of twenty had nothing but cold water to wash it in. Now, almost every species of insect will revive after an immersion of several hours in cold water, whereas water of such a temperature, that you cannot bear your finger in it for one second, will immediately destroy any insect whatever that is immersed in it.

We have ourselves carefully compared Body-lice taken from the person of a negro with others taken from the person of a white man, and can perceive no difference whatever between the two forms.

THE CRAB-LOUSE (*Pediculus pubis*, Linn.) is of a much more rounded and flattened shape than the two preceding, from which it also differs in sundry structural details, so that, since the time of Linnæus, it has been referred by some authors to a distinct genus (*Phthirus*). It differs likewise very remarkably, not only from the two preceding, but from all the true lice that inhabit other species of mammals, so far as they are known to us, in the following respect: Like the other members of the family to which it belongs, it attaches its eggs or “nits” to the hair; but the young larvae that hatch out from these eggs, instead of living on the surface of the skin, burrow under the scarf-skin or epidermis, and remain there, feeding on the

juices of the body and causing an intolerable itching, until they reach maturity, when they come forth out of their burrows to copulate and lay eggs for the future propagation of their species.

The favorite home of the Head-louse, as before stated, is the head; that of the Body-louse the more naked parts of the body; the Crab-louse, on the other hand, peculiarly affects the human *pubes*, though it occasionally strays off into the whiskers and the eyebrows.*

All the above three insects, as well as their eggs, may be readily killed by the application to the infested portions of the body of a small quantity of any kind of mercurial ointment—whether white, red or black is immaterial, though the white is preferable on account of its not soiling the linen. In the case of the Body-louse, however, as already stated, a frequent change of linen is all that is required to rid one's self of the enemy; and, moreover, the application of any mercurial ointment to the whole surface of the body, inhabited by this insect, would be injurious to delicate constitutions.

THE HUMAN BOT-FLY (*Cestrus hominis*, Gmelin).—Most persons are aware that there is a two-winged fly (*Cestrus bovis*, Linn.), the larvæ of which, both in Europe and America, hatch out from eggs deposited by the mother-fly in the hide of the living ox, and cause therein ulcers which are popularly known as "Worms" (worm holes). There is another species of the same family (*Cuterebra cuniculi*, Clark), the larvæ of which inhabit similar ulcers in the neck of American rabbits; and still another (*Cuterebra emasculator*, Fitch), which in the lar-

va state mutilates the generative organs of American squirrels, so as to cause that very general emasculation of these animals, which has been erroneously attributed, by many, to battles between the old and the young males.

In several parts of South America a larva belonging to this same family of insects, inhabits "worms" in the human body, the parent fly having every facility for depositing its eggs in the naked bodies of the natives, and being enabled to attack civilized foreigners whenever they strip to bathe. Since, however, this fly is not found in North America it will not be necessary to say anything further about it.*

THE COMMON FLEA (*Pulex irritans*, Linn.).—Most of us are so well acquainted with this insect in its perfect state, that it is not worth while to dwell upon its peculiarities. It is not, however, so generally known that its larva is an elongate, wriggling worm, totally unlike the mother insect, and that it feeds upon particles of clotted blood deposited along with the egg upon the floor of apartments by the mother flea. Hence fleas cannot multiply in a room where the floor is continually scoured and swept; and hence, also, we may deduce the practically important corollary, that the modern practice of laying down a permanent carpet in bed-rooms, instead of the old-fashioned bedside carpets, which used to be taken up every few days and shaken in the open air, affords decided facilities for the propagation of the flea.

Entomologists differ as to whether the fleas ought to be placed in a small order by themselves (*Aphaniptera*), or whether they should form an abnormal family of the order of two-winged flies (*Diptera*). As they agree in almost every respect with the two-winged flies, except in having but the merest rudiments of wings, the latter seems the preferable course. After all, these questions are questions rather of words than of things, and of taste rather than of science.

It is commonly supposed that the flea that infests the dog is the same species as that which infests man; and that, consequently, dog-fleas can exist, flourish, and multiply in bed-chambers where there are no dogs. All entomologists, however, are agreed that each species of flea is peculiar to a distinct species, or at all events to a distinct genus, of animals; and we have descriptions of some ten distinct fleas, inhabiting respectively man, the dog, the cat, the squirrel, the hedgehog, the mole, the mouse, the bat, the Australian porcupine (*Echidna*), and the domestic fowl. We have ourselves found a small species upon the young of the common raccoon.

*The scientific classification of the Lice—including the Bird-lice (*Virinus* family) which are structurally quite distinct from the True lice (*Pediculus* family) that inhabit Mammals—has greatly perplexed naturalists. Some have placed them along with certain allied forms in an order by themselves (*Aptera*) as a portion of the great class of Insects; others have considered them as not true Insects; and Burmeister has arranged the True lice as a subordinate family of the True bugs order (*Heteroptera*), and the Bird-lice as a subordinate family of the order *Neuroptera*. It is generally asserted that the True lice have a beak, while the Bird-lice notoriously have jaws—thus throwing the former among the sucking insects (*Hemiptera*), and the latter among the biting insects (*Mandibulata*). The mouth of the True lice is certainly very obscurely organized, the head terminating in an elongated, blunt, project spout, from which there is occasionally protruded a small, indistinctly formed process which is the true mouth. We believe this process can not be a beak, analogous to that of the bugs, as Burmeister supposed, because the Crab-louse, as has been already stated, burrows under the human scarf-skin, for which operation jaws of some kind or other are absolutely necessary. We should prefer, therefore, to classify both the Bird-lice and the True lice, as well as the *Podura* and *Lepisma* families, among the *Pseudo-neuroptera*, as distinct families of that sub-order. For we can see no reason why, if the lice, &c. are to be placed in an order by themselves, on account of their having no metamorphosis whatever, and not even the slightest vestiges of wings, the orthopterous genera, *Diapheromera* and *Phalangopsis* and *Rhaphidophora*, which are as utterly destitute of wings as the lice, and which are as devoid of any larval and pupal metamorphosis as the lice, should not also be placed in a separate order. Whether the *Pseudo-neuroptera* should be annexed to the *Orthoptera* or to the true *Neuroptera* is another and a very distinct question.

* See on this curious subject Say's works, II., pages 32-33

No doubt dog-fleas, if they shift their quarters from dog to man, may cause considerable irritation upon the human skin for a few days, or even weeks, just as chicken-lice, under similar circumstances, will sometimes do; but that they can increase and multiply upon such unnatural food as human blood is an entomological impossibility.

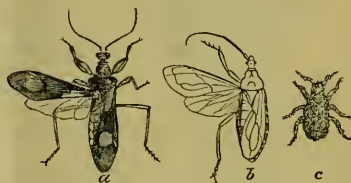
THE CHIGOE, OR JIGGER (*Pulex penetrans*, Linn.).—This is a true flea, but differs from the common flea in burrowing into the human skin, usually under the toe-nails, where it propagates its species, and thereby causes ulcerated swellings, and in some cases, if neglected, even death. It occurs in profusion in Cuba, Hayti, and other parts of Central America, but is not found in the United States. The minute and almost microscopic creature, which often goes by the name of "jigger" in the more southerly parts of the Union, is not a true flea, nor even a true insect, but a harvest-bug (*Leptus*), belonging to the same class as the spiders and mites. [See AMERICAN ENTOMOLOGIST, vol. 1, p. 38.]

THE BED-BUG (*Acanthia lectularia*, Linn.).—We presume that but few of our readers would require a figure of this insect, in order to enable them to recognize it. It belongs to the true Bugs (*Heteroptera*), but, like certain other species of that order, is remarkable for having only rudimentary wings and wing-cases. Its habits are unfortunately but too well known to almost everybody in the United States, and especially to those who travel upon Western steamboats. Ordinarily the Bed-bug is confined to the dwelling places of man, and lives on the blood of us great Lords of the Creation; but we have known it to swarm in prodigious numbers in a chicken-house, where it must have fed exclusively upon chickens' blood; and it is said to occur also in European pigeon-houses. In the whole course of our collecting we have never met with a single specimen in the woods or the fields, though many persons have assured us that it abounds under loose bark in the woods. Such persons, however, not being familiar with entomology, have most probably been deceived by the strong general resemblance to the Bed-bug borne by a beetle which is commonly found under bark (*Prometopia 6-maculata*, Say), but which, unlike the bed-bug, always has complete wings and complete shelly wing-cases.

Like almost all other insects, the Bed-bug has its insect foes. We have been informed by an old experienced steamboat captain, Edw. H. Beebe, of Galena, Ills., that whenever steamboats on the lower Mississippi become infested by Cockroaches (*Blatta* family), the Bed-bugs

are very soon exterminated. Unfortunately, however, in this case the remedy is worse than the disease.

[Fig. 73.]



Colors—(a) black and tawny yellow; (b) brown-black; (c) brown.

It was long ago ascertained by the best European entomologists, such as Linnæus, Fabricius, and DeGeer, that a cannibal bug (*Reduvius personatus*, Linn., Fig. 73, b) commonly haunts houses in Europe for the sake of preying upon the Bed-bug, and that its larva (Fig. 73, c), which is remarkable for being covered with a glutinous substance to which little pieces of dust and dirt usually adhere,* inhabits beds in Europe with the same object in view. No insect having these very commendable propensities has hitherto been discovered in America. But we have ourselves found the Two-spotted Corsair (*Pirates biguttatus*, Say, Fig. 73, a) alive and kicking between the mattresses of a bug-infested bed in South Illinois; and, as this species is closely allied to that which notoriously preys upon Bed-bugs in Europe, we infer that it has the same very gratifying habits. At all events, we know from its structure that it is a cannibal, and not a vegetable-feeding insect; and a very similar species of the same genus, but of a uniform black color (*Pirates picipes*, H. Sch.), is common in the West under stones and prostrate logs, and feeds there upon various subterranean insects.

The Two-spotted Corsair, as we are informed by Mr. Uhler, is common in Mexico, and is also found in Louisiana, Texas, and California. Hitherto it has never been met with so far north as Illinois, and we may therefore consider it as a Southern species. Housewives in the South, and other parties concerned, if they find this prettily marked bug among their bed-clothes, will now know what he is there for, and will exercise their own discretion as to whether or not he ought to be slain.

THE BLOOD-SUCKING CONE-NOSE, OR BIG BED-BUG (Fig. 74 a, *Conorhinus sanguisuga*, Le

* The larva of another species belonging to the same family, which inhabits trees (*Evagoras viridis*, figured in the AMER. ENTOM., No. 1, p. 18), has the same peculiarity.

[Fig. 74]



Colors—(a and b) black and blood-red.

Conte*.)—This species belongs to the same extensive group (*Reduvius* family) as the Two-spotted Corsair, but to a very different division of it. Like that insect, it insinuates itself into beds, but instead of having the same commendable habits, it sucks human blood at first hand. "While taking his meal," as we are informed, "he fairly spraddles himself out, and seems to enjoy it hugely." In the more southerly parts of Illinois, namely in Madison, Jersey, and Union counties, we know of no less than eight specimens having been found in beds, and it must also occur as far north as Adams county, for we saw it in a collection of insects made at Quincy and exhibited at the State Fair in 1868. Mr. Uhler, as he informs us, "formerly received a specimen from southern Ohio, near Marietta, at which place it was said to be occasionally found in beds and to cause severe inflammation by its puncturing." Dr. E. S. Hull, of Alton, Ills., was once, as he tells us, bitten in three places in the arm by one of these creatures; and the arm became so inflamed in consequence, that for three days afterwards he almost lost the use of it. In the more northerly parts of the United States, so far as we are aware, it does not occur. Like many of its allies it passes the winter in the perfect state; for we have ourselves captured it in South Illinois under loose bark in November, in company with its pupa (Fig. 74, b).

All the species of this genus, most of which are South American, fly into houses by night, according to Burmeister, and live upon the blood of mammals, the puncture of their beaks causing great pain. In the larval and pupal states they probably suck the juices of insects; for being wingless in those states, they would have no means of reaching the larger animals. The single pupa that we found under bark in the winter time occurred in a place that was about half a mile from the nearest house; so that at all events it certainly could have had no chance there to suck human blood by night.

* We are indebted to Mr. Uhler for the specific determination.

Other ringed Animals that are parasitic on Man.

THE ITCH MITE (*Acarus scabiei*, Linn.)—This almost microscopic little creature, like the American Harvest-bug, previously referred to, belongs to the class of Spiders (*Arachnida*), and is consequently not a true insect. The itching sores which it produces on the human skin are easily cured by the application of sulphur ointment, which kills the Mites that cause the sores, and affords immediate and permanent relief. Since, as has been known since the days of Linnæus, the itch is caused by the presence of a Mite, we can readily understand how one person communicates it by the touch to another, and how Robinson Crusoe, if he had lived alone on his solitary island for a thousand years, never could have been afflicted with this so-called disease, unless he had brought it there with him.

INTESTINAL WORMS (*Entozoa*).—Some ten or a dozen distinct species of these lowly organized creatures are known to inhabit various parts of the human body. We shall not dwell here upon their natural history, interesting and instructive as it is, further than to caution our readers against the fatal practice of eating uncooked pork, in any of its forms, and whether smoked or unsmoked. It is now satisfactorily proved that the Tape-worm originates from the passage into the human intestines of little bladder-like creatures (*Cystodids*), which inhabit the liver and other parts of the hog, and when abundant cause the meat of that animal to be technically known as "measly pork." And the notorious *Trichina spiralis*, which is a very minute worm, also found in the flesh of the hog, effects an entrance into the human body in the same insidious manner, and when in excessive numbers causes excruciating pains in the muscles, and sometimes even death. In both these cases, cooking destroys the worms, and prevents them from finding their way alive into the body of the living and breathing man, and there increasing and multiplying. When cooked, these little animals are no more unwholesome than Lobsters or Crabs, which, although they live in the sea, are not fishes, as is popularly imagined, but belong to the same great Branch of Ringed Animals as do Insects, Spiders, Thousand-legged Worms, and the multifarious Families of the True Worms, whether parasitic or otherwise.

The Coffee Borer.

The coffee trees in Madras and that part of the East Indies are greatly troubled with the coffee borer, an insect similar to the borers we have had in the acacias.

A MEASLY WILD DUCK.

It is well known that, under certain circumstances, the flesh of the hog becomes full of white bladder-like substances, about the size of a large pea, and that the pork is then said to be "measly." These little bladders are in reality living animals, belonging to the same order (*Entozoa*) of the great class of Worms, as the various species of worms found in the bowels of man. Formerly they were called cystadids, and supposed to be perfect animals, and how they got into the flesh of the hog was a mystery. Of late years, however, it has been clearly ascertained that they are merely the larva state of the well known Tape-worm; and that, when measly pork is eaten raw, the bladder-like creature sometimes passes alive into the human intestines, and there gradually develops into the tape-worm. Knowing what we do of the filthy habits of the hog, it is not difficult for us to understand how the minute eggs of the tape-worm may occasionally pass, in considerable numbers, from the human body into the body of a hog, and there generate a large stock of the bladder-like substances spoken of above.

We have recently been shown the body of a male wild duck, or Mallard, which was so full of a new and undescribed kind of cystadid, that you could not put your finger upon any portion of the flesh without touching some. At first sight they had the appearance of a number of very elongate kernels of wheat imbedded in the muscles. But on a closer examination they proved to be bladder-like sacks, without any external articulations whatever, from one-fifth to one-fourth of an inch long, about four times as long as wide, of a cylindrical shape, tapered a little at each end, and filled internally with a viscid yellowish substance. If introduced, along with a portion of the raw flesh of the duck, into the human stomach, they would probably have developed into some kind or other of intestinal worm; but we were by no means desirous of ascertaining the particular species of worm, by personally experimenting on this very interesting, but rather ticklish, subject.

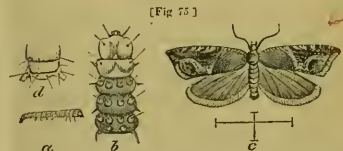
In all such cases as these, perfect security from infection is attained by thoroughly cooking the measly meat before it is eaten. This kills the obnoxious cystadids, and of course prevents them from subsequently developing into their ulterior stages within the human body.

The history of the notorious *Trichina spiralis*—an almost microscopic worm which is sometimes found in the muscles of the hog—differs somewhat from that of the above creatures, inas-

much as this species does not pass through two distinct stages of existence. But the same law prevails in all such cases as these, namely, that there is no fear whatever of any of these animals being introduced alive into the human body, except through the dangerous and every way exceptionable practice of eating raw meat. Neither, as is plainly shown from the example quoted above, are we safe by simply abstaining altogether from pork. The flesh of the wild duck, and probably that of many other animals hitherto unsuspected, and supposed to be peculiarly cleanly, may prove to be as dangerous as that of the hog, provided it be eaten raw or only partially cooked.

We repeat once more to all our readers—**COOK ALL KINDS OF FLESH BEFORE YOU EAT IT.** Of the many scores of persons who have died of *Trichina spiralis* in this country, every one had eaten either raw ham, or raw sausage, or some other uncooked or partially cooked preparation of pork. Accum, the English chemist, wrote a book long ago which he entitled "Death in the Pot." But the death that he spoke of arose from the adulteration of culinary articles *before* they went into the pot. We say most emphatically that there is "life in the pot."

STRAWBERRY WORMS.



Colors—(a and b) greenish brown; (c) reddish-brown, black and white.

THE STRAWBERRY LEAF-ROLLER (*Anchylopera fragariae*, N. Sp.).—For nearly two years, we have been acquainted with a little greenish leaf-roller, measuring about one-third of an inch, (See Fig. 75 a), which in certain parts of North Illinois and Indiana, has been ruining the Strawberry fields in a most wholesale manner; and which also occurs in Canada, judging from an account in the *Canada Farmer* of Aug. 1, 1867. It crumples and folds the leaves, feeding on their pulpy substance, and causing them to appear dry and seared, and most usually lines the inside of the fold with silk. There are two broods of this leaf-roller during the year, and the worms of the first brood, which appear during the month of June, change to the pupa state within the rolled-up leaf, and become minute reddish brown moths (Fig. 75 c) during the fore part of July. After pairing in the usual manner, the females

deposit their eggs on the plants, from which eggs in due time, hatches a second brood of worms. These last come to their growth towards the end of September, and, changing to pupæ, pass the winter in that state.*

We first heard of this leaf-roller in the summer of 1866, when it did considerable damage at Valparaiso, Indiana, and we were informed by Mr. N. R. Strong, of that place, that in 1867 they continued their depredations with him, and destroyed 10 acres so completely as not to leave plants enough to set half an acre, and that in consequence of this little pest in conjunction with the White-grub, he has had to abandon Strawberry culture.

When we met the *ad interim* committee of the Illinois State Horticultural Society at Lacon, in the beginning of July, 1868, we received from these gentlemen a quantity of infested strawberry leaves, from which in the course of the next two or three weeks we bred many of the moths. These specimens had been collected at Mr. Bubaugh's place, near Princeton, Illinois, where they were said to be very abundant, and to have completely destroyed one strawberry patch containing several acres.

Subsequently we received another lot of specimens from Mr. W. E. Lukens, of Sterling, White-side Co., Ill., with the following remarks upon this very important subject:

"Where these insects are thick I would never think of raising strawberries. It is strange that I have not noticed any of them work upon this side the river; while on the south side for a mile up and down they are ruining the crops of berries. Removing the plants does not take with them the moth nor the eggs, so far as has been observed. A gentleman by the name of Kimball, at Prophetstown, had his crop a few years ago en-

*We annex brief descriptions of this insect, both in the perfect and in the larval states. We are indebted to the distinguished English Microlepidopterist, H. T. Stainton, for the generic determination of the species, and for the further remark that "it is closely allied to the European *Anchylopera comptana* (Manual Vol. II. p. 225), which feeds on various Rosaceæ, such as *Poterium sanguisorba*, *Potentilla verna*, and *Dryas octopetala*."

Anchylopera fragaræ, new species. (Fig. 75 c.) Head and thorax reddish brown. Palpi and legs paler. Antennæ dusky. Tarsal joints tipped with dusky. Front wings reddish brown, streaked and spotted with black and white as in the figure.—Hind wings and abdomen dusky. Alar expanse 0.40–0.45 inch. Described from nine specimens.

THE LARVA (Fig. 75 a) measures, when full grown, 0.35 of an inch. Largest on the first segment tapering thence very slightly to the last. Color varying from very light yellowish brown to dark olive-green or brown. Body soft, somewhat translucent, without polish; the piliferous spots quite large, shining, always light in color, contrasting strongly in the dark specimens with the ground color. Hairs, especially lateral ones, quite stout and stiff. Spots arranged in the normal form, segments 2 and 3 having none, however, on their posterior half as have the rest (See fig. 75, b). Head horizontal, of a shining fulvous color, with a more or less distinct dark eye-spot and tawny upper lip. Cervical shield of the same shiny appearance. Anal segment with two black spots (See Fig. 75, d) at posterior edge, being confluent and forming an entire black edge in some specimens. Legs, prolegs, and venter of the same color as the body above.

tirely destroyed by this insect, though it amounted in all to two or three acres. I hear of a great many men in other places having their crops burnt up with the sun, and have no doubt that it was this leaf-roller, and not the sun, that was the real author of the damage. As for myself, I have on this account entirely quit the business of growing strawberries."

The only modes of fighting this new and very destructive foe of the Strawberry—which however seems to be confined to northerly regions—are, 1st, to plough up either in the spring or in the fall, such patches as are badly infested by it, by which means the pupæ will probably be destroyed; and 2nd, not to procure any plants from an infested region, so as to run the risk of introducing the plague upon your own farm.

The Strawberry False-worm.

(*Emphytus maculatus*, Norton.)

[Fig. 76.]



1, Ventral view of pupa; 2, side view of same; 3, enlarged sketch of perfect fly, showing veins of wings; 4, larva crawling, natural size; 5, perfect fly, natural size; 6, larva at rest; 7, cocoon; 8, enlarged antenna, showing joints; 9, enlarged egg.

This is a worm quite different in appearance and belonging to the order of four-winged flies (*Hymenoptera*), and not to that of the scaly-winged moths and butterflies (*Lepidoptera*), as does the preceding species. It is a soft, dirty-yellow 22-footed worm* that feeds externally on the leaf of the strawberry, and is illustrated in all its stages in the above Figure 76.

*We annex a more full account of the larva and pupa for those interested:

LARVA—Length 0.60 to 0.65 when full grown, having changed but little in appearance from time of birth. Somewhat translucent. General color light dirty yellow with a glaucous shade along dorsal and subsorsal regions, inclining in most cases to deep blue-green on the thoracic segments.—Minutely wrinkled transversely. Venter light glaucous. Legs—6 pectoral, 14 abdominal and 2 caudal—of the same color. Head of a more decided yellow than body, with usually a dark brown spot above, one nearly of the same size at the upper front, and too rather smaller ones at each side—joined by a brown line—the anterior spot being lower down than the other. In certain specimens these two are blended and there is but a triangular spot on the top of the head, while the depth of shading on the body is also variable.

PUPA—Of a dirty glaucous color the members being somewhat lighter than the body.

The transformations of this insect were first recorded by the junior editor of this paper, in the *Prairie Farmer* of May 25th, 1868. The parent flies (Fig. 76, 5) may be seen hanging to and flying around strawberry vines about the beginning of May, in North Illinois, Iowa and Michigan; in all three of which States we know them to occur. They are dull and inactive in the cool of the morning and evening, and at these hours are seldom noticed. They are of a pitehly black color with two rows of large transverse, dull whitish spots upon the abdomen. The female, with the saw-like instrument peculiar to the insects of the great family (*Tenthredinidae*), to which she belongs, deposits her eggs, by a most curious and interesting process, in the stems of the plant, clinging the while to the hairy substance with which these stems are covered. The eggs are white, opaque, and 0.03 of an inch long, and may be readily perceived upon splitting the stalk, though the outside orifice at which they were introduced is scarcely visible. They soon increase somewhat in bulk, causing a swelling of the stalk, and hatch in two weeks—more or less according to the temperature—and from the middle of May to the beginning of June the worms attract attention by the innumerable small holes which they make in the leaves. The colors of these worms are dirty yellow and gray-green, and when not feeding, they rest on the under side of the leaf, curled up in a spiral manner, the tail occupying the centre, and fall to the ground at the slightest disturbance. After changing their skin four times they become full grown, when they measure about $\frac{3}{4}$ of an inch.

At this season they descend into the ground, and form a very weak cocoon of earth, the inside being made smooth by a sort of gum. In this they soon change to pupæ, from which are produced a second brood of flies by the end of June and beginning of July. Under the influence of July weather, the whole progress of egg-depositing, etc., is rapidly repeated, and the second brood of worms descend into the earth, during the fore part of August, and form their cocoons, in which they remain in the caterpillar state, through the fall, winter and early spring months, till the middle of April following, when they become pupæ and flies again as related. This fly has received the name of *Emphytus maculatus* by Norton, in allusion, doubtless, to the whitish transverse lines on the abdomen.

With the facts here given, it will be no difficult matter for any one interested to make war in his own way. The worm's habit of falling to the ground enables us to destroy them with a solution of cresylic acid soap, or any other de-

coction, without necessarily sprinkling the vines; while, knowing that they are in the earth during the fall and early spring, when there is no fruit, the ground may be stirred and poultry turned in to good advantage.

FUNGOID GROWTHS.

The popular idea used to be that mushrooms, toadstools, funguses and the like, can grow only from decaying matter whether animal or vegetable. But it is now clearly established that various fungoid growths take their origin from living plants and from living animals. For example, the notorious Black-knot is a fungus, although like a variety of other such plants it is inhabited by the larvæ of many insects; and moreover, in all probability the Black-knot that infests Cherry trees is distinct from that which infests Plum trees. Again, the well known Cedar apples on the Red Cedar are funguses, and not as Dr. Fitch supposed, galls produced by gall-making insects. Lastly we occasionally find certain Pig-nut Hickories, with their twigs swelling out into gnarled blackish exerescences often as big as a hen's egg; and these exerescences, as we have experimentally ascertained, are not caused by any insect, but are most probably of fungoid origin.

In the above three cases, the fungoid growth is developed from the twig of the infested tree. In other cases it is developed from the leaf. For instance, the common Mildew on the Grape-vine is nothing but a microscopic fungus; and upon the leaves of the wild Crab orange-colored patches are in certain seasons very abundant, with the lower surface of the patch exhibiting a curious ring of dark projecting dots, each of which is hollow, and crowned with a fringe of minute hairs at tip. This last is a true fungoid growth, and was described as such more than 30 years ago by Schweinitz under the name of *Cecidium pyratum*. An excellent figure of it will be found in the *American Agriculturist* for December, 1868, where it is stated to be so abundant in an apple orchard in Tennessee as to have killed several trees. We ourselves formerly received from Ohio apple-leaves attacked by this fungus, with a statement that it was quite common there upon certain trees. According to the *Agriculturist*, the English name for fungoid growths presenting the general appearance of the above is "cluster-cups." Many other such cases might be readily enumerated, but we forbear.

It is well known that in Europe the common silk worm has, for a long series of years, been

terribly afflicted by a parasitic fungus. According to Dr. Carpenter, it is not at all unusual in the West Indies to see wasps (genus *Polistes*) flying about with plants of their own length projecting from their bodies. In our last number (page 77) we referred to a parasitic plant growing from the mouth of the common White Grub, which is apparently the same fungoid growth spoken of three years ago by Dr. Kirtland of Ohio as being well known to science.* In further illustration of this very curious subject, we annex here a communication from a Virginian gentleman, Mr. Sam. H. Y. Early, with which we have been favored through the good offices of that distinguished entomologist, Wm. H. Edwards.

"There is a white mushroom known in the region in which I was raised, as poisonous and fatal to the hogs that feed on it. I believe it is common in all localities in which I have been. In the spring of 1842 I observed in what is called a "new ground" in Virginia a great quantity of these mushrooms, and in reply to some remark I made about them, some of my father's negroes, who were then making hills with hoes for planting tobacco, inquired of me if I knew what produced these mushrooms. On my replying in the negative, I was informed that they grew from the white grub worm. I think there were some twelve or fifteen negroes present, all of whom concurred in the statement, and said it was no new thing to them. They had no difficulty in establishing the truth of what they stated, because they dug them up in all their stages of germination and growth before my own eyes. In a very short time they had furnished me with a large number of the worms in their original shape features and size, and as distinct to the eye as if they had been alive, but having the consistency, color and smell of a mushroom; and I actually broke them up, just as a mushroom breaks in one's hands, snapping them crosswise and squarely off. Many others I found to be enlarged before germinating, and many just germinating, but with the shape of the worm preserved. And in some I noticed that the features of the worm were preserved in the root; even after the mushroom had grown up through the earth and attained some size. I gathered a good many specimens in their various stages into my handkerchief, and carried them to my father's house, where they lay on the mantel for some time. They seemed, however, to be no novelty to many to whom I exhibited them. In fact they were familiar to almost all who had

* See the article by this gentleman in *Prairie Farmer* 1865, Vol. XVI, p. 71.

opportunities of investigation, and to whom I mentioned them at the time."

In the Missouri specimen referred to in our last number, there were said to be "two sprouts of green vegetable growth, growing out of the head of the grub, one on either side, of nearly half an inch in length, and resembling a hog's tusk in shape." In the Iowa specimen referred to in the second volume of the *Practical Entomologist*, page 116*, which is now lying before us, one sprout is over an inch long, and the other is scarcely one-tenth of an inch long, and both, as in the Missouri specimen, were when fresh of a green color and took their origin one from each corner of the mouth. The most remarkable thing is that in Iowa, according to Mr. Gilbert who forwarded the specimen, "there were large numbers of such specimens turned up by the plow, and the root came from the worm in exactly the same part of the body in all." Hence it is reasonable to infer that the mushroom originates inside the body of the insect, and being unable to make its way through the skin pushes a path for itself through the aperture of the mouth. We presume there can be little doubt as to the identity of the Iowa and Missouri specimens, and the probable identity with these of the numerous specimens in Virginia so graphically described by Mr. Early.

* Printed by mistake as "page 16" in A. E. p. 77.

PLUMS FOR THE MILLION.

We have shown, in preceding articles, how professional fruit-growers may raise good crops of plums, of any desirable variety suited to their locality: first, by frequently jarring their trees and destroying the Curculios that fall therefrom; and, secondly, by allowing hogs the range of their orchards, so as to get rid of all the wormy fruit as fast as it falls, and thus nip the evil in the bud.

But for the unprofessional cultivator, who has only a few fruit trees growing in his garden, both the above methods are, as a general rule, impracticable. It is as much trouble to prepare for jarring a single plum-tree as for jarring a hundred, and as to allowing hogs the run of a garden, that of course is out of the question.

Luckily, however, for those who wish to cultivate plums on a small scale, there are two varieties which, though not of the finest quality, may yet be successfully grown without any special attention to fighting the curculio. The first of these is the Columbia plum, a variety of the European species (*Prunus domestica*). The second is the Miner plum, otherwise known as

the Hinckley plum, Isabel plum, Gillett plum, Townsend plum, Robinson plum, &c., which is a cultivated variety of one of our American wild plums, distinguished by botanists as the Chick-asaw or wild-goose plum (*Prunus chicasa*). The native home of this wild species seems to be the Southwestern States; but Dr. Latham quotes it as occasionally found in Illinois. It is altogether different from the common wild plum of the West (*Prunus americana*), which has a much less elongate leaf, and differs in various other respects.

1ST. THE COLUMBIA PLUM.—According to Dr. E. S. Hull, who has grown this variety for many years near Alton, in South Illinois, this plum is round, fully two inches in diameter, and, near Alton, ripens in August. It is only of the second quality, either for cooking or for eating, fetching \$10 or \$12 per bushel when the best varieties command \$16. Near Albany, N. Y., it is extensively raised, but throughout the Western States it is comparatively unknown. According to the same authority, although the *Curculio* oviposits in this plum as freely as in others, yet the larva that hatches out from its egg is almost invariably drowned out by the exuberant flow of juice that is peculiar to this variety.

2ND. THE MINER OR HINCKLEY PLUM.—This has been very extensively grown near Galena, Ill., for the last thirty-four years, and has lately been introduced into Wisconsin. It is a deep-red, round plum, about one and a half inches in diameter, of a firm texture, and with a rather tough and thick skin. In those regions it ripens from the last of September to the beginning of October; and we were informed at Galena that it can be kept through the winter by simply scalding it with hot water, placing it in any convenient open vessel, and then covering it with the liquor with which it had been scalded. Owing to the firmness of the flesh, it bears transportation remarkably well, and it is said to meet with a ready sale in the Galena market. According to an article in the *Gardeners' Monthly*, (Sept. 1868), Louisville buyers had paid from \$4 to \$6 per bushel for all that they could meet with near Murfreesboro, Tenn.; and Dr. Hull informs us that it commands this price in the Chicago market, when the best cultivated varieties fetch from \$12 to \$16. Hence, it must be quite obvious that the Miner plum cannot even be considered second-rate in quality. Still, on the principle that "half a loaf is better than no bread at all," it may be safely recommended to those who have neither the time nor the opportunity to grow finer fruit.

As to the nearly complete exemption of the Miner plum from the attacks of the *Curculio*, there can be no doubt whatever upon this point. All authorities agree here. Dr. Hull writes us word that he has grown this plum for many years, and that "every year a part of the young plums are punctured by the *Curculio*, but the larva in them is but rarely perfected, and the fruit ripened up finely in 1868, and does so every year." Mr. Joel Barber, of Lancaster, Wis., informs us that "the *Curculio* marks the fruit and deposits its eggs as readily upon the Miner plum as upon any other variety; but the eggs never hatch out, and when the crop is abundant, a large portion of the plums escape being stung at all." Finally, the universal testimony of all the Jo Davies county fruit-growers, whom we had the pleasure of conversing with at a meeting of their local Horticultural Society in 1868, was to the same effect. Although, however, the Miner plum is almost *Curculio*-proof, it is attacked, to a limited extent, by the Plum-gouger (*Anthonomus prunicida*, Walsh). The larva of this last insect may be readily distinguished from that of the true plum *Curculio* by its habit of boring at once into the kernel, and there staying until it transforms into the perfect beetle: whereas the true *Curculio* lives exclusively in the flesh of the plum, and goes underground to pass into the perfect beetle state.

We repeat, therefore, that the Columbia plum is probably, and the Miner or Hinckley plum is certainly, the plum for the million, on account of its hardness, productiveness, and almost complete exemption from the attacks of the *Curculio*. Whether in the case of the latter this exemption is due to the drowning out of the larva, as with the Columbia plum, or to the late period at which the fruit matures, rendering it an unsuitable food for the "Little Turk," or finally to the fact of its belonging to a distinct botanical species from all the other cultivated plums, is a question of no practical moment, though theoretically of the highest interest. Possibly all these three causes may contribute towards the desired result. We ourselves, from among a bushel of Miner plums that were on exhibition at the Fair of the Jo Davies County Agricultural Society, picked out a perfectly ripe specimen that bore the unmistakable crescent-cut of the *Curculio*. Yet it was not otherwise damaged than by the slight disfigurement; and, like the rest in the basket, was, for eating, a fair third-rate plum, if it be allowable for bug-men to express a decided opinion on a question which more immediately concerns the fruit-men.

THE "COLORADO GRASSHOPPER."

Editors American Entomologist :

You have, perhaps very naturally, arrived at some quite erroneous conclusions respecting the peculiarities of the above named insect. First, impliedly, that its origin is confined to Colorado; second, that its "native home is in the canons of the Rocky Mountains;" and, third, that it deposits its eggs at various points in its flight.

The "Hateful" (new title to us) Grasshopper—by some said to be identical with the Egyptian Locust in appearance and habits—is common to *all* this western or *rainless* region, one-third of the United States, but its breeding place is upon the hot, parched plains and table lands, from four to six thousand feet above the sea, instead of in the canons of the mountains. The greater the heat, the more they flourish. Though they endure considerable cold and live, they are at the same time exceedingly sensitive to its effects; becoming torpid in frosty nights or in snow storms, and reviving to active life in the succeeding hot sunshine. The swarms that devastate the country in their flights are invariably natives of sandy plains or basins, comparatively destitute of vegetation, where the direct and reflected heat of the sun's rays in summer are more intense than you ever experience in the vernal valley of the Mississippi. The humidity, however, is very much less; the air being like that of a furnace. In such places, and on the hottest days, the Grasshopper is the most active, and then it attains its greatest perfection. When it has reached a certain stage in its existence, it takes to flight. Those hatched in the same locality, and necessarily under the same climatic influences, rise in the air about the same time, but they do not move in concert. Their course is directed by the prevailing winds more than by any other influence. Consequently, in this country, it is generally from northwest to southeast. They alight or move forward at pleasure, each individual upon its own account. Many of them fly at an immense height. When on the highest peaks of the snowy range, fourteen to fifteen thousand feet above the sea, I have seen them filling the air as much higher as they could be distinguished with a good field glass, glistening in the sunlight like snowflakes. In crossing the snowy ranges countless myriads of them perish. Nearly all that alight for food become so chilled that they are unable to rise again, and in a few days they die. On the great snow fields it is nothing uncommon to see the

dead so plentiful that they might be shoveled up by wagon loads.

When the season comes for depositing their eggs, the swarms which happen to be in favorable localities, proceed to do so, after which most of them soon die and the pest disappears. Some doubtless continue their flight. If the succeeding winter is mild, young Grasshoppers may be found upon sandy, sunny hillsides long before spring, but the great swarms appear with the earliest vegetation. Then it is they are most destructive. It is a common belief that a young Grasshopper eats more than half a dozen full grown ones. They feed and grow, and in due time take flight, as did the generation before them. But few Grasshoppers are hatched in the mountains, properly speaking. It is true they do in some of the valleys, up to an altitude of seven or eight thousand feet—possibly sometimes to nine thousand—but they usually come out so late that the frosts of the following fall catch them before they take flight. As an illustration, the Middle Park of the Rocky Mountains is a great basin, bowl-shaped, with a single notch broken out of its western rim. Otherwise, it is surrounded by snowy mountains. In 1867, it was invaded by swarms of Grasshoppers from the direction of Utah, which deposited their eggs all over it. In its lower portion the young began hatching about the first of July. They attained maturity and took flight in August. Their hatching ground was from six to seven and a half thousand feet above the sea. Further up toward the rim they came out later, and at nine thousand feet they did not appear until the last of August. September frosts and snows caught them, and they never left their native ground. About the same time these latter hatched, immense swarms of full grown insects came again from the west, but instead of alighting in the Park they drifted up against and upon the snowy range east of it, where they perished in countless millions.

In August, 1864, this country had its worst visitation of "Hateful Grasshoppers." They had hatched in the valleys of the Upper Missouri, from six hundred to eight hundred miles distant, and swept over Colorado with a solid front. They ate up late crops and then deposited their eggs and died. In the spring of 1865, their progeny came out of the ground with the early crops, which they devoured. When about one-third grown they were attacked by an Ichneumon Fly, which stung them in the back, depositing one or more eggs. The product of these destroyed probably one-half or two-thirds

of the Grasshoppers, and the balance in due time took flight and left us. With the exception of those two years, Colorado has not been generally nor severely scourged by that pest. They have done damage in certain restricted localities, and have passed over in greater or less swarms almost every year since the settlement of the country, but the prevalent idea that they are a yearly plague is all a mistake.

In New Mexico, which has been settled by the same people for two hundred years, generation after generation of the same family, cultivating the same fields, they say they expect to lose about one crop in seven by Grasshoppers. The experience of the people in Utah, Montana, Idaho and Nevada, is about the same as ours. I think you are right in the supposition that they will not propagate in great numbers in the Mississippi valley—not because it is too hot or too low, but because it is too damp.

Now, why is it that Colorado has been given the unenviable distinction of supplying names to two of the pests of agriculture—the “Colorado Potato Bug” and the “Colorado Grasshopper?” Neither is peculiar to Colorado. The Potato Bug is hardly known here, and has never done any damage worth mentioning. Both were well known before Colorado was named, and yet both have been renamed *after* Colorado. Why are things thusly?

Respectfully, your ob't serv't,

WM. N. BYERS.

DENVER, Col., Dec 6, 1868.

Editors American Entomologist:

In the last number of your excellent journal appears an article under the title “The Hateful or Colorado Grasshopper.” Now permit me to object most seriously in behalf of this Territory against attaching the odium of the nativity of this pest to this country, when Utah, Montana, Oregon, Nevada and New Mexico, all have them equally numerous with Colorado. The Colorado Potato Bug is enough; we want no more fame of that kind. The Rocky Mountain Grasshopper is the Rocky Mountain Grasshopper. Now, having pen in hand, I feel impelled to write a few thoughts, which are the result of my knowledge of this Rocky Mountain Grasshopper. Though I may differ in opinion from the article referred to, I do so for the sake of truth and the public good. The Grasshoppers are distinguished here as the Spring and Fall Grasshopper. Those of the Spring are those that hatch out here, make wings, and fly off generally about the last of June or first of

July, never remaining to lay eggs. The Fall Grasshopper flies here from the west in September, and sometimes in August. They rest, feed, and sail off if the wind suits their course for it; and, as is well known, they fly with the wind, and more generally when it is in an easterly direction. A sudden change in the wind will cause them to fall to the ground in myriads, when if it rights itself, soon they immediately rise and fly off again. They come in swarms varying from a half mile to many miles in extent. Those that come here late pair off, and in two weeks after begin to deposit their eggs, which is generally from the fifteenth to the last of September. The eggs hatch in a week of suitable warmth and moisture. After a fall of snow, succeeded by ten days of warm weather, young Grasshoppers may be seen here on hill-sides and warm places in the fall. This is the history and nature of the Grasshopper as exhibited here. That they can live in a warm climate and become adapted to it, is proven in New Mexico, where they did much damage this year, as well as in California. But the question may be asked why have they not propagated themselves in Iowa and Missouri? The reason is obvious, they came there too early and deposited their eggs too soon. The eggs having been laid so early, the hatching process began in the fall, the eggs were chilled and debilitated by frost, and when spring's warmth completed the work, there came forth a brood of sickly, dying Grasshoppers, incapable of propagating themselves. Now, should we have a late cold spring in the Rocky Mountain region, retarding the hatching of the Grasshoppers that they may reach Iowa and Missouri October 15th, and deposit their eggs after that time, there will be such a swarm of Grasshoppers in those States as was never before seen, but will be seen often thereafter.

V. DEVINNY.

DENVER, Col Ter., 1868

[There are hundreds of insects that take their name from some particular district where they were first discovered, though they are equally common in many other districts. The Pennsylvania Soldier-beetle, for example, takes its name from Pennsylvania, yet is just as common in all the other northern States. (See AMERICAN ENTOMOLOGIST, p. 52, note). Again, the New York Weevil takes its name from the State of New York, where it was first met with. Yet in that State it is exceedingly scarce, while in the valley of the Upper Mississippi it is very common and very destructive to fruit trees. If we are to change the name of the Colorado Potato-

bug, and the Colorado Grasshopper, because these insects occur in other districts as well, we must also change the name of the New York Weevil, to avoid hurting the feelings of the great State of New York; and so on *ad infinitum*. The correct scientific rule is, that specific names, when once validly established, cannot be changed—Eds.]

THE NINE-PRONGED WHEEL-BUG.

Editors American Entomologist:

The "Eggs of true Bugs," from Moorestown, N. J., referred to on page 80, 2d column, of the ENTOMOLOGIST, are, without a doubt, in my mind, those of *Reduvius (Prionotus) novenarius*, Say, a large species, which is becoming very common in this locality, but not more so than is desirable, from its known predaceous habits. This insect has long been common in and about Philadelphia, but it is only during the last ten years that it has been observed in the county of Lancaster, except on very rare occasions. In a residence of many years at Marietta, only twelve miles west of Lancaster City, and during eight years of active exploration in that neighborhood, I never saw a single specimen of this insect, although various other species of REDUVIIDS were very common. I have often obtained the eggs and the young by confining the adult female in a box. The color, the form, and the manner of agglutination of the eggs, agrees very well with the statement of your correspondent S. C. T. The subsequent hatching of the eggs, and the progressive development of the young, has furnished some very interesting "episodes in insect life." On one occasion a mass of about fifty of these eggs, which were attached to the side of a box, hatched out prematurely, in a warm room, early in March, and a few of the young survived until the first week in April, puzzling me very much to know how life was sustained with nothing but air to feed upon. Every week, however, the number of living subjects seemed to diminish, but those that *did* survive seemed to be healthy, active, and growing. One day, however, I detected one of the large individuals seizing one of the smaller ones, and in about ten minutes he had him sucked out as dry as an empty chestnut shell; and on examining the skeletons on the bottom of the box I found them all hollow. The subsequent observations of Mr. Jacob Stauffer, of this city, upon a colony which he had in his garden, confirmed those which I had made, and seem to imply that in a state of nature the habits of this insect, in this respect, are the same.

These insects, when quite young, and for some weeks thereafter, are gregarious, the stronger feeding upon the weaker, and after the colony has been reduced to eight or ten in number, and these have acquired sufficient strength and art to capture other prey, they separate and become solitary. Witnessing the gradual development of tact, cunning, assault and evasion, practiced by these insects, it would appear that the lessons learned in youth were necessary to carry them through their after life. S. S. R.

LANCASTER, PA., Dec., 1868.

[Our correspondent is not probably right, in referring these eggs to the Nine-pronged Wheel-bug (*Reduvius novenarius*, Say). We had this insect in view, in referring the eggs to some species in this genus, but it is always unwise to refer the eggs or any of the preparatory states of an insect to a definite species, unless we know positively of what we are speaking.—Eds.]

Grasshoppers in the State of New York.

Editors American Entomologist:

In your November number (page 53), you give authority for saying that grasshoppers were scarce in this State (New York), this season. This may have been the fact where Dr. Velie resides, but here in the extreme western part, they were more numerous than usual. Many fields of corn were badly injured by having the "silk" eaten from the ears before the pollen had fallen. Carrots and buckwheat also suffered badly. They ate all the carrots in my own garden, and also the onions (seed onions, not "sets"), and left the parsnips untouched. Many gardens were entirely cleaned of cabbages, and vineyards suffered materially; not from loss of foliage, but the grasshoppers ate holes in the berries, and, unless disturbed, would not leave a bunch till all the berries were spoiled. Some Delaware vineyards also suffered from the depredations of bees. My own Delaware suffered from what are called here "yellow jackets," and "black hornets," or wasps (?). Both build "paper" nests on trees, and always trouble sweet apples, but this year they injured the grapes. I think that if the grasshoppers had left the grapes alone these "hornets" never would have troubled them. No other varieties of grapes were injured much, only occasionally an Iona or Diana.

Black crickets were remarkably plenty here this season, also the tent caterpillar. The "flea beetle" (*Haltica*), was unusually destructive to young cabbages and turnips.

Yours, etc., D. A. A. NICHOLS,

WESTFIELD, NEW YORK.

UNIVERSAL REMEDIES.

We have received from Mr. J. Cochrane, nurseryman, of Havana, Ill., a copy of a circular strongly recommending BEST'S PATENT FRUIT TREE AND VINE INVIGORATOR, from which we cut the following elegant extracts:

This Fruit Tree and Vine Invigorator is the most useful combination of ingredients ever offered to any people, in any country, for the purpose designed. **To the healthful tree its use can be productive of no harm; its only effect when the system of the tree is in order being an increase of sap or growth of the tree. ** In order to cause a tree or branch to produce fruit, all that is necessary is to check in some manner the too free circulation of its sap. This can be done by using BEST'S INVIGORATOR. ** When applied to the tree it penetrates every pore—destroying the worm in the heart, and by connecting with the mineral substances of the earth destroys the cause and prevents the creation of any destructive insect. It will prevent Curculio from stinging the Plum. It will kill the Peach-grub; and if used early in the Spring will prevent the creation of the grub. It will destroy every insect that trees or vines may be effected with, in any climate. It will increase the growth of trees and vines one-third yearly. It will prevent mildew on berries. It prevents mildew and dry-rot on grapes, and invariably matures them large. In connection with the mineral substances of the earth, it produces a healthy sap that swells the tree, causing the old bark to peel off from the body, while a beautiful new, green bark takes its place. It drives all disease from the body of the apple tree, and escapes it off from the branches and the foliage. It gives such life and strength to the tree that the severest atmosphere of winter will not effect the branches. It produces a vigorous bud, and with such strength that no frost can effect it. *Apples will not rot when put away to keep.* It will kill potato bugs and parasite, and prevents potato rot. It will prevent weevil or rust in wheat, and also prevent fly from touching it. It prevents moles from taking corn, and destroys the cut-worm and ehintz bug. It has been used by thousands of the best men in the country, and they are all living and ready to testify to the truth of the above statements. In eight cases out of ten it gives health to trees, so they will bear perfect fruit. By using the Invigorator in the spring, it never fails in any instance. By using it in the fall and spring, or two successive springs, so as to give health to the tree, the fruit will be perfect, smooth, without specks, very large and free from worms. Single "Individual Rights," with full instructions for mixing and using, sent free by mail, on receipt of price, \$5 00 each.

To all which we reply as follows:

1. This remedy is warranted to destroy Borers, Curculio, Peach-grub, Potato bugs, Weevil, Hessian fly, Cutworm, Chinch bug and generally every insect that trees or vines may be effected [affected?] with." Now, the insects actually named here belong to no less than four different orders, and are, many of them, as distinct from one another as a Mole is from a Monkey or a Bear from an Opossum. Is it likely then that the same combination of drugs can be equally obnoxious and deleterious to all of them? Does not every farmer know that, even in the case of two such closely allied animals as the cow and the sheep, the sheep will eat scores of weeds that the cow will not touch? But insects are not the only animals that this wonderful Panacea operates upon! It also "prevents moles from taking corn!" Why not say that by pouring a barrel of the Invigorator into the Upper Missis-

sippi, it will cure all the citizens of New Orleans of the vile habit of chewing tobacco?

2. Animals, however, are not the only organisms that the Invigorator is death upon. It is also death upon four distinct kinds of plants, namely, mildew and dry-rot on grapes, rot in the potato and rust in wheat; for all these four so-called diseases are now known to be nothing but invasions of certain parasitic funguses; and yet upon the grape vine itself, the potato itself, and the wheat itself, instead of exercising any deleterious influence, this miraculous panacea showers down life and health in the most profuse abundance! Strange that the same remedy should discriminate so nicely between different plants, and yet slay all bugs whatever without any discrimination. For it will be observed that this wonderful mixture is warranted to kill, not only the potato bugs that are our enemies, but also the "parasite" that preys upon the potato-bug, and is consequently one of our best friends.

3. We learn that if we apply the Invigorator, the severest frost will not "effect" [affect?] the bud or the branches. Then according to Mr. Best they can go to work and grow figs and oranges in Maine! Only "invigorate" them sufficiently, and even forty degrees below zero won't hurt them.

4. "Apples," we are told, "will not rot when put away to keep." Will not rot for how long? Does the Invigorator change summer apples into winter apples? Why not say at once that rotten apples, by touching them with the Invigorator, become in three minutes' time as sound as they ever were?

5. We have heard of blowing hot and cold with the same breath. But how the same invigorator can, as is claimed, both increase the flow of sap and at the same time check the flow of sap "so as to produce fruit" is more than we can explain.

And yet, in spite of all these and a hundred other such absurdities, plenty of men who think one dollar too much for the AMERICAN ENTOMOLOGIST will cheerfully pay five dollars for an "individual right" to mix and use the new Patent Liquid Manure. Like almost any other manure, this secret composition may likely enough stimulate the growth of their trees, but in no other way can it possibly, as is claimed, protect those trees against the attacks of all insects and all diseases without exception.

☞ A flock of ants, ten miles in width, is said to have recently crossed the Shasta Valley, in California. Can any of our California exchanges confirm this statement?

COMPLIMENTARY.

At the late meeting of the Missouri State Horticultural Society, held at Columbia, a resolution was offered, strongly recommending the AMERICAN ENTOMOLOGIST to the horticulturists throughout the country.

A similar resolution was afterwards offered by Dr. Warder of Ohio, at the meeting of the Illinois State Horticultural Society, at Bunker Hill, and it was warmly supported by Prof. Turner of Jacksonville, and unanimously adopted. We ask for no higher commendation of our work than these good words of encouragement from bodies of such intelligence, and composed of men so well able to judge of its merits.

Among the very many excellent and flattering notices which the ENTOMOLOGIST has received, we make room for the two following on account of their brevity. The *Round Table* says:

"St Louis has recently produced a monthly with whose appearance and evident thoroughness we are greatly pleased. This is THE AMERICAN ENTOMOLOGIST, of which we shall take pleasure in speaking at greater length when our acquaintance with it shall have become longer. Meanwhile we may say that its twenty well-filled and admirably illustrated pages of reading matter are chiefly devoted to the insects whose habits affect agriculturists, particularly throughout the Mississippi Valley, and that about the neat little pamphlet there is an unmistakable assurance of honest work by accomplished naturalists."

The *American Farmer*, of Rochester, N. Y., says:

"This capital new monthly has reached its fourth number, and seems to be just the thing needed in these days of insects. While eminently scientific, it is thoroughly practical without a vestige of quackery. It is beautifully printed and illustrated, containing just the kind of matter, it seems to us, the most needed by farmers and fruit growers."

PAPER-MAKERS.

It is only within the last few years that man has succeeded in making paper out of wood, and even now the process is not practically a successful one. Yet the hornets—those "natural paper-makers from the beginning of time," as Harris felicitously called them—have been making a kind of tough, gray waterproof paper out of wood every summer from the most remote antiquity.

ON OUR TABLE.

L' INSECTOLOGIE AGRICOLE—A monthly paper of 32 pages, E. Donnaud, editor, Paris, France. The October number of this journal has been received. We had supposed the AMERICAN ENTOMOLOGIST to be the only paper in the world devoted entirely to economic entomology, and there probably is no other paper of the kind in the English language; but "L' Insectologie Agricole," is devoted to the same interests, and treats of useful insects and their products, noxious insects and their ravages, and of practical methods of combating them. The number before us contains a colored plate of the common Itch-mite (*Acarus scabiei*, Linn.), accompanied with an interesting account of that minute pest. A table, showing the number of caterpillars, chrysalids, and cockchafer, which seventy-six pupils, in a common school at Phalempin, destroyed between the 1st of February and the 14th of July, gives the aggregate as 23,003. A *revue* of the market, with prices for all kinds of insect produce is also given.

CECIL'S BOOKS OF NATURAL HISTORY, in three volumes. CECIL'S BOOK OF BEASTS; CECIL'S BOOK OF BIRDS; CECIL'S BOOK OF INSECTS. 16mo, 200 pages each. Handsomely illustrated. Retail price, \$1.25 per volume; in sets, \$3.50. Published by Clarke & Co., No. 8 Custom House Place, Chicago, Ills.

These books are gotten up in a very neat and popular style. They contain interesting reading for young folks, and will make an admirable Christmas present.

The *American Naturalist*, published at Salem, Mass., has the following announcement in the December number:

The approaching close of the second volume of the *Naturalist*, while exhibiting the gratifying fact that the subscription list has been constantly increasing from the start of the undertaking, also brings conclusive evidence that the Magazine cannot be maintained, with the present circulation, at its present low price. The Editors are therefore most reluctantly forced to increase the subscription price of the Magazine to \$4.00 a year, commencing with the third volume, March, 1869.

After the 1st of March, 1869, our regular price for Vols. I and II will be \$4.00 each, unbound, and \$5.00 each, bound, postage paid. Single numbers of all three volumes will be 35 cents each.

Club rates for Vol. III to present subscribers renewing for Vol. III will be as follows, until March 1st, 1869: For a club of five, \$17.00; of ten, \$32.00; of twenty, \$60.00, and a free copy to the person sending the money.

The club price of the ENTOMOLOGIST with the *Naturalist* will therefore be \$4.00 in future, and we cannot wish our friends at Salem better success than that every one of our subscribers should, in sending their names, send also for the *Naturalist*.

Look Out for the Eggs of the Apple-tree Plant-louse.

While at Columbia, Mo., at the meeting of the State Horticultural Society, we noticed that the little, shiny, black bead-like eggs of the common Apple tree plant-louse (*Aphis mali*, Fabr.) were very numerous on almost all the trees in the neighborhood. In many of the young trees on Mr. James Stephens's place, there was not a twig which was not studded with them in every crevice and crack, and around every bud. At the December meeting of the Alton Horticultural Society, twigs covered in a similar manner were presented for identification. The punctures made by the Periodical Cicada form a good shelter for these eggs, and are generally lined with them. We judge therefore that this plant-louse will be more common than usual in these localities next spring, though we are glad to state that the few warm days which occurred during the latter part of November caused about one-third of the eggs to hatch; and that those lice have since been killed by the frost. Still we advise every one owning an apple tree to look out for them next spring, about the time the buds begin to burst, and syringe them with a weak solution of lye, or a still weaker solution of cresylic acid soap.

A Substitute for the Poisonous Substances sometimes used for Preserving Insects.

The learned French chemist, T. Raspail, in his *Manuel de la santé*, gives a solution of aloes and black pepper, as a good substitute for the compounds of arsenic, mercury, etc., which are made use of to preserve insects. He says that if a small quantity of this solution be put into the paste used in lining boxes, it will form a sufficient and lasting protection against insect marauders. The plan is simple, and I strongly urge its trial by Entomologists.

CHAS. DADANT.

HAMILTON, ILLS.

Greenhouse Plants.

The Meally-bug and the Red Spider, as we hear from the best authority, will stand any amount of tobacco smoke, while Plant-lice (*Aphis*) are easily killed by tobacco smoke. The Red Spider, however, may be got rid of by exposing the infested plants to the rain, and the Meally-bug by a wash of cresylic soap, sufficiently diluted not to injure vegetation. ✓

ERRATA.—On page 79, column 2, par. 2, line 19, for "G. C. Rye," read "E. C. Rye." On page 73, column 1, line 7 from bottom, for "former," read "latter."

ANSWERS TO CORRESPONDENTS.

How to hatch Pupæ.—*Daniel Porter Smith, Had-dam Neck, Conn.*—You say you have collected a quantity of pupæ, and enquire how you can most successfully hatch them out. The best advice we can give, is to keep them as near as possible in the same conditions in which they are found in nature. Those which pass the winter in the ground should be put away in earth, which is kept continually moist. By placing them in a box of moist sand, and by burying this box a foot deep in the garden during the fall, you place them in natural conditions, and may expect to find them in a healthy state when you dig the box up in the spring. All butterfly chrysalids that transform above ground are easily bred by keeping them in a room of a low, even, and sufficiently moist temperature. We have excellent success ourselves in breeding cages, which set out tin bottoms, that will hold from three to four inches of earth. The cage is made of four glass sides, and is covered with a cap of fine wire gauze. One of the glass sides opens as a door, and the bottom is furnished with a tin tube in which to set a wide-mouthed bottle that will hold water. By keeping the earth covered in winter with damp moss, both it and the atmosphere are made sufficiently moist for all insects within the cage. Small insects may frequently be bred in closed bottles, while the pupæ of beetles should be kept in moist rotten wood, or in whatever other substance they are found. The three chrysalids which you send for names are as follows: No. 1, which you find quite plentiful on the wild cherry, is the cocoon of the Prometheus moth (*Attacus Prometheus*, Drury); No. 2 is the chrysalis of the great Yellow Swallow-tail butterfly (*Papilio Tarnus*, Linn.), and No. 3 is the ♂ cocoon, with the empty ♂ chrysalis, of the White-marked Tussock moth (*Oryia leucostigma*, Harr.), the caterpillar of which we figured on page 79 of No. 4.

Drug Store Pests.—*J. M. Good, St. Louis, Mo.*—The small whitish larvæ that are infesting your capicum, with six feet, a scaly head and brown lips and jaws, and measuring 0.15 of an inch when stretched out, though they naturally curl round in a ball; are the larvæ of some species of the beetle family, PTTINIDÆ. We searched in vain for the perfect beetles, and therefore can not tell to which particular species they belong, until we breed them. There is a species of a uniform brown color (*Pinus brunneus*, Duffschmidt) which we have bred from all-spice, and these larvæ may possibly prove to be the same species. The worms of about the same size and general appearance, but without feet, that are destroying your decorticated barley by consuming the flour, though they for the most part leave the hull entire, are the larvæ of a small brown weevil. Amongst these larvæ there were many of the perfect weevils, and we discovered two distinct species. One is the common Grain weevil (*Calandra granaria*, Linnæus), and the other is the Rice weevil (*Calandra oryza*, Linn.) These beetles resemble each other both in size and appearance, but the last named is somewhat the lighter in color, and has on the wing, covers four still lighter reddish-yellow spots. These weevils multiply very rapidly, as the female deposits great numbers of exceedingly minute eggs of a sulphur yellow color. By plunging the bottles, containing both the infested spice and barley, into boiling water, and allowing them to remain in the water for ten minutes, you can effectually kill these insects and thus prevent their further increase.

Apple-tree Worms.—*J. J. Thomas, Racine, Wis.*

—The little brown worms, enclosed in a horn-like case, and found surrounded by crumpled leaves on apple twigs, are the larvæ of the Rascal Leaf-crumpler (*Phycita nebulo*, Walsh). They remain on the trees all through the winter, finish up their feeding in the following spring, and about the middle of July transform into small moths. In 1868 they have been unusually numerous, but ordinarily they do not occur in such profusion as to do any material amount of damage. Besides the apple tree, they infest the quince, the crab and the plum. The only known way to destroy them is to pick the masses of crumpled leaves of the trees in the winter time, and either burn them or forcibly crumple them up between the thumb and finger. As the larvæ is soft and delicate, a comparatively slight pressure is sufficient to destroy it.

Crane Fly Larvæ.—*R. D. Alexander, Mexico, Mo.*—The worms which you find in such great numbers in your garden, and which you forwarded to us through Mr. O. A. A. Gardner, of Columbia, Mo., are the larvæ of some species of Crane fly (*Tipula*). You say you have noticed that they stand freezing with impunity. The larvæ of these Crane flies all have this same attribute. We do not know what particular species will be produced from the larvæ which you send, but they resemble some which we received during the month of February, 1867, from B. Seevers, of Oskaaloosa, Iowa, and which were found by him, crawling over the snow and ice in a meadow, while the thermometer showed but 10 degrees above freezing point in the sun. These larvæ, for the most part, feed on decomposing vegetable matter; though they are sometimes found in great numbers in meadows, where they feed on the roots of the grass, as well as the vegetable portions of the soil. In meadows they do a good deal of damage by detaching the roots and causing them to dry. The larvæ of a European species of Crane fly, have been noticed, in parts of Northern Europe, to have the curious habit of collecting together by thousands, each one fixed to another by a sticky substance, and forming together a serpent-like animal, at times a few feet long, at other times several yards in length. The whole company thus linked together travel at a snail's pace over the ground.

Mr. Hickman, Columbia, Mo.—The worms you found at the root of a decaying apple tree, are the larvæ of the Three banded crane fly (*Tipula trivittata*, Say), a large species which we have bred from larvæ found in similar situations. You need not fear they will trouble you. They can hardly be considered injurious.

Punctured Grape Canes.—*B. L. Kingsbury, Alton, Ills.*—The straight rows of punctures on your grape canes, each puncture about one-third of an inch apart, and appearing as though made by a rather large sized pin, are most likely the work of some species of Tree cricket. Each of these punctures leads to from ten to twelve narrow eggs, about a tenth of an inch long, and deposited on either side of the puncture, lengthwise in the pith. They are not the punctures of the common Tree cricket (*Ecanthus niveus*, Serv.) which are placed in a row contiguous to each other, with an egg placed slanting across the pith leading from each. We have never seen grape canes punctured like those you send, and therefore do not know positively what particular insect makes them, but we suspect it to be the Jumping cricket (*Orocharis saltator*, Uhler) and the more readily, since you yourself found this insect associated with the common Tree cricket on your grape vines, and like this last insect severing the grapes from their stems. We have ourselves found this Jumping cricket around St. Louis, and know it to have this destructive habit, and we therefore strongly urge the burning of all punctured canes. It would be a good plan for the vineyardist, to always burn the wood which he prunes, and thus destroy these and other eggs that they contain.

Insects to be Named.—*W. R. Marine, Greencastle, Sullivan county, Mo.*—The insects which you find in your apple and peach nurseries, and which you send for determination, are as follows: The slender, long-legged, long-bodied insect is the Stick-bug (*Spectrum femoratum*, Say), for an account of which see No. 3, p. 58. The large black beetles are the Murky Ground-beetle (*Harpalus nigricornis*, Say), illustrated at Fig. 48. The smaller beetle of the same form, with brown legs, is the *Harpalus pennsylvanicus* of DeGeer. That with a black head and thorax, and orange wing-covers, is *Tragidion fulvipes*, Say. The small ground-beetle, resembling Fig. 46 in form, is *Carabus silvaceus*, Say. There were also in the box a fractured ♀ specimen of the Ob-long leaf-winged Katydid (*Phylloptera oblongifolia*, DeGeer); the chrysalis of some large Moth unknown to us, and dried and shriveled specimens of the Round-headed Apple-tree-borer (*Saperda bivitata*, Say). In sending insects you should never put them loosely into a box, and it will be to your advantage in future to number each specimen you send, and retain duplicates that are numbered correspondingly.

Cresylic Soap.—*Jno. A. Pettigill, Bunker Hill, Ills.*—You can obtain this soap of the St. Louis Coal Tar Company, 324 North Third street, St. Louis, Mo.

Supposed Cause of Yellows in Peach Trees.

—*C. H. Roberts, Poughkeepsie, N. Y.*—The peach twigs, with a minute puncture of some insect at almost every bud, came safely to hand. You hold these punctures to be the cause of the "yellows," as the trees from which they were taken were affected with this dire disease; but, as you yourself remark, "it scarcely seems possible that these punctures can be the cause of the 'yellows' and yet escape the observation of such a close observer as Downing." The "yellows" of the peach tree is, according to the best authority, and according to our own judgment of it, a disease of vegetable origin, though it is not improbable that trees affected with it are more subject to the attacks of insects than are healthy trees.

[Fig. 77.]



That our readers may at once obtain a good idea of the appearance of a tree affected with yellows, we introduce the above cut [Fig. 77] which represents, above, a diseased limb, with a healthy limb below; both photographed last summer from the same tree by order of Mr. Peabody, President of the Missouri State Horticultural Society. We know of no insect which would produce any such effect. The punctures in the present instance have most likely been made by some species of Tree-hopper (*Aemetracis* family) long ago, as we could find no trace of eggs now within them. The Buffalo Tree-hopper (*Ceresa bubalus*, Fabr.), a light grass-green species, freckled with whitish dots, and shaped something like a beech-nut, save that it has a sharp thorn projecting from each side of the thorax, has long been known to occur on the peach, as well as on other fruit trees, in your State. In the "Insects of New York," by E. Emmons, you will find a colored figure of this Tree-hopper on Plate 3, Fig. 17; while the same figure, uncolored, is repeated on Plate 2, Fig. 4 of Dr. Fitch's Third Report.

Eggs of Katydid.—*A. A. Hilliard, Brighton, Ills.*—The flat slate-colored eggs, placed in two rows, and slightly overlapping each other, on the canes of your Clinton grape vine, are the eggs of the Katydid (*Platyphylum concavum*, Harris). These eggs are not confined, as you suppose, to the Clinton grape vine, but may be found on other varieties of the grape vine and on other fruit trees. The Katydid is not particularly injurious, and it will do no harm to let the eggs remain.

Apple-twig Borer.—*J. T. Zimmerman, Cameron, Mo.*—The beetles which we requested, came safely to hand, and proved to be, as we suspected, the Apple-twig Borer (*Borctricus bicaudatus*, Say). For the benefit of the rest of our readers we quote part of your letter: "They work during the months of August, September and October, on both pear, cherry and apple trees. I find sometimes as many as ten twigs bored on a single two or three year old tree. The twigs thus injured usually break off by the wind."

T. GLOVER

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GALLS AND THEIR ARCHITECTS.

In the language of Naturalists, "galls" are all such deformations of living and growing plants, as are produced by one or more insects or other allied animals residing therein, and deriving their nourishment therefrom. For example, the common "nut-galls" of commerce, to be found in every druggist's store, and which are such an indispensable ingredient in all our writing-inks, are caused by an exotic species of Gall-fly (*Cynips*) attacking an exotic species of oak, as our common oak-apples (Fig. 78) are caused by an American Gall-fly, very similar to that shown in figure 81, but smaller, attacking an American oak. In the language of surgeons and butchers, the word "gall" has a very different meaning, being applied to the fluid otherwise known as bile which is contained in the gall-bladder. But with this use of the term we have now nothing to do.

Galls are of various sizes and colors, and of almost every conceivable shape. Some resemble a large rose, some have the appearance of a pine-cone (Fig. 82), some imitate the sprouts from a cabbage-stalk (Fig. 84), some look like a tomato (Fig. 89), some like a potato, some like an apple (Figs. 78 and Fig. 85 a), some like smaller fruits (Figs. 79, and Fig. 80 a), some like the garden flower known as Cockscomb (Fig. 87), and some like the veritable comb of a cock (Fig. 90). Some again are smooth, some wrinkled, some downy or hairy, a few so transparent that the living insect can be seen inside them, but most of them impervious to light. Some on the other hand are so fragile that they

can be readily crushed in a child's fingers, some so hard and woody that it requires a sharp knife to cut into them. Finally in color they are of various shades of green, yellow, crimson and brown, often prettily speckled and mottled, and in many cases they have as rosy a cheek as a peach.

"As bitter as gall" is a very common expression, but galls are by no means generally bitter. The nut-galls, indeed, of commerce are well-known to be so, and the Oak-plum Gall (Fig. 80, a), when green, seems to contain the very concentrated essence of quinine. But the great majority of these vegetable excrescences scarcely differ in flavor from the plant upon which they grow. This is the case, for example, with some fifty different kinds of galls that grow upon different species of oak. And yet the very same species of oak which when punctured by the Oak-plum Gall-fly (Fig. 81) produces from the cup of the acorn this intensely bitter gall, when punctured by a very similar fly belonging to the same genus (*Cynips g. sculpta*, Basset) generates from the leaf a gall which looks for all the world like a grape, and which is as fleshy and juicy and as pleasantly acid as a partially ripe grape. Strange that two such closely allied insects should cause upon the very same plant such very different products!

Almost every part of a plant is specially attacked by gall-makers. Some confine themselves to the flower, some to the woody parts such as the twigs and larger branches, some to the roots, and a great number to the leaves. As a general rule, each gall-maker confines itself to its special part of the infested plant; but we have noticed several remarkable specimens where a certain gall-maker which habitually attacks the twig, forming thereon a closely-compacted series of galls, each of them about the size of a pea (the oak-fig gall of Fitch), "slopped over," so to speak, when it arrived at the terminal bud of the twig, so as to cause several galls to develop next year, not from the twig itself, but from one of the leaves at the tip of the twig. And yet, strange to say, these abnormal galls, generated by mistake upon a part of the plant where they had no business to

be, namely upon the leaf instead of upon the twig, differed in no respect from those that occurred upon the adjoining twig! So definitely are the form, size, color and texture of these singular production determined by the insect that cause the abnormal growth on the infested plant, so little does it matter from what particular part of the plant the abnormal growth is developed! Neither does it make any difference, as a general rule, if the same species of gall-making insect operates upon distinct species of plants belonging to the same botanical genus. We have collected, for example, numerous instances where the same Gall-fly (*Cynips*) attacks distinct but allied species of oak, and yet produces galls that are entirely undistinguishable, no matter upon what species of oak they occur.*

We are all of us so familiarized with one or more of the wonderful processes by which animal and vegetable organisms reproduce themselves, that it seems in no wise astonishing that a sheep, for example, should generate a sheep, a honey-bee a honey-bee, an oak an oak, and a cabbage a cabbage. In all such cases, however, an animal reproduces an animal, or a vegetable reproduces a vegetable, and the same species, whether animal or vegetable, reproduces an almost exact image of itself either in the next or in some subsequent generation. But in the case of galls, we have the very astonishing and otherwise unparalleled fact of two organisms, the one animal the other vegetable, cooperating together to generate a third organism, entirely different in all its characters from any thing that either of the two parent organisms is capable by itself of producing, and just as definite and invariable in shape, size, texture and color, as animal and vegetable productions that belong to the same species usually are. Take, for instance, a thousand "oak-apples" (Fig. 78) off black oak, and a thousand apples from an apple-tree. You will find that the former resemble each other, both externally and internally, quite as closely as do the latter. Yet to produce an apple all that is required is a living and growing apple-tree of sufficient age; while

* See *Proc. Ent. Soc. Phila.* III, p. 639, note. The gall resembling the oak-bullet gall (*Q. glabulata*, Fitch) which is there mentioned as occurring on Burr oak, has been since ascertained by us to be produced by a distinct species of Gall-fly from that which produces the oak-bullet gall. The gall itself has the same very remarkable internal structure, but differs externally in being somewhat rougher and in usually having a little nipple at its tip, whence we may call it the oak-nipple gall (*Q. mamma*). The fly, like that of the oak-bullet gall, occurs only in the female sex, but is distinguishable at once from that species by having antennae that are shorter, stouter, and 13-jointed instead of 14-jointed. It is also, on the average, about one-third larger, and has the tip of the ventral valve in a somewhat obtuse, instead of in a somewhat acute angle, but in other respects agrees very closely. Thirty-eight specimens, all females, came out from galls of the same year's growth Oct. 22 to Nov. 7. It may be called *Cynips q. mamma*, as it is an undescribed species.

to produce an "oak-apple" there is necessarily required the joint co-operation of a gall-fly and an oak, the first an animal, the second a vegetable organism: and if either the gall-fly or the oak were swept out of existence to-morrow, the oak-apple that they unite to produce would at the very same time cease to exist in this world.

The insects which are known to be the architects of galls are by no means an isolated group, but belong to several different Families in no less than five different Orders. They may be enumerated as follows: The Snout-beetles and the Long-horned Beetles (*Coleoptera*), the Saw-flies and the Gall-flies (*Hymenoptera*), the Tinea and Tortrix Families (*Lepidoptera*), the Flea-lice (*Psylla*), Plant-lice and Bark-lice (*Homoptera*), and the Gall-gnats and certain groups belonging to the great Musca Family (*Diptera*). In none of these Families is the gall-making faculty universal, and in not many of them is it general, but is on the contrary confined to particular species, the very same genus often containing certain species that make galls and certain others that do not.* Besides the above gall-making Families, all of which are true Insects, many of the Mites (*Acarus* family), which are not true insects, construct upon various trees galls of no very conspicuous size, shape or structure. (See *AMER. ENTOM.*, p. 57).

Galls originate in two distinct modes, either first, by the mother insect depositing one or more eggs in or on the part of the plant which she attacks, or second, by a young larva stationing itself upon a leaf or other part of a plant, and irritating its surface with the organs of its mouth, until a hollow is gradually formed which eventually becomes a more or less tightly closed sack, inside which the larva develops to maturity and propagates its species. In this latter case, which is peculiar to the Plant-lice, the Bark-lice and the Mites, young larvæ born within the gall frequently stray away through the partially open mouth of the enclosing sack, and found new galls the same season either upon the same or upon adjoining leaves. This is the rule with gall-making Bark-lice and Mites. But in galls made by Plant-lice, the entire brood of larvæ reared within the gall remain therein till they have most of them reached maturity and acquired wings. The gall then, by a beautiful provision of nature, gapes open to allow of their escape, usually at the mouth of the sack formed by the mother insect, but in certain cases in some other part of the sack.

It will thus be seen that this second mode of

*As, for example, the genus *Nenatus* among the Saw-flies and the genus *Cecidomyia* among the Gall-gnats.

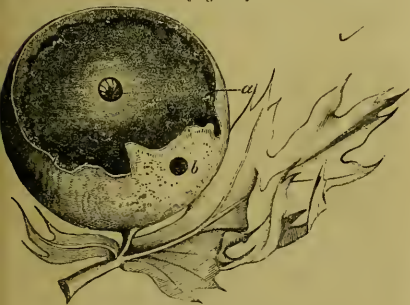
the formation of galls is the exception, and that the first mode, namely that when the mother insect deposits one or more eggs on or in the infested plant, is the rule. In the latter case, when but a single egg is deposited in one place, the larva that develops from that egg forms but a single cell, inside which it resides, as in Fig. 78 *a*. The gall is then technically said to be "monothalamous," i. e. one-celled. But whenever several eggs are deposited in one place, the larvæ developing therefrom inhabit several cells enclosed in a common envelope, as in Fig. 85, *b*. The gall is then said to be "polythalamous," i. e. many-celled. In the second group of galls, namely those made by Plant-lice, Mites, etc., the inhabitants of the gall, however numerous they may be, always reside promiscuously in the same large cell or hollow.

The number of galls formed by distinct species of insects or mites upon various plants in America is very great, and a large proportion of them are as yet undescribed and unknown to science. Of those that occur upon trees and shrubs, exclusively of herbaecous plants, we are ourselves acquainted with nearly two hundred different species, about a third part of which are undescribed. In the following paragraphs, we propose to give a brief account, illustrated by figures, of some of the more conspicuous ones out of the whole number, made by three different Families of insects, namely the Gall-flies, the Gall-gnats, and the Plant-lice.

Galls made by Gall-flies. (*Cynips*.)

THE TRUE "OAK APPLE," as it is popularly termed, (*Quercus spongifica*, Osten Sacken, Fig. 78) occurs exclusively upon the Black oak (*Quercus tinctoria*). It commences its growth in May, or as soon as the young leaves put forth,

[Fig. 78.]



Colors—Drab inside; yellowish-brown outside.

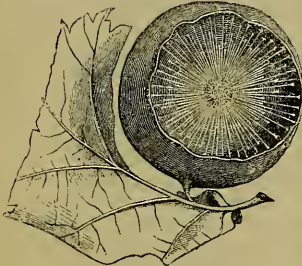
and reaches its full size in a few weeks. The central cell (Fig. 78 *a*) in which the larva re-

sides becomes eventually hard and woody, but the space between that cell and the external skin or rind of the gall is always completely filled by soft, drab, spongy matter. By the forepart or middle of June both male and female gall-flies (*Cynips q. spongifica* O. S.) eat their way out of a certain number—say about a fourth part—of these galls, having developed into the winged state from the larva in the central cell. The hole by which the fly makes its exit is shown at Fig. 78 *b*. The remaining larvæ lie dormant for more than two months, when they change into the pupa state, and subsequently about October eat their way out in the form of Gall-flies (*Cynips q. aciculata*, O. S.) closely allied to and yet quite distinct from those produced in June. Out of thousands of these autumnal flies examined by us, all were females with not a single male among them; and we have experimentally ascertained, by colonizing a number of these females upon isolated black oaks known to be not previously infested with oak-apples, that they cause oak-apples to be generated in the following spring upon such isolated Black Oaks. From Oak-apples produced in this manner we have bred two specimens of the spring form of Gall-fly (*q. spongifica*) which exists in both sexes, and five specimens of the autumnal form (*q. aciculata*) which exists exclusively in the female sex. Finally, treating these five autumnal specimens in the same manner, i. e. placing them upon another isolated Black Oak, we obtained galls in the following spring which produced two specimens of the spring form (*spongifica*), thus showing that the autumnal form sooner or later reverts to the spring form. Hence, as well as from other considerations, we may infer that the former is not a distinct species but a mere "dimorphous" female form of the latter; for otherwise, one form could not generate the other form. As to the supposed impossibility of females generating without any sexual intercourse with males, there are many species of insects where no males at all are known to exist.*

* That even with those species of insects where males are entirely unknown males may occasionally make their appearance, though perhaps only after the expiration of many years, we may infer, because there is a regular gradation from one extremity of the scale to another. 1st. In most insects the sexes are about equal in number. 2d. In other groups, as for example in many *Cynips*, the females are 4 or 5 times as numerous as the males. 3d. In the Cynipid genus *Rhodites* the males are generally of extreme rarity. 4th. In the lepidopterous *Psyche helix*, as we are assured by Dr. Hagen, out of thousands of specimens bred within the last ten years by Prof. Siebold, all were females; but in 1857 the male was discovered to occur, but in very small numbers, by Prof. Clausen. 5th. Dr. Hartig long ago bred from the gall thousands of females of *Cynips folii*, and nine or ten thousand females of *Cynips divisa*, without a single male among them; and we have ourselves bred about two thousand females of *Cynips q. punctata*, Bassett (—*C. q. podagra*, Walsh) from the gall without being able to discover on the closest examination a single male in the number.

THE BASTARD OAK-APPLE (*Q. inanis*, Osten Sacken, Fig. 79), matures like the preceding in June, but is found exclusively upon the Red Oak (*quercus rubra*). It differs from the preceding in never reaching so large a size, in the central cell not being woody, but consisting of a mere shell which can be readily broken with the thumb-nail, and in its being only connected with the external rind by slender radiating filaments. Males and females (*Cynips q. inanis*, O. S.) absolutely undistinguishable from the

[Fig. 79.]

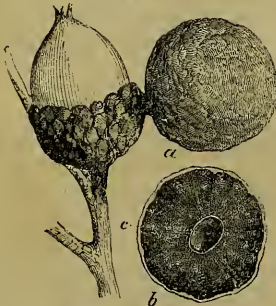


Color—Drab.

spring form of the preceding are attainable from this gall in June; but after repeated trials we have never succeeded in breeding from it a single autumnal female, and we do not believe that any such form exists in this species. Hence, and also in consequence of the very great dissimilarity of the galls, and their always growing upon distinct species of oak, we are compelled to consider these two gall-flies as distinct species, although when placed side by side the forms generated in the spring are exactly like each other.

THE OAK-PLUM GALL* (Fig. 80 a) is remark-

[Fig. 80.]



Color—Mottled with yellow and crimson.

*First described by the senior Editor under the name of *Quercus prunus* in *Proc. Ent. Soc. Phil.* III p. 639, note.

able for being the only American gall that is known to grow out of the acorn. It occurs indiscriminately upon Black and Red Oak, reaching maturity in August and September. At that period it is solid but fleshy, and when cut into is of a pink color inside shading into yellow towards the middle. Subsequently, as it dries, it becomes so hard as to be cut with difficulty,

[Fig. 81.]



Color—Black.

its color inside changing, first to blood-red and afterwards to brown. The insect that produces this gall (*Cynips q. prunus*, new species, Fig. 81), makes its appearance in April, and is remarkable for lying two years in the gall before it eats its way out, remaining in the larva state for over a year; indeed some of them remain in the larva state for over two years, and do not eat their way out until the end of the third year.* Figure 80, b, shows this same gall when cut open, and figure 80, c, the central cell inhabited by the larva.

* These galls were found fully matured and in large numbers in August and September, 1864. In December, 1864, and in April, May, June and July, 1865, the insect was still in the larva state. In October, 1865, out of 28 galls that were cut open, 15 contained the larva, and 13 the perfect gall-fly. Of these larvae 12 were re-enclosed in their galls. In April and September, 1866, they were still in the larva state, and it was not till April 12, 1867, that a single-winged fly ate its way out of a gall. On cutting into the gall from which it had emerged, the cell was found half full of excrement, showing that the larva had "fed up" since 1865. We annex a description of the perfect fly produced from this gall, as the species is new to science.

CYNIPS Q. PRUNUS, n. sp. ♀ Black. Head rather coarsely rugoso-punctate; face pubescent; antennae rather more than half as long as the body, 13-jointed, joint 13 equal in length to joints 11 and 12 put together. Thorax opaquely and coarsely rugoso-punctate, not so coarsely as in *C. q. spongifica*, but very much more so than in *C. q. globulus*; dorsal groove only extending one-third of the way to the scutellum, and the parallel carinae on each side of it only one-half way to the scutellum. Scutellar foveae very large and deep, highly polished and separated only by an acute and lofty carina. Abdomen with the large or second joint polished, and with some sparse, rather large, shallow punctures upon its basal three-fourths; its terminal one-fourth, except the extreme edge, so densely covered with small confluent punctures as to appear like virgin silver. The whole of joints 3-7 sculptured like the terminal one-fourth of joint 2. Legs rufous, the coxae, trochanters and tarsal tips black. Wings subhyaline, with a dark brown cloud extending from the first transverse vein over the areolet and the radial area to the tip of the wing. Veins all brown and distinct, but neither the subcostal, radial, cubital, nor anal veins attaining the exterior margin. Length ♀ 0.20-0.30 inch. Expanse 0.47-0.65 inch.

Described from 11 ♀ specimens; ♂ unknown. Differs from all described N. A. species by the beautifully opaque punctation, entirely unaccompanied by any pubescence, of the tip of the abdomen.

Galls made by Gall-guats (*Cecidomyia*).

[Fig. 82.]



Color—Glaucous white.

THE PINE-CONE WILLOW-GALL (*Strobiloides*, Osten Sacken), Fig. 82.—This gall grows, often in the most profuse abundance, on the tip of the twig of the Heart-leaved Willow (*Salix cordata*), single bushes sometimes bearing over a hundred galls, but never more than one gall being found upon one twig. The gall-guat that produces it (Fig. 83) appears in April or early in

[Fig. 83.]



Colors—Blackish.

May, and the gall commences its growth shortly afterwards, and is full sized by the middle of July. When young and immature it is spherical and enveloped in a dense mass of foliage, which gradually falls off towards the autumn, and by November the twig on which it grows, if small, is already killed for an inch or two downwards. At this date the larva may be found embedded in the very heart of the gall, and enclosed in a delicate membranous cocoon, somewhat of the texture of gold-beaters' skin, and thrice as long as the larva itself. In this cocoon it reposes without eating anything until the following spring, when it changes into the pupa, and shortly afterwards bursts the pupa-shell and escapes in the perfect or winged state. The gall itself is manifestly nothing but a deformed and enlarged bud; for leaf after leaf may be peeled away from it any time in the winter, as you would strip the leaves from a cabbage one after the other, until finally the larva that is quietly reposing in the very heart of the bud becomes exposed to view. It is remarkable that, although the leaves of the Heart-leaved Willow are always sharply toothed on their edges, those of the gall that grows upon it are never toothed at all.

There is a species of green Catydid inhabiting Willows, which is peculiarly addicted to depositing its elongate cylindrical eggs, for safe keeping through the winter, under the scales of this gall, as many as seventy-one of its eggs having been counted in a single gall. In the spring these eggs hatch out, and the young larvæ leave the dry galls, and disperse themselves in various directions for the purpose of obtaining green

food. There is also a very minute Guest Gall-guat (*Cecidomyia alborivittata*, Walsh), scarcely one-third as large as the species (Fig. 83) that makes the gall, but otherwise very much of the same appearance, which deposits its eggs in the same situation. The larvæ, however, that hatch out from these eggs, instead of leaving the gall, as do those of the Catydid just now referred to, remain in it till they have reached maturity, deriving their entire subsistence from the sap that they manage to extract from its leaves. In two galls, each containing of course but a single gall-making larva, we have counted as many as forty-one of these guest larvæ full fed and mature; and what is singular, numerous as the guests often are, they never seem to interfere in any degree with the health and prosperity of their host, by cutting off his due supply of sap or otherwise interfering with his domestic arrangements. With such exuberant profusion has Nature provided for the multiplication of life and happiness, and so carefully has she managed that, whether in the animal or in the vegetable kingdom, nothing shall go to waste, nothing be lost, nothing be created in vain!

THE CABBAGE-SPROUT WILLOW-GALL (*Salicis brassicoides*, Walsh). Fig. 84. Unlike the preceding, this gall is social in its location, as many

[Fig. 84.]



Color—Green

as a dozen of them sometimes growing from a single twig, like the sprouts on a cabbage-stalk. It differs from that species also in not being confined to the extreme tip of a twig, but more usually taking its origin from the side of a twig or small branch. Furthermore, it is always found exclusively upon the Long-leaved Willow (*Salix longifolia*), and we have several times noticed bushes of this and of the Heart-leaved Willow that is inhabited by

the Pine-cone Gall, promiscuously intermingled and each bearing its peculiar gall alone, and never that which is appropriate to its neighbor.

Fundamentally, the structure of the Cabbage-sprout Gall is the same as that of the Pine-cone Gall, but, as will be seen at once from the figure, it differs from that species in the leaves being more open and less deformed from their normal shape, and also in their retaining their natural green color instead of being covered with glau-

ous-white pubescence. The larva resides in the very heart of the gall, as with the other species, but instead of the cocoon being thrice as long as the body of the larva, it is scarcely at all longer, and fits so closely that it is not a very easy matter to remove it. In these two species, the larva and pupa of one are absolutely undistinguishable from those of the other, and the perfect flies resemble one another so closely that the same figure answers equally well for both. Their transformations also take place in the same manner and very nearly at the same time; and the galls attain their full growth in the same month of July.

THE GRAPE-VINE APPLE-GALL, (*Vitis pomum*, new species,) Fig. 85 a.—In No. 2, page 28, and No. 3, page 54, of the AMERICAN ENTOMOLOGIST, we referred to a "vegetable phenomenon" said to be found in Virginia, in the form of an apple-like growth from a grape-vine. The prevailing opinion in that State seemed to be, that it was a kind of hybrid fruit formed by the union of a grape blossom with an apple blossom. But we intimated our opinion at the time, that it was no fruit at all, but simply a gall produced by some unknown species of gall gnat. We have since received specimens of what is undoubtedly the same thing, from two different sources, first from Mr. B. L. Kingsbury of Alton, Illinois, and second through the kindness of Mr. Stauffer, of Pennsylvania, from Thos. Mechan, the well known editor of the *Gardeners' Monthly*. Mr. Stauffer has also favored us with a good colored figure of one that he cut from the wild Frost Grape (*Vitis cordifolia*), August 9th, 1850, which agrees perfectly well with the two specimens in our possession. Hence, after carefully examining these specimens, we can now announce with certainty that this "vegetable phenomenon" is really what we originally inferred it to be—namely, a gall made by a gall gnat. Fig. 85 a, will give the reader

[Fig. 85.]



Colors—(a) green, (b) yellow.

a very good idea of this gall, and Fig. 85, b, of its internal structure, showing the larvæ that inhabit its numerous cells, a single larva in a single cell. All the galls that we have hitherto

been treating of, have been what are technically termed "monothalamous" or "one-celled" galls, inhabited by a single gall-making larva. But this, as will be seen at once, is a "polythalamous" or many-celled gall, inhabited by a great number of gall-making larvæ.

As the fly that generates this gall will, in all probability, not make its appearance until next spring or summer, and as we have consequently had, as yet, no opportunity to breed it; it may be very reasonably asked, how we know for certain that it will turn out to be some kind of Gall-gnat (*Cecidomyia*)? We answer that the larvæ of all Gall-gnats are distinguishable at once from other larvæ by a peculiar process known as the "breast-bone," and located on the lower surface of the first joint of the breast. (See Fig. 86, c.) Usually this "breast-bone" is of so dark a color that it can be readily seen, even in a very small larva, and its use apparently is to abrade the surface upon which the larva lives and thereby cause an abnormal flow of sap, which forms the food of the little insect that is thus working for its living. In Figure 86, c, the head of the larva is shown protruded; but all this group of larvæ have the power of retracting the head within the body, so as to bring the "breast-bone" well into play. In shape, this organ differs greatly, being sometimes what we have called "clove-shaped," as in Fig. 86, c, sometimes Y-shaped, as with the larvæ of the two Willow-galls figured above, and sometimes of other allied shapes. But in every case there are several sharp prongs in front of it, adapted for wounding and piercing. As a general rule, allied gall-gnats inhabiting the same genus of plants have larvæ with "breast-bones" of the same, or a very similar shape. For example, that of the larva to be next described is absolutely undistinguishable from that of our larva; and so is that of the larva of the Pine-cone gall from that of the larva of the Cabbage-sprout gall.*

THE GRAPE-VINE FILBERT-GALL (*Vitis coryloides*, new species).—We have met with one or

*For the satisfaction of the scientific reader, we annex descriptions of the above gall and of its larva, drawn up from the Alton specimen.

GALL *VITIS POMUM*.—A smooth, globular, fleshy, grass-green gall, 0.30 inch in diameter, attached by a tough base of about 0.40 inch in diameter, like the base of a hazelnut, to the cane of the grape-vine. Its external surface with about eight or nine longitudinal striae, dividing it into eight or nine segments, like those of a watermelon. Internally fleshy and of the consistence of the hull of a walnut for one-eighth of its diameter; then a series of elongated cells, divided each into two cells by a regular series of transverse partitions, the lower tier about 0.2 inch, the upper tier about 0.3 inch long. From center of one cell to that of the adjoining cell is nearly 0.1 inch, and there are seven or eight cells side by side.

LARVA.—Bright yellow, of the normal shape. Breast-bone chestnut-brown, clove-shaped, the stem of the clove about 24 times as long as one of the anterior prongs; tip of the anal joint ventrally with two transversely arranged slender brown spines, directed upwards and backwards, above which on the dorsal tip is a tubercle. Probably jumps by taking its tail in its mouth, and it so belongs to the subgenus *Diplosis*.

two small specimens of this gall growing upon the cane of the wild Frost Grape in Illinois; and we were presented with two very large specimens by Mr. Mills of Rock Island, Ill., which had grown upon a Frost Grape planted in his dooryard, from one of which the annexed drawing is copied (Fig. 86). The whole mass of galls springs from a common centre at the point

[Fig. 86.]



Color—Green.

where a bud would normally be, and is evidently a mere deformation of a bud. Occasionally an undeformed leaf with its peduncle still entire puts forth from the common centre, sometimes bearing a couple of galls at the junction of the peduncle with the leaf. Each gall is one-celled, the cell being about a quarter of an inch long and one-fourth as wide as long, and containing a single larva. (See Fig. 86, *b*). The larva closely resembles that of the Grape-vine Apple-gall, and is therefore no doubt that of some Gall-gnat. Large sized specimens of this gall bear a general resemblance to a bunch of filbert or hazel nuts, as they grow on the bush; hence the name that we have given it. Fuller details will be found in the foot-note.*

* GALL VITIS CORYLOIDES, N. Sp. On the cane of *Vitis cordifolia*.—A roundish mass, $1\frac{1}{2}$ to 2 $\frac{1}{2}$ inches in diameter, of from 10 to 50 opaque, wooly-pubescent, fusiform, or sometimes flattish-oval, green galls, each from 0.59 to 0.75 inch long, the whole springing from the point where normally a bud would be located. Generally it is only the terminal $\frac{1}{2}$ of each gall that is pubescent, the basal $\frac{1}{2}$ being smooth. The interior of each gall is fleshy, juicy and subacid, with a single longitudinally central cell 0.25 inch long and 0.06 inch in diameter.

LARVA.—Orange-yellow, with the disk of the dorsum paler. Breast-bone as in the preceding. Length 0.11-0.14 inch.

Galls made by Plant-lice (*Aphide*).

The galls hitherto referred to have been those which are formed by the mother insect depositing one or more eggs in or on the tissues of the plant which she infests. Those to be now treated of belong to the second or exceptional group, which are formed by a young larva stationing itself externally upon some particular part of the infested plant, usually the leaf, and causing that part to bulge out into a sack, which finally closes at its mouth and shuts up the larva in a kind of prison of its own making. We see the abortive beginnings of this process in the case of many species of Plant-lice and of Mites; for example the common Currant Plant-louse (*Aphis ribis*), and sundry Mites that attack the leaves of oaks. For here, although the leaf bulges out into a capacious hollow inhabited by the leaf-feeders, yet the hollow never, under any circumstances, closes at its mouth into a true sack-like gall.

[Fig. 87.]



Color—Green.

THE VAGABOND GALL (*Populi vagabunda*, Walsh), Fig. 87.—This gall occurs in particular years in prodigious abundance on the tips of the twigs of certain Cottonwoods, but in other years there is not one to be found in the same district. The old blackened galls, however, hang on to the twigs for several seasons, giving the tree a singular appearance when the leaves are off in the winter time. The fly was discovered and described before it was known to inhabit any gall, and received its name from the habit that it has of wandering to very great distances in its native forests.* It may be called the Vagabond Plant-louse (*Pemphigus vagabundus*, Walsh), and is represented in Fig. 88.

* See Proc. Ent. Soc., Phil., I, p. 336, where the fly is described, and II, p. 462, where the gall is described. As to the generic determination of this Plant-louse, see *Ibid* VI., p. 290, note.

[Fig. 88.]

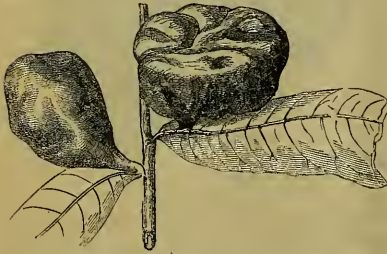


Color—Black.

It makes its appearance in the winged state in September, and early in the following summer the green and shining hollow gall, with its skin as thin as that of a capsicum, may be discovered almost full grown upon cottonwoods, and occasionally upon balsam poplars. At this period there is always found a single wingless Plant-louse inside it, which has by her sole exertions caused the growth of the gall, and which will subsequently give birth inside it to a very large and flourishing family of young Plant-lice, all of which will eventually acquire wings and leave the gall in the ensuing September.

THE SUMAC-GALL (*Rhois*, Fitch), Fig. 89.—This tomato-like gall occurs on the leaves both of the Smooth Sumac (*Rhus glabra*) and the Stag-horn Sumac (*Rhus typhina*), and in the States both of Illinois and New York. Like the preceding, its shell or skin is quite thin, and the winged flies are found inside it in prodigious

[Fig. 89.]



Color—Greenish yellow, with a rosy cheek.

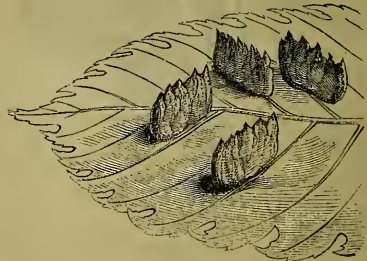
numbers in September. Early in the spring, as we have been informed by Dr. Wm. Manlius Smith, of Manlius, N. Y., each gall contains but a single wingless mother-louse in company with numerous larvæ. The winged fly has the veins of its wings arranged in the same pattern as those of the preceding species (Fig. 88), but differs in having four-jointed instead of six-jointed antennæ. It is also a very much smaller insect.

It is remarkable that there are two Chinese, one Japanese, and one Indian gall, growing upon different species of exotic Sumacs, and apparently analogous in their structure to our American Sumac-gall. They are described as

being, some of them like a radish-pod, some like an ox-horn and over two inches long, and some branched like a stag's horn. One of these Chinese Sumac-galls, which is not uncommonly to be met with in drug stores, is shaped much like ours, but has a much tougher and thicker rind. On breaking a specimen open, we found it to be filled with infinite numbers of plant lice, having wings exactly like those of our insect, being of the very same size, and apparently belonging to the very same genus. Thus we see, that even on the opposite sides of the globe, analogous galls are made on analogous plants by analogous insects.*

THE COCKSCOMB ELM-GALL (*Ulnicola*, Fitch), Fig. 90.—This species has a much thicker and more fleshy rind than the two preceding. Young White Elms often have their leaves so densely covered by these galls that you can scarcely see the leaf for the galls. After trees

[Fig. 90.]



Color—Green, often with a red cheek.

get to be about twenty-five feet high the gall-making insect ceases to trouble them; and the younger the trees the more apt they are to be infested. The Plant-louse that produces these galls is exceedingly minute, and differs in the veining of its wings from figure 70, c, (p. 82), in the hind wing having but a single branch vein, the front wings corresponding in every respect. It is, however, remarkable for holding its wings, when in repose, horizontally on its back, instead of carrying them steeply roofed, as is the case with almost all the other genera of Plant-lice. Early in the spring but a single wingless mother-louse is to be found in a single gall; but in a short time she gives birth to hundreds of very minute and wingless young larvæ. By the end of June or the beginning of July, the gall becomes full of winged plant lice, when the slit on the under side of the leaf, through which the mother plant-louse built up the gall early in

* For further details on this subject see *Proc. Ent. Soc., Phil.*, VI., pp. 281-2, notes.

the spring, gapes open and allows the insects to escape into the open air. When White Elms are planted as shade trees in large numbers in the neighborhood of houses, and become badly infested by these galls, the winged flies that are generated in such myriads in the middle of summer often become a very serious nuisance. Hence it is worth while for us to learn, that when such trees become large they will cease to be attacked in such manner.*

There may probably be some of our readers who may be desirous of breeding the gall-making insects from the galls figured above, or from such other galls as they may have themselves discovered upon other plants. We would caution all such persons not to be deceived by a very common phenomenon. Besides the true gall-maker, they will obtain from almost every gall, one or two, and sometimes one or two dozen perfectly distinct insects. These will belong to two different groups, and it will sometimes require some considerable knowledge of entomology to distinguish them from the veritable authors of the gall that is being experimented upon. The groups above referred to may be catalogued as follows:

1st. Guest-insects, sometimes very closely allied to the gall-maker, sometimes as different as it is possible to conceive. We have already, under the head of the Pine-cone Willow-gall, referred to a small Guest Gall-gnat which dwells under the leaves of the Gall, without interfering in any way with the health or prosperity of the much larger Gall-gnat, that makes the gall and lives in the very centre of it. So again in the case of the Oak-apple of the Black Oak (Fig. 78). There is a minute Gall-fly (*Synergus hericentris*, Osten Sacken) which is occasionally found in considerable numbers in little cells located immediately under the external rind of this Oak-apple, where it lives in the larva state upon the substance of the gall, without troubling, in any

*The Red Elm, or Slippery Elm, as we have ascertained by close and long-continued observation, never bears these cockcomb-like galls. But there is occasionally found upon the upper face of its leaves in small numbers, a solitary gall with quite a thin rind, about an inch long, shaped much like one of those depicted in figure 86, and hitherto undescribed. It is made by a species of plant louse belonging to the same genus (*Penaphis*) as Fig. 88. In Europe a well known elm-gall (*Umb*) is made by another genus of Plant-lice (*Byrsocampa*, Haliday=*Tetraneura*, Hartig). So that on the same genus of trees, the Elm, we have three distinct galls made by three distinct genera of plant-lice; the more general rule being that the same genus of gall-makers attacks the same genus of plants. The above described gall on the Red Elm, which we may call the Spindle-shaped Elm-gall (*Umb fusus*), was first brought to our notice by Dr. W. M. Smith of N. Y.; but we have since found several specimens in South Illinois. The winged insect (*Penaphis umbifusus*, n. sp.), which only measures 0.67 inch to the tips of the wings, and is of a uniform dusky color, occurred July 11th. Out of 29 specimens, two have both wings, and one a single wing veined precisely like those of *Eriosoma* (Fig. 70, c, p. 82)—thus affording a practical exemplification of how one genus of Plant-lice may gradually in the course of indefinite ages merge into another.

wise, the much larger tenant of the central cell that is the real gall-maker. From these little cells it escapes early in the summer through small pin-holes, each of which opens into one of the external cells; whereas the large hole (Fig. 78, b), through which the gall-maker escapes, may be always traced to the central cell. In both the above two cases the Guest-fly does not molest the Gall-maker; and this is the more general rule. But in certain other cases the larva of the Guest-fly, instead of living in a house of his own, makes his way to the house of the gall-making larva, and after having destroyed him, takes possession of his tenement. For example, there is a large undescribed Guest Gall-gnat* which, as we have clearly ascertained, treats the author of the Oak-plum gall (Fig. 80, a), in this scurvy manner; and an allied species (*Synergus oenotatus*) operates in the same way upon the Gall-making larva of the Oak-bullet gall (*Q. globulus*, Fitch). Still, even in such extreme cases as these, the Guest-fly does not cease to be a vegetable-feeder and a true Guest; for it is only incidentally, and for the sake of monopolizing the supply of vegetable food, that he destroys the gall-maker. Whereas, parasitic larvae feed exclusively upon the bodies of their victims, and make no use whatever of vegetable food.

2nd. Parasitic insects. These are usually quite distinct from the insects they infest, and are much more numerous, both in the number of distinct species and in the number of individuals belonging to each species, than the Guest-insects. There are certain species that peculiarly attack the Guest insects, and certain others that confine themselves to the Gall-makers, and it is often difficult to decide to which of the two groups they should be properly referred. Parasites belong to a great variety of different Families; but those that infest galls made by Gall-flies (*Cynips*) and Gall-gnats (*Cecidomyia*) most of them appertain to the great *Chalcis* family. For instance, there are three very distinct *Chalcis*-flies, the larvae of which prey indifferently upon the gall-making larvae of the two kinds of Oak-apples figured above (Figs. 78 and 79), and may often be found in the central cell of the gall. The first of these lives inside the body of its victim, as is the more usual practice with parasites, and produces a black and yellow fly (*Decatomia*) with a large black patch on its glassy wings. The second attaches itself externally to the body of its victim, and produces a beautiful bright metallic green fly (*Callinome*) with uniformly

*Larger and darker than *Synergus oenotatus* Fitch, and distinguishable at once from that species by the antennæ ♀ as well as ♂ being 15-jointed instead of 14-jointed.

glassy wings, and the female with a tail-like ovipositor almost as long as her body. The third is much smaller than the other two, and instead of a single parasite attacking a single victim, as is the rule with those two, eight or ten of them may often be found inside the almost empty skin of the poor gall-making larva. This last parasitic larva produces a small uniformly black fly with uniformly glassy wings (*Pteromalus*); and what is remarkable, they lie in a little bunch in the larva state inside the central cell of the gall all through the winter, and do not emerge in the winged form until the following spring; whereas, the other two species make their appearance in the winged state the very same summer that the gall is generated. Besides the above three *Chalcis*-flies, which occur in large numbers, we have also bred from the Oak-apple of the Black Oak, a single small *Ichnumon*-fly (*Bracon*), which is probably parasitic on the larva of a small moth (*Gelechia gallogenitella*, Clemens) occasionally found as a Guest in that as well as in two other galls.

As to the other galls figured above, we have only space to say that the Plant-lice of the Elm-gall are extensively preyed upon by a small six-legged larva, with white cottony filaments growing out of his back, which produces a brown Lady-bird with a red tail (*Scymnus hæmorrhous*, Lec.); and that the Plant-lice of the Sumac gall are, in the State of New York, infested by the larva of a *Syrphus* fly, somewhat similar to that figured on page 83, of which we have succeeded in breeding two individuals to the perfect fly state. For specimens of these larvae we have been indebted to Dr. W. M. Smith, of New York; and according to Dr. Le Baron, the fly belongs to the same genus (*Pipiza*) as that just now referred to, and is also like that insect, a new and hitherto undescribed species.

THE BOGUS COLORADO POTATO-BUG.

(*Doryphora juncta*, Germar.)

In a recent article we expressed our opinion that this insect could not live upon the potato vine, although it feeds naturally upon the closely allied horse-nettle. Mr. W. Julich, of New York, writes us word that at Newport News, in the neighborhood of Fortress Monroe, Va., he has seen thousands of this insect upon the horse-nettle, but never seen a single larva upon certain potato vines which grew in the immediate neighborhood, though he had occasionally observed the perfect beetle sitting upon, but not feeding on, these potato vines.

ANTS AND APHIDES.

We often see it stated in the papers that there is a species of insect called *Aphis*, that produces a honey-like substance, which is fed upon by ants.

Also, that another family of these *Aphides* are domesticated by the ants, and live with them in the ground.

If there is any truth in these stories will you please inform me through your paper, and also whether this honey-like substance is the excrement, or some peculiar provision of nature. Also, whether the *Aphides* are common among all species of ants. W. BATCHELOR.

Waverly, Pa.

The Plant-lice belonging to certain genera, almost invariably secrete a fluid resembling honey in sweetness. It issues in limpid drops not only from the end of the abdomen, but from two "honey tubes" which are placed, one on each side, just above it. The beaks of these Plant-lice are continually employed to pump up the juices of the plants which they attack, and these juices, after passing through their systems, are exuded as described above, and bear therefore some relation to excrement, being in fact little else but the feces of the lice. Ants are very fond of this sweet liquid, and may always be found amongst those aphides which secrete it, though the latter are not necessarily "common among all species of ants." For example, it has been shown by Dr. Fitch that no ants ever haunt the Grain Plant-lice (*Aphis avenæ*, Fabr.), which in certain years and certain districts does so much damage to our crops of small grain. But although this species of Plant-lice has full-sized honey-tubes, it does not appear that it ever exudes any honey-dew; which fully accounts for the ants not visiting them. As to those species of Plant-lice that, as you correctly phrase it, "are domesticated by the ants and live with them in the ground," they mostly belong to a genus (*Peniphigus*) which you will find figured on page 82 (Fig. 71), and which, unlike the genus *Aphis*, has no honey-tubes at all. Why, then, you will ask, should the ants domesticate them, seeing that these Plant-lice secrete no honey-dew? They do it for the sake of the sugary matter which is exuded from the bodies of these Plant-lice in the form of a whitish cottony substance; and we have ascertained that they often bring these sugar-producing lice home to their nests from the roots of certain plants, and keep the sugar-producers there till after a few hours a sufficient crop of the coveted dainty has been elaborated and harvested. After which they carry the Plant-lice back to the roots whence the due supply of sap is derived, just as a dairyman, after milking his cows, drives them back to pasture to elaborate a fresh supply of milk from the herbage that they find there.—Ers.]

We have lately received several specimens of this large Ground Spider from some of our subscribers in Missouri, and we therefore present herewith (Fig. 91) a life-size portrait of it. Large and formidable as it appears, it yet has a deadly enemy in a large species of Digger-wasp (*Pompilus formosus*, Say), which stings and paralyzes it. We quote from the *American Naturalist* of May, 1867, the following interesting observations on this wasp which were made by Dr. G. Linneecum:

"This large and conspicuous insect is everywhere in Texas called the Tarantula Killer, and is over two inches in length; the head, thorax, abdomen, and long spiny legs are all black, while the wings are sometimes of a bright brown, with black spots at the tips. It is armed with a formidable sting, which it invariably uses in taking its prey. * * * It takes its prey by stinging, thus instantly paralyzing every limb of its victim. The effect of the introduction of its venom is as sudden as the snap of the electric spark. The wasp then drags it, going backwards, to some suitable place, excavates a hole five inches deep in the earth, places its great spider in it, deposits an egg under one of its legs, near the body, and then covers the hole very securely. A young Tarantula Killer will be produced from this egg, if no accident befalls it, about the first of June of the ensuing year. * * *

"The Tarantula Killers have severe fights with each other. It occasionally happens, when one of them succeeds in capturing a Tarantula, that another one, or more, flying around in that vicinity, and smelling the odor that arises from the Tarantula Killer when she uses her sting, which resembles the odor of the paper-making wasp (*Vespa*), only much stronger, takes the

THE TARANTULA OF TEXAS.

(*Mygale Hentzii*, Girard).

[Fig. 91.]



Color—Brown.

scents like a dog, tracks the Tarantula, following it up closely, and makes a violent effort to get possession of the paralyzed spider. A fight ensues, which occasionally terminates in the death of both parties; at other times the contest lasts but a little while, as the stronger party drives off the weaker, and takes possession of the prey.

"It is surprising to one who has been educated to believe that the faculty of reason belongs alone to man, to contemplate the consummate ingenuity which is displayed by these insects in their efforts to secure their eggs from the observation of their own thieving sisters, and to hide the food they

have provided for their young during the period of its existence under ground."

THE MELANCHOLY CHAFER.

In number 2, page 32, we stated on the excellent authority of Mr. Parker Earle, that the Melancholy Chafer (Fig. 92) eats into the blossom end

[Fig. 92.]



Colors—Black-brown and whitish.

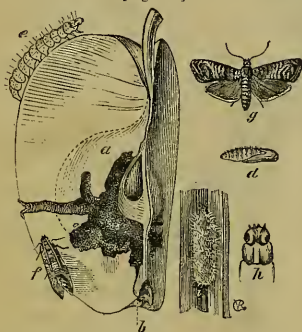
of pears and causes a clammy exudation therefrom. Mr. Glover long ago found these very same insects in cotton-bolls inside the holes pierced by the boll worm, and in one instance as many as five in a single boll. (*Patent Office Report*, 1854, p. 61). They appear, he says, to frequent such places merely for the sake of the extravasated sap. If this opinion be correct, it is possible that these Chafers may attack only such pears as have been already bored up by the Apple-worm. In the blossom end of one pear that had been attacked we distinctly recollect having observed the usual Apple-worm castings, or "frass," as it is technically termed.

APPLE WORMS.

(Carpocapsa pomonella, Linn.)

Almost every one who is in the habit of eating raw apples must have repeatedly noticed the little whitish worm, which is so often found burrowing at the core of the fruit, and filling it with its disgusting excrement. But probably not one fruit-grower out of a hundred has ever seen the little moth which is produced from this worm, and which, in its turn, gives birth to a fresh generation of such worms. In the annexed figure, *a*

[Fig. 93.]



Colors—(e) whitish; (f and g) gray, brown and bronze; (d) yellowish-brown.

shows the burrowings of this worm-like larva, *b* the point where it effects its entrance, *c* the larva itself, of the natural size when full grown, *h* the front part of its body magnified. *d* the pupa, *i* the cocoon, and *f* and *g* the perfect moth, which is distinguishable from all other moths by a patch of burnished coppery scales at the tip of its front wings. In English this moth is variously known as the Apple-worm Moth, or the Codling-worm Moth, but there is only one scientific or Latin name for it. Like most of our worst insect foes, it was originally a denizen of the Old World, having been introduced into this country only about the beginning of the present century. Twenty years ago it was unknown in Illinois; and it is only within the last eight or ten years that it has penetrated into Iowa.

The Apple-worm Moth makes its first appearance in North Illinois from the last of May to the forepart of June, and a little earlier or later according to the season and the latitude. Usually, at the time it appears, the young apples are already set, and beginning to be about as large as a hazel-nut. After coupling in the usual manner, the female moth then proceeds to deposit a single egg in the blossom end (*b*) of the

fruit, flying from fruit to fruit until her stock of eggs (amounting to probably two or three hundred) is exhausted. Not long after accomplishing this process she dies of old age and exhaustion. In a very few cases the egg is deposited in the hollow at the stalk end of the fruit, or simply glued on to the smooth surface of its cheek. In a short time afterwards the egg, no matter where it is located, hatches out, and the young larva forthwith proceeds to burrow into the flesh of the apple, feeding as he goes, but making his head-quarters in the core. In three or four weeks time it is full grown, and shortly before this the infested apple generally falls to the ground. The larva then crawls out of the fruit through a large hole in the cheek, which it has bored several days beforehand for that express purpose (as shown in the figure), and usually makes for the trunk of the tree, up which it climbs, and spins around itself a silken cocoon of a dirty white color, in any convenient crevice it can find, the crotch of the tree being a favorite spot. Here it transforms into the pupa state; and, towards the latter end of July or the forepart of August, bursts forth in the Moth state. We have noticed that a larva will occasionally spin its cocoon on the under surface of some board lying flat on the ground, instead of climbing the tree in the usual manner.

The whole of the above process is now repeated by this second generation of Moths; but, the apples being now very much larger, not near so many of them fall to the ground through the internal injury inflicted by the insidious little Apple-worms. A large part of them, in fact, hang on the trees till they are ready to be harvested, and in many of them the worms may still be found even up to the beginning of the winter. Those larvæ that leave the apples before they are harvested dispose of themselves in the same manner as the larvæ belonging to the first or spring brood. Those that remain in the apples till they are barreled up almost invariably make their way out in the course of the autumn, and spin their cocoons under the hoops of the barrel, or in any suitable cracks they can find in the staves. In a single apple-barrel, which we broke up in the spring for this express purpose, we once found about two hundred such cocoons. But wherever this second brood of larvæ spins its cocoon—whether on the tree, under some loose board, or under the hoops of a barrel—it always lies in its cocoon, in the larva state, all through the winter without eating anything, and never transforms into the pupa state till the beginning or middle of the following May. It is from this generation of pupæ that the early brood

of Moths takes its origin, which lay their eggs upon the young apples when they are about the size of hazel-nuts, as already explained.

It is remarkable that both Harris and Fitch seem to doubt the fact of there being two distinct broods of this insect every year, the one generated by the other, although Kollar (p. 231) and other European writers expressly assert that it is so in Europe. We have elsewhere shown that there are certainly two broods in Northern Illinois, and surely there must be two broods likewise in New York and New England; for Mr. W. Saunders has recently proved that the species is double-brooded in Upper Canada. (*Canada Farmer*, Oct. 1, 1868.)

Ordinarily this insect, as with other noxious species that have been introduced into America from Europe, is much more destructive in this country than on the other side of the Atlantic. Kollar, however, records that in Germany, in the year 1822, "more than the half, particularly of the choice fruit, was eaten into by the Apple-worm, and Moths were still seen laying their eggs at the end of September." And in England, in 1868, it appears to have been still more destructive, at least in the neighborhood of London. For we have been personally informed by the English entomologist, Stainton, that in that year, and in that locality, "although there was an abundant apple crop, it was yet scarcely possible to find a single apple uninfested by the larva of the Codling moth (*Carpocapsa pomonella*)."

Pears, as well as apples, are attacked by this insect, not only in America but also in Europe. Indeed, Mr. Parker Earle, President of the Fruit Growers' Association of Southern Illinois, and who is himself a very extensive grower of pears, informs us, in his annual address to that society in 1867, that "in many sections of country nine-tenths of the pears are reported as ruined by the Codling-moth." We have ourselves bred several specimens of the Moth from wild crabs; but, luckily for the plum growers and the peach growers, it is restricted to pip fruit, and never attacks any kind of stone fruit whatever, whether peach, nectarine, plum, cherry, or apricot.

It has long been known that, by placing an old cloth, or anything of that nature, in the crotch of an apple tree, the Apple-worms may be decoyed into building their cocoons underneath it, and thus be destroyed wholesale. Dr. Trimble's method—which amounts to the same thing, and has been found to be practically very beneficial—is to fasten two or three turns of a hay-band round the trunk of the apple tree, and every few days, from the middle of July to the

middle of September, to slip the hay-band up and destroy the cocoons that have from time to time been formed on the bark underneath it.

All authors are agreed as to the practical importance of picking up and destroying the wormy apples as fast as they fall, either by hog-power, or, when that is inconvenient and impracticable, by man-power. In the first number of this journal (pp. 4 and 5) we quoted several cases, proving the practical utility of allowing a gang of hogs the range of the apple orchard throughout the summer; and we could now, if necessary, add several more such cases to the list. When we consider that every female Moth that hatches out in July or August, from the first brood of Apple-worms, will probably deposit an egg in some two or three hundred nearly matured apples, thereby rendering them more or less unsaleable, the importance of destroying the wormy wind-falls—in the forefront of the season at all events—becomes at once apparent. The larvae that leave these early wind-falls lie so short a time in the cocoon before they come out in the Moth state, that there is not much chance for birds and other insect-devouring animals to get hold of them; more particularly as insects of various other kinds are always to be met with abundantly in the summer time. But with the second brood of larvae, which have to lie for six months in a torpid state, all through the long and dreary winter, when wood-peckers, and such other birds as do not migrate to warmer climates in the cold season, are often hard put to it for food, we are satisfied that the ease is very different. From the careful inspection of several large orchards in the early spring months, we are convinced that almost all the cocoons of the Apple-worm Moth, that have been constructed in the autumn on the trunks and limbs of apple trees, are gutted of their living tenants by hungry birds, long before the spring opens. How then is the breed propagated in the ensuing spring? Partly, perhaps, from such few cocoons as have been placed under boards lying flat on the ground, under logs, etc., but in a great measure, as we believe, from the cocoons contained in such vast numbers, as has been already shown, in empty apple-barrels. To these, situated as they generally are in cellars, or in barns or other out-buildings, birds have no access; consequently, as the spring opens, the Moths mature from them in great flocks, without let or hindrance, and, flying forth into the apple orchards, immediately commence their evil works. We have ourselves noticed the Moth in early spring, in the windows of a house in the cellar of which a few bushels of apples had been stored through the

winter. Suppose that from one such infested barrel there are generated one hundred female Apple-worm Moths, and that each Moth, on escaping into the orchard, lays only two hundred eggs, thereby spoiling two hundred apples; it follows that twenty thousand apples, or, allowing a hundred apples to the bushel, two hundred bushels of fruit may be ruined by the product of a single old barrel, worth perhaps some quarter of a dollar!

We would, therefore, earnestly impress upon our fruit-growing readers the practical importance of examining all barrels or other vessels, in which apples have been stored through the winter; and if, as will generally be the case, they are found to be swarming with Apple-worm cocoons in the spring, let them be either burnt up at once, or thoroughly scalded by immersing them in boiling hot water for a few minutes.

THE ASPARAGUS BEETLE

(*Crioceris asparagi*, Linn.)

There is scarcely a vegetable raised in our gardens that is not preyed upon by one or more grubs, caterpillars, or maggots, so that, when we eat it, we have positively no security that we are not mingling animal with vegetable food. Two distinct kinds of maggots, producing two distinct species of two-winged Fly, burrow in the bulb of the onion. Scabby potatoes are inhabited by a more elongated maggot, producing a very different kind of two-winged Fly, and also by several minute species of Mites. Turnips, beets, carrots and parsnips are each attacked by peculiar larvæ. And as to the multifarious varieties of the cabbage, not only are they often grievously infested by the Cabbage Plant-louse—a species which has been introduced from Europe into this country—but also by an imported caterpillar producing a small moth, and by several indigenous caterpillars producing much larger moths, some of which caterpillars, when full-grown, are over one inch long.

Up to about eight years ago asparagus formed a notable exception to the above general rule. There was no grub caterpillar or maggot peculiar to America that would touch it, and although there are several such that have long been known in Europe, none of them had hitherto found their way into this country. About 1860, however, the Asparagus Beetle was accidentally introduced into Long Island, N. Y., from the other side of the Atlantic; and in a very few years it had increased and multiplied, among

the extensive asparagus plantations in that locality, to such an extent, as to occasion a dead loss of some fifty thousand dollars in a single county. In the year 1868, as we have ascertained through specimens of this beetle obligingly furnished to us by A. HANCE & SON, nurserymen, of Monmouth county, N. J., it had already crossed over from Long Island on to the adjoining main land; and thence there can be little doubt that it will gradually overspread the whole country, working westward at the probable rate of some twenty miles a year.

That our readers may recognize at once this pernicious insect as soon as they see it, we annex figures of it in its various stages. The per-

(Fig. 94.)



Asparagus Beetle, etc.

fect beetle (Fig. 94, *a*) is of a deep blue-black color, with the thorax brick-red, and some markings of very variable shape and size on the side of its wing-cases. The eggs (*b* and magnified at *c*) are generally attached to the leaves of the growing asparagus, and are of a blackish color. The larva (*d* and *e*, and magnified at *f*) is of a dull ash color, with a black head and six black legs placed at the forward end of the body, the tail end being used as a pro-leg in walking, as with the larvæ of most of the allied beetles. The species passes the winter under loose bark and in other such sheltered situations.

The species passes the winter under loose bark and in other such sheltered situations. In the perfect or beetle state; and in May, or soon after the season for cutting the asparagus for table use has commenced, it comes forth from its winter quarters and lays the first brood of eggs. These hatch out in about eight days, and by the middle of June the first brood of larvæ are large enough to be noticed, eating the bark off the more tender part of the young stems first, and in default of this consuming the tougher and harder bark off the main stalks. About the end of June they descend to the ground, and either going under the surface of the earth or hiding under any rubbish that may have accumulated there, form slight cocoons and pass into the pupa state. From these pupæ there bursts forth the same season a second brood of beetles which lays its eggs as before, and produces about the middle of August a second brood of larvæ or grubs, whence in the same manner as before there comes forth in September the brood of beetles which is destined to pass the winter in the beetle state and reproduce the species in the following spring. Thus,

as will be seen, the economy of this species is nearly the same as that of the Three-lined Leaf Beetle (Fig. 17, p. 26), which preys so extensively on the potato plant in the Eastern States, except that our larva does not cover itself with its own dung, and instead of the Asparagus Beetle passing the winter under ground in the larva state, it passes the winter above ground in the perfect or beetle state. Entomologically, the two species are closely allied, belonging to different genera of the same small sub-group of the great group of Leaf-feeding Beetles (*Phytophaga*), and both are what are commonly called "double-brooded" insects; that is, there are two distinct broods every year, the one generated by the other.

According to Dr. Fitch, who published an excellent account of the depredations of this insect on Long Island up to the year 1862, one asparagus grower there had three acres out of seven "almost ruined;" and four others had asparagus beds so badly injured that they plowed them up. Throughout this entire region the general idea up to 1862 seems to have been, that if this beetle was not soon destroyed, the asparagus would be; for every year the insect appeared to spread further and further, extending already for a distance of at least forty miles along the northern side of Long Island, and every year it got to be more numerous and more destructive. Lime, salt, potash, and a variety of other such applications, had all been tried and found ineffectual as remedies; domestic fowls, which as Dr. Fitch ascertained, feed greedily upon the beetles, could scarcely be used in sufficient numbers to clear fields of ten and twenty acres in extent; and as to hand-picking twenty acre fields, especially where the insect is so small, that would be too discouraging an idea to be entertained for a moment by any one.

But in the year 1863, as we learn from Isaac Hicks of Long Island, a deliverer appeared in the form of a small shining black parasitic fly, probably belonging either to the *Chalcis* or to the *Proctotrupes* Family. Whether this Fly lays its eggs in the eggs of the Asparagus Beetle, or in the larva of that insect, does not seem to be at present clearly ascertained; but if the accounts that we have received of it be correct, it must do either one or the other. In the former case, the larva that hatches out from the parasitic egg will consume the egg of the Asparagus Beetle and entirely prevent it from hatching; in the latter case it will destroy the larva before it has time to pass into the perfect state. The result, in either event, will be equally destructive to the bug and beneficial to the gardener.

Thus, as we are told, "although the Asparagus Beetle has not entirely ceased to trouble them upon Long Island since 1863, it yet has never since that year been of any very material damage there. Upon a few farms it still strips the plants in the latter part of summer, but not to much extent or so as to entail any very serious loss." On this very interesting and important subject, we hope before long to be able to give our readers some more precise and definite information.

But the diminution in the numbers of the Asparagus Beetle is probably due in part to artificial, as well as to natural causes. The Asparagus growers upon Long Island have introduced a method of fighting the insect, which is founded upon correct principles, and seems to be followed by very gratifying results. Early in the spring, when the Beetle has made its appearance and is ready to lay its eggs, "they destroy," as we are informed, "all the plants upon the farm except the large plants for market, hoeing up all the young seedlings that, as is well known, start from the last year's seed every spring upon the beds." Thus the mother-beetle is forced to lay her eggs upon the large shoots from the old stools; and as these are cut and sent to market every few days, there are no eggs left to hatch out into larvae for the second brood of beetles.

At first sight we might suppose that it would be possible, by carrying out the above system rigidly to its utmost extent, to extirpate the insect entirely. But unfortunately this can not be done. Asparagus, according to Dr. Fitch, has run wild to a considerable extent upon Long Island, "and slender spindling stalks of it may be seen growing in all situations there, by the roadsides, in the fields and in the woods. Thus the Asparagus Beetle has such an abundance of food everywhere presented to it, and the insect is already occupying such an extent of territory, that there seems to be no mode by which it is now possible for us to effect its extermination."

To many persons, perhaps, such a crop as Asparagus may seem of but very trifling importance, in a pecuniary point of view. But we have already seen upon how large a scale it is cultivated on Long Island, in the State of New York; and a writer in the *American Journal of Horticulture*, who hails from New Jersey, remarks as follows: "We plant Asparagus in great fields of ten to twenty acres. Well planted, it will cost a hundred dollars to set an acre; but it will continue productive for twenty years; and if properly cared for each acre will clear two hundred dollars annually. There are men all around me who have made small fortunes out of this single article."

A POPULAR DELUSION.

There are tribes of ephemeral insects which are born, live merrily, grow old and die, within the compass of twenty-four hours.—*Agricultural Paper.*

This is a vulgar error. There is no known insect that passes through all the stages of its existence, from the egg to the perfect state, in less than several weeks. The different species of flesh-flies and blow-flies are familiar examples of such a rapid development of life; and we can readily see why it should be so with creatures subsisting upon substances that decay so quickly as carrion. Even with leaf-feeding larvae, it has been shown that the Colorado Potato-bug arrives at the mature state in about a month from the laying of the egg. But the great majority of insects require nearly a year to pass through all their stages; several require two or three years; and the Seventeen-year Locust (*Cicada*) actually requires the full period of seventeen years to elapse before it becomes a winged fly.

There are, indeed, several flies known as May-flies or Ephemera—one of which will be found figured in our first number (page 6, Fig. 1 b)—that live but a very short time, and a few of them only for ten or twelve hours, in the winged state. But the larvæ of these very same flies have lived in the water for nearly a year, before they left their native element and became denizens of the air. The proof of this fact, which is notorious to all entomologists, can be at once made manifest to every one. All these May-flies drop their eggs in the water shortly after they have assumed the winged state; and of none of them is there more than a single brood in a single year. Now if it were possible for any of them "to be born, live merrily, grow old, and die, within the compass of twenty-four hours," as we are told above, then from these eggs thus dropped in the water there would surely spring up in a day or two a second brood of winged May-flies, and from these in the same period of time there would be generated a third brood, and so on indefinitely all through the summer, for at least a hundred successive generations. Whereas the real truth of the matter is, that there is but a single brood of each species of May-fly in a single year, appearing in a particular month, and not to be met with at any other season of the year. For example, it is recorded by European authors that a particular kind (*Ephemera Swammerdiana*) swarms regularly every year at the mouth of the Rhine, but only during three successive days, which usually occur about the feast of Olophius and St. John.

It may perhaps be argued that, although the

winged May-fly that flutters round in the air for a few brief hours is developed from the body of the larva that has been swimming about for months in the water, yet that the May-fly is a distinct animal from the larva. But no such hypothesis is tenable. Every frog is developed from a tadpole, or "pollywog," as it is popularly called; and the tadpole is as unlike the frog in every respect as the larva of the May-fly is unlike the May-fly itself. Shall we then venture to assert that the frog and the tadpole are distinct animals? Or that calves, lambs and colts, are distinct beings from cows, sheep and horses? If so, then it will also follow that babies do not belong to the same species as grown men and women; although in reality the baby is as much the larva of the full grown human being, as the tadpole is of the frog, the calf of the cow, the lamb of the sheep, and the colt of the horse.

Many years ago Dr. Franklin published an address, full of very instructive philosophy, which he put into the mouth of an "ancient Ephemera," that had lived to the extreme old age of four hundred and twenty minutes. As with much of the popular literature of the day, his moral reflections are admirable, but his entomology is naught.

THE SQUIRREL BOT.

Editors American Entomologist:

In regard to the mutilation of the generative organs of American squirrels, alluded to in the January number of your paper (p. 86), allow me to make a few remarks. The emasculation of the Gray Squirrel (*Sciurus carolinensis*) by our common Red Squirrel (*S. hudsonius*) has been almost universally advocated by old hunters in this region from my earliest boyhood. But they always alleged that it was confined to the Grays, and was perpetrated by the Reds. My intelligent friend, Judge Libhart, of Marietta, Pa., however, although he had shot emasculated specimens of these, was not prepared to unite with other hunters as to the cause.

About fifteen years ago, I captured a large, short, thick-bodied, two-winged fly, sitting on a fence stake about half a mile from a wood. As dipterous insects were not my specialty, this individual remained a long time in my collection unnamed. About seven years ago, Mr. Geo. Hensel, a naturalist of this city, captured an apparently sickly Striped Squirrel (*Sciurus striatus*), which he brought home and confined in a cage. For some time this animal refused to partake of its usual food; indeed it did not seem

able to eat; and, consequently, he thought it must inevitably soon die. One day, however, three large, dark, pear-shaped larvæ emerged from its body, from the region of the kidneys, and dropped on the bottom of the cage. These Mr. H. placed on a pot of earth, and the next morning one of them had gone into the ground, and the other two had changed into blunt, oval-shaped pupæ on the surface of the earth. After this the Squirrel recovered its health, ate, and became as lively as usual, and in due time was set at liberty. One of these pupæ died, and remains a pupa still, and from the other a fly only partially emerged, and died in the effort, and it also remains so still. From the one which buried itself, however, a perfect fly in a few days evolved, which in every respect corresponded with the one in my collection. I afterwards sent my specimen to Baron Osten Sacken, whilst he yet resided in Washington, and he pronounced it *Cuterebra buccata*, Fabr.

So you see here was a case where these bots were not found in the scrotum of the animal at all. The coincidence is also singular, that both those that came under the observation of Dr. Fitch, as well as of my own, were always in the Striped Squirrel, a species which our hunters never pretended were emasculated by other species. The matter does not seem to be quite clear yet. S. S. R.

Lancaster, Pa.

[It appears to us that, if the above facts prove anything at all, they rather tend to confirm Dr. Fitch's theory than otherwise. It is not stated that the sick Squirrel was a female, or that if a male, it was unmutated when it recovered its health and was set at liberty. As to the parasitic larvæ emerging "from the region of the kidneys," it is not difficult to understand that three such large larvæ as must be those of this Fly, which is the size of a humble-bee, would soon entirely consume the testicles—supposing them to have been originally located there—and be compelled to stray off for food into the adjoining regions of the body of so small an animal as a Striped Squirrel. In one of the two cases recorded by Dr. Fitch, a single grub was actually found alive inside the scrotum of a Squirrel caught by a cat, and from this grub the fly was bred the next summer. In the second case two apparently immature grubs were found, considerably torn and injured, in the scrotum of a Squirrel that had been shot; and it is expressly stated that, even by these two partly-grown grubs, the testicles appeared to be entirely consumed. Hence we may safely infer that as many as three such grubs could not

reach maturity in the body of a single Striped Squirrel, without consuming other parts besides the testicles.—Eds.]

Notes on the Periodical Cicada.—It does oviposit in Evergreens.

Editors American Entomologist:

In the interesting account of the *Cicada septendecim*, in No. 4 of the AMERICAN ENTOMOLOGIST, on page 65, you say that "the females deposit their eggs in the twigs of different trees, but never in evergreens." I had noticed them with some attention during the past season here, and enclose you these specimens of their work in three of our commonest evergreens—*Thuja occidentalis*, *Juniperus virginiana* and *Abies canadensis*. I have so far been unable to find any traces of their work in either of our common pines—*Pinus Austriaca*, *P. strobus* or *P. sylvestris*. Should I succeed in finding them in these pines I shall send you a sample.

Your reference, page 66, to the fungus found in the posterior part of the abdomen of the *Cicada septendecim*, confirms my observations here, except that the "mould" seemed to be a drying up of the contents and membranes of the abdomen, generally of a brown color, and dry and brittle. I found that in many cases the male organs of generation remained so firmly attached to the female during copulation that the male could only disengage himself by breaking away, leaving one or two posterior joints attached to the female, and it is these mutilated males which I found affected by the peculiar fungus mentioned, and therefore concluded that the "dry rot" might be the result of the broken membranes. I never found one thus affected in the very early part of their season, and I never found a perfect male thus affected. But this is not positive proof.

Their ravages on parts of the young orchards in this vicinity were very severe—some young pear and apple trees being very much injured.

Allow me to thank you for the clear and popular manner and style of your paper. I hope it may be as successful as it deserves to be.

Truly,

R. H. WARDER.

CLEVELAND, Ohio, Jan. 22, 1863

[We examined the twigs with a good deal of interest, and found that the eggs had hatched in all but one specimen of *Abies canadensis*. Will our correspondent make still further investigations and report whether the eggs in this tree have generally failed thus to hatch? Those eggs which failed to hatch are solid and discolored, while the shells of those that hatched are extremely fine and silvery.—Eds.]

COLORADO POTATO BUGS POISONOUS.

Editors American Entomologist:

A friend of mine from Pierce county, Wisconsin, where these bugs have *enhanced* the value of potatoes to one dollar per bushel, tells me that the prairie chickens eat them readily, but that it sickens them, and some of them die in consequence; and people have quit hunting and eating the fowls. Domestic chickens seem to be affected in the same way, but turkeys will not touch them, though curious as it may seem, geese eat and thrive on them. A family within his knowledge, all ate of prairie chickens, and all were taken ill. His own son *burned* a lot of the bugs, and the fumes made him very sick. These things serve to confirm the poisonous nature of these bugs, and warn us to handle them carefully.

J. G. IRWIN.

HANNIBAL, Mo.

ENTOMOLOGICAL ANNUAL.

We have received the following prospectus from our friend A. S. Packard, Jr., of Salem, Mass.:

ENTOMOLOGICAL ANNUAL FOR 1868.—It is proposed, should sufficient encouragement be given, to publish a Year Book of Progress in American Entomology, to be edited by Dr. A. S. Packard, Jr. Dr. J. L. Le Conte will contribute a chapter on the Coleoptera; Mr. S. H. Scudder, chapters on the Butterflies and Orthoptera; Baron R. Osten Sacken, a chapter on the Diptera; Mr. P. R. Uhler, a chapter on the Hemiptera and Neuroptera; and the Editor expects to receive aid from other entomologists. It is hoped it will prove a useful hand-book to every one interested in the study of insects. It will be published in 12mo size in the spring of 1869. An edition of five hundred will be printed, provided three hundred names can be secured. Will all entomologists desirous of aiding in the publication of such an annual, send in their subscriptions in advance, that the means of publishing such a useful book be afforded at the outset? Subscriptions, Seventy-five Cents a copy, received by W. S. West, Peabody Academy of Science, Salem, Mass.

TRANSFORMATIONS OF INSECTS.

It is commonly and correctly said that there are four stages in the life of every insect: 1st, the egg; 2d, the larva; 3d, the pupa, and 4th, the perfect or imago state. In most insects the dividing line between these stages is well marked, the larva and imago being active locomotive creatures, capable both of eating and discharging *feces*, and the pupa lying still all the time and neither eating nor discharging *feces*. But in certain great groups, for instance the true Bugs and the Grasshoppers, the pupa is as active and locomotive and ravenous as either the larva or the imago, and sometimes can not be readily distinguished by the inexperienced either from the former or the latter.

DO BEES INJURE RASPBERRIES?

[From the Proceedings of the New York Fruit Growers' Club.]

A correspondent writes: I am informed by an extensive berry grower that one who keeps bees must not expect to grow raspberries. The bees meddling with the pollen of the flowers is decidedly injurious to this fruit, whatever may be the case in regard to apples, pears, etc. Can this be so? Such a question ought to be settled before the opening of spring, so that choice could be knowingly made between the bees and the berries.

J. Crane—It is certainly a mistake that bees are injurious to the raspberry, or any other fruit.

A. S. Fuller—I supposed that this question had been fully, satisfactorily, and scientifically settled years ago, in favor of the honey bee. We are greatly indebted to these little friends for the assistance they give us in producing fruits, by distributing the pollen from one flower to another, or upon the stigmas of the one in which it is produced. Bees are very partial to the flowers of the raspberry, because it yields a large quantity of honey, but I am quite positive that they do no injury, even if they are not beneficial.

Dr. J. E. Snodgrass—If bees were injurious to any plant, it seems to me that the buckwheat would be the first to suffer, for as every one knows, bees will work continually on it from the time the first flower opens, until the last is gone. But I never heard of any one complaining of bees injuring this grain, and I am inclined to believe that nature is a much better guide in these matters, than any of our correspondents.

[It is undoubtedly true that bees and many other flower-hunting insects are very beneficial by carrying the pollen from blossom to blossom, and it has been proved by Chas. Darwin and others that many plants, when secluded from the visits of insects by artificial means, always fail to set any fruit. But, on the other hand, it has been also proved by the most undeniable evidence, that honey-bees occasionally destroy quinces, peaches and grapes, and probably other fruits as well, for the sake of the sugary matter contained in them. See the AMERICAN ENTOMOLOGIST, No. 3, page 56.—Eds.]

ERRATA.—On page 90, column 1, note, line 9, for "*Anchylopera*," read "*Anchylopera*"; same page, column 2, line 12, for "too" read "two." On page 99, column 1, 3d paragraph, for "Greenhouse Plants," read "Greenhouse Pests"; same page, column 2, line 25 from bottom, for "wing covers," read "wing-covers."

BEST'S FRUIT TREE INVIGORATOR AGAIN.

Alas that we should say so! there is trouble in the camp of this great benefactor of the fruit-growers. A Baltimore firm bought out Mr. Best's old patent right some time ago, and has advertised it extensively, and now Mr. Best has taken out a new patent right (dated June 2d, 1868), for a new and highly improved Invigorator, and threatens to prosecute all who buy the old patent right. The beauty of it is, that most of the certificates that Mr. Best prints to prove the excellence of the *new* Invigorator, are dated long before that Invigorator was patented, and must consequently apply to the *old* Invigorator, which he sold out to the unfortunate Baltimore firm, and every buyer of which he threatens to prosecute.

Some of our readers may perhaps think that this is a joke, and that as there is said to be always honor even among thieves, so there must necessarily be common decency even among quacks and charlatans. But this is what Mr. Benj. Best says himself, of his *new* Invigorator in his latest circular: "Improved from eight years' experience of the use of the *old* Invigorator, it is far superior to it. Patented June 2, 1868. The public are notified to purchase no Right of JOHN AHEARN, *alias* George W. Jackson, of-Baltimore, AS I WILL PROSECUTE ALL WHO BUY FROM HIM TO SELL OR USE."

Shabby, isn't it? Sell a man a jackass and then prosecute him for riding upon it!

BEST'S TREE INVIGORATOR.—Our extract from the *Entomologist* two weeks ago showed the theoretical absurdity of this patent article. J. B., of Tolono, Ill., states that this Invigorator was used by certain parties there, and that the borers increased rapidly after its application, and that one man took fourteen borers from a peach tree some time after using the stuff, and in his opinion it is of no more use than an application of wind. As to potato bugs, he says it may be effectual as it kills the vines, and if applied to all the vines the bugs will die of starvation.—*Journal of Agriculture.*

As some of our exchanges may wish to illustrate any article they may copy from the AMERICAN ENTOMOLOGIST, we have decided to furnish electrotypes of our wood cuts, at one half the cost of engraving; these electrotypes to be retained by the parties receiving them, if they desire it.

THE INSECT EXTINGUISHER, by Joseph Treat, N. J. This is a small duodecimo pamphlet of some 15 pages, containing many useful suggestions for the destruction of insects, most of which, however, are as old as the hills. The fundamental error of the author is that all bugs, without exception, are injurious, and should therefore be ruthlessly exterminated. For example, children are to be set to work to kill off all the butterflies, "whether in the street, the garden, the field, or wherever found." And yet the commonest butterfly that we have in the United States is our friend rather than our foe; for its larva feeds exclusively upon milkweed (*Asclepias*). Upon the same principle all the birds, without exception, are to be cherished because, as we are told, they all of them prey upon bugs. And yet western horticulturists are now almost unanimously of opinion, that there are about half a dozen birds that must be destroyed by every fruit grower, if he would raise a crop that will pay for the harvesting.

MORE GOOD WORDS.

In the course of the lectures lately delivered at the Industrial Colleges of the States of Illinois and Kansas, the AMERICAN ENTOMOLOGIST was often very favorably spoken of; while every mail brings good words and compliments from our readers. The manner in which our little paper has been received throughout the country affords us much satisfaction, and we can only reiterate our promise to improve it with age, so far as it is in our power, and again thank our many friends for their kind support.

BACK NUMBERS.

We regret to have to announce that we can no longer furnish back numbers of either of our first three numbers, the unexpectedly large call for them having entirely exhausted those editions.

ANSWERS TO CORRESPONDENTS.

Lacewing Fly.—*J. Higgins, Woodburn, Ills.*—The fly which you consider a delicate and frail looking insect to be alive and active at this season of the year, and which you found in the house, is a Lacewing Fly (*Chrysopa*), belonging to the very same genus as that which was figured and treated of on page 33, of our October number. It was doubtless hibernating in some corner of the house, when the unusually warm and pleasant weather, combined with the warmth of the room, roused it to activity. It is generally supposed that these insects pass the winter in their cocoons, but besides this individual which you find hibernating in the fly state, we have ourselves bred many from the cocoons, sufficiently late in the season to necessitate their thus hibernating.

Gigantic Water Bug.—*S. E. Munford, Princeton, Ind.*—The large, brown, flattened insect which you send, and for which you could not find a name in any of your works on Entomology, is the Gigantic *Belostoma* (*Belostoma grandis*, Linn.) It is a water insect, and a true bug, belonging to the order HETEROPTERA. Like the rest of the family to which it belongs, it feeds upon aquatic insects, and not upon vegetable food.

The White-marked Tussock Moth, again.—A. S. Fuller, Ridgewood, N. J.—The seven specimens which you gathered from your apple trees reached us in good condition. They all belong to the above named insect, and its parasites. On page 79, of number 4, you will find a figure and description of the caterpillar from which they were all produced. No. 1 is a piece of the back of the female chrysalis, and the buff colored specks on it are not eggs, but minute hair masses, representing in a reduced form the brushes which adorned the caterpillar. Nos. 2 and 3, were both of them ♀ chrysalids, each containing pupae of some two-winged fly, belonging most likely to the *Tachina* family (see Fig. 35). No. 4 is one of the dried up caterpillars, but containing no parasites. No. 5, contains the parasitic cocoons of some small Ichneumon fly; belonging most likely to the genus *Microgaster*. No. 6, is an egg-mass of the moth, and No. 7 contains the brown cocoons of a four-winged fly which we have frequently bred from this caterpillar. It is of a black color, the legs being conspicuously banded with black and white. It is the *Pimpla celsus*, of Walsh's MS., being closely allied to *P. inquisitor*, Say, from which it differs very conspicuously in the face of the male being white. Besides these three distinct parasites which you send, we are acquainted with four more which attack this caterpillar, and in collecting the egg-bearing cocoons, care enough be taken to leave these parasites so that they can continue their good work, they will undoubtedly keep this pest effectually in check.

Grasshopper Eggs—Will they hatch?—C. J. Jones, Troy, Doniphan Co., Kans.—You say that the Colorado Grasshoppers deposited their eggs in your neighborhood early in the fall (August and September), and that upon examining the eggs just before the ground froze, you found the young all developed and apparently ready to hatch, and you wish to know whether or not they will hatch next spring, or whether they will freeze with the thermometer at 20° below zero. We could tell you more definitely if you sent specimens for examination, though there is every probability that they will hatch, as the frosts are not likely to affect them. The progeny from these eggs is apt to die away however, without doing material damage, as explained in the article on this insect which appeared in our December number.

Injured Apple Trees.—G. C. Broadhead, Pleasant Hill, Mo.—We cannot tell without seeing specimens, what it is that is eating around your apple trees just under the bark, and causing them to die and break off at such places. It may be the Flat-headed apple tree borer (*Chrysobothris femorata*, Fabr.), and if so, he should be searched for within his retreat, wherever he is accessible, and killed. After killing all that can be found, the tree should, receive a thorough washing with soft soap. We advise our subscribers, when it is practicable, to accompany their questions with specimens of the insects they refer to, with as full and minute account of their work as possible, as otherwise we can never give positive or satisfactory answers.

Small Snails in Gardens.—Marmadec Chappell-Smith, New Harmony, Ind.—The minute snails which you consider "as great pests as ever a garden was plagued with," and which injure so many of your flowers and strawberry plants by scraping off patches of the epidermis of their leaves and stalks, were, with the exception of a single shell, crushed to atoms on their way hither. This specimen agrees very well with *Pupilla fallax*, Say, which is quite common throughout the Northern, Middle and Western States. We suggest the application of salt around those plants infested with them, as we have seen it used in England with excellent effect on slugs and snails, which attack plants there, to a far greater extent than they do in this country.

Bagworms.—W. W. Butterfield, Indianapolis, Ind.—The specimen sent is the Bagworm, *alias* Basketworm, *alias* Dropworm (*Thyridopteryx ephemeraformis*). It infests a great variety of trees, but more especially evergreens, and can be readily got rid of by gathering the cases off the infested trees in the winter.

Butterfly Chrysalis.—W. W. Butterfield, Indianapolis, Ind.—The gray pupa, suspended by a silken thread passing round its middle, is that of the great Yellow Swallow-tail Butterfly (*Papilio Turnus*).

Eggs of the Apple-tree Plant-louse.—M. W. Seaman, Shipman, Ills.—The little oval black eggs that are salted so thickly over the bark of your apple-tree, are those of the common Apple-tree Plant-louse (*Aphis mali*). If there should be a warm spell in your neighborhood early next spring, followed by a frost, most of them will likely enough hatch out and be killed by the frost; for though the eggs can stand almost any degree of cold, the young larva cannot. Even if they all hatch out and survive, they will be attacked shortly afterwards by so many cannibal and parasite insects, that they will probably do no very material amount of damage. But for this wise provision of nature, they would soon increase with such frightful rapidity as to make it impossible to grow any apples. As it is, nobody ever knew an Apple tree to be killed by these insects, and possibly in small numbers they may produce the same beneficial results as a summer pruning.

Entomological Works.—B. B. Warfield, Lexington, Ky.—The "Insects of New York," by E. Emmons, is out of print, and forms a part of the "Natural History of New York," published by the State. A copy may possibly be had of B. Westermann & Co., 440 Broadway, N. Y. Dr. Fitch's Reports are published in the transactions of the New York State Agricultural Society, and are also published separately in volumes, the copyright being secured to the author. They may possibly be had by addressing the Corresponding Secretary of the State Agricultural Society, Mr. B. F. Johnson, of Albany, N. Y., though we understand that the first two volumes are out of print. Mr. Walsh's first Report can probably be obtained from Mr. W. C. Flagg, of Alton Ills., the Corresponding Secretary of the Illinois State Horticultural Society, by enclosing a 10 cent postage stamp to pay for postage; while Mr. Riley's first Report is not yet published, but will appear in the Report of the State Board of Agriculture. We believe there is no fixed price for any of these works.

Insects Named.—J. B. Merwin, St. Louis.—The insects you send for names are as follows: The gigantic fly is the ♂ Hellgrammite Fly, (*Corydalis corvatus*, Linn., Fig. 56, c.) an account and figure of which were given on the front page of No. 4. The four butterflies with rich purple-brown wings, margined with a buff-yellow band, near the inner edge of which there is a row of celestial-blue spots, are specimens of the Antiopa Butterfly (*Vanessa antiopa*, Linn.) It is produced from a black prickly caterpillar, which feeds on the willow. The butterfly with black wings, the fore ones having a beautiful orange-vermillion band across their middle, and large white spots near their tips, and the hind ones with an orange band at their lower margin, is the Atlanta Butterfly (*Cynthia atlanta*, Linn.) Its caterpillar is also prickly, but is not so black as that of the other species. Both these butterflies are common alike to Europe and America.

White Grubs.—Wm. C. Holmes, Plattsburg, Mo.—From your description, we judge that the white worm which cuts off the roots of your blue grass and destroys your young osage orange plants, is the common White Grub, the larva of the May beetle (*Leucosternus quercina*, Knoch.) We cannot, however, decide with certainty, nor can we tell you whether or not they will remain another year on the same land, until you send us specimens. If our surmises are correct as to the species, and if the grubs were full grown last fall, the probability is that you will not be so badly troubled with them next season, for the reasons given in answer to John P. McCartney, of Cameron, Mo., on page 37, of our second number.

Class Book of Entomology.—A. D. Lee, Rural Seminary, Scioto, Ohio.—There is no American work that will answer as a class book for students. Harris's "Injurious Insects," will best serve the purpose, and has recently been republished by Orange Judd & Co., of New York, though we do not know their prices. The "Guide to the Study of Insects," is now being published in parts, each part 50 cents, by A. S. Packard, Jr., of Salem, Mass., but it is of too scientific a nature for a class book. We refer you to what was said on this subject on page 33, in answer to B. M. Reynolds of Madison, Wis. We advise the publishers to advertise in our columns, as we have frequent queries of this kind.

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THE POLYPHEMUS MOTH.

(*Attacus Polyphemus*, Linn.)

We present herewith a life-size sketch (Fig. 95) of this magnificent moth, which has been re-

silk cannot be readily reeled off, as with the old-fashioned Silkworm (*Bombyx mori*), from the cocoons. Another trouble is that, as we learn from Dr. Hagen of the Museum of Comparative Zoology at Cambridge, Mass., a certain parasitic fungus has been recently introduced into New-England from Europe, which is making great havoc among the larvæ of this and other large moths belonging to the same group, just as another parasitic fungus has for many years back decimated the old-fashioned Silkworms in Europe.

The larva of the Polyphemus Moth is a large fleshy apple-green caterpillar as big as the thumb of a stout man. We have ourselves found it upon oaks and hickories, and it is said to occur sometimes on elm, basswood, walnut.

[Fig. 95.]



Colors—Dull ochre-yellow, clouded with black.

cently dubbed the "American Silkworm," from the fact that Mr. Trouvelot, of Massachusetts, succeeded in rearing it in very large numbers, so as to obtain whole wagon-loads of its cocoons. The practical difficulty, however, with this, as with a closely allied species from Asia, the Alanthus Silkworm (*Attacus cynthia*) is, that the

butternut and thorn. It attains its full growth in August and September, and thereupon spins among the twigs of the tree which it inhabits a tough pod-like oval cocoon, enveloped in leaves and composed of a brownish white silk. The moth usually bursts forth from the cocoon in the following May or June, shortly after which the

eggs are deposited singly by the female upon the leaves of the tree which she selects for this purpose. No case is on record of the larvæ ever swarming in such numbers, as to do any material amount of damage to the foliage of any tree; but we regret to say that those of another noble moth which is closely allied to it, and which is a still more general feeder, the Cecropia moth (*Attacus cecropia*) sometimes inflict considerable injury upon apple-trees, and, according to Mr. Perkins, of Onarga, Ill., upon one occasion stripped his young tulip-trees (*Liriodendron tulipifera*), erroneously called "poplars" in many parts of the West, completely bare of their leaves.

The antennæ of the Polyphemus Moth are feathered in both sexes, but much more widely in the males than in the females. Our figure represents the male sex; and as will be seen at once, the antennæ might in this sex be readily mistaken by an inexperienced person for a pair of little bastard wings growing out of the head. In that excellent new French periodical, *Le Naturaliste Canadien*, (p. 22) will be found an amusing account from the pen of the Editor, of such a mistake having been actually made by a certain Canuck. We cannot resist the temptation of translating here the whole story from the original French, for the benefit of the American reader.

We must look in order to see; and in Natural History perhaps, more than in any other department of knowledge, we must know how to look, in order not to be deceived in our observations. One day one of our worthy neighbours came to call upon us with a very self-satisfied air. "Oh, Sir," says he, "I can show you—you who are so fond of rare things—an insect such as you have certainly never seen." "Take care: my collection is pretty large." "I have seen your collection, and you have nothing like it. It is a butterfly with six wings!" "A butterfly with six wings?" "Yes, sir, with six wings. Besides the four wings in the ordinary places, it has two little ones in addition on its head. It has a body as stout as that of a middling-sized mouse, and two large eyes in its hind wings. All those to whom I have shown it say they have never seen anything like it. But what is most extraordinary about it is these little wings on its head. What can be the use of them?" Recognizing without trouble by means of this description the insect that was referred to, we replied, "You know that butterflies are travelers, or rather navigators, in the air. Ordinarily they have only four wings, which, if you please, we may liken to the mainsails and topsails of our common sloops or cutters. Probably your butterfly, having a longer voyage than usual to make, has found it advantageous to add a foresail; and I should not be at all surprised if some other one took it into his head, some fine day to hoist a jib ahead of his other sails, so as to be still more complete. But in the mean time let us go and see how yours is rigged out." Our friend, who had received our rallery with a self-satisfied air, because he believed that he should soon have his revenge, by the stupefaction into which we should be thrown by the sight of his wonderful phenomenon, was quite put out of countenance when, at the first glance that we threw upon his insect, we recognized the male of our Polyphemus Moth, and invited him to come and see five or six others just like it in our collection. He had mistaken for wings the feathered antennæ of that magnificent moth, which are especially well developed in the male

sex, and which he had not taken the trouble to remark in the specimens in our cabinet. But far from wishing to turn aside our young naturalist from his observations, in consequence of this unfortunate result of his first attempt, we made him faithfully promise to examine well all these little beings which are every day presenting themselves before our eyes; assuring him that, although he would never find insects with wings on their heads, he would nevertheless find other wonderful things that would interest him still more.

We repeat the same advice to all our readers. Look! observe! examine! and you will see wonders without number unfold themselves before your eyes.

It may be perhaps worth while to add, that the males of a genus of Span-worm or Measuring-worm Moths, found in Europe but not hitherto discovered in America (*Lobophora*), are remarkable for their hind wings being furnished with a small membranous lobe, which gives them the appearance of possessing an additional pair of wings; and that, among the Feather-winged Moths (*Alucita* family), each wing is split more or less deeply into from two to six feathered rays, so as almost to deceive one into believing, that they really have about ten or twelve wings, instead of only four. Of this last group, one species (*Pterophorus periscelidactylus*, Fitch) is quite common upon grape vines, on the leaves of which the leaf-rolling larva feeds exclusively, but seldom in such numbers as to do any material amount of damage.

WASPS AND THEIR HABITS.

There are, at least, five hundred different kinds, or species, of wasps found within the limits of the United States, of the natural history of which, inasmuch as it is both interesting and instructive, we now propose to give a brief sketch. Much as some of these insects resemble one another at first sight, yet their structure and their habits are often very different; but, according to the general rule, wherever their structure is the same, it will be found that their habits are nearly, or quite the same. So that, in order to know what are the general habits of a species that we may come across, it is not usually necessary to find out the name of that particular species, but only to ascertain to what particular group it belongs. For, as with other animals, species belonging to the same group have the same, or nearly the same, habits.

In common with all kinds of bees and ants that have any sting at all, it is only the females among the wasps that have stings, the males possessing no apparatus of the kind. Almost everybody, for example, knows that the drone of the honey-bee may be handled with perfect impunity; and the drone is nothing but the male of the honey-bee, as all bee-keepers are well aware. Just so, all male wasps may be

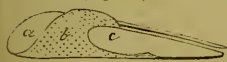
handled without fear; but, unfortunately, in order to distinguish the sex, we are generally obliged to catch the little animal first; for, as a general rule, which, however, admits of exceptions, the male wasp is scarcely distinguishable from the female, except by having, with a very few exceptions, thirteen-jointed (not twelve-jointed) antennæ, and a seven-jointed (not six-jointed) abdomen. So that, practically, this criterion is not of much value; and to ascertain whether a wasp can sting, we must first take it in our hands, and give it a fair chance to do so if it is able. It is remarkable that the very same distinctions between the sexes, as those which have been detailed above as generally found among the wasps, prevail almost universally among the ants and bees.

The Digger Wasps and the True Wasps.

The wasps are divisible into two grand groups, the first of which is two or three times as numerous in species as the second; namely, *first*, the Digger Wasps, or Fossorial Wasps (*Fossores*), and *secondly*, the True Wasps, or wasps with folded wings (*Diptopterygæ*.) There is no one obvious universal character by which, without a solitary exception, these two groups are distinguishable; but, with the exceptions hereafter to be noted, they may be distinguished by the following easily-observed criterions:

1. None of the Digger Wasps have their wings folded up in repose. All the True Wasps, on the contrary—with the single exception of an exotic genus (*Ceranius*), which has not as yet been found in North America, and to a partial extent, of another exotic genus (*Masaris*), found in this country exclusively in the Rocky Mountain region—have their wings folded in repose, in the singular manner shown in Figure 96, where *c* represents the upper surface of the hind wing, with its front edge hooked

[Fig. 96.]



on as usual to the hind edge of the front wing; *a*, all that is visible from

above of the upper surface of the front wing, and *b*, the lower surface of the front wing doubled over upon itself. Westwood has remarked that this peculiar folding of the wings "is so constant and characteristic, that we look in vain throughout the whole order (*Hymenoptera*) for any other instance." But, Westwood forgot that, in a single genus of *Chalcid* Flies (*Leucospis*), the wings are folded in precisely the same manner, as had been partly stated by himself in a

previous page of the same volume.* With this exception, his remark appears to be correct.

2. The eyes of the Digger Wasps are generally oval, rarely round, as in the female of one genus (*Mutilla*), or kidney-shaped, as in both sexes of two genera (*Trypoxylon* and *Scotia*), and in the males, but not in the females, of two other genera (*Mutilla* and *Myzine*). On the contrary, all the True Wasps, with the single exception of one Australian genus (*Paragia*), have their eyes kidney-shaped, the hollow, or scooped-out part of the kidney facing the base of the antennæ.

3. Most of the Digger Wasps, especially in the female sex, have their legs thickly set with long stiff bristles or slender thorns, the use of which we shall presently see. Certain exceptions which occur will be noticed hereafter, and the reason thereof explained. The True Wasps, on the other hand, always have their legs free from bristles or thorns, although the joints of their paws (*tarsi*) are often prolonged on each side in an acute angle at their tips, so as at first sight to somewhat resemble small thorns.

Having thus enabled the reader to tell the difference between a Digger Wasp and a True Wasp, we will take up each group in its turn and explain and illustrate its peculiar habits.

The Digger Wasps.

Every one knows that Blow-flies or Meat-flies will deposit their eggs, which are commonly called "fly-blows," upon meat; and that these eggs soon afterwards hatch out into whitish meat-feeding maggots, destined in the course of a few weeks to reproduce the mother-fly; after which the same old cycle of phenomena is repeated again and again. In the same manner, the thousands of different species of Moths and Butterflies, the larvæ of which feed upon the leaves or the buds or the stems of different herbs, shrubs and trees, deposit their eggs in or on, or at all events close to, the substance upon which their future larvæ are destined to subsist. And to these might be added a host of other insects, such as the various Clothes-moths and Fur-moths, the Cheese-fly, the different Bacon-beetles and Cheese-beetles, the Apple-worm Moth, &c., &c., all of which have the same remarkable habits in this respect. We call them remarkable, because many of these insects can not feed in the perfect state—in which state alone they are capable of laying eggs—upon the substances that they lay their eggs on. For instance, all the Butterflies and Moths feed in the perfect state upon the nectar of flowers or other

*see Westwood's *Introduction*, II, p. 233, and p. 164.

such liquid matter, if they take any food at all; while most of their larvæ feed upon the tissues of various plants, a few upon woollen clothes, a few upon furs, and a few even upon fatty substances. Yet nobody ever found one of these Butterflies or Moths depositing its eggs upon the nectary of flowers, where the honey which they themselves love so dearly is to be found; but, on the contrary, they each of them uniformly lay their eggs upon that particular substance which they are instinctively aware that their future larvæ will relish, but for which they themselves have no taste whatever.

Certain dung-feeding beetles—for example, a species (*Ligyris relictus*, Say), which is often mistaken both in the larva and in the perfect state for the common May-bug or May-beetle (*Lachnosterna quercina*, Knoch)—follow the same wonderful plan which has been detailed above; that is, they deposit their eggs in any mass of dung that they can find. But far more commonly among those beetles, the larvæ of which feed upon dung, we find an improvement upon the usual system. Instead of depositing their eggs in the dung, wherever it lies, they bore deep holes in the ground underneath it, and carry down little pellets of it into these holes, in which pellets they lay their eggs; thus securing the savory morsels from the various other insects that adopt the more primitive custom referred to above. On precisely the same principle the Burying-beetles (*Necrophorus*) lay their eggs in small pieces of carrion, such as dead rats, dead birds, &c., having previously buried the carrion completely underground to prevent Meat-flies from “fly-blowing” it, and having by this means effectually monopolized it for their future offspring. On one particular occasion, having deposited a full-grown dead rat upon newly-moved earth in a particular spot, as a trap for these Burying-beetles, we found that in twelve hours’ time the carcass had been completely buried, all but the tip of the tail, by a single individual of our largest and handsomest species (*N. americanus*, Oliv.), a beetle which is only $1\frac{1}{2}$ inch long. It would puzzle an Irish laborer to bury a full-grown whale in the same length of time; yet proportionally this would be a task of precisely the same magnitude.

In the case of the Burying-beetles and certain Dung-beetles, we caught the first inkling of an improvement upon the usual habits of insect life; for these, as we have seen, bury the substance upon which their future families are destined to subsist, a few inches under ground. In the case of the common Tumble-dung Beetles

(*Canthon*), we find a still further development of useful and intelligent industry; for these, as every American must have noticed, not satisfied with burying the pellets of dung, destined each of them to feed to maturity the larva of a future Tumble-dung, on the spot where that dung has been dropped—as, for example, is the universal practice of an allied genus (*Geotrupes*) of about the same size and shape—roll them over and over for several yards, till they have reached a snug retired spot, and then, and not till then, proceed to bury them. Authors have been much puzzled to account for this extraordinary proceeding; but, to our mind, the reason of it is obvious. There are a great number of rather small Cannibal Ground-beetles (*Carabus* family), the larvæ of which prey upon the larvæ of such dung-feeding beetles as bury the dung on the spot where it falls, the mother-beetles being directed to the spot, so as to know exactly where to lay their eggs, by the presence of the unsavory substance itself. By removing the precious pellet to a suitable distance and then carefully burying it, the provident Tumble-dung guards against such a mishap; though, even with such careful forethought, she does not in all probability entirely elude the attacks of other insect foes.

In confirmation of the above theory as to the habits of the Tumble-dung, it may be observed that, although we have in Illinois at least four distinct species of the dung-burying genus (*Geotrupes*) just now referred to as closely allied to the Tumble-dung, and only one species of Tumble-dung (*Canthon levis*, Drury) known to have the remarkable habits referred to above, * yet the latter are at least 100 times as numerous in individuals as the former. Why should this be so? These beetles are nearly all of the same size, shape and strength. They all breed in pellets of dung buried pretty deeply in the earth by the parent-beetle. The only difference in the habits of the two genera is, that the first buries its dung on the spot where that dung is dropped, and its larvæ are consequently more easily detected by their insect foes; while, taught by a wise Providence, the more careful Tumble-dung removes its odorous pellets to a safe distance from the dangerous spot, and thus escapes with comparative immunity from the attacks of its Cannibal enemies. Consequently the Tumble-dungs beat their less skillful antagonists in the struggle for existence, and out-breed and outnumber them, just as the Caucasian White man out-breeds and outnumbers the uncivilized Red

* A single specimen of *Canthon viridis*, Beauv., has been found near Rock Island by the Senior Editor; but the habits of this minute species are not known.

Indian in the great ever-recurring struggle for superiority on the Continent of America.

This curious propensity to roll balls of dung to a considerable distance was observed, thousands of years ago, with mysterious awe by the ancient Egyptians and by the ancient Greeks, and all sorts of superstitious and transcendental notions were founded thereupon. But up to the present day, no one has satisfactorily explained the phenomenon. Verily, under every stone, under every clod, and even under such despised substances as it almost offends the fastidious ear to name, there lies a whole volume of Natural History written by the finger of the great Common Father of us all.

It is always in the order *Hymenoptera* (Bees, Wasps, Ants, Ichneumon-flies, &c.), that we must look for the most exalted and widely spread developments of the instinct of insects. Among the Beetles (order *Coleoptera*) we find but a single genus, the Tumble-dungs, that remove the food of their future larvæ to a considerable distance from its natural locality; and this, too, they effect with their legs, and not with their wings. Yet they have fully developed wings, and, on a hot summer's day, fly with the greatest vigor; and by sub-dividing the dung-pellet into small portions, and carrying them one after another through the air to a suitable spot, they could effect in five minutes as much work as they now effect in five hours. Among the *Hymenoptera*, on the other hand, we find whole hosts of groups, namely our friends the Digger-Wasps, that do every day what, with all his wonderful intelligence, the Tumble-dung or "Sacred Beetle" of the Egyptians, has never yet been able to accomplish. Taught by the mysterious promptings of nature, the female Digger Wasps first of all fly round diligently till they have found a suitable spot, and then having found it proceed to construct a nest for that future offspring of theirs which they are destined never to behold; some of them for this purpose boring holes in timber, some excavating the stem of a dead weed, but the greater portion of them forming holes in the level ground or in clayey banks. The house is now built. It remains to furnish it with food, as well as lodging for the young larva that is soon to come into the world. For this purpose the wings of the female are again called into requisition; for we are almost ashamed to say that in the case of these Digger Wasps, as with nearly all other insects, it is the female only that works, the male being an idle gentleman who occupies his time entirely with sipping honey and pollen and gallanting the ladies. Flying forth among the trees

and bushes, and eagerly scanning the hidden recesses of the most tangled herbage, the female Digger Wasp soon discovers a specimen of the particular kind or kinds of insect or spider, which it is the habit of the species to which she belongs to select. Seizing it and pricking it with her sting just sufficiently to paralyze it for ever, but not so as to deprive it of life, she then flies off with it in triumph to the already constructed nest, and returns for additional specimens, till she has accumulated a sufficient supply of meat to feed one of her own larvæ to maturity. She next deposits a single egg among the still living but paralyzed animals that she has collected, seals up the mouth of her nest or cell, usually with earth or tempered clay or fragments of wood, and is off once more to build and provision new nests and repeat the same process over and over again, until her stock of eggs is exhausted. The larvæ that afterwards hatch out from these eggs are in every case soft legless whitish maggots, with a somewhat horny head and a strong pair of jaws, but no other weapons whatever, whether offensive or defensive. Yet, strange to relate, they live at their ease among the prey collected for them by maternal forethought; and this prey is often a lot of bees that, if in full vigor, would sting them to death in a moment, or a mass of ravenous spiders that, but for the fatal poison infused into their vitals, would like no better sport than to gobble them up at a single mouthful.

"But," it will be asked, "why this unnecessary cruelty? Why not at once sting the poor bees or caterpillars or spiders to death, and put them out of their misery?" The answer is, that the larvæ of these Digger Wasps live several weeks before they are full-fed and ready to form their cocoons; that during all this period they require fresh meat; that the time of the year when these operations take place is during the heats of the summer; and that, throughout that season, insects or spiders that were stung to death would putrify and become unfit for food in a single week. There are seldom any mistakes in Nature. The Power that created the Digger Wasp knew what kind of food its larva required; and—whether by direct or indirect means it matters not—He has so organized the mother-insect, that she is enabled and impelled to provide for her offspring the right kind of food, in the right quantity, at the right time, and in the right place. With a vast apparatus of steam-boilers and hermetically sealed cans, man has at length succeeded in preserving meat, fresh and untainted, for an indefinite time. With nothing but her good sharp sting and her

little bag of poison attached to it, the female Digger Wasp, even since the creation of the world, has been doing the very same thing in its own department of life. Yet, because the animal is comparatively a small one, we overlook and despise the beauty and simplicity of the process by which it works. In reality, however, this process is just as wonderfully ingenious, as if a ship-owner had the power of provisioning his ship with living sheep and living oxen, manipulated in such a manner that they could be packed in the ship's hold like so many hogs-heads; that they should require no food or attendance there, and neither kick nor struggle nor bellow nor bleat, but lie perfectly still; and yet that, whenever wanted for food, they could be hauled up out of the ship's hold and converted at pleasure into good fresh juicy beef and mutton.

In some cases, a single caterpillar, or spider, forms sufficient food for a single larva; and then the nest is provisioned with only a single individual. Sometimes, when such an animal is too large and heavy to be transported through the air, certain Digger Wasps (genera *Ammophila*, *Sphex*, and *Pompilus*) have been observed to drag it along the surface of the earth, after the manner in which the tumble-dungs work; but this is the exception, and not the rule. In other cases, as with several species of Wood Wasps (*Crabro* family), that bore nests for themselves in timber, and provision them with plant-lice; nearly a hundred individuals are stored up for a single larva. The more usual number is from half a dozen to a dozen. In no known case does any Digger Wasp attempt to rear more than a single larva in a single nest. As already hinted, each species of Digger Wasp usually selects a particular species, or, at all events a particular group, either of insects, or of spiders, as food for its young; but there are several exceptions to this rule, owing, do doubt, in part, to the occasional inability of the mother insects to procure the appropriate kind of food in sufficient quantities.

With the single exception of one small order (*Neuroptera*), no order of insects is exempt from the attacks of these all-devouring wasps. Some provision their nests with grasshoppers, some with cockroaches, some with snout-beetles of various kinds, some with ants, bees, and in Europe even with honey-bees; a few with different kinds of bugs, frog-spittle insects, and plant-lice; a great number of them with various kinds of two-winged flies, and a still greater number, perhaps, with the larvæ of various moths; and, besides all these, many distinct

species, belonging to widely distinct genera, prey upon spiders. St. Fargeau, however, has correctly remarked, that in no known case, does any Digger Wasp provision its nest with other Digger Wasps, either belonging to its own species, or to any other species.* The habits of comparatively but few North American species have been hitherto observed; but it was long ago recorded by Catesby that a

[Fig. 97.]



Color—Indigo blue.

common Blue Digger Wasp (*Chlorion cæruleum*, Drury, Fig. 97), makes its nest in the earth, and provisions it with a spider greatly larger than itself;† and we have ourselves observed a very common Digger Wasp (*Bembex fasciata*, Fabr.), a figure of which will be found below, burrowing in a sandy spot of ground, and provisioning the nests which it has

[Fig. 98.]



Colors—Black brown and pale greenish-white.

thus constructed, with the common shining, green blow-fly (*Musca Casar*, Linn). We have observed, too, on passing over sandy plains frequented by these last insects, that they will often fly round and round one's person in rather an alarming manner, though we have never known them to sting under such circumstances. Their object, no doubt, is to distract the attention of the intruder, and prevent him from noticing or disturbing their nests. St. Fargeau observed similar facts with regard to a European species (*B. rostrata*)—which, like our common species, provisions its nest with two-winged flies—and states that, as soon as he set himself down a little way off, and remained perfectly still, the insects took no further notice of him.‡ It is a good illustration of what has been called the *Unity of Habits* in insects, that all the species of this genus, the habits of which are known, whether in Europe, or in America, provision their nests with two-winged flies (*Diptera*), and exclusively with such as belong to the Second Grand Division (*Brachycera*) of the order.

The rapidity with which the Digger Wasps

*St. Fargeau, *Hymenopt.*, II, p. 548.

†*History of Carolina*, Vol. II., page 165, quoted by Westwood, Introduction, II, p. 207. Respecting the nomenclature of this insect, see the Appendix at the end of this article.

‡St. Fargeau, *Hymenopteres*, II, p. 560

dig their holes is very remarkable, and they disappear under ground in a very short time. Audubon has commented with wonder upon the fact, that our American badger can bury himself in the earth in one minute;* but we once saw the female of one of our commonest Digger Wasps (*Myzine 6-cincta*, Fabr.) bury herself in about half a minute in the sandy loam of a wagon-road.

In illustration of the habits of the same Blue Digger Wasp, which was referred to a few lines above, we will now quote a very graphic account, furnished to us by Mr. George W. Smith, of Grand Rapids, Michigan, of the mode in which this insect effaces all traces of the hole or nest which it has just provisioned. Unfortunately, Mr. Smith was prevented from seeing the Wasp actually carrying the doomed spider underground; but, judging from analogy, the nest had been dug beforehand, and the spider was carried in, the egg laid, and the entrance to the nest effectually closed up during his brief absence. On such a subject as this, we prefer, whenever possible, quoting the evidence of non-professional observers to stating facts observed by ourselves; because, in the latter case, it might be supposed by some that we were palming off "travelers' tales" upon the reader.

On the afternoon of the 23d of last June, while carrying a pail of water to my pony, and passing by a small sand-heap covered with weeds, I saw a wasp of a blue color and the size of a hornet, with a spider as large as itself in its mouth, alight on one of the weeds and from that to the ground. I watered my pony and hurried back, in time to see the curious antics performed by the wasp.

I saw it scraping away a small pile of dirt, which appeared to be sand newly dug up. It scraped with its front pair of feet and then pushed the dirt it had scraped with them further on with its other pairs of feet. Then it commenced patting this dirt with its abdomen, in the same manner as we would ram a newly-set post. It would scrape a little and pound again, and then throw on more dirt. It pounded quite forcibly and very fast. It kept up these actions until the spot was quite like all the rest of the ground. It then flew away to a pear-tree and cleaned itself.

When the wasp was gone, I opened the place where it had pounded so much, and in a hole about an inch deep I found the spider, and under it a small white speck, which I suppose was an egg. The spider did not appear to be entirely dead.

There is another and a much handsomer species of an allied genus of Wasps, the Ichneumon-like Digger Wasp, (*Sphex ichneumonea*, Linn.), of which we herewith present a drawing, at Figure 99.

Unlike the Blue Digger Wasp, which is rather a southern than a northern species, it is common everywhere in the northern States, but instead of lighting chiefly upon the ground, as does its indigo-blue compeer, it occurs more frequently upon flowers. Dr. Packard, in his *Guide to*

[Fig. 99.]



Colors—Rust-red, with dense golden pubescence.

the Study of Insects, (pp. 167—8), has published the following very interesting and original observations on the habits of this species, which with his permission we reprint:

In the last week of July, and during August and early in September, we noticed nearly a dozen of these wasps busily engaged in digging their holes in a gravelly walk. In previous seasons they were more numerous, burrowing into grassy banks near the walk. The holes were four to six inches deep. In beginning the hole the wasp dragged away with its teeth a stone one-half as large as itself to a distance of eight inches from the hole, while it pushed away others with its head. In beginning its burrow it used its large and powerful jaws almost entirely, digging in to the depth of an inch in five minutes, completing its hole in about half an hour. After having inserted its head into the hole, where it loosened the earth with its jaws and threw it out of the hole with its jaws and fore legs, it would retreat backwards and push the dirt still farther back from the mouth of the cell with its hind legs. In cases where the farther progress of the work was stopped by a stone too large for the wasp to remove or dig around, it would abandon it and begin a new hole. Just as soon as it reached the required depth the wasp flew a few feet to an adjoining bank, and falling upon an *Orechelimuma vulgare* or *O. gracile*, [two common grass-green cattydid-like grasshoppers, about an inch long.] stung and paralyzed it instantly, bore it to its nest, and was out of sight in a moment, and while in the bottom of its hole must have deposited its egg in its victim. Re-appearing it began to draw the sand back into the hole, scratching it in quite briskly by means of its spiny fore tarsi, while standing on its two hind pairs of legs. It thus threw in half an inch of dirt upon the grasshopper and then flew off. In this way one *Sphex* will make two or three such holes in one afternoon. The work was hard and composed of a coarse sea-gravel, and the rapidity with which the wasp worked her way in with tooth and nail was marvelous.

There is another genus of Digger Wasps (*Ammophila*), closely allied to the preceding, but distinguishable at once from it by the abdomen being much slenderer and attached by a much longer stem or peduncle. Of this genus there are about forty different species found in North America, some of which resemble each other so closely that it is not always easy to tell one from another. All those that are known to us are peculiarly fond of alighting upon flowers, where on a hot summer's day dozens of them may often be observed in copulation, the anorous males firmly embracing the females round

*Audubon and Bachman, *History of Quadrupeds*, I, p. 365

their necks, with their long sickle-shaped jaws. The females may generally be handled with the naked fingers with perfect impunity; for, like those of most of the Wood Wasps (*Crabro* family), it is not one time in five hundred that they will use their stings, though they will generally make ineffectual attempts to wound with their long slender sharp-pointed jaws. The species

[Figs. 100.]



Colors—Black and blood-red; wings rust-red and dusky.

sketched herewith, the Painted-wing Digger Wasp, (*Ammophila pictipennis*, n. sp. Fig. 100), is new to science, and a full description of it will be found in the Appendix. It is tolerably common in South Illinois, but we have never captured it in the more northerly parts of the State, and do not believe that it is to be met with there. Some of our common species greatly exceed it in size and beauty, many of them being elegantly marked in various patterns with patches of silvery white pubescence. All of them, however, have the same general shape and make, and no doubt have the same general habits. We figure this species here, though it is comparatively small and inconspicuously colored, because we have received the following very interesting account of its habits from the mouth of Mr. T. A. E. Holcomb, of South Pass, in South Illinois.

On June 10th, 1868, I saw this wasp carrying a good-sized cutworm along the surface of the ground for a distance of about six rods. She held the cutworm back downwards, so that the head and tail curled upwards, grasping it with her jaws and front legs and walking with her four hind legs. I watched her for a long time, and began to think she would never arrive at the end of her journey; but at last she commenced circling about with the worm till she found the hole, which had apparently been dug beforehand by her for the reception of her prey. As nearly as I could estimate it, she had directed her course in the first instance about ten feet on one side of her "objective point." Having at length succeeded in finding the hole, she proceeded to enlarge it, having previously laid the worm down, which was alive but not lively. She then went in backwards, dragging the worm in after her, and staid underground rather less than a minute. At the end of this time she re-appeared, of course without the worm, and began to fill up the excavation, ramming in the loose earth with her head. There was not quite enough loose dirt round the mouth of the hole to fill it completely up, there being about one-eighth of an inch in depth still unfilled after using all the excavated materials. I was curious to see whether she would be careful enough to supply the deficiency, so that no insect foe might be guided to the spot, where she had taken so much pains to deposit the cutworm as food for her future offspring. I was not disappointed. In a very short time she commenced digging a second hole with her jaws, about an inch away from the first; and with the dirt that came out of this she filled up the first hole so that not the least vestige of it remained. Just as the operation was completed, I caught the wasp and preserved her in my collection duly labeled, according to my custom.

I subsequently dug into the spot where the cutworm had been buried, and found the worm about two and a half inches below the surface of the ground, with an egg attached to it near its middle. This cutworm I placed, egg and all, in a small jar along with some damp earth; and on emptying out the contents of the jar eighteen days afterwards, I found that the worm was completely consumed, and that the larva of the wasp had spun itself up in a cocoon. Whether or not I shall succeed in breeding the perfect wasp from this larva in 1869, remains to be proved.

Almost all the numerous species belonging to the above genus (*Ammophila*), the habits of which are known, provision their nests, like our new species, with caterpillars; only one or two species employing spiders, either normally or occasionally, for this purpose. We might quote many similar cases in other genera of Digger Wasps; and in all of them we may see interesting examples of the great law of the UNITY OF HABITS.

In No. 6 of the AMERICAN ENTOMOLOGIST, page 111, we gave a figure of the Tarantula of Texas (*Mygale Hentzi*, Girard), and an account from the pen of Dr. Linneccum of Texas of the mode in which it is captured, and stung so as to completely paralyze it, by a gigantic Digger Wasp (*Pepsis [pompilus] formosa*, Say); after which it is deposited, as provision for the future larva of the mother-wasp, in a hole which she digs for that purpose in the ground. We pre-

[Fig. 101.]



Colors—Bluish-green; wings rufous and dusky.

sent herewith a figure of this Tarantula-killer, as it is commonly called in Texas; and we append an account of its mode of preying upon the Tarantula, by Mr. S. B. Buckley of Texas, which was printed in the *Proceedings* of the Philadelphia Entomological Society six years before Dr. Linneccum wrote on the subject.* This account embodies several particulars, which have not previously appeared in our columns.

* Vol. I, pp. 138-9.

The Tarantula-killer is a bustling unquiet insect, always in motion, flying now here, now there, and when running on the ground its wings are in a constant state of vibration. Should it discover a Tarantula, it begins instantly to fly in circles in the air around its victim. The spider, as if knowing its fate, trembles violently, standing up and making a show of fight, but the resistance is very feeble and of no avail. The spider's foe soon discovers a favorable moment and darts upon the Tarantula whom it wounds with its sting, and again commences flying in circles. The injured spider is thrown into a tremor and often becomes paralyzed, though the infliction of a second and even a third wound is sometimes necessary. Sooner or later the spider becomes powerless, when the victor approaches, carefully feeling its way to see if its work has been effectually performed. It then begins to drag the Tarantula into a hole which it has previously dug in the ground, where, after the deposition of its egg by the wasp, the spider is covered up and allowed to remain.

I once met with one of these wasps that had just killed a large Tarantula. This was in central Texas, in mid-summer, when no rain had fallen for a long time and the prairie soil was filled with numerous sun-cracks. The weight of the spider was at least three times that of the wasp, yet the wasp running backwards dragged it along through the dry grass which offered considerable resistance, overcoming every obstacle by earnest perseverance. The route was rendered still more difficult by the cracks in the soil, down which both occasionally tumbled; and several times I thought that the Tarantula was lost at the bottom of a crack, but both would soon again emerge. I had never seen such an exhibition of strength and perseverance even among ants. I watched for half an hour, much interested, the energetic wasp dragging the spider through cracks and over fallen weeds and through fences, and I followed, determined to see the result, although it was near sunset and I was distant from our encampment. After going a short distance, the wasp and spider fell into a large crack. I was then sure that the spider had been lost. After a little I bent down to see what had become of them, and was much surprised at seeing the wasp dragging the spider from the crack. At such an exhibition of strength, I inadvertently exclaimed aloud, "You are a stout fellow!" This exclamation caused the wasp to drop the spider and gaze at me for a moment, having then for the first time noticed me. It then flew three or four times around the spider, as if to mark its locality, and went away. Sorry for its departure, I took the spider to our tent and preserved it in alcohol.

In the first number of the AMERICAN ENTOMOLOGIST (pages 8 and 9) we referred briefly, on the authority of Benj. Borden, a respectable

[Fig. 102.]



Colors—Yellow and rust-red.

Quaker farmer of Norristown, Pennsylvania, to the Gigantic Digger-wasp (*Stizus grandis*, Say) Figure 102, provisioning its nest with a Cicada (Locust). We repeat here the figure given in our first number, and quote at full length what Mr. Borden told us on the subject:

In the summer of 1866 my attention was called to a colony of large wasps or hornets near this town. A company of us armed with pick and shovel paid them a visit. They were located on the side of a stone turnpike. They burrowed in towards the center of the road. Hard ground appeared to be no obstacle, and when they encountered a stone they turned and went around it. Their burrows were about three feet long, with two or three galleries about one foot long. Each gallery terminated in a chamber considerably enlarged. In each of these chambers they appeared to have reared one young. We did not find any larva, but we found several in the pupa state. Also in each chamber we found the remains of one of our common locusts (*Cicada*). This locust in our section is considerably larger than the 17-year locust. The burrows were just large enough to admit this locust. One person had witnessed the operation of taking in a locust. The wasp had him on the top of the fence, and flew off with him, but came to the ground before reaching the burrow. Then by means of a hook on each of his hind feet he dragged his prey in on its back. We captured a few of the insects, and I placed one under a tumbler, but he chafed himself to death directly. They make a coarse humming noise when on the wing. I subsequently ascertained the scientific name of the species (*Stizus grandis*, Say) through Isaac Lea, President of the Academy of Natural Sciences at Philadelphia. A person tells me that he once attempted to capture a Summer Locust as it was sitting upon a post, but just as he made a grab at it one of these large wasps pounced upon it, and he caught them both at the same time, and got stung in the finger by the wasp in consequence. The puncture was so large as to cause blood to flow freely, and the pain was very severe, but gradually passed off without any serious inconvenience.

Mr. Borden was the first person to discover that the Gigantic Digger Wasp (*Stizus grandis*) provisions its nest with a Cicada; but an allied species, which is much commoner, the Handsome Digger Wasp (*Stizus speciosus*, Drury), Figure

[Fig. 103.]



Colors—Black and cream-color.

103, has been published by many different writers during the last century, as having the very same habits.* This species we know to occur in South Illinois; the fine female specimen, from which the above figure was drawn, having been captured in 1868, in Union county, by Mr. T. A. E. Holcomb, and obligingly presented to us. Whether Dr. Hull's observations upon certain gigantic wasps, of which "he and his sons, and his hired men, see one or two every year, flying along with considerable difficulty with a locust (*Cicada*) in their grasp,"* apply to this last species, or to the other one, is for the present uncertain. Of the large and superbly

*See *American Entomologist*, I, page 9.

colored genus to which both insects belong (*Stizus*), but three species have hitherto been discovered in North America. We give in the Appendix a description of a fourth species of this same genus, the "Short-winged Digger Wasp" (*Stizus brevipennis*, n. sp.), of which but a single specimen exists in the cabinet of the Senior Editor, and none at all, so far as is known, in any other collection of insects.

The holes or nests dug in the earth by Digger Wasps are, for the most part—especially in loose, sandy soils—dug in the same manner as Mr. Smith's Blue Wasp effaced all traces of its nest, namely, by scratching with their front legs, and scrabbling the loose dirt backward with their four hind legs, the motions being performed with the rapidity of lightning. But, as we saw above in the case of Dr. Packard's and Mr. Holcomb's wasps, certain species occasionally use their jaws in digging, and more especially, perhaps, when the soil is hard and solid; but, as a rule, they dig with their front legs, and not with their jaws, and scrabble the loosened dirt backward with their hind legs. Hence, we can see at once, why most species of Digger Wasps, and more particularly the females, which have the actual work to do, have their legs garnished plentifully—as has been already stated, and as will be seen at once in the wasps that are figured above—with long, stiff bristles, or slender thorns. On the other hand, the True Wasps, which, when they dig at all, dig with their powerful jaws, and not with their legs, have perfectly smooth legs, as may be seen from the species figured below (Figures 110, 111, 112). A European Digger Wasp, however, (*Ammophila sabulosa*)—belonging to the same genus as our Painted-wing Digger Wasp, (Fig. 100), which as we saw, digs with its jaws and not with its legs—although it has very bristly legs, is recorded as using the long, sickle-shaped jaws, which are characteristic of the genus, both in burrowing and in carrying the sand out of its burrow; thus approximating the habits of the Digger Wasps to those of the True Wasps.* So true is it, that in Entomology there is scarcely a single general rule without its exception, and that, wherever we open the great Book of Nature, and whether we study the structure of insects, or their habits, we find almost everywhere intermediate grades, and connecting links.

The comparatively few Digger Wasps that make their nests in timber, also have legs more or less densely armed with the usual bristles and

thorns, because it is necessary for them to be able to scrabble the minute fragments of wood out of the holes, which they gnaw in the substance of the wood to serve as nests for their larvæ. In a single stick of partially decayed firewood, we once found in the winter several dozen of the nests of a small species of Wood Wasp (*Crabro*), from which in the ensuing summer we bred about a dozen of the perfect wasps.

And now we approach a great mystery. The genus of Digger Wasps known as *Pelopæus* (in English "mud-maker"), to which appertains the common Mud-dauber (*Pelopæus lunatus*, Fabr.) shown in Figure 104, and well known to make the so-called "mud-dabs" so often found in out buildings, does not dig at all either in earth or in wood.* On the contrary, it constructs its nests of tempered clay, affixing them to the interior of any buildings to which it has free access, or to overhanging cliffs. In search of moist clay for this purpose, it may often be seen, during a long dry spell of summer weather,

[Fig. 104.] perched on the ground in the neighborhood of wells and other places where water is habitually slopped upon clayey ground. We should naturally expect, therefore, that, as it has the same habits as many of the

Colors—Black and dull yellow. True Wasps, it would have the smooth legs of a True Wasp and not those of a Digger Wasp. No such thing. The legs of the female Mud-dauber are obviously bristly, though not so strongly as in the two most nearly allied genera (*Sphex* and *Ammophila*), both of which are known to burrow in the earth. But why should they be so, when the bristles are of no manner of use to her, any more than they would be to a True Wasp? One school of philosophers will reply, that its legs are bristly, because ages and ages ago, in the dim far-away vista of bygone geological years, the genus took its gradual origin from some species that did really dig holes in the ground, and had bristly legs to enable it to do so; and that, in consequence of the disuse of its bristles for generation after generation through myriads of geological ages, the bristles themselves have

* There is a Blue Mud-dauber (*Pelopæus caruleus*, Linn.) common in certain Northern States but very rare in North Illinois, which strongly resembles at first sight the Blue Digger Wasp figured above, (Fig. 97). It may be readily distinguished, however, from the latter, by the different veining of its front wings and by its smooth legs. Respecting the interminable confusion among our different N. A. Blue Wasps, see the Appendix.

*See Westwood, *Trans. Entom. Soc. London*, I, p. 200.

gradually become shorter weaker and less numerous. Another school of philosophers will maintain, that its legs are bristly, in order to complete the Plan of the Creation, and carry out the System of Nature, and give full and free expression to the Thoughts of the Creator. Which explanation be the more rational and intelligible, the reader must judge for himself.

Two other such cases, which may be explained upon similar principles, have been briefly referred to by Dr. Packard in his *Guide to the Study of Insects* (pp. 165 and 169). In these cases two species, belonging respectively to two genera of Digger Wasps (*Larvada* and *Sphex*), all the other known species of which burrow in the ground to form their nests and have legs covered with thorns and bristles, have been ascertained to make their nests above ground in the fold of a leaf. We might consequently expect them both, if they were both primordially created with such abnormal instincts, to have perfectly smooth legs like the True Wasp (*Eumenes*) figured below (Fig. 110, *a*), which generally attaches its nest to the stem of some weed or to a leaf in the open air. It is pretty nearly but not exactly so; for it is recorded that one of these insects has its front legs perfectly smooth, and that the other one (the *Sphex*) has its front legs almost but not quite destitute of spines and bristles. We have but to refer to the sketch of a different species of this latter genus (*Sphex*) given above in Figure 99, the Ichneumon-like Digger Wasp, which species is known to be a burrower in the ground, to see how very differently its front legs are armed. The difference can be explained in the mode that best suits the reader.

But, from discoveries of our own, we are enabled to point out still another link in the chain which connects the Digger Wasps with the True Wasps, and still another thread in the complicated web which binds together all living organisms, whether animal or vegetable. There is a genus, or, as Mr. Cresson considers it, a sub-genus (*Agenia*) of the Spider Wasps (*Pompilus* sub-family)—a very extensive group of the Digger Wasps, all the other genera of which, with a single exception, to be hereafter noticed, burrow in the ground to form their nests, and have thorny and bristly legs. This genus (*Agenia*), however, has perfectly smooth legs, with the exception of a very few species, which have the merest rudiments of bristles or thorns, on their thighs or shanks. Singular to relate, although the French entomologist, St. Fargeau, has described thirty-five species of these smooth-legged Spider Wasps, found in

various parts of the world, and although our countryman, Cresson, has described as many as twenty-eight species, found in North America, yet, up to this day, nobody can tell for certain what are the general habits of the genus, from anything that has as yet been published. Shuckard, judging from the structure of its legs, guesses that it must bore into wood to make its nest.* St. Fargeau, for the same reason, guesses that these smooth-legged Spider Wasps must be what may be called "Guest Wasps," building no nests of their own, but depositing their eggs, like the European Cuckoo and our American Cow-bird, in the well-provisioned nests of allied nest-building species.† The real truth of the matter is, that they are neither Wood-borers nor "Guest Wasps;" but make little "mud-dabs" of their own, usually under the bark of standing trees, or under prostrate logs, in which, precisely as does the well-known Mud-dauber, figured above (Fig. 104), they rear their young. Hence, we see at once why, like this last-named wasp, they have smooth, or very nearly smooth, legs. The reason is simple. Thorns and bristles on their legs, though of great service for digging nests in the ground, or in decayed wood, would be of no manner of use to them in building nests with mud; and therefore, they either have none at all, or mere rudimental ones.

Why certain species have rudimental thorns on their legs, may be explained in either of the two modes referred to above. Why, on the other hand, certain other species have perfectly smooth legs, we can readily understand if we adopt the former of these two hypotheses; but, if we adopt the latter hypothesis, this fact becomes an insoluble and unintelligible enigma.

We present herewith sketches drawn from nature, of the "mud-cells" made by four distinct species of this very remarkable genus, which, hitherto, has been such a puzzle to the entomological student. All four kinds of cells are occasionally connected together, end to end,

like a string of beads, as shown in the figures of three of them. These three, *a*, *b*, and *c*, are given in Figure 105, and the fourth in Figure 106, *a*, all of them of the natural size; and along with the fourth mud-cell, we give an enlarged drawing of

[Fig. 105.]



Color—Clay-yellow.

*Quoted by Westwood, *Introduction*, II, p. 208.†St. Fargeau, *Hymenopteres*, III, p. 441.

the female of the wasp (*Agenia bombycina*, Cresson), Figure 106, *b*, that constructs it. From

[Fig. 106.]



Colors—(a) clay-yellow; (b) dingy black.

these four different kinds of mud-cells, we have bred specimens of the four different species of Spider Wasp (*Agenia*) that build them, three of which are described species, and one (*Ag. subcorticalis*), a new and hitherto undescribed species. This last is considerably the smallest of the four, and its nest, which we have always found exclusively under the loose bark of standing trees, is shown in Figure 105, *c*. The next largest species is one which was described thirty-two years ago by Thos. Say (*Agenia [pompilus] architectus*); and it is very remarkable that, although he gives a very elaborate description of the mud-cells from which he bred it, he says not a single word about the smoothness of its legs, and refers it to the same genus (*Pompilus*), to which belong the closely allied species with strongly-armed legs. We may add that Say found the mud-cells, from which he bred his specimens of this insect, "under prostrate logs and stones," while we found our two mud-cells under the loose bark of standing trees. The largest species but one (*Ag. mellipes*), was described by Say at the same time as the other one, merely from captured specimens, and without any knowledge of its habits, or any notice of its legs being smooth. This species we have also bred from mud-cells found exclusively under the bark of standing trees. Finally, the largest species of the four (*Ag. bombycina*), Figure 106, *b*, was described only two years ago by Mr. Cresson, without any knowledge whatever of its habits. This last we have bred in large numbers from mud-cells found under prostrate logs in North Illinois, and four specimens from similar mud-cells found under the bark of a standing tree in South Illinois. Unlike the other three, it has very small rudimental spines—scarcely perceptible except under the lens—on its legs. In the Appendix will be found a full description of the new species of smooth-legged Digger Wasps referred to above, and a few other

details relative to this singular genus (*Agenia*), which would not interest the general reader.

It may be objected perhaps by the entomological purist that, as all these builders of mud-cells, including the common Mud-dauber (Fig. 104) never dig at all, either in the ground or in decayed timber, or any where else, it is incorrect to call them "Digger Wasps." But a general name must not be changed because it is inapplicable to particular species. Many Bark-lice, for example, do not inhabit the bark but the leaves of plants; for instance the Scale-insect of the Oleander (*Aspidiotus nerii*, Bouche). Yet this last is none the less a true Bark-louse (*Coccus* family). Again, we have seen with our own eyes the common Bed-bug (*Acanthia lectularia*, Linn) actually swarming, not in beds frequented by Christians, but in a chicken-house. Yet any precisian who should insist that, when it infested a chicken-house, it ceased to be a "bed-bug" and became a "chicken-bug," would be simply ridiculous. Upon the same principle, a smooth-legged Spider Wasp does not cease to be a true Digger Wasp, because it never digs.

Not being aware of the habits of these small smooth-legged Digger Wasps, any more than anybody else, and being misled by certain mis-statements as to the origin of our common American "mud-dabs," Westwood has advanced the erroneous opinion, that "it is only among the Bees and (True) Wasps that we find the habit of constructing nests with materials brought from a distance."* This habit, it is true, is the exception and not the rule among the Digger Wasps. We find it more common among such of the True Wasps as are solitary in their habits. But when we come to the most intelligent and highly-developed of the whole group—namely, such of the True Wasps as are social and live in large communities—we find it universal. Undoubtedly this practice displays great intelligence, and is as wonderful as the proceedings of most birds in building their nests with materials fetched from a distance. It is interesting, therefore, to observe here and there the first developments of this curious instinct among the lower Wasps—its gradually becoming more common among such Wasps as approximate in their organization to the Social Wasps—and its full and complete culmination among the latter, which are universally considered as the highest and most intelligent of all the Wasps.

The mud-daubing Spider Wasps (*Agenia*) are not exempt from the attacks of parasites any

* Introduction, II. p. 207.

more than any other group of insects. From a lot of the kind of mud-cells sketched in Figure 105, *c*, we long ago bred great numbers of a minute *Chalcid* fly (*Pteromalus*) only one-twentieth of an inch long; and from a lot of those shown in Figure 105, *a*, about a dozen specimens of a beautiful undescribed Ichneumon-fly, about one-third of an inch long, banded with black and white, and with a white horse-shoe on the hind part of its thorax, to which we have given the manuscript name of the Horse-shoe Ichneumon-fly (*Mesostenus ferrum-equinum*).

It is well known to entomologists that among the solitary Bees—who habit it is to provision their nests with pollen, and not, after the fashion of the Digger Wasps and solitary True Wasps, with living insects—there are many genera, physically incapacitated from collecting pollen, which lay their eggs surreptitiously in the nests of the true pollen-collecting Bees, and thus appropriate for their own offspring the rich stores laid up for another's. Not only in the case of the group of Spider Wasps just now referred to (*Agénia*), but in that of several other genera of Digger Wasps (*Trypoxylon*, *Pelopæus* and *Sapyga*), has a similar habit been inferred by several authors to prevail. We suspect that, in these particular cases, erroneous inferences have been drawn from seeing the supposed Guest Wasps entering old last year's nests made by true Digger Wasps, or by Bees, which nests they afterwards appropriate for their own use, having first in many instances repaired and remodeled them. As regards the first of the three genera enumerated above (*Trypoxylon*), Westwood has shown this to be so;* and, at the risk of being tedious, we will give some additional proofs of this and certain other analogous facts, which have been observed by ourselves for a long series of years.

Almost every American knows the so-called "mud-dabs," constructed by the common Mud-dauber (Fig. 104), to be composed of one or more layers or tiers of clay tubes, arranged side by side like a set of "Pan's pipes," and cemented on to some surface pretty well protected from the weather. In a particular locality—the rocky cliffs near Black Hawk's Watch-tower, in Rock Island county, Ills.—we have always, for many years back, found these "mud-dabs" to contain in the winter months the cocoons of the wasp that makes them, and those of another Digger Wasp of a uniform black color, and belonging to a very distinct family (*Trypoxylon albitarse*, Fabr). Figure 107, promiscuously intermixed in about equal proportions. There can be no mistake

[Fig. 107.]



Colors—Polished black, with the hind paws whitish.

here, because the cocoon of the former, after stripping off the thin semi-opaque flossy outer membrane, characteristic of all those made by Digger-wasps, is about eight-tenths of an inch long, elongate oval, five times as long as wide, of a shining transparent tawny color, as thin almost as gold-beater's skin, and with the tail end docked, thickened and blackened; while the cocoon of the latter has a mere vestige of outer membrane, and is only about half an inch long, only thrice as long as wide, cylindrical but often with the head end expanding, like a cooper's rivet, into a more or less wide flange, of a dull opaque black color except the head end, which is ash gray, with the tail end docked but not otherwise differing from the rest of the cocoon, and the whole of a pretty firm and solid consistence. In most cases the elongate mud-cell of the Mud-dauber, when it has been tenanted by the Black Wasp spoken of above, is partitioned off by a clay diaphragm in the middle into two cells, each of which contains a distinct cocoon; but occasionally such a cell contains but a single cocoon, especially when the cell is rather shorter than usual. It is well known that the Mud-dauber provisions its nest with spiders, and fragments more or less complete of spiders may often be found in the cells occupied by its cocoons. Precisely the same thing occurs in the cells tenanted by the cocoons of the Black Wasp, showing that its larva must have fed upon spiders just as does that of the Mud-dauber. Lastly, from the cocoons shaped like a cooper's rivet, isolated in a separate vessel, we have repeatedly bred, not the Mud-dauber (Fig. 104), but the Black Wasp (Fig. 107).

Now, here is a mass of evidence amounting to what lawyers would call *prima facie* proof, that this Black Wasp is really a Guest-wasp, not building and provisioning any nest for itself, but laying its eggs in the nest built and provisioned by the Mud-dauber, and thus fraudulently appropriating for its own future progeny, the provision of spiders, laid up for the progeny of the Mud-dauber, by that poor hard-working industrious insect. Otherwise, why should the

* Introduction, &c., II, p 194.

two kinds of cocoon be promiscuously inter-mixed? Why should both kinds of larvæ be fed upon spiders? Why should the clay-cell, in which the Black Wasp rears its young, be so manifestly the work of the Mud-dauber, that no difference whatever can be perceived between those tenanted by the two different kinds of cocoon, save the clay partition in the middle, usually found, when the cell contains the cocoons of the Black Wasp, but never found when it contains the cocoon of the Mud-dauber? Most naturalists are tolerably well satisfied with evidence as strong as this; and for many years it staggered and puzzled us.

In the spring of 1867, we determined, if possible, to solve the enigma. We procured a very large quantity of the "Mud-dabs," containing both kinds of cocoons, and examined them at home, at our leisure. Thus we arrived at the following results, each of which will be accompanied by the proofs that establish it.

1st. *The Mud-dauber, as well as the Black Wasp, must often make use of the old last year's mud-cells constructed by the former.*—In two "mud-dabs" where there was a double tier of cells—the outer one of course not built previously to the inner one, for the simple reason that the inner one formed the foundation-wall for it—we found on March 9th, 1867, in the outer tier, dead and dry Digger Wasps in the perfect or winged state. Hence it follows that the outer tier must have been constructed at least as early as the summer of 1865; for if constructed in the summer of 1866 its cells would necessarily, on March 9th, 1867, have contained larvæ nearly ready to change to pupæ, or at all events pupæ, and not living winged wasps, and still less dead and dried up wasps. Consequently, the inner tier, having been built before the outer tier as already shown, must also have been constructed at least as early as the summer of 1865. But that inner tier on March 9th, 1867, contained at least one fresh cocoon of the Mud-dauber, as well as numerous fresh cocoons of the Black Wasp, intermixed together; and therefore both kinds of cocoon must have taken their origin from eggs deposited in the summer of 1866 in old cells which, as has been already proved, were built at least as early as the summer of 1865 and perhaps a year or two sooner. Thus, as both the Mud-dauber and the Black Wasp are proved to make use, occasionally at all events, of the old last year's cells of the former, the promiscuous occurrence of their cocoons is easily explained.

2nd. *The Black Wasp provisions its nest with different genera of spiders from those used by*

the Mud-Dauber.—It occasionally happens with most Digger Wasps, that the egg fails to hatch out; or the larva, having hatched out, perishes from unknown causes at an early age. In these cases, therefore, the food stored up for the larva remains uneaten, or mostly uneaten. By diligent search, we found two such cells, which had manifestly been provisioned by the Black Wasp, because each formed the inner portion of a full-sized cell, divided in two by the usual partition, and the outer portion of it contained the cocoon of a Black Wasp. Emptying out into hot water the dead spiders contained in these two cells, which were in a fair state of preservation, and also, a few in tolerably good order, found at the bottom of some cells tenanted by the cocoons of the Black Wasp, we found them to be seventeen in number, and all of them to belong to one genus and species, except two, which, apparently, belonged to a different species of the same genus. It remained to ascertain what species of spiders were used by the Mud-Dauber. For this purpose, it evidently would not answer to examine the contents of a cell without any partition in the middle, and in which the egg or young larva had perished prematurely, *provided it was found in the same locality as the above.* For, as the Black Wasp occasionally erects no partition-wall in the cell which it occupies, there would then have been no certainty which insect of the two had provisioned it with spiders. Consequently, we examined "mud-dabs" from a locality where they are never tenanted by the Black Wasp; and having found several cells in them full of nothing but spiders, from causes already explained, we ascertained that these spiders, which were thirty in number, apparently belonged to, at least, four different genera, the number of individuals belonging to each genus, being respectively, 1, 6, 6, and 17; and that they were all, not only specifically, but generically, distinct from those found in the cells tenanted by the Black Wasp. We may add further, that some seven or eight more or less imperfect specimens, found in cells occupied by the cocoons of the Mud-Dauber in the first lot of "mud-dabs," all apparently belonged to the genus most numerously represented in the second lot of "mud-dabs."

3rd. *Other genera of wasps, besides the Black Wasp referred to above, occasionally use the second-hand cells of the Mud-dauber as a nest for their larvæ.* In a large mass containing numerous cells, situated partly by cocoons of the Mud-dauber and partly by those of the Black Wasp,

we found a single large cell divided by a partition into two small cells, each of which contained what was evidently the cocoon, not of a Digger Wasp but of a True Wasp. Now, the larva of this wasp had manifestly been provisioned with caterpillars and not with spiders; for each cell contained eight or ten of the empty skins of some moth-larva or other upon which the wasp-larva had fed. Consequently, as the Mud-dauber provisions its nest, not with caterpillars but with spiders, the wasp that provisioned these two cells must evidently have catered for its own offspring. It was probably from some such case as this that Paliot de Beauvois, as quoted by Westwood, was deceived into stating that the Mud-dauber sometimes provisions its nest with spiders, sometimes with caterpillars.* We have opened hundreds and hundreds of their nests, and we are sure that they invariably use spiders for this purpose.

It may be added that, in all probability, the two larvæ of True Wasps, just now stated to have been discovered by us in Mud-dauber cells, would have developed into the Fraternal Wasp (*Eumenes fraterna*, Say) which will be found figured below (Fig. 110. a); for we had long before this period bred from common "mud-dabs" three males of this very same species. We cannot, however, speak positively as to this question; for we had to strip the cocoon off one of these two larvæ in order to examine it, after which it of course perished; and from the other larva there subsequently hatched out on May 19th, not the wasp itself, but a pretty blue parasitic fly (*Chrysis bella*, Cresson) common in North Illinois, which had preyed upon the larva of the Wasp. Not improbably, it was from some such occurrence as the above, that Mr. Saunders led Professor Westwood into the erroneous belief, that "mud-dabs" were really made by the same genus of True Wasps (*Eumenes*) to which the Fraternal Wasp actually bred by us from "mud-dabs" appertains; and that the veritable Mud-daubers (*Pelopæus*) were merely parasites, or rather Guest-Wasps, sponging upon True Wasps for food and lodging.†

In illustration of the curious propensity of the Black Wasp (Fig. 107), spoken of above, to habitually build and provision its nest in the old deserted nests of the Mud-dauber, we may quote here a very similar case observed in South America with regard to another species of the very same genus (*Trypoxylon*). For calling our attention to this case we are indebted to the kindness of Baron Osten Sacken, of New York

city: "Mr. Clark found in Brazil, that *Trypoxylon fugax* closed with clay the cells of a nest of *Polistes*, thus using them for its progeny."* *Polistes*, we may add here, is a genus of social True Wasps, which will be found figured below along with its nest. (Fig. 112, a). According to Linnæus, whose assertions were subsequently confirmed by the researches of Westwood, the common practice in Europe of this genus of Digger Wasps (*Trypoxylon*)—the name of which is most unfortunately derived from two Greek words signifying "timber-borer"—is, not to bore into timber at all, but to take possession of holes in wood that have been previously made by other insects, and occasionally hollow straws, and therein to construct its nests. †

Seeing, therefore, that it seems to be a well-established fact, that the habits of this genus of Digger Wasps are, neither to burrow in the ground nor in wood, but to seek out ready-made holes or the old nests of other Digger Wasps for its nest, finishing them off with a little mud that it fetches there itself; we might naturally expect to find its legs either perfectly smooth or very nearly so. Now, what are the facts? They are actually quite smooth, and this character has been duly recorded by St. Fargeau, who, however, draws the erroneous inference therefrom that the genus has the habits of a Guest-wasp.‡

On the whole, therefore, as we have shown that at least two distinct genera of wasps (*Trypoxylon*, and *Eumenes*), sometimes use the old second-hand cells of the Mud-dauber to build their own nests in, under circumstances which would mislead most naturalists into supposing that they were true Guest-wasps; and as all the recorded cases of so-called Guest-wasps that we have met with, are explainable upon similar suppositions, we incline to believe that no author has yet made out a clear and satisfactory case of the existence of such a thing as a true Guest-wasp, though undoubtedly there are many true Guest-bees, Guest-gallflies, Guest-sawflies, Guest-beetles and Guest-gallgnats. A true Guest-insect—or "*Inquiline*," as it is technically termed—deposits its egg in the recent nest of another insect, and appropriates for the use of the larva, that afterwards hatches out from that egg, the supply of nourishment provided by the mother-insect that makes the nest; the egg or the very young larva of this last mother-insect being afterwards often starved out

* See Westwood's *Introduction*, etc., II, p. 206.

† See Westwood's *Introduction*, etc., II, p. 27.

* From a paper by Mr. Smith in *Proc. London Entom Soc* IV, p. 77, 1858.

† Westwood, *Introduction* etc., II, pp. 104-5.

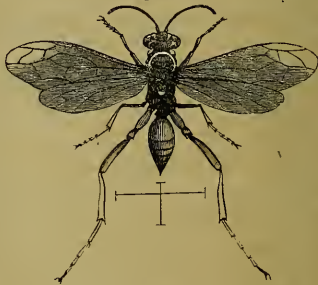
‡ St. Fargeau, *Hymenopteres*, III, p. 225.

or otherwise destroyed by the intruder. But this is a very different thing—as will be seen at once—from making use of an old second-hand abandoned and unprovisioned nest, constructed years ago by some other insect, and provisioning it afresh. Our American Cowbird always deposits its eggs in the recent nests of other birds, leaving its future offspring to be cared for by another. But it would be a very different thing, if it merely took the old abandoned last year's nests of those birds, and provided its own self for its own family therein.

But, although we do not believe that any of the genera of Digger Wasps (*Trypoxylon*, *Pelopæus*, *Agénia*, and *Sapyga*), hitherto inferred by certain authors to have the habits of Guest-wasps, do really have those habits, yet there is one remarkable genus (*Ceropales*), belonging to the Spider-wasp (*Pompilus*) family among the Digger Wasps, which most certainly has. Hitherto nothing whatever has been positively known as to the habits of this genus, although St. Fargeau long ago asserted with regard to it, that he had often observed females enter backwards into nests constructed by true Digger Wasps, whence he inferred that it had the habits of a Guest-wasp.* But St. Fargeau is so flighty and fanciful an author, and he has told so many similar tales about other Digger Wasps,† which we now know to be not Guest-wasps, but to build nests of their own, that his evidence would not amount to much, if there were any reliable facts to controvert his opinion. And indeed, even if the facts that he fancied that he witnessed were just as he represented them to have been, they scarcely justify his inference. Luckily, however, for the scientific reputation of the French entomologist, we have a fact to bring forward which demonstrates that—in this instance, at all events—he was a good guesser. The fact is this: We have already mentioned having bred four specimens of a little Mud-dauber (*Agénia bombycina*, Cresson), sketched in Figure 106, *b*, from clay cells obtained in South Illinois. Of these clay-cells we obtained in November, 1867, five specimens, all alike, and all of them found in company under the bark of the same tree, near South Pass in South Illinois. From these five cells there hatched out, about the end of June, 1868, the four little Mud-daubers just now referred to, and a single male specimen of a beautiful and hitherto undescribed species of the remarkable genus of Spider-wasps (*Cero-*

pales), already asserted by us to have the habits of a Guest-wasp. The inference is unavoidable—more especially as we had previously bred very numerous specimens of the same little Mud-dauber from the same kind of mud-cells obtained in North Illinois—that this gaily dressed Spider wasp (*Ceropales*) had, some time in the summer of 1867, laid an egg in one of the five mud-cells found in South Illinois, and thus appropriated to the use of its future larva the supply of food laid up by the provident care of the unfortunate, dingy-looking little Mud-dauber for its own offspring. Otherwise it is impossible to account for two distinct kinds of Wasp hatching out from the same lot of mud-cells. Several years before this, we had captured at large, in North Illinois three females of this very same Spider-Wasp, which are if possible still more beautiful than the male. From one of these the annexed highly magnified sketch (Fig. 108), has been drawn, in preference to drawing from the male; for the

[Fig. 108.]



Colors—Black, red and yellow.

females of the Digger Wasps, as stated before, always have their legs more bristly and spinous than the males of the same species, and it is desirable that the reader should see with his own eyes the armature of these important organs, in the sex where it is most highly developed. This genus, we may add, is especially remarkable—as may be seen in the engraving—for having hind legs of the most extravagant and disproportionate length. In the Appendix will be found a full description of our new species—which we have named the Red-bellied Spider Wasp (*Ceropales rufiventris*)—and a few other scientific details in regard to this interesting group, the true habits of which may now be considered as for the first time definitively settled.

Some authors have supposed that certain species of Digger Wasps open their nests from time to time, to furnish their young larvæ with fresh supplies of the appropriate food. But both St. Fargeau and Westwood discredit such state-

* St. Fargeau, *Encycl. Meth.* X., p. 183, quoted by Westwood, *Introd.* etc., II., p. 209.

† For example, about the genus *Agénia*, or as he names it, *Anoplius*, *Hymenopt.* III., pp. 441-2; about the genus *Trypoxylon*, *ibid* p. 225; etc.

ments, the latter correctly remarking that "none but social insects feed their larvæ periodically.* Strictly speaking, the Digger Wasps do not feed their larvæ at all. They collect suitable food into a suitable nest, lay an egg therein, close up the nest, and then leave it forever. As a general rule, it is only the higher animals that feed and tend their young after they are born. All mammals, and almost all birds do this, while it is done by but very few reptiles and by still fewer fishes. Consequently, as the Social Insects (Honey-bees, Hornets, Yellow-jackets, Ants and White Ants) have this propensity, and, as any one may see by disturbing an Ant's nest, are as much attached to their larvæ as a mother is to her child, we may justly, so far as this character goes, consider them as superior to other insects. But any mode of classification, founded exclusively upon this one single character, would be open to the same objection as certain modern Systems of Classification broached of late years in this country, and founded exclusively upon a single character; namely, that they are artificial and not natural systems.

It may not be amiss to remark here, that there is a small group of Digger Wasps (*Matilla* sub-family), the females of which have not even the slightest vestiges of wings, and strongly resemble ants, for which they are often mistaken by young entomologists. They may be distinguished, however, at once from any of the Ants by their antennæ not being flail-shaped, or "geniculate" as it is technically termed. From the great dissimilarity of the females to the males, some excellent entomologists were formerly in certain cases deceived into referring the two sexes, not only to distinct species but to distinct genera; and the very same thing has occurred with another genus (*Myzine*) belonging to an allied group (*Scolia* family), where the sexes are indeed both of them winged, but differ widely from each other in certain structural peculiarities. Through the kindness of Dr. Plummer, of Rock Island, Ills., who served in the medical corps of our army during the late war, we received several years ago from the State of Mississippi a large scarlet and black species of this sub-family, about three-quarters of an inch long (*Matilla coccinea*, Fabr.), the sting of which is said to be peculiarly powerful and virulent in its effects. The females of those species, which have been seen by us when alive, are always found in sandy localities running about like ants; and such is said to be the general habit of the whole group. The males

occur on flowers and shrubbery, and are very difficult to identify with their appropriate females, unless actually taken in copulation.

Although so snugly secluded from the world—each in his own private and peculiar cell, and with an abundant supply of delicious insect-meat close to his very mouth—the larvæ of the Digger Wasps do not escape the attacks of those universal marauders, the Ichneumon-flies and their allies. For example, besides the two parasites already referred to above as infesting the little mud-daubers (*Agenia*), a beautiful Ichneumon-fly (*Cryptus junceus*, Cresson)—represented in Figure 109 (♀) and remarkable for having when alive the peculiar and to us very

[Fig. 109.]



Colors—Black and yellow

agreeable smell of a Humble-bee (*Bombus*)—often pierces with its long tail-like ovipositor our common large "mud-dabs," and deposits an egg in the carcass of the unfortunate larva of the Mud-dauber.

From this egg the larva very soon afterwards hatches out and finally, as usual, consumes the vitals of its victim, and subsequently spins itself up in a cocoon. We have ourselves bred the above Ichneumon-fly from these "mud-dabs," and have repeatedly found its thin white silken cocoon, with the larva inside it, in the clay-cell of the Mud-dauber. Thus the spider preys upon flies, the mud-dauber upon the spider, and the ichneumon-fly upon the mud-dauber. "Kill and be killed; eat and be eaten." This is the great universal law of Nature. Every insect is checked and controlled by the attacks of others. None, as a general rule, except when man by his artificial processes interferes with the wise arrangements of Nature, is ever allowed to become unduly numerous. Every being in the world, not excluding even the human species, exists, not only for its own pleasure and benefit, but for the pleasure and benefit of other and often very inferior animals. Nothing in nature exists for itself alone; nothing is wasted. Even the dried up remains of the doomed spiders, upon which the larva of the Mud-dauber has fed, are not allowed to go to waste; but are preyed upon quite extensively by the larva of a small beetle (*Trogoderma ornatum*, Say), belonging to a Family (*Dermestes*), several species of which

* Westwood, *Introduction, etc.*, II., p. 207; St. Fargeau, *Hymenopt.* II., p. 569.

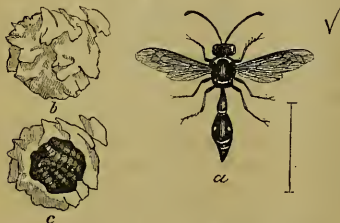
often infest badly kept collections of insects.

It is very remarkable that, although all the Digger Wasps feed in the larva state upon living animal matter, they all of them in the perfect or winged state feed exclusively upon vegetable substances, such as the honey and pollen of flowers. Hence it is the more wonderful, that they should be impelled by nature to store up for their future offspring a supply of such food, as would be utterly distasteful to themselves.

The True Wasps—Solitary Species.

The solitary True Wasps scarcely differ in their habits from the Digger Wasps, except that such genera (*Odynerus*, etc.) as construct their nests in sandy banks, in the interstices of stone walls, in holes bored by other insects in wood, etc., never dig with their two front legs, or scabble out the excavated fragments with their four hind legs, after the usual fashion of the Digger Wasps. On the contrary, they always excavate their holes solely with their powerful jaws, having first, when they are boring into hard earth, softened it with their saliva; and they always carry the excavated fragments out with their mouths, instead of scrabbling them out with their legs.* The reason is obvious: their legs, as stated above, are smooth, and, therefore, not adapted for digging, scratching and scrabbling. Many genera, however, construct mud-nests in the open air, and we present here-with a sketch from nature (Figure 110, b), of

[Fig. 110.]



Colors—(a) black and yellow; (b) mud-color; (c) mud-color and green.

that built by a common North American species, belonging to such a genus—the Fraternal Wasp (*Eumenes fraterna*, Say, Fig. 110, a). Figure 110, c, shows the same nest cut open shortly after it was built, so as to display the close and compact manner in which the small green caterpillars, with which it was stored, are

*See, on this subject, St. Fargeau, *Hymenopt.*, 11, p. 550, and Reaumur, as quoted there—a far more reliable authority for the habits of any insect than St. Fargeau.

arranged by the mother-wasp. According to Harris,* the Fraternal Wasp employs the pernicious cankerworms (*Anisopteryx vernata*, Peck) for this purpose; but it certainly can never do so near Rock Island, Ills., for there are no cankerworms in that neighborhood, and yet this wasp is very abundant there. The nest itself is sometimes firmly cemented under the loose bark of a tree, sometimes attached to the stem of a large weed in the open air, and sometimes to a leaf. We possess the leaf of some deciduous plant sent us by a correspondent, which exhibits no less than five of these nests, all placed close together on its lower surface, and from one of these the perfect insect was actually bred. So that, in this latter case, it would seem that the nests would necessarily all fall to the ground in the winter, and the larva—which does not hatch out into the perfect wasp state until the summer after that in which the nest was built—would be exposed all through the inclement season of the year to lie soaking on the ground after every storm of rain or snow. Possibly, however—as we know that the larvæ of many moths will, under such circumstances, fasten the leaf, or leaves, to which their cocoons are attached, by silken cords to the twig—the mother-wasp, in this case, might have taken the precaution to cement the leaf to the twig by the same clay mortar of which it constructs its nest.

The True Wasps—Social Species.

The Bald-faced Hornet (*Vespa maculata*, Linn, Fig. 111), is so well known throughout the Northern States, that it may be taken as a familiar example of the habits of this group.

[Fig. 111.]



Colors—Brown-black and cream-yellow. boasted pre-eminence in intellectual power, has only succeeded in doing within the last few years; that is, they manufacture paper, not out of rags, but out of wood. Alighting upon some wooden surface exposed to the weather, they gnaw off with their strong jaws the minute filaments of wood, which have become partly detached by the action of the elements, and chew them up into a fine pulp, which they afterwards spread out into the thin sheets of

**Injurious Insects*, p. 271.

strong gray weather-proof paper that form the material of their nests. Generally these nests are suspended from the branches of trees, and some of them when completed are much larger than a man's head; but we have occasionally seen small nests attached to the lower surface of the rail of a tight board-fence, and we once met with a single full-sized one which was built in a weedy place so that it touched the surface of the ground. Each nest, whatever be its location, is suspended from some object above it by a single strong pillar, its external shape being globular or oval, and is covered by an outer envelop of many irregular layers of paper. Inside this envelop the combs or layers of hexagonal cells are placed—each suspended from the one above it by numerous little pillars of the same *papier maché* that the insect employs in all its architecture—thus leaving an open passage-way between the different tiers. These combs, constructed of the same paper-like substance, and not as in the case of the honey-bee of wax, differ further from those of the honey-bee in their horizontal position, and in containing each of them but a single layer of hexagonal cells, with their mouths opening downwards; whereas those of the honey-bee are well known to all bee-keepers to contain a double layer, with their mouths opening sideways, and each comb suspended in a perpendicular direction from the roof of the hive. In the case of the Bald-faced Hornet, the cells are used exclusively for rearing their larvæ in, each cell containing a single larva; while the honey-bee, as is notorious to every bee-man, uses some of its cells for this purpose, and some of them for the storage of honey to supply its necessities during the cold inclement winter months when no flowers are to be found. The two insects, it may be remarked, agree with each other in the singular habit of beginning at the top and building downwards; and the Laputan philosopher, mentioned in Gulliver's Travels, ingeniously proposed to imitate this peculiar feature in their architecture, by building the garrets of every house first of all, and then gradually working downwards to the lower stories and the cellar.

With the Social Wasps, as with all other social insects, there are no less than three distinct kinds of individuals, namely, Males, Females, and what used to be called "Neuters" or sometimes "Workers." In the case of the honey-bee, it was long ago conclusively proved that the workers, when deprived of their queen, take an egg which would otherwise develop under ordinary treatment into a common worker, and by placing it in a cell that is much larger and

has its mouth opening downwards instead of sideways, and is always pear-shaped instead of hexagonally prismatic, and by feeding the young larva that hatches out from the egg with a peculiar food, develop that larva into a fertile female, or, as it is commonly called, a queen-bee. Hence it necessarily follows that, with the honey-bee, the workers are merely a peculiar kind of females, though they differ by certain invariable structural characters from the other kind, and there are no intermediate grades between the two. For this latter reason the two forms cannot be considered as mere varieties, the one of the other, but are clearly what naturalists now call "dimorphous forms." Of late years it has been further established by indisputable evidence, that certain workers among the honey-bees, without any sexual intercourse so far as is known with the males or drones, sometimes lay eggs which afterwards develop into complete males. Here, however, it is exclusively males that are thus generated; and as it has been shown by Siebold, a German naturalist, that the ordinary males of every hive proceed from unfertilized eggs laid by the queen-bee, we may infer by analogy that the males thus abnormally produced by worker-bees also proceed from unfertilized eggs. From all these facts, it follows that, in the case of the honey-bee at all events, the term "neuter," as applied to the worker, is clearly a misnomer.

So far as regards the Social Wasps, it has within the last few years been demonstrated in England, that Worker-wasps can and do generate other Worker-wasps, without any intercourse with the male sex.* Whether they can also generate, in the same manner, the so-called female wasps or queen wasps, and the male or drone wasps, remains to be proved; but we should not be surprised if it turns out that they can. For with many distinct Families of insects—for example, the Gall-flies, the Plant-lice, and certain Families of moths—it has been shown that several consecutive generations of fertile females may successively come into the world without any sexual connection whatever.† Be this as it may, it is quite clear that, both in the case of the honey-bee and in that of the Social

* See Stainton's *Entomologist's Annual* for 1861, pp. 37-39. It is proved by the experiments of several independent English observers, that in wasps' nests, from which the queen was removed quite early in the spring, the generation of workers continues through the season as freely as if the queen wasp had been still present there to lay eggs. Therefore these newly generated workers must proceed from eggs laid by workers; and as no males or workers ever live through the winter and the males only make their appearance towards the autumn, these egg-laying workers could not possibly have been impregnated by intercourse with the opposite sex. It would be interesting to repeat these experiments with some of our American Social Wasps.

† On this recalcitrant subject see the note in No. 6 of the AMERICAN ENTOMOLOGIST, p. 103.

Wasps, the term "neuters" must be abandoned, as leading to utterly erroneous and untenable ideas.

With all the Social Wasps, the males make their appearance only towards the autumn—say the latter end of August and during the month of September in North Illinois—as we know ourselves from long continued observations. The same fact was long ago noticed in Europe with regard to the species peculiar to that country. Shortly after the appearance of the males the large individuals called queen-wasps, which are destined to continue the race for another season, come all at once into the world. Copulation then takes place in the usual manner; but as soon as the cold weather commences the males and the workers all perish, while the queen-wasps retire to some secure spot and pass the winter in the torpid state, common at that season with almost all insects. In the case of our American Bald-faced Hornet, the queen-wasp excavates for herself a cell under some very rotten half-buried log, from which situation we have repeatedly disinterred her, in good robust vigorous health, in the early spring months. As soon as spring opens she sallies forth from her hiding-place, and each individual becomes the founder of a distinct nest, rearing nothing but workers at first, which, as soon as they are hatched out from their cells, unite with her in carrying on the labor of the community. Later in the season, the queen-wasps seldom, if ever, are seen abroad, and probably confine themselves to the nest like the queen-bee. Thus, as will be seen, every colony of Social Wasps is dissolved at the approach of winter, and every colony in the succeeding year takes its origin from a single female, that after being fertilized has passed the winter in a torpid state. The same rule holds good with the Humble-bees (*Bombus*). With the honey-bee, on the contrary, and with the various species of Ants (*Formica* family), there is no definite limit to the duration of a colony, the entire brood of workers surviving through the rigors of winter. We recollect disintering in March a nest of one of our commonest black ants (*Myrmica lineolata*, Say), in which we found a mass of the workers clustered together in a round ball as big as a hen's egg, and enclosing in the midst of them quite a number of their larvæ, evidently with the view of protecting their soft white delicate bodies from the cold.

The more usual food of our Bald-faced Hornet seems to be the honey and pollen of flowers; but we have repeatedly observed them catching Two-winged Flies upon umbelliferous flowers,

and chewing them up on the spot. Reasoning from the analogy of the Digger Wasps, which live themselves upon vegetable matter and rear their larvæ upon half-paralyzed insects and spiders, we may infer that insects chewed up in this manner are afterwards disgorged and fed out to the young larvæ in the nest at home; but it would be rather a difficult undertaking to prove the fact by direct evidence. Some persons in America have turned this insect-devouring propensity of the Hornets to good purpose, by suspending one of their nests in a house much infested by the common house-fly. In such a situation, we have been told that they soon make a clearance of the obnoxious flies; and so long as you do not meddle with them, they will not meddle with you. But woe to any one who—as we have sometimes ourselves accidentally done in beating trees for insects—strikes against the sacred home of the hitherto contented and peaceful family! Better for him that he had been subjected to the surgical process of acupuncture! for the needles of the surgeon are not envenomed, and the sting of the infuriated Hornet is bathed in liquid fire.

In no case, as authors have observed, even when, as in the instance of certain European species, Social Wasps catch and devour honey-bees, do they sting the insects that they catch, after the fashion of the Digger Wasps, and of such of the True Wasps as are solitary, and not social in their habits.* The two latter groups sting captured bees, not because they are afraid of being stung in return by them, but in order to make them lie quiet while the soft, white, helpless larva of the wasp is eating slowly and gradually into their vitals, perhaps three or four weeks after their capture. The Social Wasps, on the contrary, have no occasion to follow this practice, for they feed their larvæ personally from day to day, until those larvæ have matured; and therefore, they have no occasion to lay up a store of living meat for their helpless offspring, in the manner already described as practised by the Digger Wasps. In fact, all insects that capture bees and wasps, know perfectly well how to hold their prisoners in such a position that the sting cannot be used with effect. We have more than once seen one of the gigantic, soft-bodied, buzzing, two-winged *Asilus* flies (Order *Diptera*), that prey so ravenously on other insects, grasping a large Social Wasp (*Polistes*), or a good-sized Humble-bee by the head end, as if at arm's

*This assertion is confirmed by St. Fargeau, speaking of European species, *Hymenopt*, I, p. 481.

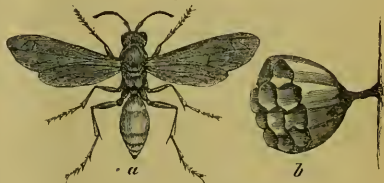
length, by means of its own front legs and stout beak, while the end that contained the sting was vainly beating the air away out ahead, and the *Asilus* Fly was gradually sucking out the vitals of the doomed insect with grim and silent satisfaction. We have also seen the same skillful tactics often practiced by a small, robust black and yellow bug, about one-third of an inch long (*Phymata erosa*, Fabr.)—common everywhere in the northern States, and found even in the streets of New York City—which haunts flowers, and preys habitually upon small bees and wasps. On the other hand, when an *Asilus* Fly captures a common grasshopper, we have remarked with astonishment, that it takes no such precautions as the above, but holds the grasshopper underneath its own body, belly to belly, in such a way that it would be sure to get stung if its prey had any sting at all. Evidently these insects know the difference between a wasp and a grasshopper, and are well aware that one has got a sting and the other has not. And yet certain two-legged animals without feathers, who do not know the difference between a bee and a beetle, and who could not for the life of them hold a bee or a wasp in their fingers for one second, without getting badly stung, consider that all "Bugs," as they are facetiously pleased to call them, have got no sense at all, and are but little superior, in the scale of the creation, to the herbs of the field and the trees of the forest!

The insects commonly known as "Yellow-jackets" in the United States belong to the same genus (*Vespa*) as the Bald-faced Hornet, and of course like that species are social in their habits and have the same general characteristics. We have a great many species of them in this country, differing by slight but invariable peculiarities of size shape and coloration, and there are two (*V. vulgaris* and *V. germanica*) which are supposed by Saussure to be identical with European species. We ourselves know but little of their economy, save that all the species with which we are acquainted build their nests underground likethe Common Wasp (*Vespa vulgaris*), of Europe, and none of them attach their nests to trees, as do certain European species. As we should naturally expect, from their belonging to the same genus, their nests are built upon the same principle as those of their ally, the Bald-faced Hornet. St. Fargeau records the fact that—as we should anticipate from the smoothness of their legs and the robustness of their jaws (*mandibles*)—such European species as burrow in the ground use their jaws, and not

their legs, in burrowing and in carrying out the excavated material.*

There is another genus of Social Wasps in North America (*Polistes*), about as numerous in species as that to which the Bald-faced Hornet and the various kinds of Yellow-jackets belong, and distinguishable at once from that genus by being much slenderer, and by having the first segment of the abdomen separated by a slight "constriction" from the second segment, as if a thread had been tied tightly round the connecting suture. They build combs, precisely similar to those of the Bald-faced Hornet, in some spot partially sheltered from the weather, but always without any paper envelope, and usually with but a single comb to a nest. What is very remarkable, and does not appear to have been hitherto animadverted on by any author, whether European or American, all known European species construct these combs in a vertical direction, like the honey-bee, attaching them laterally by their central point to some weed or shrub or building.† In Figure 112, *b*, may be seen a sketch of such

[Fig. 112.]



Colors—(a) rust-red; (b) gray.

a European nest, copied from Westwood. On the contrary, all our American species seem, as a rule, to build horizontal combs, just as does our Bald-faced Hornet, and all the European wasps and hornets that belong to the same genus as that insect. For example, the only American species of which we have personally observed the economy (*P. americanus*, Fabr.) builds a horizontal comb; in one case that came under our notice suspending it from the lintel of the doorway of an old ruinous house, and in the other case elevating it on the upper surface of the rail of a tight board fence. Thus, by the way, it results that, with this particular species, the cells must in one case have been built with their mouths downwards, and in the other case with their mouths upwards. Again, eight years ago we became aware that a large spe-

* *Hymenopteres*, I. pp. 488-9.† As authorities for this assertion we may quote Westwood *Introduction*, II., p. 252; St. Fargeau, *Hymenopt. I.*, p. 492.

cies, the Rust-red Social Wasp (*Polistes rubiginosus*, St. Farg., Fig. 112, a), the sting of which we know by painful experience to resemble closely a large darning-needle heated to a white heat, built great numbers of nests in barns and other out-buildings in the town of Jonesboro in South Illinois. We therefore wrote to our good friend, Mr. Paul Frick of that town, to ask him to examine the timbers of his barn and report the results. In reply he informed us that he found great numbers of the Wasp's combs there, and that, as a general rule, they were suspended in a horizontal position from the lower surface of the beams of the building; "though," as he adds, "he has sometimes seen the comb attached to a rafter and placed obliquely, so as to correspond with the slant of the rafter from which it hangs." Thirdly, Mr. N. C. McLean, of Coles county, Ills., informs us that a species (probably from his description *P. pallipes*, St. Farg.), which commonly builds nests under the eaves of his house, always builds horizontal combs, with the cells opening downwards. Lastly, Dr. Packard states, that three different species of this genus, with the economy of which he became personally very familiar in Virginia, all of them built their combs "with the mouths of the cells pointing downwards."*

It would be interesting to know whether most of the other North American species of this genus (*Polistes*) besides the five or six just now referred to, and most of the South American species likewise, adopt the same style of architecture. In that event, as the animals and plants of the New World are now generally allowed by naturalists to belong to a more ancient and old-fashioned type than those of the so-called Old World, we might assume that the American style of building is the normal and primordial one, and that the European style is a modern improvement upon it. Perhaps, in the course of indefinite ages, the Yellow-jackets and Hornets of Europe may improve in the same manner upon the antediluvian horizontal style of architecture, which is still universally followed on both sides of the Atlantic by all the species of the genus (*Vespa*) to which they belong, and may take to building vertical combs, like those highly civilized and highly developed Caucasians among the social insects—the honey-bees.

As to the diet of this genus (*Polistes*), it appears, like that of the Hornets and Yellow-jackets (*Vespa*), to be partly vegetable and partly animal. We once observed the same large rust-red species, which has been figured above, chew-

ing up a green caterpillar some three-quarters of an inch long, as the wasp itself sat perched upon one of the limbs of a tree; but ordinarily these insects, like most other kinds of wasps, may be found flying from flower to flower in search of honey and pollen, and occasionally perhaps gobbling up some peculiarly sweet-scented and sweet-flavored "bug" or "worm." As in the case of the Bald-faced Hornet, the probability is that they catch insects as food for their young larvae, first chewing them up into a kind of pap or pulp, and live themselves upon honey and pollen.

The females of the only two species of this genus (*Polistes*), that we have met with in North Illinois (*P. americanus*, Fabr., and *P. fuscatus*, Fabr.), we have noticed repeatedly to hibernate under the loose bark of standing trees; and in neither can we perceive any marked difference in the respective size or coloring of the hibernating females and the so-called workers found at large in profuse abundance in the middle of the summer. So that the distinction between these two forms seems to be here inappreciable to the eye, although, judging from the analogy of allied species carefully observed in Europe, it must have a real existence.

The following paragraphs from the pen of Mr. A. Fendler of Missouri, which appeared about two years ago in the *Gardeners' Monthly*, prove that wasps are occasionally very beneficial to the farmer by carrying off caterpillars on a wholesale scale. From the circumstance that the wasps observed by him are stated to have "worked up their prey into a small ball," it is quite clear that they must have belonged to some of the social species; for none of the Solitary Wasps ever do this, for reasons which have been already explained. But to which of the two genera illustrated by us (*Vespa* and *Polistes*) they really appertained, is left uncertain. Perhaps species belonging to both genera may have united in the good work. Certainly these wasps must have belonged to one or the other genus referred to above; for, with the exception of a single species found exclusively in California (*Polybia flavitarsis* Sauss.), they are the only genera of Social Wasps that occur in the United States.

One of the most tedious kinds of work in raising a crop of tobacco is the turning over of every leaf in search of the caterpillar, known by the name of horn-worm or tobacco-worm, so very destructive to that crop.* These worms can be found of all sizes, from that of a sewing-needle's point to that of a man's finger.* * * * *

*Most probably the larva of the Tobacco-worm moth (*Sphinx Carolina* Linn.). The Potato-worm, which is the larva of a very closely allied species of moth, long confounded with the other one, but quite distinct from it.

*Guide to the Study of Insects, p. 151.

Last Summer, although these caterpillars were hatched in unusually large numbers and to an alarming extent, yet, rapid as their growth is, they never reached the size of more than one inch in length. The cause of this singular phenomenon I soon found to be a number of hornets, and orange-colored wasps, dispersed over the field, and busy from morning till night during the months of July and August, in searching for tobacco-worms on the lower side of the leaves. Whenever they found one, they took hold of him with their mandibles, *worked him up into a small ball*, and then carried him off. In this way the wasps check the development of the caterpillar.

Later in the season, in September, when the nights turn cool, the wasps are busy only during the warmer part of the day; hence many of the caterpillars have a chance of growing to full size, even if the tobacco is being wormed by hand. When they have reached the length of somewhat over an inch, they become too heavy for the wasp, and are rejected.

Whether the latter render their services to man from motives of self-interest or otherwise is quite immaterial to me. These little creatures, by their efficient and voluntary aid, imposed upon me a duty of gratitude which will not allow me to pry into their motives. They will always find in me a friend ready to protect them, no matter whether they meant to benefit me or themselves. Most likely they had the preservation of their own offspring in view, and thus work for the horticulturist's future benefit.

Some years the wasps seem to be less numerous than in other years. In this part of the country one acre of tobacco, in order to be properly wormed, requires most of one person's time and attention throughout the growing season, if he has no assistance. Last summer, assisted by wasps, the acre of tobacco I planted did not require more than three mornings, leaving me plenty of time for other work.

An article on the habits and natural history of this tribe of insects, by one of our entomologists, could not fail to be of much interest to the horticulturist.

CONCLUSION.

After this very imperfect sketch of the habits of the different groups of wasps found in this country, it only remains to recommend the subject to the further attention of careful observers. Since there are at least 500 species of wasps to be met with in the United States, the field is of course a pretty extensive one; and it will richly repay the toils of the laborer in curious facts and instructive deductions therefrom. We could have easily swelled this Paper to thrice its present somewhat unwieldy dimensions, by copying blindfold what has been said by European authors respecting the habits of European species; but we preferred to lay nothing before the reader that was not based upon personal observations by resident Americans of American species of Wasps, with the exception of a few incidental remarks and illustrations, all of which have been duly credited to the sources from which they were derived.

Most people abhor the very name of a Wasp, and considering them all as an unmitigated nuisance, destroy them without mercy wherever they can be found. Certain species—we are not accurately informed which, but, judging from

(Sphinx, quinque-maculata, Haw.), and figured in all its stages in this Journal, page 21, sometimes infests tobacco, but more usually in the northern than in the southern States.

the experience of our European brethren, we should infer them to be some kind or other of Social Wasps—do undoubtedly injure fruit in certain seasons, by boring holes in the pulp to gratify their natural taste for sugary substances. But even these catch a great many noxious insects; and the great bulk of the Wasps—that is to say, the Digger-wasps and the solitary True Wasps—have, we believe, no such mischievous propensity for attacking fruit, and, as a general rule, are beneficial to mankind by checking the undue increase of other insects, and more especially of Plant-lice, Grasshoppers, and leaf-feeding Caterpillars. By what has been said above, the reader will be enabled to distinguish the former group from the two latter groups; and when we know that the two latter groups are generally our friends and never our enemies, instead of being ruthlessly destroyed they should always be cherished and encouraged.

Owing to the great length of this article, the scientific appendix is deferred to number 8.

[NOTE.—We regret to have to apologize for the inferior character of some of the figures, illustrating this article. About a month ago our engraver was suddenly called away to the sick bed of a son, and we consequently sent our drawings to Philadelphia. The firm to which they were sent has done excellent work for us on previous occasions, and after finishing the drawings with great care, and giving full instructions, we felt assured of being satisfied. When the proofs came, however, we were much mortified at finding that all instructions had been ignored, and that much of the work had evidently been done by novices in their calling. It was then too late to have them re-engraved, and the best we could do was to have them worked over and corrected. We say this in no derogatory spirit, because our Philadelphia friends have an excellent reputation, and *can* do good work; and it is quite probable, that in their endeavors to please us, they hurried the work too much. But we have their own word for it, that the wood was good and the drawings excellent, and they justly deserve a word of censure. Please recollect, gentlemen, that the readers of the ENTOMOLOGIST are abundantly capable of discriminating between a good and a bad engraving, and that in their eyes, "bugs are not creatures of such hideous mien," that any kind of botch-work will do for them. Give us in future your very best talent.

DO TOADS EAT WORKER BEES ?

Some days ago, when carrying several nuclei to my cellar to test the Kohler process, some worker bees dropped on the sand. A large toad issuing from a dark corner of the cellar came within an inch and a half of the first bee, stopped a second or two, and the poor bee disappeared down his throat. Then it hastened to the second, which was dispatched in the same way. So likewise the third, and finally the fourth and last. Had I not seen the toad's mouth opened and closed I should not have known where the bees had gone, so rapid was the motion of the viscous tongue. Seeing there was nothing more now to devour, the toad returned to his dark corner as gravely as he had come.

That toad is well known to the inmates of my family, having for months cleared the cellar of all flies, spiders, and other insects, and has thus come to be regarded in the light of a friend.

Last year, while digging a trench near my apiary for wintering my bees, we uncovered more than a dozen such toads which had already retired to winter quarters. But if I encounter any this year I shall destroy them without mercy. I advise other bee keepers to do the same.

HAMILTON, ILL., Sept. 5, 1868.
CH. DADANT.

We doubt whether toads should be thus summarily doomed without a hearing. They may and probably do "gobble up" a few workers in the course of a summer; but rarely have they a chance to seize any except the crippled, diseased, and disowned, which had better be suddenly consigned to the spacious stomach of a toad than die a lingering death by starvation. There have been dozens of toads in our apiary, year after year, and we regarded them as beneficial on the whole—riding the grounds of spiders, millipedes, ants, and various kinds of bugs and larvæ quite as "tightly and venomous," and needing some such natural enemy to prevent their undue increase.—*American Bee Journal*.

To the above remarks upon Mr. Dadant's letter, by the Editors of the *Bee Journal*, the Editors of the AMERICAN ENTOMOLOGIST have to add, that toads are upon the whole decidedly beneficial to the cultivator of the soil, and should be protected. If, however, as the *Bee Journal* and Mr. Dadant assert, they devour spiders, they are, so far as that propensity goes, injurious; for all spiders without exception are cannibals and prey largely upon insects, and chiefly upon the plant-feeding or injurious species. Again: the millipedes properly so called are some few of them, (genus *Tulus*), injurious by feeding upon the roots of plants, the rest of them living upon dead organic matter. Therefore, if toads eat millipedes (*Chilognatha*) they are blameless. But all the centipedes, (*Syngnatha*) which may be distinguished from the true millipedes by running very fast, instead of crawling along like a fly in a glue-pot—are cannibals; and as they live underground and prey upon those most unmanageable of all the multitudinous foes of the farmer, the subterranean root-feeding larvæ, should be sedulously cherished and protected. Therefore, if toads should eat centipedes, they do wrong. On the other hand—for there are no perfect and angelic reptiles, any more than there are perfect and angelic men and women—toads are particularly fond of strawberries. Even Dr. Trimble, the State

Entomologist of New Jersey, who cannot find it in his benevolent heart to make war upon any living animal possessed of a backbone (*Vertebrata*), and who even pleads the cause of those unmitigated pests of the fruit-grower, the Cedar-bird and the Baltimore Oriole, caudally owns up that a toad may sometimes be seen devouring a strawberry.* But even if toads swept away whole acres of strawberries and depopulated entire apiaries, that is no reason why those, who grow neither strawberries nor bees, should exterminate them in the usual unmerciful manner.

We confess to a sneaking kindness for the Toad. He is a sober quiet philosophical gentleman, not disturbing our nervous systems by jumping wildly with a noisy splurge into the nearest pond or pool, but pursuing the even tenor of his way at that slow and decorous and moderate pace, which Cicero thought to be the only one that became the fine old Roman gentleman. Besides, like every other animal when it is healthy and in the prime of life, the toad is really handsome. Take him up with your thumb and finger, madam, grasping him just behind the head—you need not be afraid of him—he cannot hurt you, even if he was so inclined. Now examine his eye; and if you have a jewel about your person that is more brilliant and displays a more tasteful arrangement of colors, you are a fortunate woman. Beyond all doubt it must have been to the eye of the Toad, and not to any supposed internal mineral, that Shakspeare referred when he asserted of that reptile that

It bears a precious jewel in his head.

Once more we repeat that the Toad, as a general rule, should be protected and spared, and when possible purposely introduced into gardens. Make his acquaintance; and you will find that, as with certain classes of men popularly known as "rough diamonds," the more you get to know of him the better you will like him.

* Trimble's Fruit-insects, p. 74.

ERRATA IN NO. 6.—On page 104, line 20 of note, for "one-third of the way," read "two-thirds of the way." On page 108, column 1, line 15 from bottom, for "Early in the spring," read "Early in June." Same page, column 2, line 8 from bottom, for "Early in the spring" read "Towards the end of May." On page 114, column 2, line 20, for "Some markings" read "Some yellowish markings." On page 118, column 2, line 20 from bottom, for "flower-hunting," read "flower-haunting."

BEST'S INVIGORATOR ONCE AGAIN.

In No. 5 of the AMERICAN ENTOMOLOGIST, page 97, we offered some criticisms on the high-flown pretensions of Mr. Benj. Best's wonderful panacea for all the ills of fruitdom, stating that we had received from Mr. J. Cochrane, nurseryman, of Havana, Ills., a copy of a circular strongly recommending this patent humbug. We observe that some of our agricultural contemporaries have inferred, from what we then and there said, that the Invigorator was recommended and endorsed by the gentleman who sent us the circular. This is an entire mistake. Mr. Cochrane, in a letter which accompanied the circular, compared the influence of the Invigorator upon the hundred and one noxious insects, which it is warranted to destroy, to the impotent attempt of an angry bull to stop a railroad train in full career; and otherwise spoke of it in as disparaging a manner as we ourselves have done. In justice to Mr. Cochrane in particular, and in justice to the nurserymen of the United States in general, we feel bound to make this correction. Men belonging to so intelligent a profession cannot easily be fooled by such transparent quackery, as that with which Mr. Benj. Best is now flooding the whole country through the mail, by thousands of tons at a single stroke, to the great discomfort of all the Post-office clerks and the intense delight of all the manufacturers of Railroad iron.

We are informed by Mr. Thos. Britainham, one of the most respectable citizens of Rock Island, Ills., that he was supplied gratis by a traveling agent with a quantity of the *Invigorator* in the summer of 1868, on the condition that he should try it upon his fruit trees, and if he thought favorably of it, "blow" for it all he could at the ensuing County Fair in the autumn. Having, he says, two or three very choice grape-vines, he poured a quantity of the hell-broth over the butts of them, thinking to "invigorate" them thoroughly, and also over the butts of two or three grape-vines that he set no great store by. The former were killed dead by the application; the latter still survive. Under the circumstances, he thought he was not justified in doing any "blowing" at the Fair; although, if the preparation had killed the worthless vines and "invigorated" the valuable ones, he might perhaps have acted differently.

We repeat once more that the symbol ♂ means "male," and the symbol ♀ "female." By the use of these symbols we economize space; and there is no reason why they should not become as familiar to the popular, as they already are to the scientific eye.

We recently disinterred from the columns of an old volume of the *Prairie Farmer*,* the following curious specimen of entomological poetry:

A cruel man a beetle took,
And to the wall him pinned, oh!
Then said the beetle to the crowd,
"Though I'm stuck up, I am not proud!"
And his soul flew out of the window.

Whether or not M. Provancher has, within the last few weeks, been "stuck up" like this beetle by some cruel assassin, we cannot say, but we sincerely hope not. At all events he most certainly is not "proud;" for he never thinks it beneath the dignity, either of his cloth or of his scientific standing, to enliven the monotony of scientific details by an occasional touch of genial humor, such as would have delighted the heart of Addison, and thrown William Makepeace Thackeray into convulsions of laughter. May it be many, many years before his soul takes flight out of the windows of that earthly tenement, which it now inhabits with so much credit to the writer himself and so much pleasure and benefit to the Canadian public!

* Vol. 23. 1861, p. 19)

We present our readers, this month, with an additional eight pages of reading matter, which enables us to publish entire, the article on "Wasps and their Habits." This article is necessarily somewhat lengthy, as it covers a field hitherto but little explored in America. The increase of matter has necessitated a slight delay in the issuing of the number.

Several of our subscribers having lately requested information about the Chinch-bug, we shall shortly publish an article on this insect. It last year proved very destructive in many parts of the West, and especially in Southwest Missouri.

We cheerfully acknowledge the receipt of a package of choice seeds from Wm. H. Lyman, of Leverett, Mass., whose advertisement appears in another column, and shall take great pleasure in testing their merits in the vicinity of Saint Louis during the coming summer.

We also acknowledge the receipt of a package of the "Farmers' Club Sweet Corn" from Jas. B. Olcott of Buckland, Conn. This corn is very highly recommended, and we shall likewise give it a fair trial.

We intended to have briefly noticed some of those of our exchanges which we most highly prize, but want of space obliges us to defer such notices till the next issue.

ON OUR TABLE.

LE NATURALISTE CANADIEN.*—This excellent new Monthly Journal is printed at Quebec, in what used to be denominated Lower Canada, but now, we suppose, forms part of the so-called "Dominion of Canada." By and by perhaps, after passing through the caterpillar stage of British Provinces and the chrysalis stage of an American Dominion, our northern brethren will fling off the empty pupa-shell, and wing their way into the glorious light of liberty and independence, in the perfect or imago stage of States of the Great American Union.

But two numbers of this periodical have as yet appeared, but already it shows signs of robust life and manly energy. Each number contains 24 octavo pages, illustrated by wood cuts and protected by a handsome cover. The Editor is the Rev. L. Provancher, curé of the village of Portneuf near Quebec; and as our readers will see at once from the title, the work is written in the French language. As it is published in Canada and edited by a Canadian clergyman, we carefully scanned its pages for some specimens of Canuck *patois*; but our search was in vain. It is written exclusively in elegant modern French, such as would not disgrace the pen of Eugene Sue or Victor Hugo. Many citizens of St. Louis and New Orleans are of French descent, and still retain their fondness for the literature of their primordial country. To all such we can recommend *Le Naturaliste Canadien*, as a work which they need not fear to introduce into their families, under the apprehension of its infecting the elegant Parisian language, spoken by their children, with impure phraseology and vulgar provincialisms.

Besides a quantity of other interesting matter, the first number of this Journal contains the commencement of an admirable article on the natural history of the beaver, which is concluded in the second number. This article is illustrated by a figure of the animal, showing the mode in which it fells small trees with its long sharp incisors. Among many other new and original facts, relative to the habits of this most singular creature, we learn that there is a beaver dam upon Grass Lake, west of Lake Superior, of the astonishing dimensions of 260 feet in length, with a vertical height in its central portion of 6 feet. There are also several instructive articles on Insects, Entomology being the favorite speciality of the Editor. And the whole is couched in that clear, lively and interesting style, which none but French authors know how to wield successfully.

*Published at No. 8, Rue de la Montagne, Basse Ville, Quebec; price \$2 per annum.

COMPLIMENTARY.

We recently noticed the favorable manner in which our little Journal is being received all over the country; (AMER. ENTOM. pp. 98 and 119.) It is of course exceedingly distressing to our modesty to dwell upon such a subject as this; but we cannot avoid remarking that, at the recent meeting of the Central Illinois Horticultural Society, without any solicitation on our part, it was unanimously voted by the Society that the AMERICAN ENTOMOLOGIST was worthy the support of its members.

☞ We continue to receive orders for the AMERICAN ENTOMOLOGIST and *American Naturalist*, with enclosures of but \$3.00. The present subscription price of the *Naturalist* is \$4.00, and by referring to our club rates on another page, it will be seen that the club price for the two monthlies is \$4.00, and not \$3.00. Much of this inconvenience arises from the fact that the editors of the last named Journal, in raising their subscription price, two months ago, failed to make a corresponding increase in the figures which appear in their advertisement to club with the ENTOMOLOGIST. Will our Salem friends see to it, that this change is made.

☞ As some of our exchanges may wish to illustrate any article they may copy from the AMERICAN ENTOMOLOGIST, we have decided to furnish electrotypes of our wood cuts, at one-half the cost of engraving; these electrotypes to be retained by the parties receiving them, if they desire it.

ANSWERS TO CORRESPONDENTS.

Sugar-tree Borer—*E. Simms, Aurora, Ill.*—The borer of the hard maple or sugar-tree is a handsome beetle (*Arhopalus speciosus*, Say), nearly an inch long and banded like many wasps with black and yellow. It belongs to the same genus as the Locust borer and much resembles that insect. The perfect beetle comes out in July, and by soaping the trunks of your sugar-trees the latter end of June you will probably prevent it from laying its eggs thereupon, and thus save your trees. No eggs, no borers.

Swellings on Apple Scions—*William Colwell, Sparta, Ills.*—The "small lumps" or swellings on the apple scions which you send, we believe to be galls, now vacant, but formerly inhabited by some small *Dipterous* larva. We have bred the fly from somewhat similar but larger galls on basswood twigs.

White Grub Fungus—*G. C. Brodhead, Pleasant Hill, Mo.*—The White Grub with the two tusk-like processes growing from each side of the mouth—is affected with the same fungus which we spoke of on page 77 of No. 4, and again on page 91 of No. 5.

Butterflies named—*D. P. Smith, Haddam Neck, Conn.*—No. 1 is *Vanessa Antiopa*, Linn.; Nos. 2 & 4, *Papilio Asterias*, Fabr.; No. 3, *Argynnis idalia*, Fabr.; and No. 5 *Cynthia Alalanta*, Linn. The specimens reached us in very bad order.

Gas-Waste vs. Curculio—II. of *Centralia, Ills.*—You say that Mr. Wells of Troy, N. Y., in the *Agricultural Report of the Patent Office for 1890*, p. 120, "shows that the Ammonia water or Gas-waste, which is permitted to go to loss at nearly all Gas-works, if properly applied, will destroy ALL noxious insects in the ground;" whereupon you base a proposal to sprinkle this Gas-waste upon earth which is full of Curculio larvae, and thus "destroy at one fell swoop the whole crop of the Little Turk." We have referred to the paper you quote, and find that it is not Mr. Wells who makes any such assertions as that which you attribute to him, but that he merely quotes such assertions as having been put forth by the agent of a gas company in Massachusetts! This, we opine, makes a material difference. Of course, every gas company would like to find a good market for their Gas-waste, and as long as human nature is human nature, men will cry up the virtues of whatever they are anxious to sell. Even this interested party, however, does not claim that Gas-waste will "destroy ALL noxious insects in the ground," but only that, in one particular experiment, a compost containing Gas-waste, Gas-far, Nitrate of soda, Gypsum, and three other ingredients "APPEARS to destroy the wire-worm!" Suppose, now, that the wire-worm was really destroyed in this experiment, of which fact by the way the proof is but very slight. How does the gas-agent know that it was not the Gas-tar, or the Nitrate of soda, or the Gypsum that destroyed it, instead of the Gas-waste having done this? Like the tailor in Shakespeare, when Falstaff offered him red-nosed old Bardolph as collateral security for the debt which was owing to him, "we like not such security" as that which you give us for the merits of Gas-waste as an Insect-destroyer. We would just about as soon trust to Mr. Best's Patent "Inventorator."

Eggs of the Apple-tree Plant-louse, again—C. Williams, Columbia, Mo.—The apple twigs which you sent are covered with the little black eggs of the common apple-tree Plant-louse (*Aphis mali*). On page 99 of No. 5 you will find an account of their unusual numbers around your city, and a further account of them on page 120 of No. 6, in answer to M. W. Seaman, of Shipman, Ills. You desire to cut from these infested trees a number of scions for grafting, and wish to know whether an immersion in strong lye will kill the eggs. We think it will, and that it will be more effectual if used hot, though you should first ascertain by experiment on a few, how long the twigs may be immersed without injury. If you try this experiment we shall be glad to learn the result. Probably the safest and surest mode of killing these eggs would be, to immerse the scions for eight or ten seconds in water too hot to bear your finger in it for a single second.

Wm. L. French, The small, black "insects" scattered over your apple twigs, are the same as those sent by Mr. Williams, of Columbia, Mo. See above.

Funguses among decaying Bark—J. T. Whelpley, South Pass, Ills.—The specimens sent which, as you say, were found among decaying oak-bark, appear to us to be funguses of some kind or other; but they may possibly be tubers on the root of some plant. Not being specially learned in Botany, we sent your specimens to a good botanist for his opinion, but as yet have received no answer to our inquiries. Most botanists are as ignorant as we candidly acknowledge ourselves to be of the natural history of that very difficult group, the funguses, whether large, medium-sized or microscopically small.

Drug-store Pests—J. M. Good, St. Louis, Mo.—In our last number but one (p. 99) we informed you that the small whitish six-legged larva, that were infesting your capsicum, belonged to the *Ptinus* family of beetles, but that we could not determine the particular species to which they belonged until we had bred them to the beetle state. We have since been informed by our leading N. A. authority on this order of Insects, Dr. J. L. Leconte, that a species belonging to this very same family (*Lastoderma serricornis*, Fabr.), commonly attacks capsicum, and also tobacco. In all probability, therefore, this is the species that is troubling you.

Synonyms—D. L. Die, Washington, D. C.—*Danaüs Archippus*, Smith—the butterfly figured on page 29 of No. 2—is the same as *Danaüs pterippus*, Linn., the latter name being but a synonym of the former.

Animals infesting Wells—Jonathan Huggins, Woodburn, Ills.—The soft white worm-like creatures, with seven pairs of legs, with four antennae, the upper pair of which are much shorter than the lower pair, and with the last joint of the body in the form of a shield, and bearing two forked appendages, are the common Water Asellus (*Asellus aquaticus*). They belong to the same class of animals (*Crustacea*) as the lobster and craw-fish, and are therefore not true insects, though included in the same great branch of the Animal Kingdom with them. These little animals are quite common in pools and wells, and though anything but a pleasant addition to drinking water, they can not be considered as hurtful. Indeed they tend to purify the water, by devouring the dead organic matter which it contains. They seem to thrive best in unclean wells, and we noticed much woody fibre and sediment amongst the specimens which you sent. A frog or a salamander placed in the well would probably extirpate them, though the surest method would be to clean it out.

H. J. Dunsap, Champaign, Ills.—The animals which you sent and which are commonly supposed to originate in pine pumps, but which exist also in wells that have no pumps and which are bricked and stoned up, as was shown in the discussion at the college on the 21st of January; are the same Crustaceans spoken of above in answer to Mr. Huggins. They do not change into anything else and seldom grow beyond $\frac{1}{2}$ inch in length.

G. Brodhead, Lebanon, Mo.—The animals which you find in your well, are known by the name of *Gammarus pulx*, and belong to the same great class as the above; but while the *Asellus* belongs to the order ISOPODA, this belongs to the order AMPHIPODA.

Small Galls and Minings on Apple-Twigs—O. A. Gardner, Columbia, Mo.—The specimens sent are quite new to us. The oval swellings, about one-tenth inch long, on the apple-twigs are probably incipient galls, but by what insect they are produced we have no knowledge. The snake-like tortuous elevated pathway upon a single twig is the work of some boring larva, and probably of that of some small species of moth or beetle; but nothing is known to us, or said by other authors, respecting its history. Dr. Clemens has described the mines made by several scores of small moths, but they are all made, not in the bark of the twig as yours are, but in the leaf. Please send us, if possible, specimens of the galls from time to time during the ensuing summer, that we may watch their development.

Stinking Bugs—C. L. Janney, Waynesville, Warren Co., Ohio.—The "Stinking bugs" that you discovered on a dead White oak, between the bark and the wood, are true bugs (*Heteroptera*) and belong to the genus *Brachyphynchus*. The species, though quite common, seems to be undescribed. It comes near *B. granulatus*, Say, but differs in sundry details. They hibernates in all stages of growth, as is evident from the specimens sent. They are not known to be injurious to vegetation, but, like several allied species found under bark, feed exclusively upon decaying vegetable matter. Quite a number of the True Bugs—including the common Bed-bug—have the peculiar smell that you discovered to belong to these Bark-bugs.

Eggs in Peach twigs—Geo. Fisher, East Liverpool, Ohio.—The semi-transparent yellowish eggs, about one-eighth of an inch long and four or five times as long as wide, of a cylindrical shape, but a little pointed at one end, which you find obliquely inserted into a peach twig, in a row nearly an inch long, are the eggs of the Snowy Tree-erieket (*Leantothos niveus*). You will find a figure of both sexes of this insect on page 38 of the AMERICAN ENTOMOLOGIST, with a brief reference to its habits. Owing to the gum that naturally exudes from the wounded bark of the peach-tree, the row of eggs has a peculiar appearance when located upon this tree.

Flat-headed Apple-tree Borer—B. F. Mudge, Manhattan, Kansas.—The borers which you send, and which you found in the lower branches of an apple tree, as high as five feet from the root, are the insect above named. The best method of preventing its attacks, is by thoroughly soaping your trees in the spring of the year

A Bundle of entomological Queries—Dr. W. W. Butterfield, Indianapolis, Ind.—1st. For the best mode of denuding the wings of Lepidoptera, we must refer you to Dr. Clemens's Paper in *Proc. Ent. Soc. Phil.*, 1, pp. 173-4. Dr. Clemens also gives Guenee's method. As you desire to form a good entomological library, you ought, by all means, to get this work, which is advertised in our columns. 2nd. The large edition of Kirby and Spence's *Introduction* is, of course, better than the small edition, which we have recommended for popular use, because it excludes the dry scientific details; but it costs a great deal more money. 3rd. It would take us as long to explain wherein Westwood's *Introduction* is superior to Kirby and Spence's *Introduction*, as to explain wherein chalk is superior to cheese. The two works cover quite different ground. 4th. The same remark applies to Burmeister's *Manual*, as compared with Kirby and Spence's *Introduction*. 5th. The first volume of Stainton's *Entomologist's Annual* appeared in London in 1855, price 2s. 6d. English money, and we believe the back numbers are all of them procurable. 6th. We have never seen Morris's *British Butterflies*, and can, therefore, say nothing about it. 7th. For the prices of the two other entomological books named by you, we must refer you to Westernmann & Co., 440 Broadway, New York, or any other importing bookseller dealing in scientific works. 8th. The address of W. C. Hewitson, the English entomologist, was, in 1860, "Oaklands, Walton-on-Thames, Surrey, England;" and he probably resides there still. 9th. You will find the genus *Clytus* on pages 104-6 of the Melshelmer Catalogue *U. S. Coleopt.* Of course, it is not to be found in LeConte's *Introduction*, because that work only extends at present to the Pentamerous and Heteromerous Beetles. Dr. LeConte, as he has just informed us, is now hard at work upon the Tetramera.

Grape-berry Moth.—M. C. Read, Hudson, O.—The little moths which you sent to Dr. LeConte, and which have been forwarded to us, through Mr. E. T. Cresson, of Philadelphia, are, as you rightly infer, entirely new to science. Their larvæ, the history of which you so graphically give, have attacked the fruit of the Grape very generally over the country, during the past year. Specimens of the moth, which we sent to the English Lepidopterist, H. T. Stainton, could not be referred by him to any known genus; but A. S. Packard, Jr., has furnished us with advanced sheets of his "Guide to the Study of Insects," wherein he briefly describes it as *Penthina vitivorana*. The Junior Editor has adopted this name in his first report, where this insect is more fully described and illustrated. The remedy you practice, namely, that of gathering up all the leaves and burning them in the fall, is a good one, as there is every reason to believe that the insect winters over in the cocoon, either in the larva, or pupa state. In a future number of this Journal we shall give a complete account of this most anomalous insect.

Hairy Caterpillar.—T. S. Gold, West Cornwall, Conn.—The large caterpillar, covered with stiff black hairs on each end, and with reddish hairs in the middle of the body, is the larva of a moth known as the Isabella tiger moth, (*Actia Isabella*, Hüb.). This moth is of a dull orange color, with the fore wings variegated with dusky, and spotted with black; the hind wings somewhat lighter, and also with black spots. The caterpillar, late in the fall, rolls itself up in some sheltered place, and passes the winter in a state of torpor. In the following spring, it becomes active again, and "feeds up" on the first green blades of grass which it can obtain, after which it undergoes its transformations in the usual manner. Your statement that this caterpillar "was unusually abundant last autumn, collecting by the bushes in open drains, into which they fell on their travels," is interesting. We have never before known them to occur in such numbers together.

Borer in Plum Twigs.—Wm. Colwell, Sparta, Nls.—The Borer in the plum twig which you send is in the pupa state. It resembles, in every respect, the pupa of the Oak pruner (*Elaphidion patafor*, Peck), of which we have an accurate drawing and with which we are well acquainted. If you found the twig already amputated it may possibly be that species; and it will at any rate produce some closely allied beetle.

Insects Named.—Dr. W. W. Butterfield, Indianapolis, Ind.—1st. The black and white butterfly is *Pieris protodice*, ♀ Bdv. and Lec. The ♂ has much less black on his wings. Common out west. 2nd. The other butterfly is *Cynthia carui*, Linn., common in all the four quarters of the globe, and figured in Harris's *Inj. Ins.*, p. 291. 3rd. The larger beetle is *Archopalus pictus*, ♂ Drury, Walsh, formerly confounded by all authors with *A. robinia*, ♂ Foster, Walsh, and first distinguished from that insect by the Senior Editor of this Journal. The two species are absolutely undistinguishable in the ♀, but the ♂ differ as follows: *pictus* ♂ has antennæ longer than the body, and stout; legs much longer and stouter than in *pictus* ♀, and the elytra tapered to the tip, as in a *Leptura*; *robinia* ♂ has antennæ shorter than the body, and slender; legs no longer or stouter than in *robinia* ♀, and the elytra scarcely tapered at all towards the tip. Furthermore, *pictus* breeds in hickory, and comes out in June, while *robinia* breeds in locust, and comes out end of August, and forepart of September (See *Proc. Ent. Soc. Phil.*, III, pp. 420-2). 4th. The smaller beetle would be considered by most entomologists as the variety of *Clytus caprea*, Say, with white instead of yellow bands, which Say refers to; but we believe it to be a distinct, and probably undescribed species, because the tip of the elytrum is not emarginate and spined, as in *caprea*. It is closely allied to *Cl. leucocornus*, Gory and P., found in Colorado, but differs in several characters. The genus *Archopalus* differs from *Clytus*, with which latter genus it was formerly confounded, in the antennæ not being clavate, and in the thighs not being swelled. The author's name after every species shows you where to look for a description.

Insects Named.—E. T. Dale, Yellow Springs, Ohio.—No. 1, *Melanactes piceus*, DeGeer. No. 2, *Bolboeuvus fuscus*, Fabr. No. 3, *Brachinus*, undetermined. No. 4, *Mutilla quadrifidata*, Say. No. 5, *Chlorinus sericeus*, Say. No. 6, *Chlorenus tricolor*, Dejean. No. 7, *Etranthus orbatus*, Lec. No. 8, *Pterostichus (parvulus) chalcites*, Say. No. 9 and 10, *Pterostichus cavaticus*, Say. No. 11, *Nebria pallipes*, Say. No. 12 belongs to *Harpalini*. No. 13, *Boleophagus cornutus*, Fabr. No. 14, *Cassida pallida*, Herbst. No. 15, *Cassida (coptoyela) bivitata*, Say. No. 16, *Ceruchus piceus* ♂, McLeay. No. 17, *Centronius calcaratus*, Fabr. No. 18, *Titrops jucunda*, Lec., as kindly determined by LeConte. No. 19, *Archopalus fulvianus*, Fabr. No. 20, *Scaphinotus elevatus*, Fabr. As to No. 3, which you suggest may be *B. fumans*, Dr. LeConte formerly described a great many species of *Brachinus*, but he now considers that the species run into one another so promiscuously, that they cannot be separated satisfactorily. Of No. 4, we have a single specimen from Colorado; it is apparently unknown to Mr. Cresson. No. 12 belongs to the very extensive and difficult group of *Harpalini*; but, as the genera of this group are based upon the structural characters of the male, and the only specimen you send is a female, we cannot even determine the genus to which it belongs. We found loose in the box, without numbers, 1 ♂ specimen of *Archopalus robinia* Forster; 1 ♂ and 1 ♀ *Arrhenodes septentrionis*, 1 lbst., and 1 specimen of *Culosoma Wilcoxii*, Lec. The insects came in very fair order. Always send ♂♀ of each species, when it is possible to do so.

Pear-root Borer.—Parker Earle, South Pass, Nls.—The borer in the pear-root, which has killed three of your trees, is the very same insect which we have spoken of in "Answers to Correspondents," both on page 16 of No. 1, and on page 40 of No. 2. The specimen is but half grown. The fact of its attacking the Pear is not new, as you will find by referring to the January number of the *Gardener's Monthly*, where "A. J. H.," of Vineland, N. J., describes it as even more injurious to the Pear than to the Vine. You will find further particulars about this borer in the First Annual Report of the Junior Editor, which is just published.

Insects named.—M. H. Boye, Coopersburg, Penn.—No. 1 is *Gryllotalpa borealis*, Burm. (mole-creeper), the long-winged dimorphic form which Mr. Scudder has considered as a distinct species and named *longipennis*; No. 2 is the larva of some species of the *Lampyrus* family; No. 3 is *Brochinea annulata* Fabr.; No. 4 is the larva of No. 3; and No. 5 is *Lucanus dama*, Linn.

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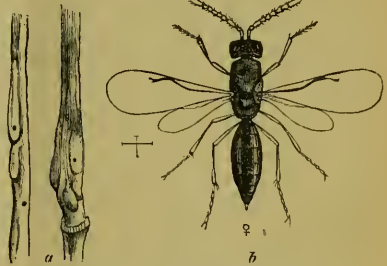
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(*Isosoma hordei*, Harris.)

Its Operations upon small Grain.

In certain years and in particular States the crops of wheat, of barley, or of rye are observed to be greatly injured by a minute maggot, popularly known as the "Joint-worm." This maggot is but little more than one-eighth of an inch long, and of a pale yellow color with the exception of the jaws, which are dark brown. It inhabits a little cell, which is situated in the internal substance of the stem of the affected plant, usually a short distance above the first or second knot from the root, the outer surface of the stem being elevated in a corresponding elongate blister-like swelling; and when, as is generally the case, from three to ten of these cells lie close together in the same spot, the whole forms a woody enlargement honey-combed by cells, and is in reality a many-celled or "polythalamous" gall, analogous in its nature and structure to those which we have described in a preceding article. (No. 6 of the AMER. ENTOM.) In Figure 113, *a*, will be seen a sketch of one of these galls, the little pin-holes being the orifices through which the flies produced from the joint-worms have escaped. At first sight, these knotty swellings of the stem are apt to elude observation, because, being almost always situated just above the joint or knot on that stem—whence comes the popular name "Joint-worms"—they are enwrapped and hidden by the sheath of the blade; but on stripping off the sheath, as is supposed

[Fig. 113]



Colors—(a) straw-yellow; (b) black

to have been done in the engraving, they become at once very conspicuous objects. We have observed that the "internodes," as botanists call them, or the spaces between the knots, in infested straws are always much contracted in length, none out of a lot of over fifty specimens examined by us exceeding six inches in length, and many being reduced to only one and a half inches. A similar phenomenon occurs in two "polythalamous" galls formed by certain Gall-gnats (*Cecidomyia*) upon the tips of the twigs of certain species of Willow.* There were only three straws in this lot of over fifty straws, where two Joint-worm galls were found in the same straw; and in all those three cases they were found in two adjoining internodes. In a very few instances the galls were situated in the middle of the internode, or even close to the upper knot, instead of being situated as usual immediately above the lower knot.

Amount of Damage done by the Joint-worm.

The damage occasioned by the Joint-worm is, in certain seasons and in certain localities, ruinously great. In the year 1851, throughout a large part of Virginia, according to the Editor of the *Southern Planter*, "many crops of wheat were hardly worth cutting on account of its

*The Willow Wheat-gall (*Salicis triticoides*, Walsh) and the Willow Barley-gall (*Salicis hordeoides*, Walsh), growing respectively on the Heart-leaved Willow (*S. cordata*) and the Humble Willow (*S. humilis*), and described in *Proc. Ent. Soc. Philad.* III, pp. 598-9. They received those names from their resemblance respectively to ears of wheat and barley.

attacks, and all that we have seen or heard of, except one, were badly hurt by it." It first began to be observed in that region in 1848, and in subsequent years it increased gradually in numbers. According to Prof. Cabell, of the University of Virginia, the loss occasioned by this insect often amounts to one-third of the average crop, and is sometimes much greater; and in 1851 "some farmers did not reap as much as they sowed* In 1860 the rye crop was considerably injured by this little pest in Lycoming Co., Pennsylvania; and according to our entomological friend, Mr. Norton, the species is very common upon rye "in Connecticut and probably the other New England States.† As long ago as 1829, it had been noticed in various parts of the New England States to attack the barley, causing it in some places "to yield only a very small crop, and on some farms not much more than the seed sown;"‡ although since that date it does not appear to have been materially troublesome in that region. But in Central New York, formerly the great barley-growing district of America, it has been ruinously destructive to the barley since about 1850. In the words of Mr. George Geddes, the late President of the N. Y. State Agricultural Society—"Formerly we expected forty bushels of barley to the acre; now we cannot rely on more than twenty."|| And he goes on to state that this falling off is principally due to the depredations of the Joint-worm; and that, unless some relief from it is found, the farmers of Central New York will have to discontinue raising this crop. Lastly, in Canada West, in the neighborhood of Grimsby, it was very abundant upon barley in the years 1866 and '67, as we learn from our esteemed correspondent, Mr. J. Pettit, of that town.

It is a curious fact that—so far as can be at present ascertained—this destructive insect does not seem to have reached the Valley of the Mississippi. At all events, no complaints from the West of any such attacks as those described above, either upon wheat, rye or barley, have hitherto been made public. It is very possible, however, that the Joint-worm may have been confounded in the West with the Hessian Fly (*Cecidomyia destructor*, Say), the larva of which infests precisely the same part of the wheat plant, namely the space immediately above one of the lowermost knots in the straw. But this last

may be distinguished from the Joint-worm by living in the open space between the stem and the sheath of the blade, although it occasionally imbeds itself pretty deeply in the *external* surface of the stem; whereas, the true Joint-worm always inhabits a smooth egg-shaped cell in the *internal* substance of that stem.

It may also seem a strange thing that—so far as is known—the Joint-worm should in Virginia attack wheat exclusively, and in New England and New York barley exclusively. This, however, may be partly due to the fact that but very little barley is grown in Virginia, and but very little wheat in New England; and partly, perhaps, to the very limited extent to which the depredations of our various noxious insects have hitherto been observed and recorded. Up to quite a recent period, even otherwise intelligent men have been in the habit of considering all "bugs" and "bug-hunters" as beneath their notice. And the consequence is that, when we search the back numbers of our Agricultural Journals for information on the past history of any particular "bug," we often find nothing but a mass of error and confusion, and are almost always utterly incapable of ascertaining of which particular "bug," out of the thirty thousand "bugs" found within the limits of the United States, the few entomological articles that we meet with, are intended to treat.

Natural History of the Joint-worm.

The mode in which the Joint-worm produces its destructive effects upon small grain, may be readily explained. Not only is the sap of the plant abstracted on its road to the ear, in order to form the abnormal woody enlargement or gall, in which the larvæ are imbedded, each in his own private and peculiar cell, but a very large supply of sap must be wasted in feeding the larvæ themselves. Hence the ear that would otherwise be fully developed becomes more or less blasted and shriveled; although we are told that, in the case of barley more particularly, the plant tillers out laterally, so as partially to supply the loss of the main crop of ears. A similar phenomenon occurs with almost all galls that grow upon a slender stem or twig, that is, the stem or twig is more or less killed or blasted thereby; but when a twig is quite large, this result often fails to be developed.

The Joint-worm Fly (Fig. 113, *b*, ♀) makes its appearance in the North in the fore part and

*Quoted by Harris, *Injurious Insects*, p. 557.

†See his note in Harris, *ibid.*, p. 561. Also Fitch's *N. Y. Rep.* 111, p. 163.

‡Harris, *ibid.*, p. 551.

||*Trans. N. Y. St. Agric. Society*, 1859, p. 332, quoted by Fitch.

middle of June, and in southern latitudes in the middle of May. From a large lot of galls that had been found upon barley, obligingly furnished to us by Mr. J. Pettit, of Grimsby, Canada West, the first flies came out June 9th, and they continued coming out in very large numbers till June 16th and subsequently. As is usual with most insects, the males came out first, and not a single female appeared until June 11th; whereas from and after June 15th there were nothing but females to be met with, the whole number of females, however, greatly exceeding that of the males. The cause of this singular phenomenon of the males preceding the females by several days—which has been noticed by other writers in the case of other insects, and which we believe to be a very general law—has never been explained. But it is probably due to the desire of nature, that the males may have time to gain their full strength and vigor, before the females come into the world and require their immediate attentions. Be this question as it may, after coupling in the usual manner, the female Joint-worm Fly proceeds to lay her eggs in the stems of the growing grain. The following excellent account of this operation, from the pen of Mr. Pettit, we extract from the *Canada Farmer* for 1867, page 268:

About the 8th of June of the present year the perfect insects began to make their way out of the galls. * * * * * Being desirous of knowing more of their habits, I watched the growing barley, and on the 10th of June found them actively at work ovipositing in the *then healthy stalks* of the plant. Before commencing operations they walk leisurely upon one side of the plant as far as the last leaf, and then down the other, apparently to make sure that it has not already been oviposited in. Head downward, they then begin by bending the abdomen downward, and placing the tip of the ovipositor on the straw at right angles with the body, when the abdomen resumes its natural position, and the ovipositor is gradually worked into the plant to its full extent. With the aid of a good lens, and by pulling up the plants on which they were at work (which did not appear to disconcert them in the least), I could view the whole operation, which, in some cases, was accomplished in a few minutes, and in others was the work of an hour or two. When a puncture was completed, they usually backed up a little and viewed it for a few seconds, and then apparently satisfied, moved to one side and commenced another.

Very shortly after this time, the egg must hatch out. For, upon July 3rd, we examined a large lot of the green barley-galls, which had been obligingly forwarded to us by Mr. Pettit, and found the larva of the Joint-worm Fly almost half-grown, that is from 0.004 to 0.006 inch long, and about five times as long as wide. In these green galls, upon the most careful search, we could find no Gall-gnat larvæ, nor any vestiges of any such larvæ. So that we are now fully persuaded, that the idea originally entertained by Dr. Harris and Dr. Fitch, and

subsequently favored by the Senior Editor of this JOURNAL, namely, that these galls are in reality made by some undiscovered Gall-gnat, upon which the so-called Joint-worm Fly that has been figured above is a parasite, is a false and fallacious one. Otherwise, if the so-called Joint-worm Fly were really a parasite, we must certainly have discovered, at this early period in the year, a few specimens of the larvæ upon which it was parasitic, or at all events some traces of their handiwork. Both Harris and Fitch afterwards became of opinion, that the Joint-worm Fly was the real author of these galls; and we think it right to bear this public testimony to the correctness of their entomological inferences. We write for truth, and not for victory, and have never claimed to be infallible.*

By the beginning of September, the infested grain having ripened long before this period, the galls are already dry and hard, and the larvæ contained in them full grown, measuring now about 0.13 inch in length. The great majority of these larvæ are destined to remain in that state, enclosed in their little cells, until the succeeding spring; but—as happens with many different insects—a small percentage of them seem to pass into the pupa, and thence into the perfect state, the same summer that the eggs are deposited. For, out of a lot of 124 barley-galls, received September 10th from Mr. Pettit of Upper Canada, 39 galls, or very nearly one-third part, were already bored with the same kind of small round holes as are made in the succeeding spring by the escaping Joint-worm Flies, some galls containing six such holes, but most of them about three. It is true that we are not personally cognizant of the fact, that these holes are bored by the same Joint-worm Fly, that escapes from similar holes in such profuse abundance in the following June; but Prof. Cabell, of Virginia, stated to Dr. Harris with reference to the wheat-inhabiting Joint-worm, that he had known a few flies to leave the straw the first year, but in each instance the

*The Senior Editor of this Journal published in the *Canada Farmer* for 1867, pp. 267-8, a letter on the Barley Joint-worm, in which he disavowed and repudiated his former skepticism (as given to the world in the *Practical Entomologist*, I, pp. 10-12, and 37-8), on the subject of this insect being a true gall-maker. Dr. Packard, not being scientifically bound to read all the Agricultural Periodicals that are printed in America, has erroneously, and no doubt inadvertently, quoted him in November, 1868, in his *Guide to the Study of Insects*, p. 205, as still retaining his original belief. It is proper to add here that, in the letter in the *Canada Farmer*, the same opinion on the classification of this insect which will be subsequently elaborated in this article, was briefly expressed as follows: "The Joint-worm Fly differs generically from all the numerous species of the *Eurytoma* group, which I have ascertained to be parasitic on other insects, and cannot, I think, be referred with any propriety to the genus *Eurytoma*, although it undoubtedly belongs to the *Eurytoma* group."

fly which came forth thus was the true Joint-worm Fly.* As already shown, the flies that emerged from these Canada galls in the succeeding summer, came out from June 9th to June 16th and subsequently.

Parasites of the Joint-worm.

On cutting open a great number of the cells of the dry barley-galls, obtained from Canada in September, we found in one of them a small stout parasitic larva, of a pale glaucous color, attached externally, in the manner common with the larvæ of many *Chalcis* flies, to the half-dead and blackened and partially shrunken carcass of one of the true gall-making Joint-worms. In another cell we found a much larger parasitic larva, evidently belonging to the same species, which had apparently devoured entirely the body of its victim. And from the body of still another Joint-worm, wounded by accident in opening the cell, but which was neither shrunken nor discolored, there emerged under our very eyes a third parasitic larva, of medium size, and apparently belonging to the same species as the two just now referred to. Thus it would seem that in the earlier stages of its existence this parasite is an external feeder, but subsequently penetrates inside the body of its victim after the more usual fashion in such cases. In the summer of the succeeding year, we bred 31 specimens of what is evidently the perfect fly of this same parasitic larva, from the same lot of barley-galls in which we found the above three parasitic larvæ, and from which we reared such hosts of the true Joint-worm Fly. Out of this lot of galls, 17 male parasites came out from June 11th to 22nd, and 14 female parasites from June 14th to 28th, thus showing that in this species also the males appear several days on the average before the females. Below we give figures of both sexes of this insect, which is an entirely new and undescribed species, and which we have called "The *Chalcis*-

[Fig. 114.]



Colors—Blue-black; abdomen coppery.

cating *Chalcis*-fly" (*Semiotellus chalcidiphagus*). It is a true *Chalcis*-fly like the Joint-

* Quoted by Fitch, *N. Y. Rep.* III, p. 149.

worm Fly, but belongs to an entirely different group of that extensive and much neglected family. The female (Fig. 114, *a*), is distinguishable at the first glance from the male (Fig. 114, *b*), by the front wings having a large dark smoky cloud on their middle. Those that desire a fuller description of this species in its different stages, are referred to an article upon certain groups of *Chalcis* flies, from the pen of the Senior Editor, which will probably appear before long in the *Transactions of the American Entomological Society*.

Two other *Chalcis* flies, quite distinct from the above, were found by Dr. Harris and Dr. Fitch to be parasitic upon the Joint-worms that infest wheat in Virginia. But as we have no personal knowledge of these insects, and the descriptions given of them are very brief and imperfect, we shall say nothing further on this subject.

Are there different Species of Joint-worm?

It will have been long ago noticed by the entomological reader that, in all that we have said above respecting the Joint-worm and its habits, we have assumed the race that infests barley to belong to the same species as that which infests wheat, and both of them to the same species as that which infests rye. Such was also the opinion of Dr. Harris, who had bred very numerous specimens of the perfect Fly, both from Massachusetts barley-galls and from Virginia wheat-galls. "The only apparent difference," he observes, "between them consists in the color of the front shanks; these, in the wheat-insects, being pale yellow, and faintly tinged with black only on the outer edges in a few individuals;" whereas the same author describes the barley-insects as having their front shanks "blackish."* Dr. Fitch, however, has manufactured four species out of the Joint-worm Fly, two of them infesting barley, one wheat and one rye, to each of which he has given distinctive names. These four so-called species he acknowledges to differ only in the coloration of their shanks, and—so far as regards the fourth species—in the antennæ of the males being less profusely surrounded by whorls of hairs than in the other three species. The colorational differences specified by Dr. Fitch may be concisely expressed in the following tabular form, copying as near as may be Dr. Fitch's own language.† The number of males examined by this author was so limited—in some of his so-called species but one or two—that the assumed difference in

* See Harris, *Injurious Insects*, pp. 554 and 556.

† See his *N. Y. Reports* III., p. 154.

so fugitive a character as the hairs on the male antennæ are scarcely worth talking about. We have ourselves, by immersing a male in hot water, caused the conspicuous whorls of hairs on the antennæ to disappear thereafter almost entirely from view.

JOINT-WORM FLY (*Eurytoma tritici*, Fitch). On Wheat.—Front shanks dull pale yellow; middle and hind shanks black.

RYE-FLY (*Eurytoma secalis*, Fitch). On Rye.—Front and hind shanks dull pale yellow; middle shanks black.

BLACK-LEGGED BARLEY-FLY (*Eurytoma hordei*, Harris). On Barley.—Front shanks of the same dusky or blackish color with the middle and hind ones.

YELLOW-LEGGED BARLEY-FLY (*Eurytoma fulvipes*, Fitch). On Barley.—Legs, including all the shanks, bright tawny yellow.

In order to test this question, we mounted and preserved 70 specimens of the Joint-worm flies, bred by us in June from Canada barley-galls all received from the same quarter, 23 of these specimens being males and 47 females. On carefully examining all these specimens time after time under the lens, we find that most of them have the pale yellow front shanks stated by Fitch to be peculiar to the Joint-worm Fly that infests wheat; that not a single specimen has the distinctly black front shanks stated by Fitch to be peculiar to the Black-legged Barley-fly, although a very few have the front shanks slightly clouded outside with black; that two female specimens have the shanks colored in the style which Fitch asserts to be characteristic of the Rye-fly; and that but seven female specimens have, with the exception of the front thighs being black, the yellow legs which Fitch assigns as the peculiar character of the Yellow-legged Barley-fly. We also find numerous intermediate grades between these different forms; so that it would be utterly impossible for any rational entomologist to separate the 70 specimens into four, three, or even two parcels, and to consider each parcel as a distinct species, for the simple reason that it would be impossible for him to draw a distinctive line anywhere. Hence we incline to consider Dr. Fitch's four species of Joint-worm Fly—as several other species which he has published are now generally considered—to be mere varieties of one and the same species, and not four distinct species. At all events the colorational characters of the shanks, as laid down by Dr. Fitch, do not coincide with the particular plants to which he assigns each colorational form. For the majority of our barley-feeding flies correspond exactly in their coloration with his wheat-feeding flies; and two of them correspond with his rye-feeding flies.

In further confirmation of the fact, that the Joint-worm Fly which infests barley is the same species as that which infests rye, Dr. Fitch's

own evidence may be adduced. For he says himself that he captured off the growing rye of a rye-field, at the end of May and beginning of June, three males and several females of what he identified as being the genuine Black-legged Barley-fly. (*N. Y. Rep.* III. p. 159.) Now, if these insects did not want to lay their eggs on the rye, what business did they have there?

It is true that Dr. Fitch observes that, out of about 15 males and 45 females bred by him from a single lot of New York barley-galls, all the specimens without exception had yellow legs. But we have ourselves remarked, that peculiarities of treatment in the breeding of gall-insects sometimes affect their coloration in a most remarkable and hitherto unprecedented manner. For example, from a certain lot of Oak-galls gathered in the autumn and kept through the winter in a warm room until the following spring, we bred April 8th–28th no less than 47 female gall-flies (*Cynips q. podagræ*, Walsh), all of which without exception proved to have perfectly black abdomens, on being carefully examined when recent. The same year, from another lot of the same galls gathered off the same tree about April 1st, and therefore only retained in the breeding-jar for a few weeks instead of six months, and not subjected to an unnaturally warm temperature through the winter like the first lot, we bred April 18th–24th about 426 females of the same species, fully one-third part of which, when recent, had the abdomen decidedly rufous, pitchy-rufous, or with the base of the segments rufous, the remaining part of them having black abdomens. Thinking that this rufous color of the abdomen might be due to the immaturity of the specimens, we kept four of those that had rufous abdomens alive in a vial for four days; but at the end of that period their abdomens were still as red as ever. We may add that the 23 females from which the above species of gall-fly was originally described by the Senior Editor, and which had been bred in the same manner as the first lot referred to above, all of them had abdomens of the same uniform black color as the first lot, as is particularly specified in the published description. Thus it results that 70 gall-flies, bred in a particular manner, all of them had black abdomens; and that about 426 gall-flies, belonging to the same species, but bred in a different manner, had, at least one-third part of them, rufous or partly rufous abdomens. Hence we infer that the great difference in the coloration of the legs of Joint-worm Flies, bred respectively from similar barley-galls by Harris, by Fitch, and by ourselves, is very probably due

to the differences in the mode of breeding adopted by each of these three parties; and that Dr. Fitch's four different species of Joint-worm Flies are not true species, but mere varieties, so far at least as can be established from their colorational differences.

Unity of Habits in Insects and other Animals.

If we consider for a moment the habits of the larger animals, with which most of us are better acquainted than with those of insects, we shall find that the same genus of animals always has the same general habits. For example, the species of the Horse genus—the Horse, the Quagga, the two species of Zebra, and two or more species of wild Ass—all of them feed upon herbage, live in the plain and not in the forest, feed in the day time and not in the night, gather together in large herds led by the old males, and when attacked defend themselves by the hoofs of their hind legs. On the other hand, the multifarious species of the Cat genus—the Lion, the Bengal Tiger, the various Leopards and Panthers of the Old World, and the Puma (Cougar) and Panther (Jaguar) of the New World—all of them feed upon flesh, haunt the forest rather than the plain, seek for their prey in the night rather than in the day-time, never gather together in herds but live either solitary or in pairs, and fight with their mouths and their front paws rather than with their hind paws. Look where we will among the larger animals, whether among the Bear genus, the Dog genus, the Owl genus, the Hawk genus, the Pigeon genus, or the Sparrow genus, we shall find the same law to hold good. And the reason of it, upon a little consideration, becomes at once manifest to our minds. Different species are classified under the same genus, because they have very nearly the same structure. Now, it is the structure that determines what the habits of the species are to be. For example, a bird with a hooked bill like that of an Eagle is necessarily debarred from pecking vegetable food like a Sparrow, and is compelled by that and the other corresponding parts of its organization to live by tearing and rending living animals. Conversely, a Sparrow is physically incapacitated from preying upon animals of its own size, as does the Eagle, and is driven by its structural peculiarities to peck at small insects, fruits and seeds. Consequently, as the Genus and the Habits of any particular species of animal are both of them determined by the Structure, when the Genus of two species is the same, the Habits also must of necessity be the same or very nearly the same.

To this great and universal law has been given the name of the UNITY OF HABITS; and it may be recognized everywhere, not only among the higher animals, but also among Insects.

Prof. Agassiz has used language which would seem to imply that he extends to a certain degree the operation of this law, not only to all the species belonging to the same genus, but also to all the genera belonging to the same Family. "The more I learn upon this subject," he says, "the more am I struck with the similarity in the very movements, the GENERAL HABITS, and even the intonation of the voices of animals, belonging to THE SAME FAMILY."* But there are several cases among the higher animals, where genera classified by all authors in the same Family have very widely distinct habits; and we find many such examples among the great Class of Insects. For instance, most of the multifarious genera of the Ground-beetles (*Carabus* family) are cannibals and prey upon other insects; but there is a particular genus of them (*Zabrus*), found in Europe but not in America, which feeds upon living and growing vegetables. Again, most genera of the above-named Family of Beetles are terrestrial in their habits; but there is a particular genus of them (*Oodes*) which habitually in the perfect beetle state lives under water, and when endeavoring to escape generally makes for the water, and as soon as it has reached it immediately crawls under any floating rubbish and disappears from view.† Lastly, the genera *Arma* and *Stiretrus* (Fig. 41, p. 46 and fig. 43, p. 47 of the AMER. ENTOM.), both of which have very stout robust beaks suitable for piercing the bodies of other insects, are cannibal in their habits, as we showed in the pages just now referred to; while all the genera of the same group (*Scutellera* family) of the True Bugs (*Heloptera*), which have slender beaks adapted only for piercing vegetation, are almost exclusively vegetable-feeders.

The law then, as we assume it to exist, may be briefly stated as follows: In the case of all known animals, species belonging to the same genus have the same, or nearly the same habits; and this is also partially true of genera belonging to the same Family; but not infrequently genera belonging to the same Family have very widely distinct habits.

* *Essay on Classification*, p. 59.

† For the habits of *Oodes fluviatilis* Lec., see a Paper by the Senior Editor in *Proc. Ent. Soc. Phil.* III p. 643. We have kept this insect in an aquarium and know the facts to be as stated. Mr. H. Eike, of Washington, D. C., has since informed us that he has detected the same habits in *Oodes amaroides* Dejean.

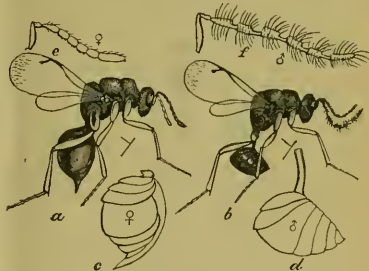
Generic Classification of the Joint-worm Fly.

It will be within the knowledge of most American entomologists, that the Joint-worm Fly has always been referred by all writers, from Harris and Fitch down to the times of Glover and Packard, to a genus of *Chalcids* Flies (*Eurytoma*) known to be generally parasitic in its habits. But—as has been shown above from the examination of its larval history in its earlier and immature stage as well as in its mature stage, and as was long ago asserted, both by Dr. Fitch and by Dr. Harris, from the examination of its larval history, solely in its mature stage—the Joint-worm Fly is a true gall-maker and therefore a true vegetable feeder. Here, then, as it seems at first sight, we have at once a glaring exception to the law of the UNITY OF HABITS, which has been laid down above as universally prevalent in the Animal Kingdom; for we have one species, the Joint-worm Fly, of a particular genus (*Eurytoma*), which is a vegetable feeder, and a great number of other species of the very same genus which are parasitic upon other insects. Indeed it was principally from his unwillingness to believe in the violation of the above great Law, that the Senior Editor of this journal formerly discredited the theory, that the so-called Joint-worm Fly was a gall-maker and a vegetable feeder, and strongly inclined to suspect that these galls were in reality made by some unknown species, probably a Gall-gnat, upon which the so-called Joint-worm Fly was parasitic.

In reality, however, there is here no real violation of the law of the UNITY OF HABITS; for—as we shall now proceed to show—the Joint-worm Fly does not belong by any manner of means to the parasitic genus (*Eurytoma*), to which all preceding authors have been in the habit of referring it; but to an entirely distinct genus (*Isosoma*), none of the species belonging to which have ever, so far as we are aware, been shown to be parasitic in their habits.

Below will be found magnified figures (Fig. 115, *a* ♀, *b* ♂) of both sexes of the true genus *Eurytoma*, all the species of which are closely alike in shape and structure, though they differ very greatly in size, and occasionally in coloration, and at least five species of which are personally known to us to be one or more of them parasitic on the insects of twenty-four different kinds of galls, growing respectively on Oak, Blackberry, Rose, Willow, Hickory, Goldenrod, and Ironweed. Of these twenty-four galls, ten are made by Gall-flies (*Cynips*) upon Oak, one by a Gall-fly upon Blackberry,

[Fig. 115.]

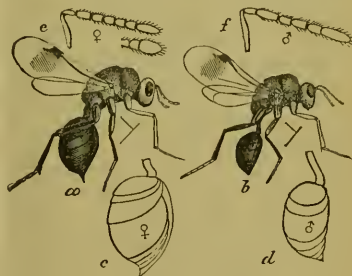


Color—Black.

one by a Gall-fly upon Rose, three by Gall-gnats (*Cecidomyia*) upon Willow, five by Saw-flies (*Tenthredo*) upon Willow, one by a Gall-gnat upon Goldenrod and Ironweed indiscriminately, one by a Plant-louse (*Aphis*) upon Hickory, one by a Bark-louse (*Coccus*) upon Hickory, and one by a small Moth (*Pinea*) upon Goldenrod; and in addition, a few specimens of the very same parasitic genus have been bred by us from certain large black woody funguses, growing respectively upon Oak and Hickory and inhabited by other insects. The whole number of specimens of this parasitic genus (*Eurytoma*), bred from the above galls and funguses and now contained in the collection of the Senior Editor, is 279.

There is another closely allied parasitic genus (*Decatoma*), the sexes of which are represented in the annexed drawings (Fig. 116, *a* ♀, *b* ♂), and of which four different species, all closely

[Fig. 116.]



Colors—Rufous and black.

alike except in size and color, are personally known to us to be parasitic on the insects of eleven different galls. Of these eleven galls, no less than ten are made by Gall-flies on Oak, and but a single one is made by a Gall-gnat on Willow. The whole number of specimens of

this genus (*Decatoma*), bred from the above galls and now in the collection of the Senior Editor, is 217. Those that require further information on this somewhat dry subject are referred to the forthcoming Scientific Article by the Senior Editor, in which will be found descriptions of about a dozen new species belonging to these two parasitic genera (*Eurytoma* and *Decatoma*).

We will now give lateral or profile views of the same Joint-worm Fly, the female of which has been drawn as viewed from above in Figure 113, *b*. Compare these profile views with those

[Fig. 117.]



Color—Black.

of the two true parasitic genera (*Eurytoma* and *Decatoma*) given in figures 115 and 116, and it will be seen at once, even by the unscientific reader, that the last insect is totally unlike either of the two first, and manifestly can not be referred to the same genus. Not to dwell upon structural minutiae which will be explained elsewhere, it will be seen at once that in the Joint-worm Fly (Fig. 117, *a* ♀, *b* ♂) the abdomen in both sexes, but especially in the female, is shaped quite differently from that of either of the two parasitic genera (Figs. 115 and 116), and that the body is nearly straight in repose, instead of being curled into a semicircle as in the two first genera. This latter peculiarity is not a mere fortuitous circumstance, happening to particular individuals, but is universal in all specimens belonging to the two genera first figured (*Eurytoma* and *Decatoma*); so that it is with great difficulty that their bodies can be sufficiently straightened out in death, to admit of their being mounted upon card in the comparatively straight posture shown in the figures (115 and 116), their heads being usually found stiffly doubled up downwards upon their tails. Even in life, they frequently assume this posture, when they wish to "play opossum" and escape

the attention of the observer. On the other hand, the Joint-worm Fly has no such peculiarity either in life or in death, or at all events but to a very limited extent.

A very curious chapter might be written on the different modes in which different insects—upon the same principle as that just now explained—form themselves into the similitude of a round ball-like seed or pellet of dung, and thereby escape the attention of their enemies. To refer to but a few of such cases: Among the Beetles, one genus (*Byrrhus*) has separate cavities on the lower surface of its plump oval body to receive each leg, the leg doubling up and fitting into the cavity as smoothly, as does each particle of the finest piece of mosaic work into its appropriate position. In other genera (*Agathidium*, *Leiodes*, *Clambus* and *Sphaeromorphus*) the body itself is rolled up downwards, head and tail together, into a more or less complete and smooth ball. In the well known Curculio (*Conotrachelus nenuphar*, Herbst) and many other Snout-beetles, the beak in repose is laid along the breast between the front legs, certain genera having a deep groove there to receive it; and the legs being then crumpled up close to the body, the whole creature looks exactly like the dead bud of a tree. In other genera of beetles (*Chlamys* and *Exema*), belonging to the same great Family (*Chrysomela*) as the Colorado Potato Bug, the whole upper surface of the body is rough, dark-colored and opaque; and when the legs are retracted, even good entomologists have been often deceived into mistaking the insect for a pellet of dung voided by some large caterpillar. Lastly, among the Golden-tail Flies (*Chrysis* family) in the Order *Hymenoptera*, all the genera, when threatened with danger, roll themselves up head and tail together, leaving their wings exposed. In this case, as indeed in all other such cases hitherto recorded in any Order of Insects, the little creature curls itself up downwards, and the back forms the convex and the breast the concave side of the ball into which it contracts itself. The same thing holds good with certain genera of Sow-bugs (*Oniscus* family) belonging to the Crustaceans, which roll themselves up into a more or less complete ball. But there is a remarkable and hitherto undescribed genus of *Chalcis* flies, a single species of which (*Antigaster mirabilis*, n. sp.) exists in the Cabinet of the Senior Editor, and which will be found figured below, 1st in Figure 118, *a*, as viewed from above with the wings and legs expanded, 2nd in Figure 118, *b*, in profile when preparing to curl up, and 3rd in Figure 118, *c*, in profile,

[Fig. 118.]



Color—Black, with some metallic reflections.

when almost completely curled up. And in this genus—wonderful to relate—the insect rolls itself up in an upward instead of a downward direction, like a clown turning a back summerset, so that the breast becomes the convex side of the curve, and the back the concave side.* No such example, so far as we are aware, has hitherto been recorded by authors as found in any Order of Insects; and we may learn from this and other such cases what pains Nature has taken, and how many various devices she has adopted, to enable these poor despised little “bugs,” that are considered by many as beneath the notice even of children, to escape the observation of the myriads of foes that are constantly seeking to devour them.

For the reasons stated above, and others to be enumerated elsewhere, we have referred the Joint-worm Fly, as will be seen at once from the heading of this Article, to the genus *Isosoma*, instead of the genus *Eurytoma*, which consists exclusively of parasitic insects. Thus, as the reader will perceive, the seeming violation of the great law of the UNHAPPY OF HABITS, in the case of the Joint-worm, is shown to be no violation at all, and to have been based upon pure ignorance of the true classification of that very extensive and interesting and important, but too much neglected group—the great *Chalcid* family.

Practical Results.

“But,” it will be perhaps objected by the utilitarians, “of what practical benefit is all

* A full notice of this most remarkable and anomalous insect will be found in the Scientific Article by the Senior Editor

this discussion? What possible odds can it make to the farmer, for example, whether it is the so-called Joint-worm Fly that produces the galls on wheat, rye and barley, or whether this fly is in reality a parasite, and the galls are caused by some unknown gall-gnat never yet seen by mortal entomologist? What odds again is it to the farmer, whether the same fly produces the knotty galls on wheat, rye and barley, or whether there is a distinct species infesting each of these three plants, and even, as Dr. Fitch maintains, two distinct species producing galls upon barley straws? Lastly, what odds is it to the plain practical farmer, whether or not this fine law of the UNHAPPY OF HABITS, about which you have been making such a pother, has any real existence in nature?”

Men and brethren! it makes all the odds in the world! If the joint-worm galls are produced by a gall-gnat, that gall-gnat must necessarily come out long before the autumn; for otherwise—so many thousands of these galls as have been handled by entomologists in the autumn—somebody or other would have certainly bred the supposed gall-making gall-gnat therefrom, or at all events found some traces of it. Upon this hypothesis, therefore, namely, that Joint-worm galls are made by a Gall-gnat, it would be utterly useless to burn up and destroy the infested straw in the autumn or subsequently; for the culprit gall-gnat will have left it long ago in the summer. Nay, it will even be a positive injury to do this; for the straw is then swarming with the so-called Joint-worm Flies in the larva state, which, on the hypothesis of the galls being caused by some unknown Gall-gnat, must necessarily be parasitic upon that Gall-gnat and therefore be our friends instead of our foes. If, on the other hand, the joint-worm galls are really caused by the Joint-worm Fly—as we have shown above—then it must be highly beneficial to burn up the infested straw in the autumn or subsequently; for almost all the Joint-worms lie in the straw until the following summer, and of course, if you burn the straw, you burn the culprit Joint-worms at the same time.

Again: If the very same Fly that causes Joint-worm galls upon Wheat can also cause similar galls, as we incline to believe, upon Barley and upon Rye, then the farmer cannot escape from the damage inflicted upon him by this little pest, by ceasing to grow Wheat and seeding down his fields to Barley or Rye. If, on the other hand, the converse proposition, which is that maintained by Dr. Fitch, be the true one, then the remedy just now indicated,

namely, shifting from one kind of small grain to another, would be a perfectly effectual one.

Lastly, if the law of the UNITY OF HABITS be a false and fallacious law, then no American farmer can of himself find out anything about the habits of any new insect that is infesting his crops, without studying out those habits in detail—which is often a good twelvemonths' job of work. We hope it is not now necessary to add, for the information of our regular readers at all events, that, without becoming acquainted with the habits of any particular noxious insect, it is folly to attempt to fight him. If, on the contrary, as we maintain and firmly believe, the great Law of the UNITY OF HABITS be universally true throughout the Animal Kingdom, then a moderate knowledge of Entomology will enable the farmer to tell, at a glance, to what particular group of insects the new species that is infesting his crops belongs; and he may then infer the habits of the stranger, with a close approximation to accuracy, from the habits of species which are already well known and are closely allied to that stranger.

Messieurs the Utilitarians, are you answered?

The Remedy.

We repeat, however, for the benefit of those who like to "go it blind" and adopt a prescription without knowing the why and the wherefore, that, whenever you discover the stems of your small grain to be badly affected near the root, in the manner shown in Figure 113, *a*, then you ought to burn off your stubble ground any time before the following summer, and burn up all the tailings and refuse straw after threshing. If you do this, and can persuade your neighbors to do the same, you will soon kill out the Joint-worm; if you neglect it, the parasites sent by a kind Providence may perhaps do the work for you; and again it may be possible that, in spite of the parasites, the Joint-worm may increase upon you year after year, as it did in Central Virginia from 1848 to 1851, till at length it becomes an almost unbearable nuisance.

Postscript.

We have only to say in conclusion, that we shall be greatly obliged by specimens of Joint-worm work either on Wheat, Rye or Barley, but especially on the two former plants, from any State in the Union, or from any part of the British Provinces to the North of us. There are still several interesting problems respecting this insect that remain to be definitively solved. For example, does Joint-worm work ever occur upon Oats?

THE WAVY-STRIPED FLEA-BEETLE.

(*Haltica* [*Phyllotreta*] *striolata*, Illiger.)

This insect appears quite early in the spring, and proves very destructive to many of the garden plants and flowers belonging to the natural order CRUCIFERÆ, and is especially hard on mustard and all kinds of cresses. Common as is this Flea-beetle, its transformations had never been observed, in this country, till quite recently. A closely allied and very similarly marked species (*Haltica nemorum*, Linn.), occurs in Europe, where it is known as the Turnip Flea-beetle. This last species lives in the larva state, above ground, by mining the leaves of the same kinds of plants upon which the beetle feeds; and its transformations were first made known by Mr. H. Le Keux in a valuable paper published in the Transactions of the Entomological Society of London, Vol. II, page 24.

Our American species, being so closely allied to that of Europe, Dr. Fitch inferred its habits to be the same, and in his eleventh New York Report, he quotes Le Keux's observations as applying to our insect, and reproduces from Curtis's "Farm Insects" the figure of a mined turnip leaf, in illustration. In the December (1868) number of the *American Naturalist*, however, Dr. Henry Shimer of Mt. Carroll, Ills., shows that our American insect lives in the larva state underground, where it subsists on the roots of plants, in the same manner as does the larva of the common Cucumber-beetle (*Diabrotica vittata*, Fabr.); and we thus see that it is not always safe to judge of an insect's habits by those of its nearest allies. We have ourselves frequently searched in vain for the larvæ on the leaves of both mustard, cress, radish, and lettuce plants that were thickly covered with the perfect beetles, and as Dr. Shimer's observations are of interest, we quote them in part:

"The Striped Turnip-beetle (Fig. 119 *a*) is less than one-tenth of an inch in length. Its general appearance is black, with a broad wavy yellowish, or buff-colored stripe, on each wing-cover. The larva (Fig. 119 *b*) is white, with a faint darkened or dusky median line on the anterior half of the body, being probably the contents of the alimentary canal seen through the semi-translucent skin. The head is horny and light brown. On the posterior extremity is a brown



Colors—(*a*) black and buff-color; (*b* and *c*) whitish.

spot equal to the head in size; and there are six true legs and one proleg. In its form and general appearance it somewhat resembles the larva of the Cucumber-beetle, but it is much smaller. Its motion is slow, arching up the abdomen slightly, on paper or any smooth surface, in such a position that its motions are necessarily awkward and unnatural, because in a state of nature it never crawls over the surface, but digs and burrows among the roots in the ground. Its length is 0.35 of an inch, and breadth 0.06 of an inch. It feeds upon roots beneath the ground.

"The pupa (Fig. 119 *c*) is naked, white, and transforms in a little earthen cocoon, pressed and prepared by the larva, in the ground near its feeding place. This period is short.

"From my notes I see that on June 14, 1865, I put a number of the larvæ into a breeding-box with a supply of their natural food. June 17, some of the larvæ had disappeared beneath the ground. July 4, I found in the box the beetle. This gives us seventeen days from the time the larva entered the ground, having ceased eating, until I obtained the perfect insect. I did not open the breeding-box every day, but as the insect was yet quite pale and soft, conclude that it was not more than a day or so out of the ground. The actual time, however, in the pupa state, was less than seventeen days, for, like the larva of the Cucumber-beetle and other beetles, these worms pass a kind of intermediate state, in a quiet, motionless condition, in their little dirt-tombs beneath the ground. During this time they decrease in length very much, becoming a shorter, thicker 'grub.' This period is a peculiar part of the larval state, and may be called the quiescent or 'shortening period,' in contrast with the feeding period. At the end of this preparatory, shortening period, the little larva casts its skin and becomes a pupa.

"During the past summer I bred a good number of these beetles from the larva and pupa, taken from their breeding places beneath the ground; but as I took no precise notes of the date, I can say no more regarding the time of the pupa state, except that it is short, only a few days.

"Every gardener knows that these insects are very injurious to young cabbages and turnips as soon as they appear above the ground, by eating off the seed-leaves; he also almost universally imagines that when the second, or true-plant leaves appear, then the young plant is safe from their depredations; then the stem is so hard that the insect will not bite it, and the leaves grow out so rapidly as not usually to be injured by them. But if we would

gain much true knowledge of what is going on around us, even among these most simple and common things, we must learn to observe more closely than most men do.

"The gardener sees his young cabbage plants growing well for a time, but at length they become pale or sickly, wither and die in some dry period that usually occurs about that time, and attributes their death to the dry weather; but if he will take the pains to examine the roots of the plants, he will find them eaten away by some insect, and by searching closely about the roots will find the larva, grub, worm, or whatever else he may choose to call it; from this he can breed the Striped Turnip-beetle, as I have often done.

"I have observed the depredations of these larvæ for ten years, and most of that time had a convincing knowledge of their origin, but only proved it in 1865; since that time I have made several verifications of this fact.

"Every year the young cabbage plants and turnips in this region receive great damage from these larvæ, and often when we have dry weather, in the latter part of May and early in June, the cabbage plants are ruined. A large proportion of the plants are killed outright in June, and the balance rendered scarcely fit for planting; but when the ground is wet to the surface all the time by frequent rains, the young plant is able to defend itself much more effectually, by throwing out roots at the surface of the ground, when the main or centre root is devoured by the larva; but in dry weather these surface roots find no nourishment and the plant must perish.

"This year I saw these beetles most numerous in early spring, but have often seen them in August and September, so abundant on cabbages, that the leaves were eaten full of holes, and all speckled from their presence, hundreds often being on a leaf; and at this time the entire turnip crop is sometimes destroyed by them, and seldom a year passes without their doing great injury." * * * * *

As the Cucumber-beetle exclusively raises its young on the roots of the Cucurbitaceous (gourd) family, so from these observations I am led to believe from analogy, that the Striped Turnip-beetle raises its young always on the roots of the Cruciferous (mustard) family.

As some of our exchanges may wish to illustrate any article they may copy from the AMERICAN ENTOMOLOGIST, we have decided to furnish electrotypes of our wood cuts, at one-half the cost of engraving; these electrotypes to be retained by the parties receiving them, if they desire it.

CONCERNING CERTAIN SMART BUGS.

It is very remarkable that many insects will fiercely attack certain varieties of a particular species of plant, and either leave certain others entirely alone or attack them but to a limited extent. For example, the roundish green leaf-galls about the size of a small pea (*Vitifolia*, Fitch), that in certain seasons and in certain localities swarm so profusely on the under side of the leaves of the Clinton grape-vine, and in a less degree on those of the Taylor and the Delaware, are never found on the Catawba, the Isabella, or any other cultivated variety of the wild Fox grape. Again, the common Rose-bug (*Macrodactylus subspinosus*) will often gather in swarms on the Clinton vine, and almost entirely neglect other cultivated varieties of grape. In all probability, however, most of these are rather cases of a particular insect preferring particular species of plants, than of its preferring particular varieties of one and the same species; for the Clinton and the Taylor—whatever may be the case with the Delaware—are most likely cultivated varieties of the Frost Grape (*Vitis cordifolia*), and not, like the Catawba group, of the northern Fox Grape (*Vitis labrusca*). But we know that in the West the Colorado Potato-bug will almost always leave Peachblow Potatoes alone, when it has a chance to fall foul of other varieties of the potato; and we recently showed that, in the East, the Three-lined Leaf-beetle nearly ruined the Early Goodrich in a certain locality, while other varieties of the Potato growing in the same neighborhood were scarcely hurt by it. (AMERICAN ENTOMOLOGIST, p. 54). Upon similar principles, our Oyster-shell Barklouse, which is a species imported from Europe, is said by reliable European authors never to be found upon a particular variety of apple grown in the Old World—the Winter Majetin apple unless our memory has deceived us. Hence we may see that insects are not by any means such mere machines as most people suppose them to be; for while it would generally puzzle everybody but an experienced horticulturist to distinguish one variety of plant from another, except by the flower or the fruit, insects often distinguish them without difficulty at any period of their growth.

It would seem from information that we gathered together at the recent meeting of the Central Illinois Horticultural Society, that the Apple-worm Moth (*Carpocapsa pomonella*), the history of which we illustrated in a recent article (AMERICAN ENTOMOLOGIST, pp. 112-114), is in the same way perfectly able to discrimi-

nate between different varieties of apples. According to Mr. E. E. Perkins, of Onarga, Ill., the Carolina Red June is much worse infested with the larva of this moth than any other variety; and the same thing has been observed of the Milam by Mr. M. C. McLean of Coles county, Ills. On the other hand, Mr. McLean, Mr. Cochran of Calumet, Ills., and Mr. Hammond of Warsaw all agree, that the Maiden's Blush is entirely exempt from Apple-worms; and the same thing is asserted of the Gilpin by Mr. McLean, Mr. Cochran, and Mr. L. C. Francis, of Springfield, Illinois.

Subsequently, on our attending the annual Meeting of the North Illinois Horticultural Society, the above good character of the Maiden's Blush was fully confirmed by Messrs. D. F. Kinney, J. W. Robson, D. B. Wier and J. S. Shearman of N. Ills. and Suel Foster of Iowa; and that of the Gilpin by Messrs. Kinney, Robson and Foster. We further learnt from Mr. E. E. Bacon of Ogle Co., and Mr. J. W. Robson of Jo. Davies Co., in N. Ills., that they found the Benoni apple to be entirely exempt from apple-worms; while on the other hand the Willow-twig was reported by Mr. D. F. Kinney, and the Carolina Red June by Mr. Suel Foster, as peculiarly subject to the attacks of this little pest. Moreover, according to Hon. Elmer Baldwin of La Salle Co., and Mr. J. S. Seely of Kendall Co., N. Ills., the Early Harvest apple is more infested by Bark-lice than any other variety; and it seemed to be a pretty general idea, that sweet apples are generally more subject to the attacks of bark-lice than sour ones.

Practically, such observations as these are of great value, and should be multiplied and recorded as extensively as possible. The Gilpin apple, for instance, is but a poor fruit; but it is so good a bearer and so late a keeper, and withal has so tempting an appearance from its bright red color, that—as the phrase goes—"there is money in it." And when we add to these recommendations the fact of its entire exemption from apple-worms, it may perhaps be advisable to plant largely of it, in spite of its comparatively poor quality either for eating or for cooking.

ANTS.

Although these are not generally to be feared in the green-house or flower-garden, yet we have occasionally suffered by them, and have found the simplest way to destroy them to be to lay fresh bones around their haunts. They will leave everything else to attack these; when thus accumulated, they can easily be destroyed by dipping in hot water.—Peter Henderson, in *Practical Floriculture*.

CURCULIO REMEDIES.

[From an Essay on the Plum by L. C. FRANCIS, of Springfield, Ill.]

Remedies, offensive and defensive, have been proposed.

First in the offensive department, I will give the *New York Observer's* great curculio remedy.

To one pound of whale oil soap add four ounces of sulphur; mix thoroughly and dissolve in twelve gallons of water. Take half a peck of quick lime, and, when well slacked, add four gallons of water and stir well together. When well settled and clear, pour off the transparent liquid and add it to the soap and water mixture. To this mixture add four gallons of strong tobacco water. Apply this compound, when thus incorporated, with a garden syringe to your plum or other fruit trees, so as to drench all parts of the foliage. If no rain succeeds for three weeks, one application will be sufficient. If washed by rains it should be renewed.

The receipt was effectual in raising, not plums, but the price of whale oil soap from one dollar and fifty cents per hundred pounds one year, to six dollars the next. [Laughter]. We tried it faithfully upon a portion of our orchard, and finding the curculio had misunderstood the object of the syringing [laughter], or was obstinate and wouldn't take the hint, we fitted up a curculio-catcher, similar to Dr. Hull's, and invariably caught as many curculios from the trees that were syringed as from those that were not.

Gas tar has been recommended, but it is utterly worthless for this purpose. Indeed, a gentleman informed me that he had tried the strongest smelling substance to be obtained at the gas-works—so strong that his neighbors complained of it as a nuisance—but without any effect.

Coal oil is also recommended, but as it will not drive off lice from cattle, it is doubtful whether it will drive the curculio from the plum trees.

[Mr. P. L. Cable—one of the wealthiest and most intelligent citizens of Rock Island, Ill.—informed us in the spring of 1867 that, having always hitherto had his plums destroyed by Curculio, he was now going to try an effectual remedy. "He intended," he said, "to have a number of large swabs, thoroughly saturated with coal-oil, hung up among the branches of his plum-trees." We told him that he might just as well hang them up in his stable, for any good that they were likely to do; and that he had better have his plum-trees regularly jarred, after the approved old fashion. But no. He had seen the coal-oil remedy highly recommended, and he was going to try it. Besides, bug-men of course

knew nothing about bugs. Shortly afterwards, on passing by his grounds, we noticed a plum-tree garnished with a great variety of old rags, and a very loud smell of coal-oil saluted our nostrils. In the following autumn, we asked Mr. Cable how many bushels of plums he had raised. "Ah," he replied, "the Curculio took every plum for me, and I am not going to try the Great Coal Oil Specific any more."—Ebs.]

Among the defensive remedies cotton batting tied around the trunk of the tree has been recommended; in entire ignorance of the fact that the curculio has wings and flies readily.

Common salt has been suggested. After smoothing the ground and packing hard, the salt is to be spread a quarter of an inch thick as far as the branches extend. I have seen no report from any one who has tried it, but would suppose, from the fact that the curculio will fly half a mile or more, that the remedy would have to be extensively applied to be anything more than partially successful.

Hogs running in an orchard while the plums are falling is, from the fact above mentioned, also only a partial remedy.

But after all that has been said, the only reliable plan of fighting the "little Turk" is the jarring plan. Knock the rascals down on a sheet spread under the tree, and pinch their heads off. Dr. Hull's curculio-catcher is an admirable contrivance for doing this splendidly and effectually. It has been suggested that, if the "umbrella plan" was carried out more closely, it might be an advantage. A jointed handle, a handle that could be inserted so as to fold up the sheet from the barrow, would make it more convenient for passing through gates, and also storing away when not needed. In conclusion, I would say, whoever would be a successful plum grower must exercise the persevering unconditional-surrender spirit of our President elect, and fight it out on this line (the jarring and sheet process) if it takes all summer.

HOW GREAT WITS JUMP TOGETHER.

A correspondent says that, after twenty years' experience, he has found that the most effectual remedy for the borer is stopping up the holes with hard soap.—*Agricultural Paper*.

A correspondent of the *Police Gazette* says that, having had fifty years' experience among horse thieves, he has at length discovered, after a number of laborious and very troublesome experiments, that the only effectual mode to prevent your horses from being stolen is, to put one of Chubb's Patent Burglar-proof Padlocks upon the stable door, after the horses have been stolen already.

Appendix to the Article on "Wasps and their Habits," in No. 7.

BY THE SENIOR EDITOR.

GENUS CHRYSIS.

Westwood* has suggested that the *Chrysis* family are not true Parasites, preying on the body of the victim-larva exclusively, but that they prey upon the supply of food laid up for that larva by the mother-fly, that is, that they are what I have called "guest-flies." But, in the first place, they are known to infest both the nests of Digger Wasps and those of solitary Bees, the former of which are provisioned with living insects, the latter with honey and pollen. Consequently, on the above supposition, the *Chrysis* larva must feed exclusively, sometimes on animal, sometimes on vegetable food; which is in the highest degree improbable. In the second place, *Chrysis* has been ascertained to infest the nests of the Social Wasps, which lay up no stores of food whatever, but feed their young larvae from day to day.† In this case, therefore, Westwood's supposition is reduced to a physical impossibility.

St. Fargeau was of opinion that the larva of the *Chrysis* flies were true parasites, in the sense in which the term is commonly used; for he says that the eggs from which they take their origin do not hatch out till after the legitimate inhabitant of the cell has become nearly full grown; when the parasitic larva seizes its victim by the back and slowly and gradually sucks away his life.‡ Brulle, writing six years after Westwood, says that the *Chrysis* flies are—in some mode which he does not explain—intermediate in their habits between what I have called "Guest-flies" and what are commonly known as Parasites; and concludes by acknowledging that their habits are not yet fully understood.¶ Fred. Chevrier, who published an elaborate work upon this family at Geneva, in Switzerland, in 1862, eludes the vital question by simply saying, that the *Chrysis* flies "deposit their eggs, like the cuckoo, in nests built by other species." But as to the food of the larva that subsequently hatch out from these eggs, he preserves a deep silence.‡ Mr. Fred. Smith, however, writing in the same year as Chevrier, in the work already referred to, evidently entertains no doubt whatever as to the true parasitical habits of this family. Finally, Dr. Packard, writing in 1868, first asserts that "the larva [of the *Chrysis* flies] are the first to hatch and devour the food stored up by other fossorial bees and wasps," and then by way of compensation goes on to quote the passage from St. Fargeau, which has been already referred to and which asserts the exactly opposite doctrine, namely, that they feed, not on the food stored up for the use of the infested larva, but on the bodies of the larva themselves.

GENUS BEMBEX.

I am not quite certain that the species figured in the text (p. 126, fig. 98) is *B. fuscinta*, Fabr., but it is undoubtedly *B. Spinola*, St. Fargeau. This author has re-described a great many old species under new names.

GENUS STIZUS.

STIZUS BREVIPENNIS, n. sp. ♂ Black. Head subopaque and pubescent. Anterior orbits up to the front ocellus, a very narrow abbreviated orbit behind the eye, face except the clypeal suture, clypeus, labrum, and middle half of mandibles, all pale yellow. Palpi pale rufous. Antennae with the basal joint below, laterally, and at the extreme tip, pale yellow; the second joint, the basal half of the third joint, and the tip of the last joint, rufous. Thorax very finely and rather closely punctured, with long cinereous hairs behind and below; the hind edge of the collar above, a small spot beneath the front wing and a longitudinal line above it, a small basal spot on each side of the scutellum and a band behind it, all pale yellow. Wing-veins pale rufous. Abdomen very finely

and rather closely punctured, basally with a few cinereous hairs. On the dorsum, a large lateral subquadrate spot on joint 1, slightly behind the middle, another such spot covering the basal two-thirds of joint 2, but basally prolonged upwards in an acute angle, and on joints 3 and 4 a band covering the basal two-thirds of each joint, narrowly interrupted above on joint 3 and scarcely interrupted on joint 4, all pale yellow. On the venter, joints 3 and 4 have each a large pale yellow subtriangular lateral spot, transversely elongated, and with the apex of each triangle towards the middle, each pair of spots not quite meeting in the middle. Anal organs rufous, the tridentate process horizontally flattened with its sides parallel on its basal half, when on each side a slender thorn projects backwards and outwards at an angle of 45°, and the process, being suddenly reduced one-half in width, is continued in a spear-shaped form with its tip curving downwards in the shape of a long thorn. Legs yellow varied with rufous; coxæ, trochanters and basal half of femora, black. Wings subhyaline; veins dark rufous, the costal veins verging upon brown.—Length ♂ 1.00 inch; expanse of wings 1.55 inch; length of front wing, including the wing-scale, 0.67 inch.

One ♂ taken in the summer on wild parsnip flowers near Rock Island, Ill.; ♀ unknown. When recent, the front wing attains only the middle of the 5th abdominal joint. In *St. Hoagardi* ♀, judging from St. Fargeau's and Latreille's figures, in *St. rufipes* ♀ (St. Fargeau's figure), in *St. grandis* ♀ (Say's figure), and in *St. speciosus* ♀ (figured p. 129, fig. 103, from nature), it attains or more than attains the tip of the abdomen. Mr. Cresson kindly informs me, that in the males also of three of the species enumerated above (*Hoagardi*, *grandis* and *speciosus*), which are contained in the Society's collection, that the wings reach beyond the tip of the abdomen. The only other described species, besides *brevipennis*, with abdominal joints 1, 2, 3 & 4 dorsally spotted or banded, is *St. grandis*, St. Fargeau, a North African species, the specific name of which having been preoccupied by Say, should be changed to *gigas*. From this species, *brevipennis* may be at once separated by the four yellow ventral spots and by other less obvious characters.

The only two N. A. *Stizus*, the habits of which are known (*speciosus* and *grandis*), provision their nests with *Cicada*, as stated in the text; and I believe that, in accordance with the law of the UNITY OF HABITS, the other two species will probably turn out to do the same thing. Dr. Packard, in his *Guide*, etc., (p. 163) erroneously states that the species of this genus provision their nests with "grasshoppers and other large insects." The mistake probably arose from his confounding "Locusts," the popular name for *Cicada*, with "Locusts" the scientific name for certain grasshoppers.

GENUS AGENIA, SCHIÖDTE=ANOPLIUS, ST. FAR.

AGENIA SUBCORTICALIS, n. sp. ♂ Slender; blue-black ranging to dark indigo blue. Head opaque, very finely and confluent punctured, with a not very obvious stria extending from between the antennae to the anterior ocellus. Clypeus widely and squarely truncate. Face, extending upwards and outwards from the origin of each antenna so as to strike the inner line of each eye at an angle of about 45°, and also the clypeus, both white, except a square black spot occupying the whole length of the face below the antennae and connecting with a large basal black blotch on the clypeus, not quite attaining its anterior margin. All the above white parts, including the two black spots, covered with short dense prostrate white pubescence. Labrum and palpi pale dull rufous. Antennae brown-black above, dull reddish brown beneath. Occiput laterally with long white hairs. Thorax sculptured as the head, with white pubescence beneath and behind; often brilliant indigo blue, always more tinged with blue than the head and abdomen. Abdomen slender, subpolished, almost microscopically punctate and pubescent. Joint 1 elongate, two and one-half times as wide at tip as at base, its sides straight; joints 2-7 gradually diminishing in length; joint 7 white above. Legs black; the four front legs, except their coxæ and trochanters, rufous; their femora and tibiae with a superior blackish line, and in the middle legs sometimes almost entirely black. Wings tinged with dusky; veins and stigma dusky,

* Introduction, 11, p. 176.

† Fred. Smith in *Entomologists' Annual*, 1862, p. 80.‡ *Encycl. Meth.*, X, 9.§ *Hymenopt.*, pp. 5 and 9.¶ *Chrysidés du Bassin du Léman*, p. 13.

Neuration as in Cresson's Figure 8, *Trans. Amer. Ent. Soc.*, 1, p. 121.—Length ♂ 0.20–0.22 inch.

The ♀ differs from ♂ only as follows: 1st. The body is stouter. 2d. The clypeus is widely rounded, not truncate. 3d. The parts of the head that are white in ♂ are black, but the white pubescence remains there. 4th. The first abdominal joint swells out backwards on a sudden near its base, so that its sides are not straight. 5th. The last abdominal joint is on its upper surface flattened, highly polished and slightly dished, but is immaculate. 6th. The legs are black immaculate.—Length ♀ 0.21–0.23 inch.

Described from 10 ♂, 4 ♀, bred, except 2 captured ♂, from three different lots of clay-cells (Fig. 105, c). Of the 13 U. S. *Agencia* described by Mr. Cresson in the ♂ sex, but 4—viz: 1st, *pulehriai*; 2d, *agilis*; 3d, *petiolata*; and 4th, *mellipes*—have the tip of the abdomen white, and all four are in my collection and differ from *subcorticalis*, the first in the anterior coxae being partly white, the second and third in the face being entirely black, the fourth in the first joint of the antennae being white beneath and in all six legs except their coxae being rufous immaculate. The first, second, and fourth, are also about twice as large as *subcorticalis*. From four *Agencia* described by the same author in ♀ sex only, viz: *cupida*, *varipes*, *congrua* and *accepta*, our ♀ differs in being only half as large, and also in other characters. As to the fifth *Agencia* described by him in ♀ sex only, see the two following paragraphs.

AGENCIA ARCHITECTUS, Say, ♂ ♀ Bright clear blue. Head opaque, very finely and closely punctate; dark blue; the face and clypeus, especially ♂, with silvery pubescence. A more or less distinct stria extending from the antennae to the anterior ocellus. Clypeus ♂ squarely and widely truncate; ♀ widely rounded. *Thorax* subopaque, very finely and closely punctate, and with long pubescence beneath and behind. *Abdomen* ♂ ♀ sculptured and shaped as in *subcorticalis*. ♂ ♀ and the apical joint ♂ ♀ as in that species, and blacker than the rest of the abdomen. *Legs* black immaculate, the femora faintly tinged with blue. *Wings* subhyaline, ♀ slightly more tinged with dusky than ♂. Neuration as in *subcorticalis*.—Length ♂ 0.27 inch; ♀ 0.20–0.32 inch.

Two ♂, bred from the clay-cell drawn in Figure 105, b; 4 captured ♀. The ♂, which is hitherto undescribed, is at once distinguished from ♂ *subcorticalis* by the black face and clypeus and immaculate black legs; but ♀ can scarcely be distinguished from ♀ *subcorticalis*, except by her greater size and brighter color. Say describes the tergum of his *architectus* ♀ as having "the anal segment polished." Mr. Cresson describes *architectus* ♂ as having the anal segment "brown and hairy," without taking any notice of the smooth and polished space on its upper surface, which, as he has since informed me, occurs in all ♀ *Agencia* in the collection of the Society except *cupida* and *pulehriennis*.

AGENCIA CUPIDA, Cresson.—I possess a single ♀ of this species, which is very closely allied to the preceding ♀. It differs as follows: The anal segment is brown, and entirely opaque, pubescent and closely and rather finely punctured, and has no polished space above. This last character has been omitted in Mr. Cresson's description, but only, as I am informed by him, through an oversight.

AGENCIA BOMBYCINA, Cresson.—(Fig. 106, b).—Out of 10 ♀ of this species, the clay-cell of which is sketched in Figure 106, a, 7 ♀ have the front wings as described by Mr. Cresson, viz, "hyaline, dusky at tips," the dusky part of the wing varying considerably in extent, and 3 ♀ have them entirely dusky. Very numerous specimens ♂ ♀ were bred by me from clay-cells found in North Illinois under prostrate logs; and from such cells found in November in South Illinois under the bark of a standing tree I bred 2 ♂ 2 ♀ in the June of the following year, and also the *Ceropales* to be presently described. Of the 3 ♀ with dusky front wings, 2 ♀ came from the latter lot of cells and only 1 ♀ from the former lot.

GENUS CEROPALES.

CEROPALES RUFIVENTRIS n. sp. (Fig. 108).—Black. Head polished and glabrous, below the antennae opaque and with fine short appressed pubescence. Wide anterior and narrow posterior orbits, interrupted on the vertex, and also the clypeus and labrum, except

upon each a large basal longitudinally oblong black patch not quite attaining the anterior edge, and the mandibles except their extreme tips, all yellow. Palpi pale rufous. Antennae two-thirds as long as the body, with joints 1 and 2 each rufous above, but yellow beneath and at their tips. *Thorax* glabrous and polished, mesothorax and the sides and posterior surface of the metathorax with fine white pubescence. Hind edge of collare, a semicircular spot above each of the front and hind coxae, and a small transverse spot immediately behind the scutell, all yellow. *Abdomen* polished and glabrous; rufo-ferruginous with the tip of the ventral valve and the sting blackish. *Legs* pale rufo-ferruginous; the front of the anterior coxae and a small spot on the posterior tip of the anterior tibiae, yellow; and all the 6 tarsi, except their black tips, stained more or less with yellow. In the four hind legs the entire last tarsal joint is black, but occasionally in the middle legs only black above. Wings fuscous, the apex of the front wings hyaline. Wing-veins and stigma fuscous.—Length ♀ 0.26–0.30 inch; expanse 0.54–0.66 inch.

The ♂ differs from ♀ only as follows: 1st. The entire face below the antennae, as also the clypeus and labrum, is yellow immaculate. 2nd. The antennae are full $\frac{1}{2}$ as long as the body, and joint 2 is black above instead of rufous, and the basal $\frac{1}{2}$ of joint 3 is yellow below instead of black. 3rd. Besides the yellow markings on the ♀ thorax, there is a minute dot above between the front wings and a rather larger one on the tip of the scutell. 4th. In the front legs, the terminal $\frac{1}{2}$ of the femora and the entire tibiae are posteriorly yellow, and the tip of the middle tibiae is also yellow. 5th. The wings are almost hyaline with only their extreme terminal edges fuscous.—Length ♂ 0.24 inch; expanse 0.50 inch.

One ♂, three ♀; the ♀ ♀ captured in July on umbelliferous flowers near Rock Island, Ills.; the ♂ bred towards the end of June from a lot of five clay-cells of *Agencia bombycina* Cresson, all found in November in one spot under the loose bark of a standing tree in South Illinois; four cells the next summer producing four *Agencia* and the remaining one the ♂ *Cer. rufiventris*. (Quite unlike the other 8 described N. A. *Ceropales*—of which I possess *hipunctata* Say, *frontaria* Smith and *longipes* Smith, being 3 out of the 5 hitherto found in the U. S.—except *Cer. agilis* Smith (Mexico), the ♀ only of which is known. Our ♀ differs from that ♀ in being marked with yellow instead of white; in the antennal joints 1 and 2 being rufous above, not black; in having no pale spot on the scutell, and no "series of very fine short striae on the anterior margin of the mesothorax;" in the coxae not being black; and in the wings not being hyaline. Otherwise the resemblance is very striking. I may add here that I have always taken *Cer. bipunctata* Say, upon umbelliferous flowers in considerable numbers, in company with various large *Pompilus* (*P. unifasciatus*, *P. tropicus*, *P. athiops*, *P. ferrugineus*, etc.); and as *Cer. rufiventris* is now proved to be a Guest-wasp infesting *Agencia*, I infer that *Cer. bipunctata* is not improbably a Guest-wasp infesting some large *Pompilus*.

By an error of the artist, the tarsi of the hind legs in Figure 108 are drawn entirely too short; in nature they only lack one-sixth of being as long as the front wing. The hind coxae also are represented as only half as robust as they ought to be; in nature their diameter is one-half that of the abdomen.

CEROPALES LONGIPES Smith (= *Cer. fasciata* Say).—The ♂ of this rare species is hitherto undescribed. It differs from ♀ only in having an additional pale fascia on its additional abdominal joint. Length ♂ 0.33 inch. Two ♂, three ♀, all taken on umbelliferous flowers near Rock Island, Ills.

SPIHEX FAMILY.

For the benefit of young entomologists, I append the following table, by which the different modern genera of the *Sphex* family, that have hitherto occurred in North America may be distinguished. The genera not hitherto found there are inclosed in brackets []. All the genera of this family are characterized by having the abdominal peduncle of considerable length. But the old Linnean genus *Sphex*, which has been split up into all these modern genera, included also the

Pompilus family or subfamily, in which the abdomen is almost sessile.

GENERA OF THE SPHEX FAMILY.

- ** Two submarginal cells. (Legs smooth.)
 1. Each submarginal cell receiving a recurrent vein.....*Rhinopsis*.
 2. Second submarginal cell receiving both recurrent veins.....*Co-optera*.
 ** Three submarginal cells.
 A. Second submarginal cell receiving both recurrent veins.
 a. Legs smooth.
 1. Labrum hid by the clypeus.....*Podium*.
 2. Labrum distinctly visible.....*Pelopon*.
 b. Legs thorned and bristly.
 1. Third submarginal cell 4-sided and sessile.....*Ammophila*.
 2. Third submarginal cell triangular and peduncled.....*Miscus*.
 B. Second submarginal cell receiving only the first recurrent vein.
 a. Legs smooth.....*Dolichurus*.
 b. Legs thorned and bristly.
 1. Tarsal claws one-toothed. (Face short).....*Chlorion*.
 2. " " two-toothed.....*Sphex*.
 3. " " three-toothed.....*Parasphex*.
 4. " " four-toothed.....*Priocoryx*.
 C. Second submarginal cell receiving neither of the two recurrent veins.....*Ampulex*.

It is remarkable that no less than three perfectly distinct N. A. Blue Wasps, belonging to three different modern genera, have all of them been described by old authors under one and the same name—*Sphex corulea*. They may be enumerated as follows: 1st, One by Linnaeus (*System. Natur.*, Vol. I, page 947, No. 38), which is now considered to be a *Pepsis* (*Pompilus* family) found in Mexico and the West Indies. 2nd, Another by Linnaeus (*ibid.*, page 941, No. 2) and subsequently by DeGeer, which is now known as *Pelopus coruleus* (*Sphex* family), and has the same habits as *Pel. lunatus* Fabr. This species occurs sparingly in North Illinois, and I found a few of its mud-cells, with the dead wasps still in them, promiscuously intermixed among those of the other species obtained near the Black Hawk Watch-tower. (See above, p. 133). In Pennsylvania and other Eastern States, according to Mr. Cresson, it is quite common. 3rd, Another by Drury, which is the *Chlorion* (*Sphex* family), figured on page 126 (Fig. 97.) It is to this last species that the *Sphex corulea* of St. Fargoe (*Hymen.* III, p. 336) must be referred, who, however, seems to have made a strange confusion between his *Pelopus coruleus* (*ibid.*, p. 320) and his *Sphex corulea*, quoting the same old authors, Linnaeus and DeGeer, for both species. In reality, many species of insects are described by old authors in so brief and loose a manner, that to decide what particular insect they refer to is often a mere scientific conundrum, the answer to which is all guesswork, unless the typical specimens happen to have been preserved in some museum.

GENUS CHLORION.

CHLORION CORULEUM Drury (Fig. 97.)—This species has never hitherto been recorded as found any further north than Colorado, Texas and certain Southern States; but I know it to be very common near Rock Island, in North Illinois, and probably in other parts of the North-Western States. I am not absolutely certain that the "Blue Wasp" as large as a Hornet," the habits of which are described by Mr. George W. Smith of Michigan in the text of this article (p. 127), is the true *Chlorion coruleum* of Drury; but I infer that it is, because there are but two Blue Wasps found in the North-Western States that answer to Mr. Smith's description, namely, *Chlorion coruleum* and *Pelopus coruleus*; and the latter of these two is a mud-dauber, and consequently does not make its nest in the ground, as the Michigan Blue Wasp did. The Blue Wasp, however, referred to by Catesby in his *History of Carolina*, is the *Pelopus* and not, as from the language used by Westwood was erroneously inferred in the text (page 126), the *Chlorion*. Mr. Cresson has obligingly copied out for me the passage in Catesby bearing upon this subject; and I find that that writer expressly says that his Blue Wasp was a mud-dauber, and that one of them dragged a spider, subsequently ascertained to be eight times as heavy as itself, up a perpendicular wall to its mud-cell. (Vol. II, p. 103.)

I have to return my thanks to Mr. Cresson for his valuable assistance in disentangling the intricate synonymy of these Blue Wasps, and also in preparing the Table of Genera of the *Sphex* family given above. It is but little to the credit of the great and wealthy Northwest, that not a single Public Library, even decently supplied with books on Natural History, is to be found

within its limits. So that Western naturalists are continually compelled to go begging for bibliographical assistance to the doors of their friends in the East, who—more fortunate than themselves—have free access to good scientific libraries.

GENUS AMMOPHILA.

AMMOPHILA PICTIPENNIS n. sp. ♀. (Fig. 100, p. 128).—Black. Head subopaque, with a few short black hairs above and some long black ones below, finely rugose and in front almost aciculate, the aciculations directed towards the eye and slightly downwards. Clypeus subpolished, a little rounded, rugose, with sparse large impressed punctures and a few long black hairs. Antennae about reaching to the origin of the front wings. Thorax perfectly opaque, finely rugose, with a few short black hairs especially below. Tegulae and prosternal tubercles glabrous and polished. The enclosed space on the metathorax with fine transverse striae, directed on each side a little backwards. Abdomen subopaque, very finely rugose, glabrous. Peduncle superiorly 1-3rd longer than joint 1, shining black; the extreme tip of the peduncle below, the whole of joints 1 and 2 and more or less of the basal part of joint 3, more narrowly above more widely below, all sanguineous. Legs immaculate; front legs polished; the 4 hind legs opaque with a whitish bloom. Front wings ferruginous on their basal 2-3rds; hind wings hyaline on their basal 2-3rds, but generally tinged with ferruginous near their base; the terminal 1-3rd of all the four wings dusky. Veins colored to correspond with the wing.—Length ♂ 0.65–0.80 inch; expanse ♀ 0.85–1.00 inch.

The ♂ differs from the ♀ only as follows:—1st, The entire head is finely rugose and covered with long black hairs. 2nd, The hairs on the thorax are much denser and longer. 3rd, In the abdomen the entire peduncle is black; joint 1 is piecous, and only joint 2 sanguineous. 4th, The four hind legs are but slightly opaque. 5th, It is only the basal 1-3rd of the front wing that is ferruginous, that of the hind wing scarcely so, the middle 1-3rd in both wings being subhyaline and the terminal 1-3rd dusky.—Length ♂ 0.60 inch; expanse ♀ 0.69 inch.

One ♂, eight ♀. Five ♀ were taken in South Illinois, one of them under the circumstances narrated in the text. Three alcoholic ♀, taken by Dr. Vellie in Colorado, do not differ from the others except in the 3rd abdominal joint being rather more widely sanguineous. Mr. Cresson, to whom I have forwarded a ♀ specimen, informs me that it is nowhere described in print that he can find, and that he had himself recognized it as a new species from specimens already in the collection of the Society, none of which, however, were received from Colorado. In the coloring of its wings *A. pictipennis* agrees with *A. fera* (Europe); but that species has no transverse striation on the metathorax.

What the N. Y. Farmers' Club thinks of Best's Invigorator.

AN AGRICULTURAL HUMBUG.—Sidney Keith writes to Horace Greeley, asking what he thinks about "Best's Tree Invigorator." Mr. Greeley refers the letter to the Club, and we advise Sidney Keith and all others to have nothing whatever to do with the "Tree Invigorator," or any other patent manure, or lotion, or swab, or drench. You may as well buy pills to cause cows to give cream, or stuff in a vial to fatten hogs, or a patent hen persuader to get eggs without roosters or grain.—*Proceedings of the N. Y. Farmers' Club, Feb. 23, 1869.*

ERRATUM IN NO. 7.—Page 130, under the figure, for "Black and dull yellow" read "Black and bright yellow."

ON OUR TABLE.

HARRIS'S INSECTS INJURIOUS TO VEGETATION.—Orange Judd & Co., of New York, have just issued a new edition of this popular and most excellent work. It is a perfect fac-simile of the last edition, corresponding page for page, and obviating the unpleasant necessity, in quoting from the work, of referring to it by the edition, as is too often the case with works which run through different editions. At the same time it has the advantage of being compressed into a smaller volume, while, as we are pleased to find from the uncolored copy on our table, the press-work is fully as good as in the former editions. Price, uncolored, \$4.00; colored, \$6.00.

PRACTICAL FLORICULTURE, by Peter Henderson.—The Western News Company, Chicago, send us this little work, which is a fitting companion to *Gardening for Profit*, the first very popular work of the author. It contains many radical views, and we read it with a good deal of pleasure and profit. It is not our province, even if we had the space, to review any other than entomological works, but we can safely recommend this little book as invaluable to those who wish to cultivate flowers successfully. Price \$1.50.

THE AMERICAN HORTICULTURAL AND THE AMERICAN AGRICULTURAL ANNUALS FOR 1869.—By Orange Judd & Co., of New York. Two elegantly gotten up and valuable year books, each giving a record of what has been accomplished during the year, and each containing practical essays by men who are known to be well qualified in their special departments. Price of each, 50 cents. paper cover; 75 cents cloth.

GRAY'S SCHOOL AND FIELD BOOK OF BOTANY.—A valuable class book added to Gray's Botanical Series, just issued by Ivison Phinney, Blakeman & Co., of New York. The work supplies a great desideratum to the Botanist and Botanical Teacher, there being no similar class book published in this country. Price \$2.50.

L'INSECTOLOGIE AGRICOLE, Paris, France.—We have already noticed this neat little monthly (see p. 98 of No. 5), and need only say that it increases in utility and interest. It is the only other periodical in the world besides the AMERICAN ENTOMOLOGIST, which is devoted primarily to economic entomology.

SCIENTIFIC OPINION.—A Weekly Record of Scientific Progress at Home and Abroad. London, England. A most welcome addition to the truly able publications of the day. It shows

great editorial ability, and promptly reports the proceedings of all prominent Scientific Societies. We heartily wish it success and prosperity.

HARDWICKE'S SCIENCE GOSSIP: London, England—Is exactly what it purports to be, viz: a monthly medium of interchange and gossip for students and lovers of Nature. It is well edited, beautifully illustrated, and devotes more space to the wonders of the microscope than any other of our exchanges. It is now in its fifth year.

NOTE FROM THE JUNIOR EDITOR.

Having recently received numerous letters inquiring as to how and where my "First Annual Report" can be obtained, I will state in answer to these inquiries, and for the benefit of the general reader, that 6,000 copies of the report are printed by the State, and that they are bound up with, and form a part of, the Missouri Agricultural Report. Mr. Chas. W. Murtfeldt, Secretary of the State Board of Agriculture, has charge of the distribution of a certain portion of these Agricultural Reports, and residents of Missouri can doubtless obtain copies by addressing him at 612 N. Fifth St., St. Louis, and by enclosing the requisite postage—50 cents. A few extra copies of the Entomological Report were printed at my own expense, on somewhat better paper than the State furnishes, and I can, to a limited extent, supply those of my entomological friends who desire them, with separate copies fully indexed and covered in paper, at \$1.00 with plain, and \$2.00 with colored plates.

SPECIAL NOTICE.

The Rev. A. Matthews, well known to all students of Coleoptera for his valuable contributions to science, has completed his MMS. of a Monograph of TRICHOPTERYGIDÆ, and the work is about going to press. The volume will be illustrated by figures of all the species, and careful dissections of all the genera, and will be indispensable to the library of every Coleopterologist who does not wish to depend entirely on the labors of others to identify his specimens. Subscriptions to the work may be made through any importing bookseller, but subscribers are requested to send their names as soon as possible to Dr. John L. LeConte, 1325 Spruce Street, Philadelphia, in order that he may inform the author how many copies will be required to supply the American demand for this very interesting work. The price will be £1 English money.

ANSWERS TO CORRESPONDENTS.

Eggs of the Oblong-winged Katydid—T.

A. Throp, Troy, Ills.—The eggs which you found on a twig of a Mountain Ash, and which are faithfully represented in the annexed (Figure 120), are those of the Oblong winged Katydid (*Phylloptera oblongifolia*, De Geer). They differ from those of the common Broad-winged Katydid (*Platyphylum concavum*, Harr.), in being narrower in width and thicker in depth, which gives them a more rounded appearance.

J. L. Rice, Lee's Summit, Mo.—The eggs which are so abundant on your grape vines, are of the same kind as the above.

B. J. Campbell.—The eggs you find on your grapevines are likewise of the same kind as those above referred to. You ask if the eggs would be killed by burying them in the fall, together with the canes on which they occur; these canes to be used in the spring for cuttings. We cannot say positively, but are decidedly of the opinion that such a treatment would destroy the eggs, as they are thereby placed in very unnatural conditions.

Dr. H. Cheeney, Old Ripley, Ills.—The eggs you send are also of the same kind.

A. McMoore, Louisiana, Mo.—The eggs on your Concord and Delaware vines, as you will perceive from the engraving above, are eggs of the same species of Katydid. We advise their destruction as they appear to be very numerous this year; but as a general rule these "Katies" do us but little, if any, injury.

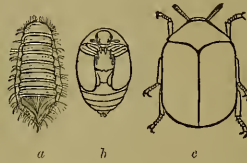
Mossy Rose Gall—F. W. Collins, Rochester, New York.—The bunch growing from the twig of Sweet Briar, about the size of a chestnut, and covered with dense moss-like filaments, is composed of an agglomeration of hard cells, and is in reality a polythalamous gall. Since its receipt, we have bred two specimens of the gall-maker, which proves to be *Rhodites rose* of Linnaeus. This fly measures about 0.15 of an inch in length, and is principally distinguished by the ♀ having a black tip to her reddish abdomen. Baron Osten Sacken could perceive no difference between this fly and one bearing the same name which forms a very similar gall on the rose in Europe, which gall is known as the *bedeguar* of the rose. The genus *Rhodites* seems to be exclusively confined to the rose, and bears a general resemblance to the genus *Cynipe* (Fig. 81), which infests the oak and gives its name to the Family to which both these two genera belong. Osten Sacken has described eight different galls which occur on the different kinds of roses in this country, and we are acquainted with a ninth, which is produced by his *Rhodites ignata*. This last gall occurs on the leaves, is of the size of a large pea, and has the form of a mangelwurzel or beet seed.

Caterpillars on Lombardy Poplars—J. F. Gurley, Burlington, Iowa.—The caterpillar which you found last summer on your Lombardy poplars, with long straw-colored or bright yellow hairs covering each side of the body, with slender black tufts issuing from the back, and with black heads; were evidently the larvae of a gray moth known by the name of *Acronycta acericola* Guenee, and figured on page 436 of Harris's "Injurious Insects." There are two broods of the caterpillars during the year, the first brood spinning up about the first of July, and coming out as moths about the end of July, and the second brood wintering in the chrysalis state. We have found this pretty caterpillar tolerably common on both the Cottonwood and Poplar and have frequently bred it to the moth state. It is subject to the attacks of a minute ichneumon fly and also to those of a *Tachina* fly. The story told you by the Doctor, about these caterpillars being poisonous, is, in our opinion, all balderdash, as we have handled great numbers of them with impunity.

Unknown Larvæ.—Geo. W. Copley, Alton, Ills.—The larvæ you send belong to some two-winged fly, but to what particular species we know not.

Museum Pests—F. W. Hoit, Jr., G. M. L. and J. Huggins.—We learn from Mr. E. T. Cresson, the Secretary of the American Entomological Society, that the common European Museum Pest (*Anthrenus museorum*, Linn.) is not known to occur in this country; but that it is the closely allied species—*Anthrenus varius*, Fabr.—which attacks in such a serious manner, our American collections of insects. In further corroboration of this fact, we have since bred several specimens of the last named species from the larvæ received from Mr. Huggins, and which we erroneously referred to *A. museorum* on page 79 of No. 4. These two beetles are very much alike, both in size, form and general appearance, and their larvæ are so much alike, that, as

[Fig. 121.]



already stated (p. 79), it is very doubtful whether they could be distinguished from each other in this last state. The annexed outlines (Fig. 121) will give a good idea of the larva (a), the pupa (b), and the perfect beetle (c) of either species. Both species have wavy bands running across the wing-covers, and the pattern of these bands seems alike in both; but while *Anthrenus museorum* has these bands very indistinctly marked, and is a dull looking insect, *A. varius* has them very distinctly marked, and partly spotted with white. The two insects are furthermore distinguished by the antennæ in *varius* being 11-jointed, the club consisting of three joints, while those of *museorum* are but 8-jointed, the club consisting of two joints.

Cockroach eggs—H. C. Freeman, South Pass, Ill.—The shining mahogany-colored bean-shaped body not quite $\frac{3}{8}$ inch long, which you found in the rotten cavity of a peach-tree, is the egg-case of our common Cockroach (*Plutamoedes unicolor*, Scudder). This species is very abundant in Illinois under the loose bark of old stumps, &c., where also the empty egg-cases may be found at all times of the year. The insect acquires wings and becomes full grown in June, the wings of the perfect female only reaching about $\frac{3}{4}$ of the way to the tip of the abdomen and those of the perfect male much beyond the tip. About this time the females may often be seen running along with the egg-case partly protruding from their tails; and if you then open one of these egg-cases, you will see that it is laid off internally in two tiers of little cells, one tier on each side and each cell containing an egg. In the empty egg-cases the cells remain, but the eggs have hatched out and the young larvæ made their escape. There is a smaller species of Cockroach (*Leptohia germanica*), known in the East as the "Croton Bug," which we found last summer to be common in the houses at Cairo, Ills. Unlike the other species, which runs wild in the woods, this is a civilized bug and inhabits towns and cities. It is very common and a great pest in Eastern cities, but until we met with it at Cairo was not known to have made its way out to the West. It was originally introduced into this country from Europe, along with a species still larger than either of the two referred to above, (*Blattella orientalis*), which was first imported into Europe from Asia and has now been imported into America from Europe. This last is a terrible pest in the City of London, in England, and traps for catching it may be seen exposed for sale in all the hardware stores there.

Currant Borer; Angle Worms—Geo. W. Copley, Alton, Ills.—For an answer to your queries about Currant Borers, see page 79 of the present volume, under this same head. Angle worms never "assume the fly state." They do not belong to the true insects, but to a distinct class (*Vermes*) of the Jointed Animals (ARTICULATA), and undergo no transformations.

Apple-tree Leaf-crumplers—J. F. Jones, Mexico, Mo.—The worms which you send and which twist up the leaves of your apple trees, and thereby retard their growth, are the larvæ of a little gray moth known as *Phycita nebulo*, Walsh. See answer to J. J. Thomas, of Kaelme, Wis., on page 99 of No. 5.

A most Precious Bug—*Dr. E. S. Holmes, Grand Rapids, Mich.*—The ordinary-looking, dingy-colored, cylindrical beetle, scarcely half an inch long, and about four or five times as long as it is wide, of which you sent us four ♂ one ♀, delighted the very cockles of our heart, the instant that we got a lens to bear upon his body. He is a most precious rarity—the Melancholy Timber-pest (*Hylecoetus lugubris*)—described 34 years ago by Say as found by him in Indiana, in considerable numbers, flying and running over the bark of a prostrate maple on the 16th day of April. Say's collection of insects, as is well known to entomologists, was destroyed after his death; and since his time no one has been fortunate enough to meet with this insect, and not a single specimen of it, so far as we are aware, existed in any cabinet, whether public or private, up to this day. At all events, Dr. LeConte, in his edition of *Say's Works* in 1859 and in his *Catalogue of N. A. Coleoptera* in 1866, marks the species as unknown to him. It will from this period no longer remain unknown to him; for, in the noble generosity of our hearts, bearing in mind the many favors that we have received from this gentleman, we mailed him one fine ♂ specimen on the very next day after we received your letter. In the Great Book, where Sterne's Recording Angel keeps the Dr. and Cr. account of all our poor frail mortals, we have no doubt that this liberal act on our part is set down with as wide a margin to our credit, as if we had donated one thousand dollars for the civilization of the sooty inhabitants of Borra-bhoola Gha. Talk indeed of the vaunted liberality of Peabody or Stewart, in giving away one-tenth or one-twentieth of their vast pecuniary possessions, when they had already a thousand times as much money as they knew how to spend upon themselves! Why, we have actually given away with a free heart one entire fifth of our newly-acquired entomological wealth, although we can find good use for a hundred more such precious gifts as you have been kind enough to send us!

All the *N. A.* species of the small group of beetles (*Lymeriella* Family), to which this insect belongs, are of extreme rarity in this country, though a European species of this group, the Naval Timber-pest (*Lymeriella navale*), is very common and destructive in dock-yards and lumber-yards in the more northerly parts of Europe, boring up and spoiling in some instances millions of dollars' worth of valuable ship-timber. It was against this last insect that Linnaeus devised the ingenious expedient of sinking under water such timber, as the Swedish Government wished to preserve from its attacks, during the short period of the year when the pregnant female flies abroad to deposit her eggs. You will find further details on the subject of this simple remedy—which proved afterwards to be entirely satisfactory—in Harris's book on *Injurious Insects* (p. 37). Your specimens, as you tell us, came out on March 16th, in an old cigar factory, now used for office purposes. As Say's specimens came out just a month later and in a much more southerly region, the probability is that the appearance of yours was artificially accelerated by the fires kept up in the building during the winter. Doubtless, like other species of the family, they are timber-borers, and not, as you suggest may be possible, the perfect form of some kind of tobacco-feeding larva.

Throughout this entire Family, of which but two genera are found in the United States (*Lymeriella* and *Hylecoetus*), the maxillary feelers (*palpi*) of the males have a singular branched process of very considerable size growing from the side of the last joint but one. This process you noticed yourself, but do not seem to have remarked that it was peculiar to the male sex. The use of it is most probably to sooth the reluctant coyness of the females during the rutting season. Naturalists generally consider the specialization of any particular organ for any particular purpose as a sure indication, so far as that character goes, of a high grade in the scale of nature. If this be the correct doctrine—and we firmly believe in it ourselves—your beetles, so far as this particular organization of their feelers goes, must be of a higher grade than the species to which we ourselves have the honor of belonging. For when a young gentleman wishes to coax a kiss out of some coy young virgin, he has no specialized organ that he can call into play for this peculiar purpose, but is compelled to pass the very same arm round her waist or round her

neck, which has perhaps been employed all the preceding day in wielding the sledge-hammer, the trowel or the jack-plane.

Blackberry-cane Borers—*Chas. Parry, Cinnamonson, N. J.*—The pale-yellow boring larva, about an inch long, with a red head and blackish jaws, which bores into the heart or rather pith of your blackberry-canes near the root, and more especially into those of the Dorchester variety, are identical with a single specimen which we received two years ago from A. S. Fuller, of Ridgewood, in your State. That specimen unfortunately died, before it reached maturity; but we hope to have better success with yours. Till the perfect insect is bred, it is impossible to say what particular species this larva belongs to, as, with the exception of what has been stated above, it is unknown to science. It will, however, beyond all question produce some moth or other, and most probably some species belonging to the same genus (*Egeria*) to which also belongs the common Peach Borer. No such larva has hitherto, so far as we know, been recorded by any one else as infesting the blackberry; the common borer of that plant being a legless grub and producing a beetle (*Obera perspicillata*, Hald.), whereas your larva has sixteen legs and must necessarily therefore produce some kind of moth. Besides the species belonging to this genus (*Egeria*) which inhabits the Peach-tree, there are distinct species known to infest the Pear-tree, the Ash, the tame Currant, the wild Currant, the Grape-vine, the Squash and Pumpkin vine, the Poplar, the Maple and the Lilac. As a general rule, each species seems to confine itself to a distinct genus of plants; but the Peach-tree borer is occasionally found to attack the closely-allied Cherry-tree and Plum-tree, and we have bred what appears to be one and the same species (*hospes*, Walsh) both from a woody black fungoid swelling found on the twigs of Black and Red Oaks and from a similar fungoid growth on the Pignut Hickory.

You remark that "the hollow tube formed in the centre of the blackberry cane extends about three or four inches above the surface of the ground, and occasionally for a short distance into the root, the entrance to the tube being always near the surface of the ground." What you call the "entrance," is not the hole by which the young larva originally entered into the cane, after it hatched out from the egg deposited by the mother-moth on the surface of the cane. Such minute holes, bored by young larvae no thicker than a small pin, always fill up by the growth of vegetable matter. Your so-called "entrance" is, in reality, the hole made by almost all boring larvae to afford a ready means of escape to the perfect insect, and is therefore, not the point of entrance, but the point of exit.

The preference of the mother-moth of your Blackberry borer for the Dorchester variety of blackberry is another curious illustration of that remarkable "smartness" of certain bugs, to which we have called attention on page 160 of this number of the ENTOMOLOGIST.

Rows of Eggs in Pear twigs—*H. C. Freeman, South Pass, Ill.*—Of the two rows of eggs in pear twigs, one has hatched out already, as may be seen from the minute puncture in the bark covering each egg; in the other row the egg is still there, and is a flattened, oval, yellowish body placed immediately under the thin outer bark in an elevated sack, each egg closely adjoining its neighbor, so that the whole forms a whitish ridge, $\frac{3}{4}$ inch long and containing 18 eggs. We have never seen anything like this before and do not know what insect they belong to. We will try and hatch them out when the spring opens, and if successful will then advise you further. As to the first row that formerly contained eggs, we must remain in ignorance; for this too is new and unknown to us. The eggs of insects are many of them so closely alike, that it is often difficult to identify them with certainty.

Small Knots on Apple twigs—*G. C. Brackett, Lawrence, Kansas.*—The minute swellings or knots on the apple twigs which you send are most likely egg nests of some Tree-hopper. If you send us fresh specimens about the time that the buds begin to burst, we shall perhaps be able to ascertain definitely the species which produces them. Orange Judd & Co., of New York, have just published a new edition of Harris's work on *Injurious Insects*.

An Orchard giving out—*Wm. M. Clemons, Minerva, Iowa*.—The borer that works in your apple trees "just above the ground," is most probably the common Round-headed Borer (*Saperda bivitata*, Say). After he is once in the tree, the knife is the only mode to get rid of him; and you can easily see where one of these borers is at work, any time in the summer, by the rust-colored castings that they throw out of the crevices in the bark on to the ground. When first discharged, these castings look as if they had been forced through the barrels of a very minute double-barreled gun, being arranged closely together in two parallel strings. Of course, the first heavy rain disturbs this very singular arrangement—the cause of which is a perfect mystery to us, though the fact is indisputable. Hence, the best time to hunt these borers in an orchard, is after a long dry spell; for then you will see the greatest number of these curious double-barreled wads of rust-red excrement, which will show you where to look for Mr. Borer. Sometimes, but not often, he is found in the crotch.

The above kind of borer makes a hole about the size of a pea, that is newly round. There is another and a smaller kind—the Hammer-headed Borer (*Chrysobothris femorata*, Fabr.)—which makes a much smaller hole of an oval shape, being twice as long as wide. This kind is peculiarly fond of sun-scalded trees. You can keep both kinds out of the trunks of your trees by soaping the trunks about the last of May. The first kind is by far the most destructive of the two.

Plant-louse Eggs on Apple and Mountain Ash—*Wm. Stewart, Quincy, Ills.*—The minute oval shining-black eggs which you send—some on Apple and some on Mountain Ash twigs—are the same as those spoken of in the Answer to C. Williams on page 147 of our last number. The genus of trees popularly known as "Mountain Ash" (*Sorbus*), botanically speaking, has nothing whatever to do with true Ash (*Fraxinus*), but is so closely allied to Apple (*Pyrus*) that Dr. Gray considers it as a mere subgenus of that genus. Hence, although we are not personally aware of the fact, that the same species of Plant-louse that infests the Apple likewise infests the Mountain Ash, yet it may very probably do so. We know that the same indigenous Bark-louse (*Aspidiotus Larriisi*) attacks both trees indiscriminately. Still, the eggs of most insects are so simple in structure and coloration, and present so few distinctive characters, that the Mountain Ash Plant-louse may prove to belong to a distinct species from the common Apple Plant-louse (*Aphis mali*).

Peach Borer and "Sow-bugs"—*D. W. B. Kirtz, State University, Columbia, Mo.*—The insects which you took from the roots of your Peach trees reached us all smashed up, and as flat as a pancake. Soft larvae should never be enclosed loosely in a letter, as their lives under such circumstances can never be vouched for when they once get into Uncle Sam's clutches. We had no difficulty, however, in recognizing the large white grubs as the common Peach-borer (*Egeria vitiosa*, Say), while the little gray 14-legged animals were "sow-bugs," popularly so called. These last are not true insects but belong to the same class (*Crustacea*) as the lobster, craw-fish, etc. We judge that to be the species named the Un-spotted Porcellio (*Porcellio immaculatus*) by Dr. Fitch, though from their mangled condition it is impossible to tell definitely. These "sow-bugs" in reality do no harm to the trees, as they simply shelter in the holes which the Peach-borer has made, and subsist entirely on the gummy matter and detritus which said borer leaves behind him.

Gigantic Rhinoceros Beetle—*F. G. Smith Vaniz, Canton, Miss.*—The beetle which you found in a dry rotten log, is a ♂ specimen of the Gigantic Rhinoceros-beetle (*Dynastes Titus*, Linn.). The spots on the wing-covers vary greatly in size, form and position, while in some instances the wing-covers are uniformly chestnut-brown and immaculate. The ♀ lacks the peculiar Rhinoceros-like horns of the ♂.

Eggs under Scales of Apple-tree Bark—*G. C. Brackett, Lawrence, Kans.*—The eggs which you found under the scales of the bark of one of your apple-trees, are apparently those of some Lepidopterous insect. We can tell you nothing definite about them till they hatch.

Bee queries—*Wm. R. Howard, Forsyth, Mo.*—1st, "Langstroth on the Honey Bee" is the work you need; it is published by Orange Judd & Co., of New York, at \$2.00. 2nd, the bee-moth is always injurious to a hive of bees and never beneficial. 3rd, A new swarm is composed of both old and new bees, as may be ascertained by examining them the moment they are hived, when some will be found with the wings quite ragged, denoting age, while others are so young as to be scarcely able to fly. Thus your neighbors were each partly right and each partly wrong in their several assertions.

Supposed gall on Pear branch—*H. C. Freeman, South Pass, Ill.*—The roundish body, about the size of a hazel nut, "found around a node or new starting point of growth on a large stalk of pear-tree," is not a gall, nor has it anything to do with any insect, so far as appearances indicate. We take it to be simply a diseased mass of spongy dead wood, which has been surrounded by a new growth of solid and healthy wood. So that in all probability this is a nut that ought to be cracked by the plant-men and not by us bug-men.

Insects named—*Dr. W. W. Butterfield, Indianapolis, Ind.*—As to your *Clytus* (No. 4), it is probably the true *C. caprea*, Say, and Say was in error in describing the tip of the wing-case in this species as emarginate and spined. Dr. LeConte informs us that all the *caprea* in his possession have the tip of the wing-case simply rounded, and that he has never seen any with the apical spine, as described by Say. Generally, Say is exceedingly accurate; but we are none of us infallible, and it is a sure sign of an entomological charlatan to pretend to be so.

Elm Tree Borer—*Willie M. Gregory*.—The borer which you found while splitting dry elm wood, is evidently the larva of some long-horned beetle belonging to the *Cerambyx* family; but to what particular species it belongs, cannot be definitely ascertained till we breed it. Two beetles belonging to this family—the one known as the Lateral Saperda (*Saperda lateralis*, Fabr.), and the other as the Six-banded Dryobius (*Dryobius 6-fuscatus*, Say)—attack the elm in the larva state, and your borer may perhaps belong to one of these.

Insects named—*E. T. Dale, Yellow Springs, Ohio*.—We have since heard from Dr. LeConte, that your ground-beetle (No. 12) is *Bradyceilus vulpeculus*, Say. The genus *Bradyceilus* belongs to the same group (*Harpalini*) to which we referred your species. After the above lines were penned we received your letter stating that Mr. Cresson had referred it to the same species.

Singing mice—*W. H. Gill, York Station, Mo.*—Mice are not insects, and as this journal is the AMERICAN ENTOMOLOGIST and not the American Naturalist, we cannot enter upon the very singular subject of musical mice! Thanks for the curious extracts which you send us.

NOTICE.

All letters, desiring information respecting noxious or other insects, should be accompanied by specimens, the more in number the better. Such specimens should always be packed along with a little cotton, wool, or some such substance, in any little paste-board box that is of convenient size, and never enclosed loose in the letter. Botoists like their specimens pressed as flat as a pancake, but entomologists do not. Whenever possible, larvae (i. e. grubs, caterpillars, maggots, etc.) should be packed alive, in some tight tin box—the tighter the better—along with a supply of their appropriate food sufficient to last them on their journey; otherwise they generally die on the road and shrivel up to nothing. Along with the specimens send as full an account as possible of the habits of the insect, respecting which you desire information; for example, what plant or plants it infests; whether it destroys the leaves, the buds, the twigs, or the stem; how long it has been known to you; what amount of damage it has done, etc. Such particulars are often not only of high scientific interest, but of great practical importance.

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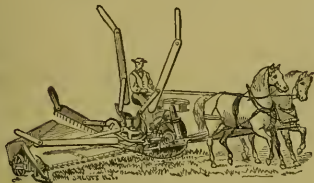
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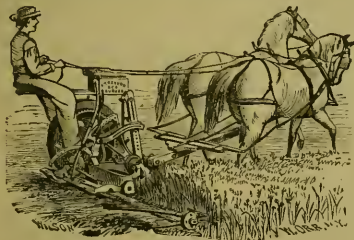


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THE CHINCH BUG.

(*Micropus leucopterus*, Say.)

If we ask the Western Fruit-grower, what particular insect is the most difficult for him to combat and the most destructive to his crops, he will probably answer "The Cureulio." If we put the same question to the Western Grain-grower, he will infallibly reply "The Chinch Bug." And he will be in the right. The Wheat-midge—popularly known in the West as the "Weevil" or the "Red Weevil"—does a considerable amount of damage there, in particular years and in particular localities, by its little legless orange-colored larva sucking away the sap from the growing kernel of the wheat. The Hessian Fly—often called simply "the Fly"—injures the wheat by the maggot that produces it living between the stem and the sheath of the blade, and intercepting the sap before that sap can reach the ear. The Grain Plant-louse, easily distinguished from the above two little pests by its long sprawling legs, has in certain years somewhat injured the small grain in the West, by accumulating, first on the growing stem and afterwards on the ear, and abstracting the sap with its long pointed beak. The Joint-worm—which we illustrated in a recent article—may likely enough exist in the West, forming unnatural galls on the stem not far from the ground. There are also in all probability several minute Two-winged Flies, the Natural History of which has not yet been fully developed, and which do more or less injury to the growing grain by their larvæ breeding in the stem. We are ourselves acquainted with the larva of some unknown

moth, which burrows upwards and downwards in the stem of oats and as we suspect of wheat also, causing the ear to become prematurely white and the kernel to be entirely blasted. The White Grub, the Wire-worm, and certain Cut-worms take a certain per centage of the young grain, almost as soon as it peeps out of the ground. But undoubtedly the meanest bug, out of the whole crowd of the multifarious insect-foes of the grain-growing farmer, is the Chinch Bug. He is not satisfied with taking a field here and a field there, and sparing the remainder. But when his time comes—and in mercy to the Western Farmer we are not cursed every year with this little savage—he sweeps the whole country with the besom of destruction. The Wheat-midge, the Hessian Fly, the Grain Plant-louse and the Joint-worm, destructive as they are to small grain, yet spare our corn. If they take the good white wheaten bread out of our mouths, they yet leave us an ample supply of corn-dodgers. But the Chinch Bug makes a clean sweep, whenever he gets the upper hand of us. He "goes the entire hog." Nothing in the way of grain comes amiss to him. He is not dainty, not he! Whenever he gets a chance to spread himself, he first of all at one fell swoop destroys the small grain, and then fastens his liquorish beak upon the corn and takes that also.

For two successive years—1866 and '67—we were entirely, or almost entirely, exempt from this most pernicious insect in the West. In 1864 it had been more destructive than usual; and again in 1868 it did considerable damage in certain counties in Southern Illinois and especially in South-west Missouri. Hence it is apprehended by many that it is likely to be as destructive as ever in 1869. We propose, in this article, to show upon what contingencies that event depends—under what particular circumstances the insect is likely to be as destructive as ever, and under what other particular circumstances it will be certain to do us no damage of any consequence. Surely, if we could do no more than this, the information would be worth our subscription-money ten times over, to every grain-grower who does not

live from hand to mouth. Suppose, for example, that a certain grain-grower is holding over a thousand bushels of good plump wheat, uncertain whether or not to throw that amount into market in the spring of '69; and suppose, from what he reads in the AMERICAN ENTOMOLOGIST, he becomes aware that the wheat crop of '69 is likely to be badly shrunk by the Chinch Bug, so that a good article of wheat will command a much higher price in the autumn of '69 than in the spring of '69—say fifty cents per bushel more. If this grain-grower holds over his wheat and realizes the additional price upon it, he then clears \$500, less six months' interest on what the price would have been in the spring and deducting also for the wastage in the granary; and so in proportion for any smaller amount of wheat that he holds on to. Surely, then—assuming the state of things to be as represented above—he ought not to grudge the paltry dollar, that he pays for the information upon which his successful speculation is based.

But, besides enabling the Western wheat-grower to tell beforehand whether the Chinch Bug is, or is not, likely to be destructive in the ensuing season, we shall point out the most effective means to prevent its undue multiplication, and shall moreover give a few hints as the best mode of fighting it when it is already in great force upon the farmer's crops. We do not profess to offer any new and original invention for these two very important objects. Quite the contrary. Almost everything that we have to say upon this subject has already appeared in print. But, seeing that such a vast mass of contradictory and impossible absurdities has been put forth about this insect, surely it is something considerable gained, if we can succeed in winnowing away the chaff from the wheat, and present our readers with the pure truth unalloyed by misstatement and error.

In investigating the Natural History of this insect—which is in every case the first step to be taken before we can begin to talk about any rational remedy—we shall be compelled to criticize, perhaps with undue severity, some of those who have criticized us. As for ourselves, we have never claimed to be infallible, and have never felt in the least offended or annoyed, at having our statements corrected and our inferences called in question, by authors who have thought fit to do either the one or the other. We hope, therefore, that these authors will not begrudge us the privilege which they have so freely exercised themselves.

Past History of the Chinch Bug.

The first record we have of the prevalence of the Chinch Bug was in the old Revolutionary times in North Carolina, where it was confounded with the Hessian Fly, an insect just then imported from Europe into the United States. Ever since these times it has been an epidemic pest, in particular years, in North and South Carolina and in Virginia. The great American entomologist, Thomas Say, in 1831, when he had been residing in Indiana for six years, was the first to name and describe it scientifically. He states that he "took a single specimen on the Eastern shore of Virginia;" whence we may reasonably infer that it was then either unknown or very rare in Indiana, and probably also in the other Western States. In Illinois it was first noticed in the year 1840 in Hancock county, which lies on the extreme western border of Central Illinois; and being absurdly supposed to have been introduced by the Mormons of Nauvoo was called the "Mormon louse." In Mercer Co., which lies about 60 miles to the North-east of Hancock, it was not observed by the farmers, as we learn from Mr. Wm. R. Riggs of that county, till the year 1845. In Winnebago Co., which lies about 110 miles still further to the North-east, "the first year of Chinch bug," according to Mr. D. S. Pardee of that county, was 1849.* In DeKalb Co., which lies immediately to the South-east of Winnebago, it was first noticed in 1850, according to Wm. Patten, of Sandwich, in that county. In LaSalle Co., which lies immediately South of DeKalb, according to Charles Hastings of that county, it was not observed by farmers till the year 1854, and even then it did but little damage, though in '55 it was very destructive there.† But, according to the more reliable testimony of Dr. LeBaron, of Geneva, Kane county, it prevailed in 1850 throughout Kane and the adjoining counties [DeKalb, Kendall, DuPage, Cook and McHenry] in ruinous profusion.‡

Putting all these facts together, we may conclude, either that the Chinch Bug gradually spread into Illinois and the other Western States from North and South Carolina and Virginia—just as the Hessian Fly, the Wheat Midge, the Locust-borer, and the Imported or Oyster-shell Bark-louse have spread there from the Eastern States—or else, which we rather incline to believe, that it has always existed in

* See *Trans. Ill. St. Agr. Society*, IV, p. 314.

† These two last statements are quoted on the authority of Fitch, *N. Y. Rep.* 1. p. 284.

‡ See his excellent article on the Chinch Bug in *Prairie Farmer*, Sept., 1850, p. 280.

the West in very small numbers, but that it was for a long time prevented by certain causes from multiplying to the injurious extent that it now does. At all events, we know from the evidence of Dr. Harris and Dr. Fitch, that it existed long ago in exceedingly small numbers in New York, and even in Massachusetts. What the causes may have been, that thinned out the numbers of this insect in former times in the West, is another question. We strongly suspect that, in former times, the great bulk of these bugs were destroyed every winter by the prairie fires, and that, as cultivation has extended in consequence of the country being gradually settled up, and less and less prairie has been annually burnt over, the number that has survived through the winter to start the next year's broods has annually become greater. If these views be correct, we may expect them, unless more pains be taken to counterwork and destroy them, to become, on the average of years, still more abundant than they now are, whenever prairie-fires shall have become an obsolete institution; until at last Western farmers will be compelled, as those of North Carolina have already several times been compelled, to quit growing wheat altogether for a term of years.

It may be very reasonably asked, why the Chinch Bug does not increase and multiply in Massachusetts and New York, seeing that it existed there long ago, and that there are, of course, no prairie-fires in those States to keep it in check. The answer is, that the Chinch Bug is a Southern, not a Northern species; and that hundreds of Southern species of insects, which on the Atlantic seaboard only occur in southerly latitudes, are found in profusion in quite a high latitude in the Valley of the Mississippi. The same law, as has been observed by Prof. Baird, holds good both with Birds and with Fishes.*

Natural History of the Chinch Bug.

In the four great and extensive Orders of Insects, namely, the Beetles (*Coleoptera*), the Clear-winged Flies (*Hymenoptera*), the Scaly-winged Flies (*Lepidoptera*), and the Two-winged Flies (*Diptera*), and in one of the four small Orders in its restricted sense, namely, the Net-winged Flies (*Neuroptera*), the insect usually lies still throughout the pupa state, and is always so far from being able to eat or to evacuate, that both mouth and anus are closed up by membrane. In the remaining three small Orders, on the contrary, namely, that of the Straight-

winged Flies in its most extensive sense (*Orthoptera* including *Pseudo-neuroptera*), the Half-winged Bugs (*Heteroptera*) and the Whole-winged Bugs (*Homoptera*), the pupa is just as active and just as ravenous as either the larva or the perfect insect, and the little creature never quits eating as long as the warm weather lasts, except for a day or so while it is accomplishing each of its successive three, four or five moults. As the Chinch Bug belongs to the Half-winged Bugs, it therefore continues to take food, with a few short intermissions, from the day when it hatches out from the egg to the day of its unlamented death.

Most insects—irrespective of the Order to which they belong—require 12 months to go through the complete circle of their changes, from the day that the egg is laid to the day when the perfect insect perishes of old age and decrepitude. A few require 3 years, as for example the Round-headed Apple-tree Borer (*Saperda bivitata*, Say) and the White Grub which produces the May-bug (*Lachnosterna quercina*, Knoch.) One species, the Thirteen-year Locust (*Cicada tredecim*, Riley), actually requires 13 years to pass from the egg to the winged state; and another, the Seventeen-year Locust (*Cicada septemdecim*, Linn.), the still longer period of 17 years. On the other hand there are not a few that pass through all their three states in a few months, or even in a few weeks; so that in one and the same year there may be 2, 3 or even 4 or 5 broods, one generated by the other and one succeeding another. For example, the Hessian Fly (*Cecidomyia destructor*, Say), the common Slug-worm of the Pear (*Selandria cerasi*, Peck), the Slug-worm of the Rose (*Selandria rosa*, Harris), the Apple-worm and a few others, produce exactly two generations in one year, and hence may be termed "two-brooded." Again, the Colorado Potato-bug in North Illinois is three-brooded, and not improbably in more southerly regions is four-brooded. Lastly, the common House-fly, the Cheese-fly, the various species of Blow-flies and Meat-flies, and the multifarious species of Plant-lice (*Aphis*) produce an indefinite number of successive broods in a single year, sometimes amounting in the case of the last-named genus, as has been proved by actual experiment, to as many as nine. So far as regards the Chinch Bug, we know from the very valuable and pains-taking observations of Dr. H. Shimer, that in North Illinois it produces just two generations or broods in one year. But it is quite agreeable to analogy, that in more southerly latitudes it may be three-brooded or possibly

* Silliman's Journal, XLI, p. 87.

even four-brooded. For instance, the moth known as the Poplar Spinner, (*Clostera americana*, Harris), is stated by Dr. Harris and Dr. Fitch to be only single-brooded in Massachusetts and New York, the insect spinning up in September or October, passing the winter in the pupa state, and coming out in the winged form in the following June. But Dr. Harris—no doubt on the authority of Abbott—states that “in Georgia this insect breeds twice a year.”* and we ourselves reared numerous specimens of the moth, July 19th and subsequently, from larvæ obtained at Champaign in Central Illinois at the beginning of the same month of the same year. Whence it necessarily follows, that in Central Illinois, as well as in Georgia, this species must be double-brooded; for otherwise the majority, at all events, of our larvæ would have remained in their cocoons till the following spring; whereas every cocoon that we obtained produced a moth the same season, and in ample time for a second brood of caterpillars to mature from the eggs laid by this brood of moths. If, therefore, the Poplar Spinner can be single-brooded in Massachusetts and New York, and double-brooded in Central Illinois and in Georgia, it is quite reasonable to infer that an insect such as the Chinch Bug, which in North Illinois is only allowed by the shortness of the summer to mature two broods, may be enabled in regions where the summer is so much longer to mature three or possibly even four broods.

It is these two peculiarities in the habits of the Chinch Bug, namely, first, its continuing to take food from the day of its birth to the day of its death, and secondly its being either two-brooded or many-brooded, that renders it so destructive and so difficult to combat. Such as survive the autumn, when the plants on the sap of which they feed are mostly dried up so as to afford them little or no nourishment, pass the winter in the usual torpid state, and always in the perfect or winged form, under dead leaves, under sticks of wood, under flat stones, in moss, in bunches of old dead grass or weeds or straw, and often in corn-stalks and corn-shucks. In the winter all kinds of insect-devouring animals, such as birds, shrew-mice, etc., are hard put to it for food, and have to search every hole and corner for their appropriate prey. But no matter how closely they may thin out the Chinch Bugs, or how generally these insects may have been starved out by the antumnal droughts, there will always be a few left for seed next year. Suppose that there are only 2,000 Chinch Bugs remaining in the spring

* *Injurious Insects*, p. 434.

in a certain field, and that each female of the 2,000, as vegetation starts, raises a family of only 200, which is a low calculation. Then—allowing the sexes to be equal in number, whereas in reality the females are always far more numerous than the males—the first or spring brood will consist of 200,000, of which number 100,000 will be females. Here, if the species were single-brooded, the process would stop for the current year; and 200,000 Chinch Bugs in one field would be thought nothing of by the Western farmer. But the species is not single-brooded and the process does not stop here. Each successive brood increases in numbers in Geometrical Progression, unless there be something to check their increase; until the second brood amounts to twenty millions, and the third brood to two thousand millions. We may form some idea of the meaning of two thousand millions of Chinch Bugs, when it is stated that that number of them, placed in a straight line head and tail together, would just about reach from the surface of the earth to its central point—a distance of four thousand miles.

Dr. Shimer states that “on May 16, 1865, a bright, sunny, summer-like day, the atmosphere was swarming with Chinch Bugs on the wing at Mt. Carroll, in North Illinois.” “They were so numerous,” he adds, “alighting on the pavements in the village, that scarcely a step could be taken without crushing many of them under foot. In a few days they had all disappeared.” He had, as he tells us, witnessed the same phenomenon in their “antumnal love-season” in the year 1861, and again in the year 1864; and it appears from the context that by “antumnal” he means a period in the year at least as early as August.* In the course of an entomological experience of eleven years in North Illinois, we have ourselves witnessed one such flight of Chinch Bugs—not however by any means as copious a one as that described by Dr. Shimer—and this occurred near Rock Island on July 26th, 1864. Dr. Shimer deduces from the facts observed by him what seems to us rather a strained inference, namely, that it is the normal habit of these insects to take wing in vast droves every spring and summer, or as he would call it “antumu;” that these occasions form their only “love-seasons;” and that “these remarkable little creatures prefer to conduct their courtships under the searching gaze of the noonday sun.” If his theory were correct, and Chinch Bugs regularly took wing in North Illinois in vast swarms twice every year, it seems

* See Dr. Shimer’s Paper in Trans. N. Ill. Hort. Soc. and compare pages 98 and 99.

to us that we must ourselves have noticed more than one such flight in the course of eleven years' careful observation. Our own private opinion is, that it is only when Chinch Bugs have become so unduly numerous, as to be instinctively aware that they must either emigrate or starve, that they take wing in the manner occasionally observed both by Dr. Shimer and by ourselves. This is strictly analogous to the habits of the Army worm, and the different migratory Grasshoppers, whether European or American; all of which insects, and many others which might be mentioned, do not emigrate regularly every year, but only in those particular years when their numbers happen to have become very large and food begins to run scarce. Be this as it may, Dr. Shimer's concluding remarks are correct, so far as our observations extend: "At no other time save their love-season, twice a year, have I ever seen one Chinch Bug flying. It is quite remarkable that the winged insect, under no other circumstances, will even attempt to use its ample wings. No threatening danger, however imminent, whether of being driven over by grain-reapers' wagons, or of being trodden under foot, etc., will prompt it to use its wings to escape. I have tried all imaginable ways to induce them to fly, as by threshing among them with bundles of rods or grass, by gathering them up and letting them fall from a height, etc., but they invariably refuse entirely to attempt to use their wings in escaping from danger." Mr. D. K. Emerson, however, of Stoughton, Dane county, Wis., is reported in the *Proceedings of the New York Farmers' Club* as saying that "after they commence flying, corn is too far advanced for them to damage, as it is too ripe to roast;" which would bring the period of their flying well on into September, instead of the orthodox "love-season" of July. And Dan. F. Rogers, of Waltham, LaSalle county, North Illinois, gives the following graphic account of their vagaries, from which it follows that, at the very period of the year when, according to Dr. Shimer's theory, the insect ought to be in the air and using its wings, it was crawling rapidly along the earth in vast crowds in the most heterodox manner, and without paying any attention to Dr. Shimer's so-called "love-season," was actually traveling a-foot in a provokingly irregular way in the very midst of harvest.

There never was a better "show" for wheat and barley than we had here the 10th of June, and no more paltry crop has been harvested since we were a town. Many farmers did not get their seed. In passing by a field of barley where the Chinch Bugs had

been at work for a week, I found them moving in solid column across the road to a corn field on the opposite side, in such numbers that I felt almost afraid to ride my horse among them. The road and fences were alive with them. Some teams were at work mending the road at this spot, and the bugs covered men, horses and scrapers till they were forced to quit work for the day. The bugs took ten acres of that corn, clean to the ground, before its hardening stalks—being too much for their tools—checked their progress. Another lot of them came from a wheat field adjoining my farm into a piece of corn, stopping now and then for a bite, but not long. Then they crossed a meadow 30 rods into a 16-acre lot of sorgho, and swept it like a fire, though the cane was then scarce in tassel. From wheat to sorgho was at least sixty rods. Their march was governed by no discoverable law, except that they were infernally hungry, and went where there was most to eat. *Helping a neighbor harvest* one of the few fortunate fields, early sown—and so lucky!—we found them moving across his premises in such numbers that they bid fair to drive out the family. House, crib, stable, well-curb, trees, garden fences—one creeping mass of stinking life. In the house as well as outside, like the lice of Egypt, they were everywhere; but in a single day they were gone.*

It has long been known that the Chinch Bug deposits its eggs underground and upon the roots of the plants which it infests, and that the young larvæ remain underground for some considerable time after they hatch out, sucking the sap from the roots. If, in the spring of the year, you pull up a wheat plant in a field badly infested by this insect, you will find hundreds of the eggs attached to the roots; and at a somewhat later period the young larvæ may be found clustering upon the roots and looking like so many moving little red atoms. According to Dr. Shimer, the egg is so small as to be scarcely visible to the naked eye, of an oval shape, about four times as long as wide, of a pale amber white color when first laid, but subsequently assuming a reddish color from the young larva showing through the transparent shell.† As the mother Chinch Bug has to work her way underground in the spring of the year, in order to get at the roots upon which she proposes to lay her eggs, it becomes evident at once, that the looser the soil is at this time of the year the greater the facilities which are offered for the operation. Hence the great advantage of ploughing land for spring grain in the preceding autumn, or, if ploughed in the spring, rolling it repeatedly with a heavy roller after seeding. And hence the remark frequently made by farmers, that wheat harrowed in upon old corn-ground, without any ploughing at all, is far less

* From the *Proceedings of the N. Y. Farmers' Club*, printed in the *N. Y. Sem. Tribune*, June 13, 1865.

† In Dr. Shimer's Paper the dimensions of the egg, as "determined with fine mathematical instruments," are said to be ".04 inch long and 0.01 inch wide." (p. 93.) We never measured the egg ourselves, but we suspect that this is either a clerical or a typographical error for ".004 inch long and 0.001 inch wide." Otherwise the egg would be nearly one-third as long as the insect itself; and as Dr. Shimer thinks that every female lays about 500 eggs, this would be something like getting a bushel of wheat out of a quart measure.

infested by Chinch Bug than wheat put in upon land that has been ploughed. There is another fact which has been repeatedly noticed by practical men. This insect cannot live and thrive and multiply in land that is sopping with water; and it generally commences its operations in early spring upon those particular parts of every field where the soil is the loosest and the driest.

There are, as is well known to Entomologists, many genera of the Half-winged Bugs, which in Europe occur in two distinct or "dimorphous" forms, with no intermediate grades between the two; namely, a short-winged or sometimes even a completely wingless type and a long-winged type. Frequently the two occur promiscuously together, and are found promiscuously copulating so that they cannot possibly be distinct species. Sometimes the short-winged type occurs only in particular seasons and especially in very hot seasons. More rarely the short-winged type occurs in a different locality from the long-winged type, and usually in that case in a more northerly locality. We have a good illustration of this latter peculiarity in the case of the Chinch Bug, of which we received eleven specimens (Fig. 122)

[Fig. 122.]



Colors—Black and dirty white.

some years ago from Canada West, that unquestionably are a dimorphous short-winged form of the normal long-winged form found so abundantly in the Western States. So far as we are advised, it has never occurred in such numbers in Canada as to do any damage there; neither is such an event probable, because, as already stated, the Chinch Bug is decidedly a Southern species and does not flourish even in New England and New York.

Natural Checks to the Multiplication of the Chinch Bug.

It will be asked why Chinch Bugs do not increase every season, with the same frightful rapidity and at the same terrific rate of Geometrical Progression, that has been referred to above. The answer is simple. They are checked in their increase in certain years by two causes, first, the prevalence of frequent heavy showers, and second, by being themselves preyed on by several carnivorous or cannibal insects and

to a certain extent by birds. We will now discuss the first branch of this subject, and afterwards take up the second. As to the popular idea, that cold winters kill this and other noxious insects, we do not believe that there is any truth in it. You may take any large wood-boring larva and expose it to a temperature of many degrees below zero, till it freezes as solid as an icicle; and you may then take it into a warm room and thaw it out, and it will be as brisk and as lively as ever. It is very true that it requires a very low temperature to freeze such a larva—probably for the same reason that gum-water will not freeze at any ordinary temperature—but still freezing, even if repeated several times, does not seem to injure its vitality in the least. As a general rule, we believe that it is only extremes of drought and moisture, and not extremes of heat and cold, that affect insects injuriously. Some of the very worst summers for noxious insects have followed very cold winters.

Heavy Rains destructive to the Chinch Bug.

As the Chinch Bug, unlike most other true Bugs, deposits its eggs underground, and as the young larvæ live there for a considerable time, it must be manifest that heavy soaking rains will have a tendency to drown them out. The simple fact, long ago observed and recorded by practical men, such as Mr. B. E. Fleharty of North Prairie, Knox county, Ills., that this insect scrupulously avoids wet land, proves that moisture is naturally injurious to its constitution. Hence it was many years ago remarked by intelligent farmers, and we have ourselves repeatedly observed the same thing, that very often when the spring opens dry Chinch Bugs will begin to increase and multiply in an alarming manner; but that the very first heavy shower checks them up immediately, and repeated heavy rains put an almost entire stop to their operations. It is very true that nearly all insects will bear immersion under water for many hours, and frequently for a whole day, without suffering death therefrom; for although animation is apparently suspended in such cases, they yet, as the phrase is, "come to life again." But no insect, except the few that are provided with gills like fishes and extract the air out of the water, instead of breathing it at first hand, can stand a prolonged immersion in water without drowning. And it must be obvious to the meanest capacity, that an insect, such as the Chinch Bug, whose natural home is the driest soil it can find, will have its health injuriously affected by a prolonged residence in a wet soil.

Here we might stop. The thing is so plain that even a child can understand it. It is no new theory of ours. It is simply the result of the experience of all the intelligent farmers of the West for a long series of years. It may be expressed in these words: *In a hot, dry season Chinch Bugs are always the worst; in a wet season it is impossible for them to do any considerable amount of damage.* But Dr. Henry Shimer is not satisfied with a theory so simple and clear, that it scarcely deserves the name of theory. He has gotten up and expounded to the world a new and recondite theory of his own, namely, that in the terribly wet season of 1865, when the Chinch Bug, although in early spring it had appeared in very great numbers, was almost annihilated in the course of the summer, it perished, not as others had foolishly supposed, from the direct operation of the rain, but indirectly through a certain mysterious epidemic disease, analogous to the Cholera or the Yellow Fever among human beings. He fully allows that the mortality among the Chinch Bugs was contemporaneous with the wet weather; but he will have it that it was not the wet weather that killed the Bug, as we common folks have always hitherto believed, but that it was his newly-discovered Epidemic Disease. He gives no name to this disease; but we think that those who may still believe in its existence should, for convenience' sake and for the sake of additional scientific display, call it for the future "FEBRIS SHIMERANA."

In science, when a new theory is broached, we always ask, "Where are the proofs of it?" Here follows all the proof, that we have been able to find of this hypothesis of Dr. Shimer's, after repeatedly perusing his own Paper on the subject.* As in common fairness bound, we quote his own language at full length. The italics are ours, not his.

PROOF 1ST (p. 101).—"There can be no doubt about this being an epidemic disease, because the insects died without attaining their maturity."

PROOF 2ND (p. 101).—"This disease among the Chinch Bugs was associated with the long-continued wet, cloudy, cool weather that prevailed during a greater portion of the period of their development, and doubtless was in a measure produced by deficient light, heat and electricity, combined with excessive humidity of the atmosphere, whereby an imperfect physical ('bug') organization was developed. The disease was at its maximum during the moist warm weather that followed the cold rains of June and the first part of July. The young Chinch Bug spent a great portion of its time on or near the ground, where its body was colder than the atmosphere; hence, upon philosophical principles, there must have been an excessive precipitation of watery vapor in the bronchial tubes. These are the facts in the case."

We are no physicians ourselves; but in all humility we should like to ask the following

* First printed in *Proc. Acad. Nat. Sc. Phil.*, May 1867; reprinted in *Trans. N. H. Hort. Society*, 1867-8, pp. 97-101.

most unprofessional questions of Dr. Shimer, before we can consent to believe that the above two quotations demonstrate the existence of *Febris Shimerana*.

AS TO HIS PROOF 1ST.—Half the children that are born die before they are one year old. Does it follow therefore that they all die of "epidemic disease?" And if not, why not? Surely this would be just as legitimate an inference as Dr. Shimer's. Again, we have ourselves repeatedly had whole broods of larvæ, that we were endeavoring to rear to the perfect winged form, perishing "without attaining maturity." Hitherto we had always supposed that they died because we had kept them too dry or too moist, given them the wrong food, etc., etc. Did they in reality die of *Febris Shimerana*? Certainly such an inference would be just as legitimate as the inference quoted above, namely, that the Chinch Bugs in 1865 MUST have died of epidemic disease, simply because they "died without attaining their maturity."

AS TO HIS PROOF 2ND.—If *Febris Shimerana* is produced by "an excessive precipitation of watery vapor in the bronchial tubes" of the Chinch Bug, in consequence of "its body being colder than the atmosphere;" how does it come about that, according to Dr. Shimer himself, this dreadful epidemic disease commenced with the "cool weather" and was only at its "maximum during the moist warm weather?" Or is the body of the Chinch Bug naturally so cold, when it is "on or near the ground," that even in "cool weather" it is so much colder than the atmosphere, as to cause the "precipitation of watery vapor in its bronchial tubes?" If so, we should like to know what prevents this "precipitation of watery vapor" every year, and why the dreadful epidemic only prevailed in 1865? The whole thing from beginning to end is pure assumption. Neither Dr. Shimer nor any other mortal man ever inserted the bulb of a thermometer into the "bronchial tubes" of a Chinch Bug, so as to ascertain what the temperature there was. Besides, the theory contradicts itself. First, we are told that *Febris Shimerana* is "doubtless in a measure produced by deficient heat" in the atmosphere, and then immediately afterwards it is accounted for on the hypothesis of the "body of the Chinch Bug being colder than the atmosphere," which implies a superabundance of heat in the atmosphere. And such gratuitous assumptions as these are called "facts," and such untenable principles are put forth with a great parade of learning as "philosophical!" Verily, if this is philosophy, we do not know where we can go to find charlatan-

ism. And all this from an author who sees fit to read his entomological brethren a severe lecture for "filling their pages with the unreliable and worthless sayings of incorrect observers, chiefly correspondents;" for "speaking from conjecture and comparisons and hearsay;" and for being "all of them one-idea men, who get the BUG so close up to their eyes, that there is danger that it may obscure even the light of the sun!" And who finally, after depreciating the labors of all his predecessors, complacently blows his own trumpet, at the end of his precious jumble of false physiology, illogical inferences, and gratuitous assumption, by asserting that his Article is "the most complete Natural History of the Chinch Bug upon record." We do not now deny, and never have denied, that Dr. Shimer is a good observer; and so long as he confines himself to telling us what he has seen with his own eyes, we are always glad to hear from him. But it is really too bad to be dosed with gaseous speculations, about "the precipitation of watery vapor in the bronchial tubes" of a Chinch Bug, by a writer who tells us in the same breath, that he "has long ago come to the conclusion, that we have no right to know anything by mere conjecture, unsupported by observation."

Prophecies About the Chinch Bug.

One of the most dangerous things for a Naturalist to attempt is to prophecy. We have ourselves in bygone years put forth two prophecies as to the future progress of certain insects; 1st, in the year 1865, one year after the Colorado Potato Bug had invaded the western limits of Illinois, that it would subsequently sweep westward at the rate of some fifty miles a year till it touched the Atlantic Ocean; 2d, in the year 1866, that the Colorado Grasshopper would not progress westward in that manner, but that on the contrary it would never get farther east than the western half of Iowa and of Missouri. We leave others to say how far these prophecies of ours have been verified by subsequent events. Now let us see what success Dr. Shimer has had in prophecying as to the future doings of the Chinch Bug in Illinois. On February 11th, 1868, at Freeport in North Illinois, he thus discourses before the North Illinois Horticultural Society:

Even our State Entomologist, Mr. Walsh, believes that Chinch Bugs are many-brooded, and strangely, after the great epidemic of 1865, that almost swept the last vestige of them away, teaches (lecture before the Horticultural Society, Mt. Carroll, Dec. 19, 1867,) that when we have a wet spring we will [shall] not have many Chinch bugs, but that whenever we have a dry spring we will [shall] be troubled again with them as

heretofore. Where is the seed of them? I HERE STAKE MY REPUTATION AS A NATURALIST on the declaration, that for our region of country it will require many years of warm dry summers and mild or snowy winters for protection, to develop such a numerous host of Chinch Bugs as we had in 1863, '64 and '65.

Assuming that the above prophecy of Dr. Shimer's was intended to apply only to the State of Illinois, and not to the whole Western region which is subject to the attacks of the Chinch Bug, let us see how far, in that one single State, his prediction has been verified by facts. Of course, if it was really an Epidemic Disease, like the Cholera, and not merely the direct operation of the wet weather, that caused the great mortality among the Chinch Bugs in 1865, it is unreasonable to suppose that this Epidemic Disease could only have spread through a single township, or a single county, or any very limited extent of territory. We think, therefore, that we are safe in inferring, that Dr. Shimer intended his observations to apply to a district of land at least as large as the whole State of Illinois. Now, if we search the valuable "Records of the Season" which appeared weekly in the year 1868, in the *Prairie Farmer*, we shall find the following paragraphs, dated from several counties in South Illinois some six months after Dr. Shimer had discoursed as quoted above:

Clinton Co., Ills., Aug. 1, 1868.—I think I might say with safety, that one-tenth of the corn planted in this neighborhood was entirely killed by the Chinch Bugs in ten days after wheat harvest, at which time we had a good rain that seemed to stop operations. The ground is now getting quite dry and a fresh crop of Chinch Bugs are hatching by the myriad. It does not appear to make any difference now whether it is near wheat-stubble or not, for I saw to-day on new land just cleared of timber last winter (full 80 rods from where wheat ever grew) stalks that were blown down, almost covered, and the ground under them red with the little pests, scarce able to crawl. Unless we have a great deal of rain this month and next, I think our corn must be very light. C. T. S.

Randolph Co., Ills., Sept. 3, 1868.—On account of the repeated very dry season and the ravages of Chinch Bugs, corn-raising in this county is nearly abandoned. In addition to the general extreme heat, we have had no rain here so as to wet the ground half an inch during the months of June, July and August until August 28th. W. A.

Clinton Co., Ills., Sept. 19, 1868.—It was quite dry here the last half of July and up to the 20th of August. As I expected when I wrote to you last, the bugs sucked our corn very hard, so that a great deal of it will be quite light and chaffy. Had a good rain on Aug. 20th, which cleared the bugs from the corn. C. T. S.

Effingham Co., Ills., Oct. 4, 1868.—We should have had a good crop of corn this year, had it not been for the ravages of that most detestable of all insects, the Chinch Bug, which has been working on our own corn since the 1st of July. K. G. E.

The following appeared in the *Western Rural* of Aug. 1, 1868, from the pen of a correspondent:

Effingham Co., Ills., July 20, 1868.—Owing to the dry weather from June 8th till harvest, the Chinch Bug has injured the wheat crop very much—almost, if not quite one-half. They have destroyed hundreds of acres of corn in this and adjoining counties. W. B.

On July 18, 1868, Col. Hecker, of Lebanon, St. Clair Co., Ills., wrote to us as follows:

The Chinch Bug this year has ruined a great many fields of corn in this neighborhood, and I attribute the failure of our wheat crop to the same insect. The ears became dead just when the dough of the kernel was forming, that is, when the kernel was in the milky state. As the Chinch Bug was in our wheat fields by millions, I suppose that, in consequence of its abstracting the sap of the plant, the ears could not fill.

Thus it appears that throughout a large district of Southern Illinois, where there was long-continued drought during the summer of 1868, the Chinch Bug was very numerous and very destructive that summer. On the contrary, in Northern Illinois, which did not experience any scarcity of seasonable rains in the summer of 1868, there was no complaint whatever of the Chinch Bug, although a few solitary specimens were noticed there that summer even on the extreme northern verge of the State, as, for example, by Mr. Elisha Gridley, at Half Day, Lake Co.

The above quoted cases will probably be enough to satisfy the reader, as to the truth of the common old-fashioned theory, the fallaciousness of Dr. Shiner's new-fangled notion, and the unreliability of that gentleman's entomological prophecies. But, if necessary, it would be easy to multiply such communications as these from other sources; and we have ourselves, in the course of our peregrinations through Southern and Central Illinois, heard of other such cases in other counties. It is certainly most unfortunate for the scientific reputation of a naturalist, that after he had pledged that reputation in February upon the assertion, that the Chinch Bug could never swarm as it used to do in Illinois for many years to come, the little rascal should be provoking enough to do so only six months afterwards! We fear, however, that, in spite of the notorious falsification of his prophecies, the prophet will blame us greatly for "filling our pages with the unreliable and worthless sayings of incorrect observers, chiefly correspondents." But, for our own part, we must say that we set much more store by ten lines of plain facts from the pen of a practical farmer than by a whole printed volume of physiological speculations from a Doctor of Medicine, about "the precipitation of watery vapor in the bronchial tubes of a Chinch Bug."

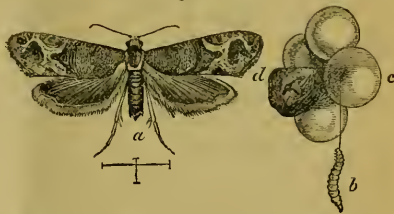
[TO BE CONCLUDED IN OUR NEXT NUMBER.]

As some of our exchanges may wish to illustrate any article they may copy from the AMERICAN ENTOMOLOGIST, we have decided to furnish electrotypes of our wood cuts, at one-half the cost of engraving; these electrotypes to be retained by the parties receiving them, if they desire it.

THE GRAPE-BERRY MOTH.

(*Penthina vitivorana*, Packard.)

[Fig. 123.]



Colors—(a) deep brown, pale buff and slaty; (b) olive-green or brownish.

It is surprising to notice what a great change sometimes takes place in the fauna and flora of a newly settled country like our own, in the short space, even, of a single decade of years. It is a well known fact among botanists that a great many of our indigenous North American plants have already become almost, if not quite extinct, while other species and varieties have taken their places; and the entomologist who collects, for a dozen years, in one and the same locality—no matter how limited that locality may be—is pretty sure to find new species every year, while many of those which he first found in abundance either become rare or disappear entirely. The late Dr. Harris, writing to Mr. Edward Newman, in 1844, remarked: "Were I to be required to say in one word What is the System of Nature? I should say, Variety;" and if a second word were to be added, we think that word should be, Change! Scarcely a year passes but some new insect foe suddenly makes its appearance amongst us; and were it not for the fact that the ravages of others are at the same time abating, the destruction which they unitedly would cause would be intolerable.

The insect which forms the subject of this article may be cited as an illustration of such a sudden appearance in many different parts of the country, for until last year no account of it had ever been published, and it was entirely unknown to science. It had, however, been observed at Hudson, Ohio, for three or four years past, by Mr. M. C. Read, of that place, and several gentlemen who live in different parts of Missouri and South Illinois have informed us that they have also been acquainted with it for about that number of years, though they all testify that it has gradually been on the increase, and that it was never so numerous as last year. Last summer we received specimens

of it from Mr. Read, and likewise from Mr. Huron Burt, of Williamsburg, Missouri, and we found it universal in the vineyards along the Pacific and Iron Mountain railroads, in the last named State. It was equally common around Alton, in Illinois, and we were informed by Dr. Hull, of that place, that it ruined fifty per cent. of the grapes around Cleveland, Ohio. It also occurs in Pennsylvania, judging from articles which appeared in the November and December numbers of the *Practical Farmer*, where Mr. S. S. Rathvon gives an account, with description, of some worms which were sent to him by the editors, and which answer in every respect to the Grape-berry moth.

Its Natural History

may be given as follows: About the 1st of July, the grapes that are attacked by the worm begin to show a discolored spot at the point where the worm entered. (See Fig. 123 c.) Upon opening such a grape, the inmate, which is at this time very small and white, with a cinnamon-colored head, will be found at the end of a winding channel. It continues to feed on the pulp of the fruit, and upon reaching the seeds, generally cuts out their interior. As it matures it becomes darker, being either of an olive-green or dark brown color, with a honey-yellow head, and if one grape is not sufficient, it fastens the already ruined grape to an adjoining one, by means of silken threads, and proceeds to burrow in it as it did in the first. When full grown it presents the appearance of Figure 123 b, and is exceedingly active. As soon as the grape is touched the worm will wriggle out of it, and rapidly let itself to the ground, by means of its ever-ready silken thread, unless care be taken to prevent its so doing. The cocoon is often formed on the leaves of the vine, in a manner essentially characteristic. After covering a given spot with silk, the worm cuts out a clean oval flap, leaving it hinged on one side, and, rolling this flap over, fastens it to the leaf, and thus forms for itself a cozy little house. One of these cocoons is represented at Figure 124 b, and though the

[Fig. 124.] cut is sometimes less regular than shown in the figure, it is undoubtedly the normal habit of the insect to make just such a cocoon as represented. Sometimes, however, it cuts two crescent-shaped slits, and, rolling up



Color—(a) honey-yellow.

the two pieces, fastens them up in the middle as shown at Figure 125. And frequently it rolls over a piece of the edge of the leaf, in the manner

[Fig. 125.] commonly adopted by leaf-rolling larvæ, while we have had them spin up in a silk handkerchief, where they made no cut at all.



In two days after completing the cocoon, the worm changes to a chrysalis. In this state (Fig. 124 a), it measures about one-fifth of an inch, and is quite variable in color, being generally of a honey-yellow, with a green shade on the abdomen. In about ten days after this last change takes place, the chrysalis works itself almost entirely out of the cocoon, and the little moth represented at Figure 123 a, makes its escape.

The first moths appear in Southern Illinois and Central Missouri about the 1st of August, and as the worms are found in the grapes during the months of August and September, or even later, and as Mr. Read has kept the cocoons through the greater part of the winter, there is every reason to believe that a second brood of worms is generated from these moths, and that this second brood of worms, as in the case of the Codling moth of the apple, passes the winter in the cocoon, and produces the moth the following spring, in time to lay the eggs on the grapes while they are forming.

Specimens of the moth were sent by us, last summer, to the English Lepidopterist, Mr. H. T. Stainton, for identification, but Mr. S. could not very well refer it to any known genus. Mr. A. S. Packard, jr., of Salem, Mass., however, has referred it to the genus *Penthina*, and has given it the specific name of *vitivorana*, on page 336 of his "Guide to the Study of Insects;" and from advanced sheets which were furnished him by the author, the Junior Editor of this Journal adopted this name in his "First Annual Report" (p. 135), where the insect was first described.

In the accounts above referred to, Mr. Read is quoted as authority for the statement that the first worms which appear, roll up the leaves and feed upon them; but we learn from that gentleman that this is a gross mistake, which was made by some misconception which Mr. Packard put upon his (Mr. Read's) communications.

The Remedy.

From information obtained at the late meeting of the "Mississippi Valley Grape Growers' Association," recently held at Alton, Ill., we learn that this worm is found in greatest numbers on such grapes as the Herbemont, or those varieties which have tender skins, and close, compact bunches; though it has also been known

to occur on almost every variety grown. As already stated, there can be little doubt but that the greater part of the second brood of worms passes the winter in the cocoon on the fallen leaves; and, in such an event, many of them may be destroyed by raking up and burning the leaves at any time during the winter. The berries attacked by the worm may easily be detected, providing there is no "grape rot" in the vineyard, either by a discolored spot as shown at Figure 123 *c*, or by the entire discoloration and shrinking of the berry, as shown at Figure 123 *d*. When the vineyard is attacked by the "rot," the wormy berries are not so easily distinguished, as they bear a close resemblance to the rotting ones.

Many wine makers are in the habit of picking up all fallen berries, and of converting them into wine. The wine made from such berries is but third-rate, it is true; but we strongly recommend the practice, as upon racking off the juice obtained from them, countless numbers of these worms are found in the sediment, while unseen hosts of them are also, most likely, crushed with the husks. Those who do not make wine should pick up and destroy all fallen berries.

POISONOUS FLOUR. ✓

The black Snout-beetle, (*Sitophilus granarius*, Linn.), about one-fifth of an inch long, which is commonly found in granaries preying upon small grain, and which was introduced into this country a long time ago from Europe, is the only grain-feeding insect properly called "the Weevil." The orange-colored larva, indeed, of the Wheat-midge (*Diplôsis tritici*, Kirby), which infests small grain, not in the granary, but in the field, is frequently designated by this name of "Weevil;" and in the West is otherwise known as the "Red Weevil," and in the East as the "Milk Weevil." But this is a mere popular misnomer; for this last insect belongs in reality to the Two-winged Flies (Order *Diptera*), and all the true Weevils belong to the Beetles (Order *Coleoptera*).

We have recently been informed by Dr. W. D. Hartman, of West Chester, Penn., that "in the South this beetle has been used successfully as a substitute for the Spanish Blister-beetle (*Cantharides*), and with this advantage over the foreign insect, that it does not cause strangury, to escape from which," as Dr. Hartman further observes, "is a very great and important item in the action of a blister." We are not informed how the above discovery came to be made in the Southern States; but infer that

it was probably from the great scarcity there of the imported Spanish fly, during the late war, in consequence of the rigid stringency of the blockade of their sea-ports. Dr. Hartman goes on to suggest, that it would be a very good idea to ascertain experimentally, whether the Colorado Potato-bug may not possess the same medicinal powers as the Grain Weevil, and the true Blister-beetles (*Lytta*) both native and exotic; and that, in that event, we might turn the hateful pest to some practical account.

There can be no doubt that great numbers of this Grain Weevil are often ground up into flour; and that, although the coarser and harder parts of them, such as the legs, snouts and wing-cases, would probably be for the most part retained by the bolting-cloth, yet that a considerable portion of the body will be ground up fine enough to be incorporated with the Extra Superfine Family Flour, of which most of us partake every day. In that event, if the number of Weevils should be large, the flour would undoubtedly be poisonous; for we know now that these Weevils have nearly the same medicinal properties as Spanish flies, and Spanish flies, as is notorious, are, even in comparatively very small doses, a most violent and dangerous drug to take internally, and when swallowed in larger doses are a deadly poison.

That this is not a purely speculative view of the subject is proved by the following passage from the *Transactions of the London Entomological Society*,* which, be it remembered, was written a great many years ago, and long before it was discovered in our Southern States that the Grain Weevil raised as good a blister as the true Blister-beetles or *Cantharides* of the shops: "A medical man in Madeira assured Mr. Mills, that he considered the wings and the crustaceous parts of the Weevil so heating to the system, as to be almost as injurious as *Cantharides*, taken internally, on a slow scale."

May not a remarkable case, which occurred in 1868 in the State of New York, of a particular lot of flour from a particular mill having poisoned all those who used it, and which was accounted for at the time on the hypothesis of a small quantity of lead having been ground up along with the flour, be in reality explicable on the theory of this flour having been manufactured from old buggy wheat, full of this particular species of Weevil? At all events, no flour made from wheat, containing any considerable percentage of these Weevils, ought ever to be employed for human food. Such an article is only fit for the starch-makers.

* Volume I, p. 242; quoted in Curtis's *Farm Insects*, p. 335.

Wool S. Any-
is the grain beetle
or the weevil

MOUNDING PEACH-TREES.

There is a considerable amount of evidence that, by maintaining a permanent mound of earth—say a foot and a half or two feet high—round the but of full-grown, good-sized peach-trees, the peach-borer can be entirely or almost entirely excluded from trees of this size, although not from young trees—say under four years old. Without ourselves offering any definite opinion on this practically important question, we propose to furnish our readers with the facts and arguments that have been adduced on either side of the question.

In common with the rest of the Fruit-growers' Excursion Party, we were enabled, through the liberality of the I. C. R. R., to visit in October, 1868, the extensive peach orchard of the Messrs. Winter Brothers at Duquoin, in South Illinois. They have 6,000 large, full-grown trees in their orchard, and in 1865 commenced mounding them up about two feet high, the crotch in such of them as are low-headed being now completely covered with earth. Before mounding they wormed their trees; and in such as are mounded they now find no worms to signify, although, as they informed us, in certain trees near the house that have never been mounded there are plenty. We ourselves could see no signs of any worms in any mounded trees, although several genuine peach-borers were dug in our presence out of two unmounded trees, that immediately adjoined the part of the orchard that had been mounded, and exhibited at the first glance the usual gummy exudation indicative of worm-work. It is proper to add, that the Messrs. Winter Brothers keep about one hog to the acre in their orchard to pick up the fallen fruit, by way of heading off the Curculio; but that, according to them, it is but very seldom that these animals root into the mounds round the butts of the trees.

At the meeting of the Illinois State Horticultural Society in December, 1868, Mr. B. Pullen of Centralia, Illinois, personally informed us that he finds the mounding system an effectual remedy against the Peach-borer; but that it is no use until the trees are about four years old. Up to that age, he depends upon the knife. He banks up his trees about ten inches high, and packs the earth tightly against the but with the foot. He once mounded up some very wormy trees—so wormy indeed that a few of them contained each from forty to seventy larvæ, so that he was afraid of girdling and killing them if he went to work at them with the knife. Contrary to what might have been expected, however,

these trees did well; and there have been no worms to be found in them since.

As, in cases of this practical importance, it is often necessary to add line upon line and precept upon precept, we shall subjoin here what has been said upon this same subject by Mr. Pullen, in the columns of the *Western Rural*:

As Spring will soon be upon us, I wish to add my testimony in favor of the "Banking System" as a preventive against the peach-borer. As to its efficacy there can be no doubt. I have practiced it four years with complete success. I would not advise its adoption until after the trees are four years old. During most of this period the bark is tender, and trees are liable to be entirely girdled by even a single worm. Safety lies only in personal examination and removal with the knife, in Fall and Spring, (September and April). In April of the fourth year, bank up to the height of from ten to twelve inches, pressing the dirt firmly around the tree. A little dirt should be added each successive Spring. It is not only a preventive but a great saving of labor.

Centralia, Ill.

B. PULLEN.

So much for the experience of Illinois peach-growers. We shall now furnish the reader with the details of the mounding system, as practiced in Ohio, from the pen of a correspondent of the *Journal of Agriculture*—Mr. E. A. Thompson. The letter will be found in the *Journal* of November 14, 1868, and it will be observed that, contrary to the belief of Mr. Pullen, it recommends the system to be applied, not only to old, but also to young trees.

HILLSIDE, (near Cincinnati), November 10, 1868.

The mounding system was first practiced, so far as I know, by Isaac Bolmar of Warren county, Ohio. I visited his orchards some years ago—acquainted myself with his system—and concluded to try it upon my orchard of 4,000 trees—then one year planted. I plant my trees in the fall, and in the spring following cut them back to six inches above the bud. The tree then instead of having one body has several—from three to six. The second summer I plow both ways, turning the furrows toward the trees. The men follow with shovels, throwing the loose soil around the tree to the height of about one foot. In the fall I cut the trees back, taking off about one-third of the year's growth. The next spring or summer I pursue the same method, raising the mound about one foot higher; cut back in the fall, and the third summer repeat the process, raising the mound another foot, which finishes the job. The mound will then be about three feet high at its apex and six feet in diameter at its base. The mounding need not be done in the summer, or at any particular season; it is just as well done in the fall when the hurry is over. The dirt is never taken away from the trees—in fact it can not be removed without injury to the tree—for the young rootlets each year keep climbing up through this mound. I had occasion to remove one of these mounds a few days since and found it a mass of healthy roots.

Now for the benefits. First you have no trouble with grub or borer; he must have light and air, and the mound is too much for him; he comes out and that is the last of him. I have never wormed my trees, or hunted for the borer, and an orchard of healthier or thriffter trees can not be found. It has been asserted that the borer will re-appear again near the top of the mound—but I am satisfied this is not the case; I have never thus far been able to find one. Second, the system imparts longevity to the tree. I saw a tree in Warren county treated in this manner, thirty (30) years old, still healthy or bearing annual crops. Third, trees thus treated are not subject to disease. I have never had a case of yellows in my orchard. Fourth, the expense is trifling—one man can mound fifty trees per day. The system can be applied to old as well as young orchards; but if old trees are

thus treated they should be first severely cut back, when they will make a growth of young wood.

E. A. THOMPSON.

It only remains now, after giving all the evidence that we have space for in favor of the mounding system, as an effectual remedy against the Peach-borer, to adduce what has been said on the other side of the question. The reader can then make up his mind for himself, and govern his own practice by the conclusions that he himself arrives at. It is to be hoped that he will not be as much plagued and annoyed as the apocryphal Justice of the Peace, who complained that, after the Plaintiff's counsel had made out a plain case on his own side of the question, the counsel for the Defendant made out just as plain a case on the other side; and yet it was utterly impossible for the poor man to decide in favor of both of them!

It is allowed on all hands, among the peach growers in South Illinois, that of late years, for some unexplained reason, the peach-borer has not been near as destructive or common as formerly. Hence it is contended by many good practical observers, and among others we believe by Dr. Hull of Alton, that the almost complete exemption from borers in mounded peach-orchards is due, not to any special effect produced by the mounds, but to the general rarity of the insect. In confirmation of this theory, it may be remarked that Mr. A. Mitchell has ten acres of peach-trees that are not mounded immediately adjoining the mounded peach-orchard at Duquoin, belonging to the Winter Brothers; but that, although he has paid no attention to worming his trees, he finds no worms in them of any consequence. As, however, he has had from fifteen to twenty hogs running in this 10-acre lot for the last two years, it may be supposed by some that the worms are more or less completely destroyed by these hogs. But we heard that Mr. E. A. Blanchard of Cobden, S. Illinois, has a lot of unmounded peach-trees six years old, which he has not wormed for three years, and among which no hogs have been suffered to run; and yet that he finds no borers of any consequence in these trees. So, that in this case at all events, we cannot attribute the paucity of peach-borers to the multitude of prairie-rooters.

Finally we have been assured by Dr. Hull, that several years ago he placed heaps of lime or of ashes round the butts of all his orchard trees; and that it produced no effect whatever towards heading off the peach-borer. And we were told by Mr Ransom of St. Joseph, Michigan, that he has given the mounding system a fair trial upon his own peach-trees in that State; and that his

experience is that it produces no beneficial effect whatever.

A single suggestion from ourselves, and we will then leave this case to be decided by the Jury: The mounded trees belonging to the Winter Brothers and to Mr. Thompson, and also, if we mistake not, those owned by Mr. Pullen, were all low-headed trees, so that the mound reached, or sometimes even covered, the crotch. On the contrary, Dr. Hull's peach-trees have a clear trunk of some four feet, so that the mound would not here come any where near the crotch. May not this difference in the growth of the different trees respectively experimented upon by these gentlemen, explain the otherwise inexplicable fact of the diametrically opposite results arrived at in either case? The Peach-borer prefers especially the butt of the trunk. By mounding up a low-headed tree, you leave it—strictly speaking—without any trunk at all, and consequently without any butt to the trunk; and you thus annihilate what is more especially the favorite spot for the Moth of this insect to deposit her eggs upon.

As many fruit-growers, who are familiar with the Peach-borer, have never seen the moth that it produces, we subjoin here figures of the two sexes (Fig. 126.)

[Fig. 126.]



piece, that to the left (1) representing the female, and that to the right (2) the male.

NOTE.—Since the above was in type, we have received the following very interesting statement, in confirmation of the fact that the Peach Borer is becoming exceedingly scarce in South Illinois, from Judge Brown, of Villa Ridge:

“The Peach Borer has almost entirely disappeared from these parts. In digging into more than fifty trees of two and three years' growth, I found not more than two worms. They were scarce last fall. Evidently they have fallen a prey to some cannibal insect.”

☞ The Empress of Austria appeared at the last State ball at Vienna, in a new dress composed of the green and golden wings of South American Beetles, sewn with gold thread on a tissue of white silk. A splendid suite of diamond and emerald completed this costume.

GOING IT BLIND.

It is astonishing how the great majority of mankind go through the world with their eyes shut. Scarcely a single day passes in the summer season, but some ingenious person or other fetches us, as a great and stupendous rarity, some common butterfly or other, of which all but those, who wilfully keep their eyes shut, may see dozens flying about everywhere in the open air. Farmers who have lost thousands of dollars worth of corn and grain through the ravages of the Chinch Bug, can scarcely ever tell a Chinch Bug when they see it in a collection of insects. And many other wise well-informed men are so blind to what is passing under their very noses every day of their lives, that they are not aware that every fly that God ever made has got exactly six legs, never more and never less; and will inform you, by way of describing any particular species that they wish to identify, out of the thousands of different species of flies that are found in the United States, that it is remarkable for having six legs! They might just as well, by way of putting a detective on the track of some thief that had stolen their horses, gravely tell that officer, that they were quite certain that the guilty person had a head upon his shoulders, and had got two arms and two legs.

But it is not only so far as regards insects that people usually keep their eyes diligently shut. They do the very same thing with the larger animals, and even with that particular one which is more especially the peculiar favorite of mankind—the Horse. Everybody is supposed to have seen a horse gallop time and again. Painters, engravers, and artists of all kinds, whose special business it ought to be to copy correctly from nature, are supposed to have seen thousands of horses gallop. And yet, out of thousands of different pictures and engravings, that we have examined in the course of a reasonably long life, all of them evidently intended to delineate one or more horses at full gallop, not a single one represents the legs in the natural and normal position, that is necessarily assumed by the galloping horse. Nay, further. Every such picture and engraving places the legs in such an unnatural and impossible attitude, that, if it were assumed for one single second, it would inevitably cause the animal to fall to the ground like a sack of wheat. This assertion will perhaps astound the reader; but we think that we can demonstrate the truth of what we assert. And even if the mind fails to recognize the validity of our arguments, let but the eye be for once

opened, when the next runaway team passes along the street, and it will then be found that "seeing is believing." The chief trouble is that most people will persist in resolutely keeping their eyes shut, from the time that they get up in the morning to the time that they go to bed at night.

When a horse gallops, he "leads," as the jockeys call it, at discretion either with the right or with the left front leg. If he "leads" with the right front leg, that leg, when the animal is beginning to come to the earth after his leap through the air, touches the ground first. Immediately afterwards the left front leg and the right hind leg touch the earth simultaneously; and then in very quick succession the left hind leg. If, on the other hand, the horse "leads" with the left front leg, the only difference in the above operation is, that "left" is throughout to be substituted for "right," and the reverse. The evidence made by this peculiar foot-fall is well represented to the ear by the words "Potato, potato, potato," etc., so familiar to every horseman. And nearly two thousand years ago the Roman poet Virgil, imitated to perfection this peculiar cadence, by the sonorous mimicry of the often-quoted line

"Quadrupedante putrem sonitu quatit ungula campum."

The sound, but not the sense of which may be faithfully translated by the words

Gallop, and gallop, and gallop, and gallop, and gallop, and gallop.

Now, at the time that each leg strikes the earth, it is necessarily, in order to take its due share in elevating and propelling forwards the body for a fresh stride, thrown *forwards*; for if it was thrown *backwards* at the moment when it touched the earth, it would be powerless for any such purpose. Consequently, as all the four legs strike the earth nearly at the same moment of time, they are all thrown forwards nearly at the same moment of time; and when they leave the earth, after taking another stride in that succession of leaps through the air which we call a "gallop," they are all thrown backwards nearly at the same moment of time. And yet—strange to say—all the galloping horses, that we see in pictures, have the two front legs thrown forwards and the two hind legs thrown backwards! Whereas in reality, as stated above, one front leg and one hind leg move forwards simultaneously and move backwards simultaneously, and the other two legs respectively precede and follow those movements by so very short an interval, that for all practical purposes all four legs may be said to move forwards together and to move backwards together.

Suppose now—for the sake of argument—that a galloping horse were to strike the earth in the posture in which such an animal is invariably represented in pictures, that is, with the two front legs thrown forwards and the two hind legs thrown backwards. What would be the inevitable result? The front legs would be in the proper posture for propelling the body of the animal forwards and upwards, but the hind legs would be absolutely incapable of any muscular effort; and the necessary result would be, that the fore-quarters of the poor beast would be thrown feebly upwards, and the hind-quarters would tumble to the ground with two long useless appendages trailing along behind.

An old Greek philosopher was once arguing to a large crowd, that in reality there was no such thing in the world as motion. One of his audience, finding that the philosopher was argument-proof and could not anyhow be theoretically convinced of his error, succeeded at last in practically refuting his ingenious sophistry, by mounting on to the stage on which the old gentleman was delivering his learned lecture, seizing him by the waist, and hurling him bodily among the laughing assembly. Upon the same principle, if any one of our numerous readers should fail to see the force of our arguments, we can only beg of him to open his eyes, for once in his life, the very next time that he hears a horse gallop past him; and we pledge our word for it, that he will by this practical test be as thoroughly convinced of the truth of our theory, as the old Greek philosopher was convinced that there really was such a thing as motion, by moving in his own proper person with very great velocity through the air some two thousand years ago.

But is it not a shame for the "hoss" men of America to have to come to a bug-man, to find out how a horse gallops? And is it not a most wonderful thing, that so many thousand pictures of galloping horses should have been drawn by men with their eyes shut? And is it not the strangest thing of all, that so many millions of people should day after day have pretended to look at all these thousands of pictures, and yet that not one single person, out of all this enormous crowd, ever up to this day opened his eyes wide enough for him to be able to tell the world, how ridiculously absurd every one of these pictures was?

NOTE.—Since the above remarks on the galloping horse were written, we have noticed that the very same position is taken by a brother of the Senior Editor, in an English work on the Horse, which has recently been reprinted in

America.* It seems, however, that we were mistaken in supposing that artists were not aware of their error. "These facts," says Mr. J. H. Walsh, "are well known to artists, and some of them, including the celebrated Leech, have tried the experiment of drawing the galloping horse properly. But their entire want of success shows the impossibility of the performance." Perhaps the only impossibility consists in this, that our eyes are so used to error, that they would be shocked at the sight of truth. So the eye accepts with complacency manna-like angels with two wings and two arms, all growing out of one pair of shoulders, cherubs flying about without either legs or body, and many other such impossible absurdities.

* *The Horse in the Stable and the Field; his Management in Health and Disease.* By J. H. Walsh, F. R. C. S., ("Stonehenge"); author of "British Rural Sports," etc., etc. From the last London Edition. With Copious Notes and Additions, by Robert McClure, M. D., V. S.

ANOTHER NEW CURCULIO HEMBUG.

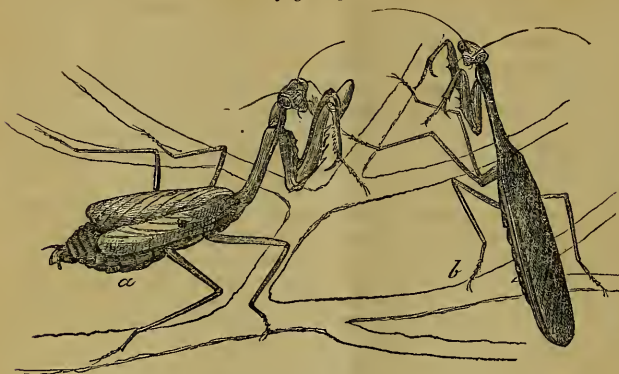
A citizen of Morristown, N. J., spoke of a German gardener of his acquaintance, whose plum trees bear, notwithstanding the Curculio. He puts under his trees a tub partly filled with potash water, or very strong soap-suds; on the water floats a small candle fastened to a block. The light is near the water, and as the insects fly near it, many of them dip their wings and perish.—*Agricultural Paper.*

Wonder if the "German gardener" doesn't grow all his plum trees in a green-house under glass, where the Curculio would have no chance at all to get at his plums? Because, if he grows them in the open air, like other folks, and if the wind ever blows at all in his "diggings," it seems to us that his "small lighted candle fastened to a block and floating in a tub half full of soap-suds," would be apt to *blow out* semi-occasionally. We are confident that it would do so in Illinois or Missouri, but perhaps in New Jersey the soil is so poor that the wind can not get strength enough to blow there.

Wonder if the New Jersey Curculios fly by night, so as to be attracted by a lighted candle? Because out West Curculios will not fly, even in the day time, except when the sun is shining very hot upon them. But probably that is in consequence of all our Western bugs, whether big ones with two legs or little ones with six legs, being afflicted with that terrible complaint known in the West as the "Illinois disease," and in the East as "laziness."

"Dear! dear!" says Falstaff, "how all we old men" (except of course certain ancient Teutonic horticulturists) "are addicted to lying!"

[Fig. 127.]



Colors—(a) green; (b) brown.

REAR-HORSES vs. GRASSHOPPERS.

General Engelmann of St. Clair county, Southern Illinois, has found by experience, that the best way to get rid of the grasshoppers in a vineyard is to raise Rear-horses there, which

[Fig. 128.]



are also known as Devil's-horses, *alias* Praying Nuns, *alias* Intelligence Bugs, *alias* Devil's Riding-horses, but the correct English name of which is "Camel-cricket." Figure 127 gives a very good view of the sexes of this insect, *b* representing the male and *a* the female. The female has such short wings that she is incapable of flight; but the male flies as readily and as strongly as an ordinary grasshopper. The General's mode of colonizing this insect in his vineyard is, to collect the masses of eggs in the dead of the year and place them upon his grapevines. Figure 128 will enable the reader to recognize these singular egg-masses whenever he may happen to meet with them. Persons are very generally ignorant of their real nature, and on the principle that "Everything that is unknown must be something hateful and destructive," are apt to cut them off and throw them into the fire. They should under no circumstances be destroyed. As a general rule Camel-crickets are only found in the central and southern parts of Missouri, in the southern part of

Illinois, and in other southerly regions. But Mr. D. B. Wier is domesticating them at Lacon on the Illinois river, and on one occasion one of their egg-masses was found as far north as Lee county, northern Illinois. We are inclined to believe that, with a little care and attention they may be acclimated at points farther North than these.

APPLE-TREE PLANT-LICE.

(*Aphis mali*, Linn.)

From Georgetown in Ohio; from Columbia, Kirkwood and Eureka in Missouri; and from Bunker Hill and Alton in Illinois, we have received apple buds covered with the above named plant-louse, accompanied with queries as to what they are, and how to destroy them. We have ourselves scarcely been able to find an apple tree in the vicinity of either St. Louis, Mo., or of Alton, Ill., that was not teeming with these lice, and they are in all probability quite numerous throughout the West. Our subscribers will recollect that we repeatedly received the little oval black shiny eggs of this insect during the past winter, and that we predicted that under favorable circumstances the lice would swarm on the trees in the spring. We have also suggested the proper remedy, namely, that of drenching the trees with strong soap suds or tobacco water.

We are of opinion that no great alarm need be felt on account of the great numbers of these lice. They swarm in like manner almost every year in some part or other of the country, but they have so many enemies in the form of the different cannibal insects and of the small birds, that their numbers are soon reduced. They are also susceptible to the influence of the weather, and a good sharp frost would clean them off as with a besom. On the nights of the 12th and 13th of April there was frost in the Mississippi Valley, but as we proved from observation, it was not severe enough to destroy them. Their numbers, however, are now (April 19th) fast waning, which may be attributed to the late heavy rains, and to the perseverance of the birds.

ON OUR TABLE.

From T. L. Harison, Secretary—Transactions of the New York State Agricultural Society, Volume XXVIII, 1867. In two parts, and containing the Twelfth Annual Report of the State Entomologist, Dr. Fitch.

From the author—Revision of the Large Styled Fossorial Crickets, by Saml. H. Scudder. Published by the Peabody Academy of Science.

From the same—the Entomological Correspondence of Thaddeus William Harris, M. D., edited by Samuel H. Scudder. Published by the Boston Society of Natural History. We shall notice this work at greater length in our next number.

CRACK-JAW NAMES.

We repeat once more, that such scientific names as we are compelled to use, in order to make our meaning clear to the scientific student as well as to the popular reader, are enclosed in a parenthesis and printed in *italics*, the common English names being inserted before them. Those that do not care about the scientific or Latin names, have nothing to do but to skip every parenthesis (printed in *italics*), and they will find the sense just as complete without, as with, the parenthesis that is skipped. By this contrivance we aim to accommodate all parties; and while we attain the necessary degree of scientific accuracy, to avoid jarring harshly upon the ear of the plain practical man.

A NEW WORK ON THE BUTTERFLIES OF NEW ENGLAND.—We are glad to learn that Mr. Samuel H. Scudder has in preparation a work on the Butterflies of New England. We have not room for a proper notice of it in our editorial columns, but make room in our advertising pages for a circular which we have received from Mr. Scudder, and to which we call the attention of our readers. We wish Mr. S. success, and hope he will get all the assistance he desires.

TO OUR SUBSCRIBERS IN CANADA.—Parties in Canada, who wish to subscribe for the AMERICAN ENTOMOLOGIST, should bear in mind that they can obtain it, postage free, by remitting one dollar to the Rev. C. J. S. Bethune, Secretary to the Entomological Society of Canada, Credit, C. W.

Communications from S. S. R., and from D. A. A. Nichols, are unavoidably crowded out of the present number, but will appear in Number 10.

SEND PLENTY OF SPECIMENS.

Correspondents often wonder why we so often ask them to send us plenty of specimens of the same kind or species of insect. Let us explain why we do so.

1st. In certain groups of insects, the classification depends upon characters peculiar to one sex, generally to the male sex. Hence, in order to give us a fair chance of seeing both sexes, it is necessary to send a number of specimens. In many species of insects the males greatly outnumber the females or the reverse; and even where this is not so, it might and often does accidentally happen that, out of half a dozen specimens taken at random, there will not be a single male, or perhaps not a single female.

2d. It often happens, when only one or two specimens are sent, that one or both happen to have lost the very organs—say the antennæ, or the front legs—upon which their classification depends. Or, if they are moths, that all the scales are rubbed off their wings in the particular part of the wing which governs the classification.

3d. Suppose it is living larvæ that are sent us, and they happen to be unknown to us and we have to breed the perfect insect to ascertain the species. It often happens that out of twenty larvæ all but one or two are infested by parasites which eventually destroy them, and it very generally happens that about one-half of a lot of larvæ are so destroyed. This reduces the original stock of twenty larvæ to ten. Probably, even with the most careful treatment, one-half of this remaining number will die of disease before they attain the winged state, owing to the unnatural conditions to which we are of necessity compelled to subject them. This reduces the stock to five; and five is the very smallest number which is sufficient to give us a reasonable chance of breeding both sexes, for the reasons explained above.

We repeat therefore to all our correspondents, that the more specimens they send the better it will be both for them and for us. Where an insect is abundant, it is no more trouble to collect a score of them than to collect one; and even where it is not so very abundant, the trouble does not by any means increase in proportion to the number gathered. In such matters as these, we cannot calculate by the Rule of Three.

ERRATUM IN NO. 8.—Page 151, column 1, line 7 from bottom, for “from 0.004 to 0.006,” read “from 0.04 to 0.06.”

ANSWERS TO CORRESPONDENTS.

White Grub Fungus—*Joe. Smith, Stewartsville, De Kalb Co., Mo.*—The White Grubs which you send, with the peculiar sprouts at their heads, are attacked by the same fungus which we spoke of both on pages 77 and 91 of the present volume of the ENTOMOLOGIST.

[Fig. 129.]



Colors—green and whitish.

The annexed Figure represents one of these white grubs thus attacked, though the sprout on one of those which you send is much longer than represented in the cut, and measures fully two inches in length. For the benefit of our readers we quote the descriptive part of your letter: "I send you two yellow-headed grub worms with sprouts or protuberances from the vicinity of the mouth; on one of them the sprout is now quite fresh and green, but it will be quite dry when it arrives, for they shrivel in a few hours when out of the earth. Grub worms, last season, destroyed corn, potatoes, meadows and many other crops, to a considerable extent in this vicinity. I have been in Missouri twenty-five years, and never knew them half so bad. There are many such specimens, and they create much interest and speculation. They are generally found about one and a half inches from the surface of the ground, and the worm is always dead. Some persons are growing them." We shall be glad to learn of the success or failure attending the efforts which are being made to grow them, and we should be glad to receive specimens, enclosed in a tight tin box, filled with moist earth, so that we might receive them fresh and green.

T. J. Freeman, Bethany, Mo.—As you may learn from the above Figure 129, the "curious shrivelled grubs" which you send are attacked by this same fungus. We are glad to learn from our Missouri exchanges that this fungus is quite common in the northwest part of the State, and that it has very generally attacked and killed the White grubs in Harrison, DeKalb, Ray and Jackson counties in that State.

"Buck Fly"—*Geo. W. Copley, Alton, Ills.*—You enclose a water color drawing of a moth, which you say "was once very common in this vicinity, and is called in the backwoods parlance, a Buck Fly." You further remark that "they are said to lay their eggs in the nostrils of the deer, from whence they crawl, after hatching out, up into the head. I cannot speak 'knowingly' of this, but I have seen the head of a deer full of worms about an inch in length, which were perhaps the larvae of this moth." The colored figure represents a moth which may be known as the Buck Moth—the *Saturnia [Euchronia] Maita*, Hübn. There is no foundation whatever for the idea, which seems to be prevalent in your neighborhood, that they deposit their eggs in the nostrils of deer. They have been dubbed "Buck Fly" or "Deer Fly" simply because they appear in the fall at the time the deer run. Their eggs are deposited, out West, on the Scrub Willow and different species of Oak. The larvae are covered with prickles, and are at first entirely black, and feed in company. When full grown they have a yellow band, variegated with short black lines, on each side of the body, and besides the compound spines they also have tufts of rufous bristles, while the head and collar are chestnut-brown. During the month of August they descend into the ground, where they change to chestnut-brown chrysalids without spinning any cocoon. From these cocoons the moths soon afterwards emerge. The larvae are said to feed also on the Wild Cherry, and their prickles are reputed poisonous, though we were never stung by them. The worms you found in the head of a deer belonged doubtless to some two-winged fly (*Cestrus* family), the larvae of many of which are known to inhabit different parts of living animals; but the larvae of no scaly-winged insect (order LEPIDOPTERA) are known to occur in such situations.

Swarms of minute Flies in Rooms—*S. S. Rathvon.*—The minute dipterous insects which you send belong to the genus *Sciara*, as kindly referred for us by Baron Osten Sacken. Their larvae commonly occur in flower-pots, and hence the occurrence of the flies in your friend's room. The species is doubtless undescribed.

Worms in Osage Orange Seed—*Alfred Plant, St. Louis, Mo.*—We have never succeeded in breeding the dark brown objects which you find among your Osage Orange seed, and which look not unlike small specimens of the seed, though they are more pointed at one end, and are found to be divided transversely into thirteen segments, when carefully examined. They are evidently the larvae of some two-winged fly, and we believe they do no harm to the seed itself. We have always noticed that they were most numerous in badly cleaned seed, and pieces of the dried pulp of the orange are generally crowded with them. There are many two-winged flies belonging to certain genera, which breed in decomposing vegetable matter, and we suspect that while the Osage Oranges are being piled into heaps, in order that they may rot and the seeds be more readily separated from the glutinous pulp, some species of fly that is perhaps peculiar to Texas, delights to deposit its eggs on this rotting mass. The larvae hatching from these eggs revel in the pulp, and when the seeds are washed out, many such larvae will inevitably pass through the sieve with them. These are of course deprived of their necessary food and moisture, and reach you in the dried-up condition of those you send. It is because they are thus dried up that we have always failed to breed the perfect fly from them. They have probably been called the "Screw-worm" because in their fresh state they must greatly resemble the true "Screw-worm" which attacks cattle in Texas, and which is likewise the larva of some two-winged fly. We shall be glad if any of our Texas subscribers will send us, during the coming summer, living specimens of either the Osage Orange larva or of the true cattle "Screw-worm." We may thus be enabled to rear them to the perfect state, and dispel the darkness in which the natural history of these curious insects is now enveloped.

Insects to be named—*X. Q. Z., Indianapolis, Ind.*—We cannot undertake to return specimens of insects that are sent us to be named, and you are the first person that ever asked us to do so. Least of all, can we return them prepaying the postage thereon out of our own pockets. It adds at least nine hundred per cent. to the cash value of a collection of insects to get it correctly named. Now, to name insects correctly and conscientiously, involves considerable labor. It is only fair, therefore, that those who perform this labor should have the chance of being recompensed for their time and trouble, by occasionally finding a rare species among the hundreds of common species that are sent on to be named. If we were to return all specimens, after naming them, and in addition prepay the postage thereon, we should not only be working for nothing, but we should tax ourselves for the privilege of putting money into our correspondents' pockets. We respectfully decline any such one-sided operation. If you choose to send on the requisite stamps, we will return your insects just as we received them and without names: otherwise we cannot even do this.

The Spotted Ladybird—*Robert Seavers, Onkaloua, Iowa.*—The beetles which you send, of which you find [Fig. 130.] large numbers about the roots of your Apple trees, and which were "lying in piles under the leaves and grass, and always on the south side of the tree," are specimens of the Spotted Ladybird (*Hippodamia maculata*, DeGeer,) which is represented at Figure 130. Spare every one of them, for they are your best friends! Your observations about their devouring the eggs of the potato beetle are doubtless correct, and we have already recorded the fact (see p. 46 of No. 3). We cannot say positively whether they will destroy the eggs of the Canker worm, but have every reason to believe that they will do so.

Eggs of the White-marked Tussock Moth—*Sam'l G. Knight, Racine, Wis.*—The mass of eggs which you found glued to a loose gray cocoon, the latter being fastened to a leaf, and the whole attached to the twig of one of your plum trees, belongs to the White-marked Tussock Moth (*Orgyia leucostigma*, Sm. & Abb.). For a figure of the larva which they produce, and a fuller account of it, we refer you to what was said, under the same head, on page 79 of the present volume.



Colors—Pink, black.

Owl's Pellets—Chas. H. G., Central, Mo.—The oval pellet, about $1\frac{1}{2}$ inch long, "composed of the harder portions of partly digested insects," as you very justly remark, and found by yourself early last autumn on the top of a fence in one of your fields, is not, as you suspected, the excrement of some animal or other. Birds of prey, such as Hawks and Owls, have the habit of disgorging from their mouths the indigestible parts of their food, such as the hairy skins of mice, the feathers of birds, and the hard shelly parts of insects, in the form of an oval or round wad or pellet, and the specimen you send is undoubtedly of this nature. Upon soaking it in hot water it came readily to pieces, scarcely discoloring the water and exhaling no offensive odor whatever as excrement would have done. On carefully examining the fragments of which it was composed, we find no less than fifteen complete specimens of the egg-laying apparatus situated at the extremity of the tail of a certain Grasshopper (*Caloptenus differentialis*, Uhler Ms.), which is intermediate in size between our common Red-legged Grasshopper (Fig. 65, b, p. 73) and the large European species represented on page 50 of our Journal (Fig. 32). Hence to compose this one pellet the lives of as many as fifteen females of this Grasshopper must have been sacrificed, besides those of an unknown number of males, the tails of which are not hard and shelly like those of the females, and are consequently more completely digested. In this same pellet we also found eleven jaws and a great number of the front legs of this same insect; besides three of its large and very conspicuous hind thighs, prettily twilled outside with black and yellow, and inside of a yellow color with two large black patches. To one of these three hind thighs the prickly shank was still attached. The entire remainder of the pellet was composed of different parts of the shelly crust of this grasshopper; and we could not, on the most diligent search, find a single fragment belonging to any other insect.

We cannot say for certain what particular bird it was that discharged this pellet from its craw, but strongly incline to believe that it was some species of Owl. We will endeavor to ascertain from our ornithological friend, Dr. Velie, what particular species of Owls or other birds are known to him to prey upon grasshoppers, and report the result of our enquiries in the next number of the A. E.

Insects named—E. T. Dale, Yellow Springs, Ohio.—No. 1, *Eburia quadrigeminata*, Say. No. 2, *Labidomera trimaculata*, Fabr. No. 3, *Chrysomela pulchra*, Fabr. No. 4, *Copris anaglypticus*, Say. No. 6, *Tenebrio* [*Neatus*] *tenebrioides*, Lec. No. 7, *Agonoderus pallipes*, Fabr. No. 8, *Anisodactylus St. Crucis*, Lec. No. 9, *Mevaeantha contracta*, Beauv. No. 10, *Cionus*, —? No. 11, *Baridius furcatus*, Lec. No. 12, *Trox aequalis*, Say. No. 13, *Pterodicticus femoralis*, Kirby. No. 14, *Elaeodes tricornata*, Say. No. 15, *Leptura proxima*, Say. No. 16, *Aphonus tridentatus*, Lec. No. 19, *Pirates picipes*, H. Sch. No. 20, *Gastropus splendidus*, Fabr. No. 21, *Lygus reclinatus*, Say. No. 22, *Ips fasciatus*, Say. No. 23, *Chrysomela cyanea*, Melsh. No. 24, *Melandrya striata*, Say. No. 25, *Anomala minuta*, Burn. No. 26, *Hymenarora nervosa*, Say. No. 27, *Phymata erosa*, Fabr. There are a great number of species belonging to the CURCULIONIDÆ which are not yet described. The *Cionus*, No. 10, we sent to Dr. Le Conte, and he kindly informs us that it is not yet investigated.

Crab Apple Borers—J. Huggins, Woodburn, Ills.—The two borers which you took from the trunk of a Crab apple tree are, as you rightly suppose, not the common apple tree borer—*Saperda bicincta*, Say. They have sixteen legs, and are, beyond all doubt, the larvæ of some large moth. They agree very well with a figure and description which we have, of a borer which is found both in the Locust and in the Red Oak, and which produces a large moth known as the Locust-tree Carpenter-moth (*Xyleutes robinia*, Peck). We have never before known of a borer of this kind inhabiting the Crab, and cannot say, till we succeed in breeding those which you have sent, whether it is the same as the Oak and Locust borer species, or whether it is distinct.

Nine-pronged Wheel-bug—S. C. Thornton, Moorestown, N. J.—The eggs you formerly sent were really those of the Nine-pronged Wheel Bug (*Reduvius notenarius*, Say), as we have lately obtained from them a number of the young of that species.

Musquitoes—A. M. Abbott, Union Grove, Ills.—The eggs of the Musquito are laid in a bowl-shaped mass upon the surface of stagnant water by the mother-fly. After hatching out they finally become the "wiggletails" or wriggling worms that may be seen in the summer in any barrel of water, that is exposed to the atmosphere for any length of time. Finally, the "wiggletails" come to the surface, and the full-fledged musquito bursts out of them, at first with very short limp wings, which in a short time grow both in length and in stiffness. The sexes then couple, and the above process is repeated again and again, probably several times in the course of one season. It is a curious fact that the male musquito, which may be known by its feathered antenna, is physically incapable of sucking blood. The musquito is not an unmitigated pest. Although in the winged state the female sucks our blood and disturbs our rest, in the larva state the insect is decidedly beneficial by purifying stagnant water, that would otherwise breed malarial diseases. Linnaeus long ago showed, that if you place two barrels of stagnant and impure water side by side, neither of them containing any "wiggletails" or other living animals, and cover one of them over with gauze, leaving the other one uncovered, so that it will soon become full of "wiggletails" hatched out from the eggs deposited by the female Musquito; then the covered barrel will in a few weeks become very offensive, and the uncovered barrel will emit no impure and unsavory vapors.

Large silken Cocoon—Dr. W. W. Butterfield, Indianapolis, Ind.—The empty cocoon which you send is that of the *Pronetha* moth (*Attacus Pronetha*, Drury). These cocoons are generally found on sassafras, and occasionally upon wild cherry, swamp-pink (*Azalea*), button-bush (*Cephalanthus*, poplar (*Populus*), snow-drop (*Halesia*), bay, and lilac. You say that you found yours upon ironwood (*Ostrya Virginica*). But it does not necessarily follow therefore that the larva fed upon ironwood leaves. Dr. Fitch has recorded the fact, that numbers of these larvæ had for several consecutive years fed upon an ash-tree standing upon his premises, and that they invariably at maturity deserted the ash, and often spun their cocoons upon an adjoining lilac, although no larvæ had ever fed upon the leaves of this lilac. As, however, all the larvæ belonging to this genus are pretty general feeders, it is likely enough that yours fed upon ironwood leaves, although, until it is actually seen to do so, the fact cannot be considered as firmly established.

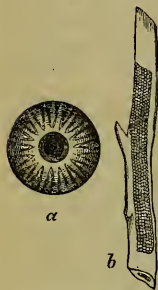
Bugs in Alcohol—D. P. Smith, Haddam Neck, Ct.—The least troublesome mode of preserving bugs, which you do not intend to study for three or four years, is to do as you have already done—put them in alcohol. The alcohol must be replenished as it wastes away, but need not be changed. Alcohol changes the fine grass-green of cætydids and grasshoppers to a dingy brown, and scarlet it changes to a dirty salmon color. It also ruins irrecoverably many hairy insects, such as bumble-bees, etc., and it stiffens the connecting membranes of the joints of all insects, so that even the longest soaking in hot water will not make them as limber as those of a dried insect can be readily made. As to Two-winged Flies (*Diptera*), and moths and butterflies (*Lepidoptera*), no experienced collector ever puts them into alcohol, because it renders them almost entirely worthless as specimens. On the whole, we consider alcohol as a kind of entomological make shift, or what the French call a *pis-aller*.

Borer in Plum Twig—Wm. Colwell, Sparta, Ills.—We have since bred the Plum twig borer which you sent some time ago. It is the *Elaphidion* [*Hypernallus*] *parallellum*, Newman, as kindly determined by Dr. Le Conte. This beetle greatly resembles both in size, coloration and general markings, the common Oak Pruner, (*Stenocorus* [*Elaphidion*] *villosus*, Fabr.) and we should expect from analogy that this Plum borer also pruned the twig which it inhabited. The fact therefore, which you mention, that it does not so prune the plum twig is interesting.

Animals infesting Wells—H. C. Edrington, Bryan City, Texas.—We cannot tell you, without seeing specimens, what the minute animals are, which infest your wells; nor can we recommend any other remedy than that suggested on page 147 under the same heading as the above.

Eggs of Cut-worm Moths—*Gustavus Pauls, Eureka, Mo.*—The belt of minute eggs, of a flesh-color, and all fastened closely together on the twig of one of your Peach trees, we have figured in the annexed cut (Fig. 131), *a* showing the belt, natural size, and *b* giving one of the eggs highly magnified. These eggs soon hatched out after we received them: It is not often that we can tell all about an insect from its egg, but the moment we saw those which you sent, we knew from their curious pattern what they were. They are in fact the eggs of the Unarmed Rustic (*Agrotis inermis*, Harr.), and the worms which hatch from them are among the most destructive of the cut-worm tribe. This worm has been called the Variegated Cut-worm by the Junior Editor, and a full history of it will be found in his First Annual Report (pp. 72-74), where both the moth and the worm which produces it are figured (Pl. I, Figs 1 and 2). It has heretofore

[Fig. 131.]



Color—(a and b) flesh-color.

worm moths deposit their eggs on or near the surface of the ground, but here we have a clear case of their being deposited far away from the ground, and we have seen these same eggs deposited on both Apple and Cherry twigs and on Mulberry leaves. The shells of these eggs are extremely thin, and of a delicate glistening pink color, and they are always devoured by the young larvae soon after the latter hatch. These larvae are at first of a dirty yellow color, covered with black shiny elevated spots. They have the full complement of 16 legs, but the two hindmost pair of abdominal prolegs are much longer than the two foremost pair, and the worms have at this time the peculiarity of looping up the back when in motion, in the same manner as does the notorious Canker-worm, while they can also let themselves down by a web. For a while they live, for the most part, in company on the leaves, but after the first moult, strange to say! they lose their looping habit, the legs having become of nearly equal size. They can no longer let themselves down by a web, and they now disperse and begin to show the true Cut-worm characteristic of hiding during the day time just under the surface of the ground, and of cutting off our vegetables.

T. A. Thorp, Troy, Ills.—The belt of eggs which you found attached to one side of a Mulberry tree are of exactly the same kind as those sent by Mr. Pauls. We carefully counted them and found there were no less than 542. These were, beyond a doubt, deposited by a single moth. With such fecundity, it is to be wondered at, that cut-worms appear so suddenly and plentifully in our fields and gardens, when we reflect that, as we have experimentally proved, each egg will produce a fat, greasy worm, two inches long, in the incredibly short space of three weeks!

Emory S. Foster, Bushburg, Mo.—The eggs which you find attached to your Concord grape vines, belong to the same species of moth. They should be destroyed wherever found. Your neighbor, Mr. I. Bush, was last year troubled with the worms which they produce.

Works on Natural History—*Byron Carson, Findlay, Hancock Co., Ohio.*—You ask what works we would recommend to any one "desiring a thorough knowledge of Natural History." We reply that to enumerate the works necessary to such a thorough knowledge would require a whole number of the ENTOMOLOGIST. First and foremost we advise you to commence to read carefully the Great Book of Nature, and as you have subscribed to us for the *American Naturalist*, you will find at the end of each number of that periodical a tolerably full list of works on Natural History, and the proper information as to how they can be obtained. We have already advised as to the best works for the beginner in the study of Entomology. (See pp. 39 and 120 of present vol.)

Snow Fleas—*H. H. G. Bradt, Eureka, Wis.*—The minute black insects which you send, and which you found in countless myriads on the surface of the thawing snow, are known by the name of Snow Fleas. They are the *Podura nivivola* of Dr. Fitch, and may be found at almost any time during the winter at the foot of trees, under the bark of which they live. In such situations they are not readily noticed, but as soon as the sun becomes sufficiently warm to rouse them into activity, they issue forth and seem to be attracted by the snow, upon which, congregating by millions, they become at once conspicuous and cause us to wonder at their sudden appearance. They jump by means of a forked "spring tail" placed on the under side, near the extremity of the body. Their food consists of decaying vegetable matter.

Fuzzy Galls on Blackberry Twigs—*Jonathan Huggins, Woodburn, Ills.*—The globular, reddish, seed-like, hollow bodies which you find placed close together in irregular belts around the canes of your blackberries, each one measuring about one-tenth of an inch in diameter, and each giving rise to one or more long spines, are in reality Cynips-galls peculiar to the blackberry, and caused by a four-winged fly—the *Diastrophus cuscutoformis* of Osten Sacken—of a pithy brown or black color with red feet and antennae. As you rightly remark, many of them have been gutted by the birds, but if you open those which are not thus gutted you will find, at the present time, the pupa of the future fly lying snugly within the hollow gall.

Pithy Galls on Blackberry Twigs—*T. W. Gordon, Georgetown, Ohio.*—The large, dark red, pithy swelling which you find on your blackberry twigs, and which looks not unlike a dried and crinkled apple, is a polythalamous gall, produced by a small four-winged fly belonging to the very same genus and of much the same appearance as that spoken of above, in answer to Mr. Huggins. This fly was named *Diastrophus nebulosus* by Osten Sacken, and together with the other species referred to, was described in the "Proceedings of the Entomological Society of Philadelphia," vol. II., pp. 36-39. By making a transverse section of the gall, you will find near the centre a number of oblong cells which are at present occupied by pupae. Both these blackberry gall-makers are attacked by parasites which doubtless serve to prevent their undue increase.

Moth Eggs—*A. M. Shults, Troy, Lincoln Co., Mo.*—The belt of pale, cream-colored eggs encircling a twig (of what tree?) apparently are those of some moth, but of what particular species we cannot tell unless we breed them. The eggs of the Tent Caterpillar moth are much smaller, are fastened closer together, and are covered with a sort of varnish. We have formerly received just such eggs as you now send, from C. R. Babbitt, of Carroll City, Iowa, who found them encircling the twig of a Honey Locust.

J. Huggins, Woodburn, Ills.—The circle of eggs which you took from an Apple tree are of the same kind as the above.

Horse-hair Snakes—*A. M. Abbott, Union Grove, Ills.*—The popular notion that these animals are animated horse-hairs is nothing but a superstition. Like every other living creature, including ourselves, they spring from an egg in the first instance. They are not true insects, but belong to the Class of Worms; and just as man has intestinal worms that live and thrive in his body, so many insects are infested internally by these so-called horse-hair snakes. We have ourselves seen living specimens six inches long, that came out of the gigantic caterpillar of the *Cecropia* moth; and have often seen smaller ones come out of grasshoppers.

Fungus on Blackberry—*Wm. Calwell, Sparta, Ill.*—The singular excrescence on the root of the Dorchester blackberry is evidently some kind of fungoid growth and not the result of insect work.

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To render the volume as complete and useful as possible, your co-operation is earnestly solicited in securing living or fresh specimens of larvae, etc., from which colored illustrations can be made. These may best be obtained by confining a female of any species in a small, dark box—a pill box, for instance—where she will lay her eggs, which can easily be reared; if the food-plant of the larvae is not known, I will be happy to give any information; or, the plant may sometimes be detected by observing over what species the butterfly seems to hover. Specimens are desired, of the egg, of each stage of the larva and of the chrysalis of every species; they should be sent promptly by mail in light boxes (tin is preferable) to the address below, marked, in addition, "Insects," to secure prompt attention. The specimens should be accompanied by the name and address of the sender and, when known, the name of the insect (or, far better, by the very insect that laid the eggs) and of the plant on which it feeds; if larvae are sent, fresh moistened leaves of their food-plant should be placed in the box with them.

Complete lists of the species found in different localities are also desired, and especially, if accompanied by careful memoranda of the exact times of the first appearance and of the duration of each brood. It will be necessary to receive specimens from every possible quarter, to arrive at a definite knowledge of the habits of insects in different places. To secure this more effectually, I am willing to name any collection of local butterflies sent to me (with notes) about the first of October; such collections would be returned before the first of January; for the safety, however, of my own collection, and of others entrusted to me, it will be necessary to return at once, and unnamed, any collection showing traces of having been previously attacked by Museum pests.

For all favors or scientific intelligence received, the amplest credit will be given, and earnest attention is called to this appeal, as without material assistance, it will be impossible, in a single season, to obtain the necessary specimens to complete the undertaking.

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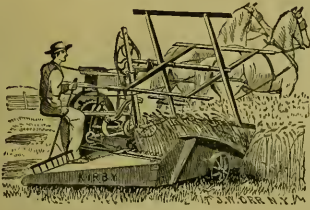
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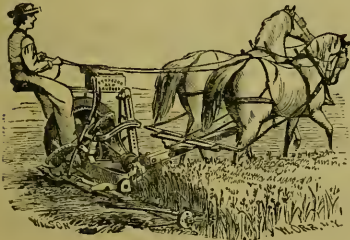
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IMITATIVE BUTTERFLIES.

There is a particular group of Butterflies, which is known to entomologists as the *Danais* family, and of which the very common N. A. species, represented on page 191 (Fig. 132) may be taken as an example. The different species belonging to this group are most of them remarkable for occurring in very great numbers in those countries which they inhabit. Their wings are rather longer than usual, but their flight, compared with that of many other Butterflies, is slow, and they do not dodge and zig-zag about, with many sudden skips and jerks in their travels through the air, as do the little butterflies known as Skippers (*Hesperia* family). Hence we cannot assume that they are enabled, by their peculiar mode of flying, to escape to a great extent those cannibal animals that would otherwise catch and devour them; and if we propose to account for their prodigious abundance at all, we are driven to have recourse to some other hypothesis. Indeed, so far is it from being the case that it is their mode of flight which enables them to escape from their cannibal foes, that Mr. H. W. Bates, the English naturalist, who spent eleven years in the Valley of the Amazon River, studying the Natural History of the insects of that region, where this particular group of Butterflies is very copiously represented, declares that he never saw a single one of them attacked by any cannibal foe whatever, whether Bird, or Dragonfly, or Lizard, or Asilus-fly. Hence he infers, with great appearance of reason, that they must be from some cause or other unpalatable to animals of prey; and in confirmation of this

idea, he remarks that they all of them without exception have a peculiar smell.* So far as regards the single species belonging to this group which is found in the Northern States, namely that shown on page 191 (Fig. 132) we ourselves have never noticed any peculiar smell about it; but we can add our testimony to the negative fact of its never being attacked by any carnivorous animal, so far as our experience has gone.

There is another group of Butterflies, the *Pieris* family, to which appertain the two common white butterflies (*Pieris oleracea* and *P. protodice*) found respectively in the Northern and in the more Southerly States. This group is also represented by many species, as we learn from Mr. Bates, in the Valley of the Amazon; but instead of the species being exceedingly abundant in individuals, as in the case of those belonging to the *Danais* family, it is quite the contrary; the proportion between the number of individuals belonging respectively to two of the commonest genera of either group (*Leptalis* and *Ithomia*) being, according to that author, only as 1 to 1000.† Hence it is reasonable to infer that this group must be much persecuted by cannibal foes, as was found by Mr. Bates to be generally the case, although from the great rarity of the particular genus named above (*Leptalis*) the fact could not be established so far as regarded that one genus‡.

It must be observed that the usual colors found in the different species of the *Danais* family are red, yellow, orange, white and black; and those found in the different species of the *Pieris* family are white and black, the white sometimes more or less tinged with greenish yellow. Some persons, perhaps, may consider that it is a vain and fanciful notion thus to define what are the colors of a whole group of insects; but it is none the less true that, not only in Insects, but throughout the whole Animal Kingdom each group wears a peculiar livery, not only as regards the shades of coloration, but as regards the pattern of coloration. This livery indeed

* See Mr Bates's Paper in *Trans. Linnean Society*, Vol. XXIII., p. 510.

† *Ibid.*, p. 505.

‡ *Ibid.*, p. 511.

varies more or less in different species belonging to the same group—as we see ladies who are all of them dressed in one and the same fashion differ slightly from each other in the cut and in the color of their garments—but still it is one and the same livery. To the above remarkable generalization has been recently given the name of the Law of the Unity of Coloration. We may add here that while the different species of the *Danais* family have wings that are somewhat longer than usual, in proportion to their breadth (see Fig. 132), those of the *Pieris* family usually have wings of rather less than medium length.

So far so good. We see fitting about in the great Valley of the Amazon vast swarms of long-winged butterflies, gorgeously dressed in red, orange, yellow, white and black; and certain short-winged butterflies, in very much smaller numbers, whose proper livery is but the plain black and white that befits a funeral. We see the former enjoy an entire immunity from the attacks of all predaceous animals, and the latter snapped up by every hungry Dragon-fly or *Asilus*-fly that happens to come across them. Will it be believed, now, that there are certain particular species of the homely, much persecuted, short-winged group, that assume the livery worn by certain particular species of their gaily-dressed compatriots, and actually even copy their elongated wings? Yet such is the indubitable fact. In the Memoir by Mr. Bates, which has been already referred to in a foot-note, will be found beautiful colored figures, in the highest style of art, both of the species that mimic and of those that are mimicked; and no one that looks at those figures with an unprejudiced eye can believe for a moment that the resemblance is merely accidental. We might as well suppose that it was only by accident, and not with any deliberate design of following a prevailing fashion, that the ladies, throughout the whole civilized world, have within the last few years taken to wearing hoop-skirts and long trailing dresses. What is still more remarkable, although most of these species are quite local, the mimickers are always found in the same district with the mimicked, and usually fly in company with them. The number of such cases met with in the Valley of the Amazon amounts to many scores, besides several analogous instances quoted by Mr. Bates as occurring not only in South America, but also in the Old World. Even the practised glance of the experienced bug-hunter is deceived by the close resemblance, when the imitators and the imitated are on the wing, and fails to distin-

guish the one from the other; although, as soon as they are captured, the eye perceives at once that there are structural differences between the two, which separate them as widely from each other as a camel is separated from a buffalo. On this subject, we cannot do better than to quote Mr. Bates's own language:

These imitative resemblances, of which hundreds of instances could be cited, are full of interest, and fill us with the greater astonishment the closer we investigate them; for some show a minute and palpably intentional likeness which is perfectly staggering. I have found that those features of the portrait are most attended to by nature, which produce the most effective deception when the insects are seen in nature. The faithfulness of the resemblance, in many cases, is not so striking when they are seen in the cabinet. Although I had daily practice in insect-collecting for many years, and was always on my guard, I was constantly deceived by them when in the woods. (p. 507.)

Mr. Bates accounts for these singular cases of mimicry by supposing that, ages and ages ago, certain individuals of this plainly-dressed and much-persecuted *Pieris* Family happened to vary slightly, so as to resemble slightly some species or other belonging to the gaily-dressed and unpalatable *Danais* Family; that, in consequence of this slight resemblance, they were sometimes mistaken for their more fortunate compatriots by cannibal animals, which would otherwise have preyed upon them forthwith; and consequently that they survived long enough to propagate their species, while almost all the individuals that had not varied in this particular manner perished prematurely by a violent death. Now, we know that, in the language of breeders and stock-raisers, "like produces like," which is what naturalists express by the well-known term of the "Law of Inheritance." Hence the descendents of this primordial race of imitative butterflies would naturally, most of them, vary in the same manner as did their ancestors from the normal type; and some of them would probably vary in a still more marked manner and in the same direction. These last individuals, as they would bear a still closer resemblance to the unpalatable butterflies, would of course stand a still better chance of surviving and propagating their species, in the course of that great Struggle for Existence, which we see going on all around us, not only among the inferior animals, but among the Human Species itself. By the perpetual repetition of this process, during indefinite ages, that perfect imitation of the imitated butterfly would at length be formed, which at first view appears so utterly inexplicable. And when it had once been formed, the very same process that originally formed it would afterwards keep it up to the standard of perfection. For all individuals, that varied in a backward direction towards the primordial type, would

be more liable than the rest to be devoured in early life by Cannibals, and would therefore be less likely than the rest to propagate their own image in succeeding generations. The whole process, indeed, is so beautifully simple and intelligible, that, but for certain prepossessions and prejudices, it would at once command the assent of every logical mind. In fact, it is strictly analogous to the common operation of "roguing" a bed of seedlings, which every gardener is familiar with. The only difference is that, when the gardener pulls up what he calls the "rogues" out of a thousand seedling tulips, i. e., those which deviate from the standard of perfection which he is aiming to attain, he acts with the definite object of preventing the farther propagation of those so-called "rogues;" whereas, when cannibal animals destroy the "rogues" among the imitative butterflies, they are of course perfectly ignorant of the consequences likely to follow, and act wholly and solely for the gratification of their own carnal appetites.

The great objection, in the minds of many men, to this solution of what otherwise seems to be an almost insoluble enigma is, that it proceeds upon Darwinian principles; and Darwin, in their opinion, is a horrible and pernicious monster who holds that Man is nothing but a Gorilla. They might perhaps see the error of this belief of theirs, if they would only condescend to read a book before they condemn it. In the meantime, if they refuse to accept the explanation of the mystery which has been given above, they are driven to believe that each of these species of imitative butterflies—which usually only extend over a district of country a few hundred miles long and broad, and are then replaced by other species with similar peculiarities—was originally created in the complete possession of all its present abnormal peculiarities of shape and coloration, and placed by the Creator in the very limited district which it now occupies, there to propagate its like for indefinite ages. In other words, instead of one grand general primordial creation, we are compelled to believe that there must have been tens of thousands of distinct local creations. For there is not an island in the vast illimitable

ocean, that does not contain certain species of animals and plants that are peculiar to that island, and are found nowhere else upon the face of the globe; and even in so small a district as the United States the fauna and flora of the Pacific States are, as a general rule, specifically distinct from those of the Atlantic States; and there are actually wide differences between those of the Eastern States and those of the great Valley of the Mississippi; even when the districts that are compared lie in the same latitude and enjoy nearly the same climate.

But imitative butterflies are not confined to South America, nor to the districts of the Old World specified by Mr. Bates. On the continent of North America we have but two poor

[Fig. 132]



Colors—Coppery-red, black and white.

solitary species of the *Danais* family—one of which (*Danais berenice*, Cram.), is confined to the more southerly regions and the other (*D. archippus*, Fabr.), being the species represented above in Figure 132, is common almost everywhere in the United States. Here, then, there are but two species to be mimicked. Let us see if they find any mimickers. There is a large group of butterflies, known as the *Nymphalis* Family, which agrees with the *Danais* Family in the front pair of legs being more or less aborted and functionally impotent, but differs very remarkably in the large cell in the centre of each wing never being closed externally by a distinct tubular vein, and in its being generally altogether open towards the outer margin of the wing. The typical genus (*Nymphalis*) in this family is normally for the most part of a blue-black or black color, often with a wide white band across the middle of each wing. But there is a single species, the *Disippus* butterfly, (*Nymphalis disippus*, Godt.), of which we herewith present a drawing (Fig. 133), which differs widely from the rest in its coloration, and both in the shades of color and in the coloration

tional pattern is an almost exact counterpart of the *Danais* that is figured above.* So servilely indeed does it mock the other species, that

[Fig. 133.]

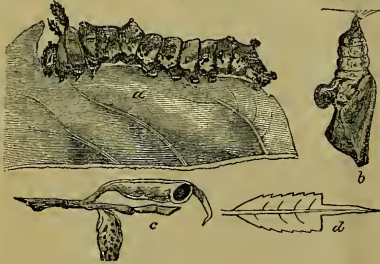


Colors—Coppery-red, black and white.

Prof. Jaeger, in his *Life of North American Insects*, has actually favored his readers with a wood-cut of it, and gravely informs them that its scientific name is *Danais archippus*! And yet—close as the resemblance is, and common as both species are—no author seems hitherto to have observed, that we have here a clear case in North America of that very same curious imitative process, which eight years ago was so beautifully expounded and explained by Mr. Bates, so far as regards the butterflies of the Valley of the Amazon!

The larva of this *Disippus* butterfly, of which a drawing will be found below (Fig. 134 a), occurs

[Fig. 134.]



Colors—(a) cream-color and olive; (b) cream-color and brown.

most commonly on different species of willow, but is often found on the closely allied poplar and cottonwood (*populus*) and occasionally on the plum. There is another larva, which resembles it so closely that the two can scarcely be distinguished, and which normally, like most species of the genus *Nymphalis*, inhabits the willow, but is occasionally met with on scrub-

* In Figure 133, the left wings represent the upper surface, and the right wings, which are detached from the body, represent the lower surface. The difference in the coloration of the two surfaces is but slight in this species, neither does it amount to much in the *Archippus* butterfly; but in some butterflies it is very considerable.

oak (*Quercus ilicifolia*), on whortleberry, on cherry, and on plum, from which last tree we have ourselves bred a single specimen. This second larva produces the *Ursula* butterfly (*Nymphalis ursula*, Fabr.), a species belonging to the same genus as the *Disippus* butterfly, but differing widely therefrom in being of a sombre blue-black color, with its wings bordered both above and below with blue, and below with a series of dull orange spots inside the blue border. Place this insect side by side with the *Archippus* butterfly, and everybody would say at once that no two species could possibly be more unlike in the general style of their coloration. Clearly, therefore, it cannot be considered as in any wise mimicking the latter. Now, the *Ursula* butterfly is found everywhere throughout the Northern States wherever the *Disippus* butterfly is met with; and yet, while the latter is a common and abundant species, the former is everywhere quite rare.* To what are we to attribute this fact? It can scarcely be owing to structural differences in the external organization of the two species; for the two belong to one and the same genus. It surely cannot be because the larvae of the former are more exposed to the attacks of predaceous animals than those of the latter; for they inhabit the same, or very nearly the same trees, and in size, shape and general coloration the two are almost exactly alike. Certainly it can not be because the pupæ of one species are more subject to be devoured by birds, insects, etc., than those of the other species; for it is impossible to tell one pupa from another, when placed side by side. The only cause to which we can reasonably attribute the great abundance of the *Disippus* butterfly and the comparative rarity of the *Ursula* butterfly is, that the former mimicks the *Archippus* butterfly, as has been shown above, and is consequently often mistaken by tree-frogs, dragon-flies, *Asilus* flies and other beasts of prey for its unsavory prototype and allowed to escape with impunity; while the latter, being too honest a bug to assume a fraudulent and deceptive disguise, is ruthlessly devoured by every insect-eating animal that can get hold of him.

Figure 134 b, shows the *Disippus* butterfly in the pupa state, with the strange knife-edged

* As we do not desire that the relative abundance of these two species should depend upon our authority alone, we subjoin a corroboratory evidence of the fact.

According to Mr. J. A. Lintner *ursula* is "rare" and *disippus* is found abundantly in New York. (*Proc. Ent. Soc. Phil.*, III, pp. 63-4.) According to Mr. J. Kirkpatrick *ursula* is "rather rare" and *disippus* "common in the fall" in Ohio. (*Ibid.*, p. 329.) According to Mr. Sam. H. Scudder, *ursula* is "rather rare" and *disippus* is "common" in New England. (*Proc. Essex Inst.*, III, p. 165.) According to Mr. Billings, who does not seem to have met with any *ursula* at all, *disippus* is "very common from July to October" in Canada West. (*Canad. Entom.*, I, p. 45.)

projection, which has sometimes been likened to a Roman nose, growing out of the middle of its back. This projection, however, is not a peculiarity of this particular species, but occurs in the pupæ of all the species belonging to this genus (*Nymphalis*), the transformations of which are known.

The *Disippus* butterfly, as is correctly stated by Harris, is double-brooded; but that author is entirely wrong in asserting that the second brood passes the winter in the pupa state.* He probably jumped to this conclusion from finding the butterfly flying about so early in the spring, that it could not have had sufficient time to hatch out from the egg and acquire its full larval growth the same season; and with its wings so bright and unworn, that it could not have hibernated in the butterfly form, as do certain allied species (*Vanessa Antiopa* and several species of *Grapta*). The real truth of the matter is, that the autumnal brood of larvæ have only attained about one-third their full size when the winter sets in, and hibernate in a singular house (Fig. 134 c), which they construct for this purpose out of the leaf of the willow. First and foremost—with wise forethought, and being well aware through its natural instincts, that the leaf which it has selected for its house will fall to the ground when the cold weather sets in, unless it takes measures to prevent this—the larva fastens the stem of the leaf with silken cables securely to the twig from which it grows. It then gnaws off the blade of the leaf at its tip end, leaving nothing but the mid-rib, as shown in Figure 134 d. Finally, it rolls the remaining part of the blade of the leaf into a cylinder, sewing the edges together with silk, the gnawed portion of the leaf forming a long flap which is bent down and fastened by silken cords so as to act as a door to the house. The basal portion of the cylinder is of course tapered to a point, as the edges of the leaf are merely drawn together, not overlapped; and invariably the lower side of the leaf forms the outside of the house, so as to have its projecting mid-rib out of the way of the larva, as it reposes singly in the inside. The whole when finished (Fig. 134 c), has somewhat the appearance of the leaf of a miniature pitcher-plant (*Sarracenia*), its length being 0.50—0.65 inch, and its diameter 0.11—0.14 inch.

We have found these winter-houses in the summer time, old, dry and empty, on the Heart-leaved Willow (*Salix cordata*); and on April 18th, 1865, and for a week or two subsequently we found great numbers of recent ones

on the Humble Willow (*S. Humilis*), some few of them still containing the larva, but most of them empty and with the larva in the immediate neighborhood, crawling sluggishly about and nibbling the catkins of this willow, which were then in full flower but not yet in leaf. We placed a lot of these larvæ in a breeding-cage and fed them upon willow; and from this lot we bred one pupa on May 5th, and four others between that date and May 15th. The first butterfly appeared May 21st, and two afterwards on May 24th. We have also bred the butterfly on August 15th, from a pupa found in the open air suspended from the stem of a grass-plant in the woods, and of course belonging to the first brood of larvæ.*

No other American butterfly has hitherto been recorded as hibernating in the larva state, and this is the first complete account that has yet been published of the singular mode in which this process is accomplished by the larva of the *Disippus* butterfly.† Not the least wonderful part of the phenomenon is, that it is only the autumnal brood of larvæ that form pitcher-like houses to live in during the inclement season of the year, the summer brood having no occasion to shelter themselves from the cold. We thus have an instance of a curious architectural instinct being only developed in alternate generations; which is much the same thing as if, with a certain race of men, the great-grandfathers, the fathers and the grandchildren ran wild in the woods, and the grandfathers, the sons and the great-grandchildren lived in houses and led the life of civilized human beings.

*As there is no good description extant of this larva, we annex a description carefully drawn up from the examination of three living specimens.

Cylindrical, 1.20 inch long and 0.25 inch in diameter. General color whitish. Head dull olive, with dense minute prickles; its vertex bifid and terminating in a pair of prickly cylindrical horns, transversely arranged and each about 0.03 inch long. Back speckled and mottled with olive of different shades above the line of the spiracles, except joints 2 and 8 and the upper part of 7 and 9, but with a continuous pure white line above the spiracles, beneath which white line on joints 4-10 is a large olive patch extending on joints 6-9 to the external tip of the prolegs. A pair of black transversely-arranged dorsal dots in the suture behind joint 2, and a less obvious lateral one above the 2nd and 4th pair of prolegs surrounding the lateral white line. Joints 3-7 and 9-11 with more or less, shining, elevated, blue dots. On joint 2 a pair of prickly cylindrical black horns, transversely arranged and 0.16 inch long. On joints 3, 10 and 11 a pair of large dorsal tubercles transversely arranged, each crowned by a little bunch of 8-12 robust prickles. On joint 5 a pair of similar tubercles, but still larger, of a yellowish color, and mamma-like. On joints 4, 6, 7 and 9 tubercles similar to those on joints 3, 10 and 11 but smaller. On joint 12 four black prickly dorsal horns, quadrangularly arranged and each about 0.03 inch long. Spiracles and legs blackish.

†As long ago as 1859, the late Dr. Harris, as we learn from a letter of his to Miss Morris, recently published in the *Harris Correspondence* (p. 245), was aware of the existence of these curious cases. He speaks of them as "the little leafy cones of the bases of leaves upon willows and poplars, into which these caterpillars [*Limentis disippus* and *Lim. ursula*] retire for protection during the winter, and in which they remain unchanged until the following spring." It appears also, from a brief notice in the *Proceedings of the Boston Society of Natural History*, Nov. 27, 1867, that these larva cases were known both to Mr. Trouvelot and to Mr. Sanborn at least as early as the year 1867.

THE CHINCH BUG.

(Micropus leucopterus, Say.)

[CONCLUDED FROM NUMBER NINE.]

Cannibal Foes of the Chinch Bug.

As long ago as 1861, the Senior Editor, in his *Essay upon the Injurious Insects of Illinois*, published facts which tended to show that four distinct species of Ladybirds preyed upon the Chinch Bug.* The first of these four is the Spotted Ladybird (*Hippodamia maculata*, DeGeer, Fig. 135), which also preys upon a great variety of other insects, attacking both the

[Fig. 135.]

*Hipp. maculata.*

Colors: Pink and black.

eggs of the Colorado Potato Bug and those of certain Bark lice; and which is further remarkable for being one of the few insects found both in Europe and in North America.

[Fig. 136.]

*Cocc. munda.*

Colors: Light brick red, white and black.

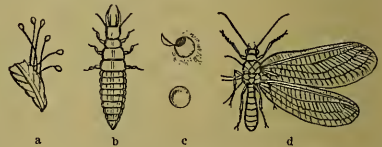
The second is the Trim Ladybird (*Coccinella munda*, Say, Fig. 136), which is distinguishable at once from a great variety of its brethren by having no black spots upon its red wing-cases. The other two are much smaller insects, belonging to a genus (*Scymnus*) of Ladybirds, most of the species of which are quite small and of obscure brown colors, and hard to be distinguished by the popular eye from other beetles, the structure of which is very different, and which therefore belong to very different groups and have very different habits. Of these last we present no figures; as the scientific reader knows perfectly well by what characters they can be recognized, and no mere figures would enable the popular reader to recognize them at a glance.

In the autumn of 1864 Dr. Shimer ascertained, apparently by actual observation, that the very same Ladybird which has been sketched above (Fig. 135) preys extensively upon the Chinch Bug. In a particular field of corn, which had been sown thick for fodder, and which was swarming with Chinch Bugs, he found, as he says, that this Ladybird "could be counted by hundreds upon every square yard of ground after shaking the corn; but the Chinch Bugs were so numerous, that these hosts of enemies made very little perceptible impression among them." On the general subject of Ladybirds and their lizard-like larvæ, we must refer the reader to what we have said in our article on Potato Bugs (No. 3, p. 46), where figures of several species in their different stages will be und.

* See *Trans. Ill. St. Agric. Society*, IV, pp. 346-9.

In the same autumn the same observer made the additional and entirely original discovery, that in the very same field of fodder-corn the Chinch Bugs were preyed upon by the larva of a very common species of Lacewing Fly—the Weeping Lacewing (*Chrysopa plorabunda*, Fitch).* With the exception of the Eyed Lacewing (*Chr. oculata*, Say), and perhaps the Red-lipped Lacewing (*Chr. rufilabris*, Burm.), this is our commonest species in Illinois; and Dr. Fitch says that he met with it in abundance in the very months, September and October, in which Dr. Shimer noticed it in such profusion in a corn-field, and not only in his own State, New York, but also in the State of Illinois. All the Lacewing Flies, however, resemble one another so closely both in size, shape and color, that the ordinary observer would suppose them all to belong to the same species; and the same may be said of their larvæ. Hence we shall merely repeat here from page 33 the figures there given of one of them, where *a* represents

[Fig. 137.]



Colors—(a) white; (b and c) brown; (d) green, with green wing-veins.

the eggs, *b* the larva with its long sickle-shaped jaws, by which it may be readily distinguished from all the Ladybird larvæ, *c* the ridiculously small cocoon, and *d* the enormous fly that comes out of this very small cocoon, as the Bottle-

* Dr. Shimer has re-described *plorabunda* as a new species under the name of *illinoensis* in *Proc. Ent. Soc. Phil.*, IV, p. 208. He favored us some years ago with five specimens of this so-called new species of his, which expand from 0.93 to 1.05 inch. He himself states it to expand from 1.025 to 1.08 inch, and says that it differs from *plorabunda* in the "larger size," Fitch giving "1 inch" as the expanse of that species! So that, by his own showing the average difference in the expanse, which is to form one of the reasons for grinding out a new species, is only about five-hundredths of an inch! This is certainly pretty fine wire-drawing! The other differences that he points out are equally futile. For example, this species has the wings as much rounded at tip as any *Chrysopa* known to us, though the tip of each wing and especially of the hind wing is still very slightly angulated. Now, *plorabunda* is very properly described by Fitch as having "the wings rounded at tips, the hind pair slightly angular;" and in comparison with such species as *rufilabris*, Burm., it may well be said to have rounded wings, though strictly speaking the typical obtuse angle can still be obscurely seen at the tip even of the front wing. Hereupon Dr. Shimer remarks that his so-called new species "differs from *plorabunda* in having the anterior wings, as well as the posterior, a little acuminate." We should like to see a *Chrysopa* where they are not more or less acuminate! As another glaring proof of the scientific unreliability of this writer, upon any question of classification, we may add that he asserts that his *illinoensis* differs from *Harristi*, Fitch, "in having no black nervures," (p. 212). Now, *Harristi* is expressly stated by Fitch to have the nervures "greenish white without any traces of dark green or black at their ends." (*N. Y. Rep.*, I, p. 90). How then is it possible for *illinoensis* to differ from *Harristi* by having no black nervures, when neither species has black nervures?

conjuror promised to come out of the quart bottle and fooled the London cockneys so stupidly in the last century.

According to Dr. Shimer, this Lacewing Fly was not quite as abundant as the Spotted Lady-bird among the fodder-corn, but still there were so many of them, that he thought that "there was one or more of them for every stalk of that thickly sown corn." "Every stroke of the cutter," he adds, "would raise three or four dozen of them, presenting quite an interesting spectacle as they staggered along in their awkward, unsteady flight." And he not only actually observed the larvæ preying very voraciously on the Chinch Bugs in the field, but he reared great numbers of them to the mature Fly by feeding them upon Chinch Bugs. His account of the operations of the larva when in captivity is so interesting that we give it here in full:

I placed one of the larvæ in a vial, after having captured it in the field in the very act of devouring Chinch Bugs of all sizes, and subsequently introduced into the vial a number of Chinch Bugs. They had hardly reached the bottom, before it seized one of the largest ones, pierced it with its long jaws, held it almost motionless for about a minute while it was sucking the juices from the body of its victim, and then threw down the lifeless shell. In this way, I saw it destroy in quick succession, about a dozen bugs. Towards the last, as its appetite was becoming satiated, it spent five or more minutes in sucking the juices from the body of one bug. After this bountiful repast, it remained motionless for an hour or more, as if asleep. Never for a single moment, during the feast, did it pause in the work. When not in possession of a bug, it was on the search for, or in the pursuit of others. It manifested much eagerness in the pursuit of its prey, yet not with a lion-like boldness; for on several occasions I observed a manifest timorousness, a halting in the attack, as if conscious of danger in its hunting expeditions, although here there was none. Sometimes, when two or more bugs were approaching rapidly, it would shrink back from the attack, and turning aside go in the pursuit of others. At length, awakening, it would renew the assault as before. On one occasion, when it was on the side of the vial, two inches up, with a large bug in its mouth, I jarred the vial, so that it fell to the bottom and rolled over and over across the bottom; but holding on to its prey, it regained its footing and mounted up to its former position. Occasionally the Chinch Bugs would hasten to escape when pursued, as if in some degree conscious of danger.*

We will now give a drawing of the true veritable Chinch Bug (Fig. 138 *a*), and by the side of it one of a common species of the Half-winged Bugs, the Insidious Flower Bug (*Anthocoris insidiosus*, Say, Fig. 138 *b*). This last was re-described and re-named by Dr. Fitch as the False Chinch Bug (*Anthocoris pseudo-chinche*, Fitch), a quarter of a century after it had been originally described and named by Thos. Say; but according to the received rules of scientific etiquette, Say's name must take precedence of Fitch's.† It is so often found in company with

[Fig. 138.]



Colors—(a and b) black and white.

Chinch Bugs, that Dr. Fitch states that it had upon one occasion been sent to him by a correspondent by mistake as the veritable Chinch Bug;* and he adds that it may be frequently met with upon the same flowers and leaves with the Chinch Bug, in Illinois and Wisconsin, from the forepart of July until the close of the season. We have ourselves repeatedly found it in company with Chinch Bugs under the husks of ears of corn in the latter part of the season; and the fact was stated as long ago as 1861 in an Essay upon the Noxious Insects of Illinois by the Senior Editor.† Once in the month of September, when we were examining the corn-husks in a piece of sweet-corn belonging to one of the most extensive growers of market vegetables near Rock Island, Ills., we showed the Market-gardener himself a corn-husk with several genuine Chinch Bugs, and also several of these False, or Bogus Chinch Bugs upon it. We had previously asked him if he knew a Chinch Bug when he saw it. "I guess I do," was his reply. "Well, then," we rejoined, "tell us which are the true Chinch Bugs upon this husk." To our great amusement, he pointed out the False Chinch Bugs as the genuine article. And yet this man, who could not tell a Chinch Bug when he saw it, probably had his pocket annually picked of some hundred dollars on the average of years, by this rapacious little savage! Now, in the eyes of an entomologist, the two insects look as different one from another as a Cow does from a Horse. And yet the popular eye is, up to the present day, so uneducated in appreciating even the most glaring differences in shape and structure among these almost infinitesimally small creatures, that because the two are each of them colored black and white, though the Bogus Chinch Bug is only about half the size of the Genuine Chinch Bug, and is also shaped quite differently from that insect, the two are very generally con-

*From Dr. Shimer's Paper in *Proc. Ent. Soc., Phil* 1V pp. 209-210.

† For a further account of this insect, see a Paper by the Senior Editor in *Proc. Ent. Soc. Phil.*, VI, p. 274.

* *New York Reports*, I, p. 294.

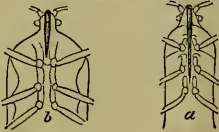
† *Trans. Ill. St. Agric. Society*, 1V, p. 347.

founded together! And the strangest thing of all is, that the very same persons who confound together these very dissimilar insects, will yet have no difficulty whatever in distinguishing between a pie-bald horse and a pie-bald cow, and are not at all likely to undertake to milk the horse or to yoke up the cow in their buggy!

From the fact that the Insidious Flower-bug never occurs in large numbers in any particular location, although it is very generally to be met with on a great variety of plants, we have for several years back been inclined to suspect, that it is not a vegetable-feeder but a cannibal. This opinion was strengthened by the structure of its beak (Fig. 139, *b*),

[Fig. 139.]

which like that of the great *Reduvius* family of the Half-winged Bugs (see Fig. 44, *b*, p. 47), all of which family are cannibals, is



short and three-jointed; whereas that of the Great *Capsus* family, to which our insect bears a strong general resemblance and which are almost universally vegetable-feeders, is long and four-jointed. This last remark also applies to the beak of the closely-allied *Lygaeus* family among the Half-winged Bugs, which is likewise, as may be seen from examining the beak of the Chinch Bug (Fig. 139, *a*), a species belonging to this same *Lygaeus* family, not short and three-jointed but long and four-jointed. The opinion that the Insidious Flower-bug, and two other species belonging to the same genus (*Anthocoris musculus*, Say and *Anth. n. sp.?*), which like the first are never met with in any considerable numbers, are in reality Cannibals, has been further confirmed by sundry observations which it would be tedious to particularize here. And we have been finally convinced that this is the case, by ascertaining that two European species of this genus (*Anth. nemorum*, Linn. and *Anth. minutus* Linn.) have been well known in Europe for a long time to prey upon plant-lice, "the perfect insects," as Curtis says, "inhabiting flowers and the immature ones running about in search of the plant-lice, which they transfix with their sharp beak."* The second of these two Transatlantic species so closely resembles our Insidious Flower-bug, that it might be a question with some whether they are not identically the same; still there are, in our opinion, sufficient characters to distinguish them as separate species.

The figures given above will, we think, be

amply sufficient to enable the intelligent farmer to tell the difference between the Insidious Flower-bug, which doubtless preys upon the Chinch bug and upon a variety of other plant-feeding insects, and which is consequently one of the best friends the farmer has got, and that miserable little skunk in the world of insects, the true Chinch Bug, which as every one knows is one of the very bitterest enemies of the grain-growing farmer. It is very true that, practically, it will be found almost impossible to separate the sheep from the goats, and spare the lives of the former while condemning to destruction the unsavory little carcasses of the latter. Still, it will be some comfort to the grain grower, when at some future day he may discover his small grain or his corn to be alive with Chinch Bugs, to perceive the bright orange-colored larvæ of the Insidious Flower-bug dodging about among the blood-red or blood-brown larvæ of his bitter foes, and sucking out their life-blood with ravenous avidity; or to discover the little slow-going larvæ of the *Scymnus* group of Ladybirds, with such dense and evenly-shorn masses of short milk-white cottony threads growing out of their entire bodies that they look like little animated flakes of cotton wool, crawling about among the stinking crowd and making many a hearty meal off them, stink they never so badly; or, finally, to watch the lizard-like black and yellow larvæ of the Spotted Ladybird, and the Trim Ladybird, with their short, robust jaws, or the greenish-brown larvæ of the Lacewing Fly, with their long slender sickle-shaped jaws, running rapidly about among the hosts of his enemies, and smiting them hip and thigh without any more mercy than the Amalekites of old experienced at the hands of avenging Israel. He will then know that, even if he is himself powerless to make head against a host of minute foes, as numerous as the sand on the seashore, and as destructive and irresistible as the waves of the great ocean itself, Providence has provided a check upon the unlimited increase of his enemies; and that a Power which is above us all and provides for us all, and which alloweth not even a sparrow to fall to the ground unless by His especial permission, has said to every vegetable-feeding insect, through the moulds of the various Cannibal and Parasitic species which He has appointed to do His work: "Thus far shalt thou go, and no farther; and here shall thy proud hosts be stayed."

We suppose that there can be no reasonable doubt that the common Quail of the Middle and Western States (*Ortyx Virginiana*), otherwise

* Curtis's *Farm Insects*, pp. 429-430.

known as the Partridge in the Northern States, feeds habitually upon Chinch Bugs, whenever it can get a chance. The fact was long ago published to the world; and assuming the truth of it, this bird ought to be protected from the gun of the sportsman, and the net of the "pot-hunter" in every State where the Chinch Bug has ever been known to run riot. We were informed, indeed, in the autumn of 1868, by Mr. Joseph Conet, of Rock Island, Ill., that in order to test this question, he purposely examined the contents of the stomachs of about twenty Quails, and at least ten of the whole number in the summer, and found no insects therein, but only corn and seeds. But as these observations must have been made in some of the years when Chinch bugs were very rare, owing to the long-continued rainy season of 1865, and the seasonable showers of the years '66 and '67, we do not think that they prove much either one way or the other.

"The Chinch Bug," said Dr. Fitch in the year 1856, "so far as we yet know, is exempt from any molestation by predaceous insects and other animals. No bird probably has a relish for such an unsavory morsel as one of these fetid insects."* But it seems to be a tolerably well established fact that the Quail is not too dainty to prey ravenously upon them, which possibly may be one cause of the fine "game flavor," which makes this bird so acceptable a dish at the table of every epicure. And we have already enumerated no less than six insects, four of which are Beetles, one a True Half-winged Bug (*Heteroptera*) and one a species belonging to the Net-winged Flies (*Neuroptera*), and all of which probably prey upon Chinch Bugs, while two of them unquestionably do so. Whatever croakers and grumblers may chuse to say, the Entomological World, as well as the Moral and the Political World, does undoubtedly move. If we have not yet discovered any Universal and Infallible Remedy for the Chinch Bug disease, we are yet on the high road towards that desirable consummation. For the more we know of the habits and the Natural History of any noxious insect, the more likely we are to discover some efficient means of counterworking its depredations, or at all events some palliation of the evil.

Amount of Damage done by the Chinch Bug.

According to Dr. Shimer's estimate, which we consider a reasonable one, in the year 1864 "three-fourths of the wheat and one-half of the corn-crop were destroyed by the Chinch Bug

throughout many extensive districts, comprising almost the entire North-west." At the average annual rate of increase, according to the U. S. Census, in the State of Illinois, the wheat-crop of 1864 ought to have been about thirty millions of bushels, and the corn-crop about one hundred and thirty-eight million bushels. Putting the cash value of wheat at \$1.25 and that of corn at 50 cents, the cash value of the corn and wheat destroyed by this insignificant little bug no bigger than a grain of rice, in one single State and in one single year, will therefore, according to the above figures, foot up to the astounding total of OVER SEVENTY-THREE MILLIONS OF DOLLARS! Put it as low as we chuse, it is still "a big thing;" and it is unnecessary to argue a question any further, when facts and figures speak so plainly.

Remedies against the Chinch Bug.

It has long been noticed that the Chinch Bug commences its ravages in the spring from the edges of a piece of grain, or occasionally from one or more small patches, scattered at random in the more central portions of it, and usually drier than the rest of the field. From these particular parts it subsequently spreads by degrees over the whole field, multiplying as it goes and finally taking the entire crop unless checked up by seasonable rains. In newly-broken land, where the fences are new and consequently no old stuff has had time to accumulate along them, the Chinch Bug is never heard of. These facts indicate that the mother insects must very generally pass the winter in the old dead stuff that usually gathers along fences. Hence, by way of precaution, it is advisable, whenever possible, to burn up such dead stuff in the winter or early in the spring, and particularly to rake together and burn up the old corn-stalks, instead of ploughing them in, or allowing them, as is often done, to lie littering about on some piece of waste ground. It is true, agriculturally speaking, this is bad farming; but it is better to lose the manure contained in the corn-stalks than to have one's crop destroyed by insects. Whenever such small infested patches in a grain-field are noticed early in the season, the rest of the field may often be saved by carting dry straw on to them and burning the straw on the spot, Chinch Bugs, green wheat and all; and this will be still easier to do when the bugs start along the edge of the field. If, as frequently happens, a piece of small grain is found about harvest-time to be so badly shrunk up by the bug, as not to be worth cutting, the owner of it ought always to set fire to it and burn it up along with

* *New York Reports*, 1, p. 295.

its ill-savored inhabitants. Thus, not only will the insect be prevented from migrating on to the adjacent corn-fields, but its future multiplication will be considerably checked.

A very simple, cheap and easy method of prevention was recommended seven years ago by Mr. Wilson Phelps, of Crete, Ills., which we give for what it is worth. It may very probably be effectual when the bugs are not too numerous, and certainly can do no harm.

With 12 bushels of spring wheat mix one bushel of winter rye and sow in the usual manner. The rye not heading out, but spreading out close to the ground, the bugs will content themselves with eating it, until the wheat is too far advanced to be injured by them. There will of course be no danger of the winter rye mixing with the spring wheat.—*Prairie Farmer*, April 19, 1862.

When Chinch Bugs are likely to march, as they often do, after the fashion of Army-worms (*Leucania unipuncta*, Haw.), from an infested to an uninfested field, Mr. H. J. Everest, of Stoughton, Dane county, Wis., recommends the following plan, which is stated to have been tried by several persons and found to be perfectly effectual:

Take common fence-boards, six inches or less wide, and run them around the piece, set edgewise, and so that the bugs can not get under them or between the joints, and then spread either pine or coal tar on the upper edge, and they will not cross it. The tar needs renewing till the edge gets saturated, so that it will keep wet and not dry in any more, and either kind of tar is effectual. Then dig holes close to the boards, about like a post-hole, once in four or five rods, and run a strip of tar from the top of the board to the bottom on the outside opposite the hole, and they will leave the board, and in trying to get around the tarred stripe will slide into the hole, where they will be obliged to remain till they can be buried at leisure, and new holes opened for more victims. It is seldom one has to fence more than one side of a field, but wherever the fence is, it is a sure stop.—*Proc. New York Farmers' Club*.

Finally, when the Chinch Bugs are already in the field which it is proposed to rescue from their clutches, Mr. Michael Hopps, of Lyonsville, Cook county, Ill., says that he saved a piece of wheat by sowing gas-lime broadcast over it, at the rate of six or seven bushels to the acre; and that the effect was that the bugs immediately left his field, and his crop was saved, while the wheat of his neighbors was nearly ruined by them. He further states that "a neighbor had a field of wheat adjoining his (Mr. Hopps's) cornfield, in which the bugs worked badly. Thinking that, as soon as the wheat was cut, they would emigrate to his corn, he dropped a handful of the gas-lime upon each hill of corn, in the same manner as plaster is often dropped upon corn in the East. The consequence was that the bugs did not attack the corn in the least."—*Prairie Farmer*.

But, if gas lime keeps off Chinch Bugs, which may or may not be the case, it appears that coal-tar most certainly will not do so, as the following experiment of Dr. Shimer's proves:

May 26th, 1864.—I saturated some saw-dust with coal tar, and mixed some quick-lime among it, so that it might be in a good condition for handling, and sowed it thickly broadcast over a portion of my wheat-field, where the bugs were very numerous.

May 27th—29th, 1864.—The bugs refuse to leave the part of the field where I sowed the tarred saw-dust, so there is but little hope of driving them from their once chosen grounds, by the seasonable application of strong-smelling drugs.

We have selected the above remedies from a vast mass floating around in the various Agricultural Journals, some of them utterly absurd and irrational and others of very doubtful validity, not because we have any personal knowledge of their efficiency, but because they appear the most in accordance with analogy and the most likely to prove practically successful. As to a ridiculous proposal, put forth in the year 1865, with a great flourish of trumpets, by a gentleman in the North-east corner of Illinois, namely to destroy the Chinch Bug in the egg state by pickling all the seed-wheat; it is sufficient to observe that this insect does not lay its eggs upon the kernel of the ripe wheat, but upon the roots of the young green wheat. Consequently, to attempt to kill Chinch Bug eggs, by doctoring the seed wheat, would be pretty much like trying to kill the nits in a boy's head, by applying a piece of sticking-plaster to his great toe.

Recapitulation.

We consider the following important points to be firmly established:

1st. Chinch Bugs hibernate in the perfect or winged state in any old dry rubbish, under dead leaves, in old straw, in corn-shucks and corn-stalks, among weeds in fence-corners, etc., etc. Therefore all such substances should be burned up, as far as possible, in the spring.

2nd. The earlier small grain can be sowed in the spring, the more likely it is to escape the Chinch Bug; for it will then get ripe before the spring brood of bugs has had time to become fully developed at the expense of the grain.

3d. The harder the ground is where the grain is sowed, the less chance there is for the Chinch Bug to penetrate to the roots of the grain and lay its eggs thereon. Hence the importance of fall-ploughing and using the roller upon land that is loose and friable. And hence, if old corn-ground is sufficiently clean, it is a good plan to harrow in a crop of small grain upon it without ploughing it at all.

4th. A single heavy rain immediately checks up the propagation of the Chinch Bugs. Continued heavy rains diminish their numbers most materially. A long-continued wet season, such as that of 1865, almost sweeps the whole brood

of them from off the face of the earth; but from the rapid rate at which they multiply there will always be enough left for seed for another year. It may be laid down, not only as a general, but as a universal rule, that this insect is never ruinously destructive, except in those sections of country where there is continued hot dry weather; and that if, in two adjoining districts, there has been a dry summer in one and much wet weather during the summer season in the other, however plentiful and destructive the bug may be in the first district, it will scarcely be heard of in the second. Certainly this state of facts is not exactly that from which any reasonable man would infer, that the paucity of Chinese Bugs in a wet season is caused by an Epidemic Disease taking them off. We might as well maintain that, although there was no Epidemic Disease among the children of Israel that had just crossed the Red Sea, or among the Egyptians that staid at home, it was simply and solely an Epidemic Disease that slew the pursuing hosts of the Egyptians and covered the bottom of the Red Sea with their carcases.

✓ CABBAGE-WORMS UPON GILLY-FLOWERS.

There is a small green worm, about one-third of an inch long, which commonly infests cabbage leaves in the West, eating holes through their substance, and when very numerous riddling them like a sieve. When full-fed this larva spins a very slight cocoon of white network upon the cabbage-leaf, inside which it transforms into the pupa, and subsequently into the perfect moth state. The moth—which may be recognized by the white hind margin of its gray front wings, and which scarcely measures half an inch across its expanded wings—has been imported into this country from Europe, and according to Stainton, into all the four quarters of the globe, wherever cabbages are grown. In this country, and probably in Europe also, there are two broods of them every year, one coming out in the middle of the summer and the other in October. (The proper name of this insect is *Plutella cruciferarum*; but the late Dr. Clemens, not being aware of its identity with the European species, re-described it as *Plutella limbipennella*, and under the same circumstances Dr. Fitch gave it the name of *Cerostoma brassicella*.)

We have received specimens of this moth from Capt. Edw. H. Beebe, of Galena, Ills., along with some of its cocoons. He says that the larva is very destructive to gilly-flowers, and

some other plants in green-houses, and that in green-houses it hatches out into the moth state as late as the end of November. This hatching out as late as November, instead of in October, is no doubt due, as Capt. Beebe suggests, to artificial warmth. The gilly-flowers upon which the insect occurred belong to the same botanical family (*Crucifera*) as the cabbage; and we learn from its European name, that the larva feeds in Europe upon a variety of species belonging to this great group of plants.

PRACTICAL IMPORTANCE OF SCIENCE.

[Translated from *Le Naturaliste Canadien*, No. 4.]

We lately met a friend who, thinking that it was necessary to apologize to us for not having subscribed to our Journal, told us that he had paid no attention whatever to Natural History. "I care but very little," he added, "to know whether a butterfly has a yellow tail or a red one, and I willingly let that question alone without troubling my head about it." "It is fortunate," we replied, "that there are other people who do not think as you do, for the thing is of more importance than you suppose. If all the world had reasoned as you do, steam, electricity, magnetism, etc., would have never received from man those practical applications which astonish the intellect to-day, and constitute the wonder of the age. A butterfly's tail being yellow or red contains nothing which ought intrinsically to interest us; but it by that character one is enabled to distinguish a friend from an enemy—a beneficial being from a dangerous animal capable of causing considerable damage—then this character acquires a very special importance. And you ought to think yourself fortunate," we added, "that others have done for you what you do not feel the courage to undertake for yourself, and have given you the power, by means of such publications as ours, to jump to results without having been subjected to the toilsome labor of the demonstration—that is to say, to draw your interest without having deposited any capital in the great Bank of science."

The majority of our readers will, we think, be of our opinion. They will proclaim with us, that progress among men demands the concurrent action of every intellectual power, and that in working, each of us in the speciality which has fixed our choice, we promote the general good of the community, and engineer effectively for the great cause of veritable progress.

"WASPS AND THEIR HABITS."

Editors American Entomologist:

In reading the very interesting paper on "Wasps and their Habits," in the March number of the ENTOMOLOGIST, on page 141, first column, I notice the following paragraph, in reference to those species belonging to the genus *Vespa*, commonly called "Yellow-Jackets."

"We ourselves know but little of their economy, save that all the species with which we are acquainted, build their nests under ground like the common wasp (*Vespa vulgaris*), of Europe, and none of them attach their nests to trees, as do certain European species."

As nothing is said in the paper about any other species attaching their nests to the branches of trees, except the Bald-faced Hornet (*Vespa maculata*), and as the general reader might be led to suppose that no other species in this country *does* build such a nest; allow me to say that in Pennsylvania, or at least in Lancaster county, we have a species of "Yellow-Jacket" or "Yellow Hornet" (*Vespa vulgaris*, American variety) which builds such nest, and which is almost as common as the *maculata*. This insect is about the size of the common Yellow-Jacket (*Vespa germanica*), and the nest is globular and about the size of an ordinary man's fist, and usually is attached to twigs, about three or four feet from the ground. I secured a nest and captured the whole family of wasps that occupied it, last summer, in the north part of this county, and have taken them frequently, as much as twenty years ago. It however requires some adroit reconnoitering to elude the watchful vigilance of these little wasps, for I always found one of them at the door, head outward, apparently "smelling danger." But I at length suddenly "charged on their works" with two or three plics of soft wet paper, about the size of my hand, which I clapped over the hole, before the sentry could come forth. I however soon found that it would not take them long to work their way through the paper, therefore I held a wide-mouthed collecting bottle, containing a quantity of alcohol, over the hole, which is at the lower end of the nest, when the whole colony, very spitefully and very hastily, precipitated themselves into the alcohol, and thus were secured.

Although Mr. Smith of the British Museum, and M. De Saussure contend that our *vulgaris* and *germanica* are identical with the European species, yet Mr. Norton thinks differently, or did in 1862. It seems to me that the European

species, which nests underground, and ours of the same name which nests on branches of trees, must be two distinct species. S. S. R.

EDITORIAL REMARKS.—We fully agree in the opinion of Messrs. Norton and S. S. R., as to our so-called *vulgaris* being a distinct species from the European wasp bearing that name, provided that its habits are essentially different, as appears to be the case. It is immaterial, according to our views, whether or not these two wasps be externally undistinguishable. If their habits be essentially different, then either their external or else their internal organization must be essentially different; and upon either of these two suppositions even the most rigid systematists would concede them to be specifically distinct. Upon the same principle, we consider the Seventeen-year Cicada and the Thirteen-year Cicada to be specifically distinct, although externally these two forms cannot be distinguished from one another.

THE SOCIAL WASPS.

BY D. A. A. NICHOLS, OF WESTFIELD, N. Y.

In the March number of the AMERICAN ENTOMOLOGIST is a valuable and nearly exhaustive article on the "Wasps." I would like to add a little information in regard to the Bald-faced Hornet. The article in question mentions but one species, but here we had two at least, the past summer. I saw many of the nests of the common species, and in a hollow log there was a nest, the builders of which were about half the size of the ordinary Bald-faced Hornet. Their markings were the same, at least to the naked eye, but they were no larger around the abdomen and thorax than the Yellow-Jacket, and they were much shorter. They were the only ones of the kind I ever saw. I called the attention of several persons to the nest and its inmates, and no one had ever seen the species before. Their habits were apparently the same as their larger relatives, except that I never saw them try to catch the common house-fly as the large Bald-faced Hornet will often do.

On page 141 of the same number, you say the Yellow-Jacket always builds under ground. Here nearly all the nests we find are on trees or bushes. I found as many as twenty on this farm, and but one of them was in the ground. One nest was built near the roof of the granary, on the inside of the building, about twelve feet from the ground. It was sixteen inches in diameter and twenty inches in length. This colony was as large as a good swarm of bees, but

T. GLOVER

made a poor choice for a home, as they got burned out.

EDITORIAL REMARKS.—The Hornets, resembling our common Bald-faced species, of which Mr. Nichols noticed a single nest in a hollow log, were probably the common European Hornet (*Vespa crabro*, Linn.), which according to that excellent observer, Mr. Angus of Long Island, N. Y., has become domesticated in the neighborhood of the City of New York.* This species has the head and thorax mostly of a dull rufous color, without any white face such as our native Hornet has; but the abdomen is marked and colored in almost exactly the same manner as in our species. Its habit in Europe is to build in hollow trees, so that in this respect it agrees very well with the wasp observed by Mr. Nichols. In Europe, however, instead of being "about half the size of the ordinary Bald-faced Hornet," it is one or two sizes larger; and it does not seem at all agreeable to analogy that, when imported into America, it should degenerate in size. How the European Hornet came to be introduced into this country, unless some mischievous person brought a nest of them over with him in a steamship by way of "devilry," is difficult to explain; but we suppose that the fact is indisputable. With the exception of the Bald-faced Hornet, all the American species of this social genus (*Vespa*), that we are acquainted with, are colored yellow and black and not greenish-white and black. Mr. Nichols's remark that his wasp was "much shorter than the Yellow-Jacket," excludes the idea of its having been some species of the other genus (*Polistes*) of Social Wasps found in the Atlantic States. The question can only be finally solved by the actual examination of specimens by some competent entomologist. We hope to receive such from Mr. Nichols in the course of the coming season, and also specimens of the genuine European Hornet from Mr. Angus or any other citizen of New York who may meet with them. They will form an interesting accession to our Cabinet.

Mr. Nichols is mistaken in quoting us as asserting that "the Yellow-Jacket always builds underground." What we really did say (p. 141), was, that "all the species *with which we are acquainted* build their nests underground;" and so far as we are at present advised, none of the species that build upon trees and bushes occur in Illinois or Missouri. We shall be glad to receive from any of our correspondents, whether in the East or the West, Yellow-Jack-

ets taken from nests built in the open air, that we may compare them with the different species captured by us in the West. The best way to transmit such specimens is, to kill the insects by immersing the bottle or vial in which they are confined, nearly up to the cork, in water so hot that you cannot bear your finger in it for a single second, and then without suffering them to get dry to pack them immediately, along with a little moistened paper to fill up the empty space, in any small stout pasteboard box.

MOUNDING PEACH TREES.

Editors American Entomologist:

Your article in last issue leads me to give my experience with the Peach borer. In 1865, when I purchased my present farm, I knew nothing of the borer. In the spring of 1866 I found from ten to thirty in each tree of all sizes. I thought that would never do; by enquiry and reading I found the moth laid the egg for the future borer during the summer months. I thought then to head it off, and in 1867, I mounded the trees about a foot above the general level, and in October I scattered the mound away. In 1868 I did not find one borer to fifty trees. I was pleased with my experiment, and again mounded the trees; but in the summer I thought to see if the mound was the remedy, and so hoed it away in July. This spring I found from ten to thirty (more or less) in nearly every tree, *all* of them about the size of a needle, and from one-sixteenth to one-eighth of an inch long; and all of them on the exterior bark, showing that they were produced from eggs laid last summer.

I shall continue to mound my trees in the spring and hoe away the mound in the fall, for the reason that my experience shows that, to mound the tree in the spring leaves a place for the fly to lay the egg, the same as though on level ground, and hoeing the mound away in the fall scatters the eggs not hatched, and freezes or dries up the young grub before it can penetrate the exterior bark.

I may be all wrong, but I prefer this to having an unsightly mound of two or three feet in height and the same in diameter in my orchard.

Respectfully,

R. L. WELLS.

ST. JOSEPH, Michigan, 1869.

[The above experience of Mr. Wells, speaks well for the mounding system. So long as he kept the mound around the tree till into the month of October, he found no borers the following spring. When he scattered the mound away as early as July, he afterwards found

* See Packard's *Guide*, etc., p. 159.

plenty of borers. This last result might have been expected, since the period of egg-depositing was not yet over, and the moths had ample time during July, August and September, to furnish the trees with a good stock of eggs. The practice of leveling the mound late in the fall is a good one, as it exposes those young worms that may chance to be on the trunk, to the action of frost, and to the attacks of birds. We are always glad to get facts from practical men. Let us hear from those who have had experience in the matter of mounding peach trees.—Eds.]

OUT OF EVIL THERE COMETH GOOD.

It seems that the prospect for an abundant fruit crop was never greater, in the West, than at present. During recent trips in South Illinois and in various parts of Missouri, almost every orchardist whom we questioned, declared that he had never seen more profuse blossoming or better setting of the fruit, and our own observations tally with these declarations. These remarks do not apply to peach trees, which, in many sections, lost their fruit by frost. We are greatly inclined to believe that much of this excessive fruitfulness may be attributed to the puncturing of the limbs, last summer, by the Periodical Cicada, which acted as a good summer pruning, coming as it did, at the very time when such pruning should be done. We are strengthened in this belief, from having observed that many two and three-year old trees have been thrown prematurely into bearing from the same cause. Thus we have a present good, resulting from what was at the time an evident evil, though whether or not excessive fruitfulness from such a cause will be of any ultimate benefit is matter of doubt.

THE PERIODICAL CICADA.

In the chronological history of this insect which we gave in our December issue, occurs the following paragraph (p. 68):

BROOD I.—*Septendecim*—1852, 1869.

In the year 1869, and at intervals of seventeen years thereafter, they will probably appear in the valley of the Connecticut river. According to Dr. Asa Fitch (N. Y. Rep. I, p. 40), they appeared there in 1818 and 1835; although, strange to say, there seems to be no record of their having appeared there in 1852. Hence this may be considered as a somewhat problematical brood.

We hope that our Connecticut or Massachusetts subscribers, will duly inform us whether or not they appear there during the summer, and thus either confirm or disprove the genuineness of this brood. We shall also be glad to learn of the appearance of this insect in any other part or parts of the United States.

THE CURCULIO SCARCER THAN LAST YEAR.

Judge A. M. Brown of Villa Ridge, writing under date of May 11th, says:

Curculios are very much scarcer than ever before. I have never caught, at one catching, more than two and one-half to the tree. Even the plum trees in the yard, since the first three or four days, are almost entirely free from their attacks. Indeed, they seem to like peaches better than plums. Can it be that their taste is changing?

I am inclined to think that something is destroying their eggs as they are deposited. I have cut a number of plums and peaches, bearing their mark, and in none of them can I find a trace of egg or worm. Can it be that the Ladybirds are doing this? They swarm on the trees in great numbers. If the warm rain now falling does not bring out a swarm of the little savages, I shall conclude that the crop is very short.

Last year Mr. Parker Earle, of South Pass, Ills., thirty miles north of Villa Ridge, captured 6,500 Curculios from one hundred peach trees during the first six days of May, and if the same diminution occurs at South Pass, which Mr. Brown has noticed at Villa Ridge, they will have but little trouble from Curculios this year, in that region. The comparative scarcity of this insect is not, however, confined to South Illinois, for we have noticed the same state of things in Missouri since the date of Mr. Brown's communication. Elsewhere we have stated our opinion, in contradiction to those who claim that this little pest will destroy the peaches in South Illinois for all time to come, that, so far as insects are concerned, the prospect for a good crop the year succeeding an entire failure, is greater than at any other period. We are inclined to think that the present year will prove the truth of the statement, so far as the Curculio is concerned; at least we hope so for the good of the peach-raiser. It is poor logic to argue that, because an insect is numerous one year, therefore it must necessarily be so the next. Nature is ever endeavoring to bring about a balance.

STINKING OUT THE CURCULIO.

[From a Letter from Lucius C. Francis, Springfield, Ills.]

It seems to be a very fallacious way of reasoning, that because Whale-oil Soap, Coal-oil, Gaster and a host of other things are stinks to us, of course they are so to the Curculio and to any other noxious insect. The Dung-beetle delights to work in manure. The, to us, stinking carcass swarms with thousands of happy maggots, fairly reveling in corruption. Even as clean an insect as the honey-bee is often found frequenting places which our nasal organs are not very well pleased with. In like manner, the Curculio, as we know from sad experience, does not intend to be stunk away, and the knock-down argument is the only thing that he will pay any attention to.

THE AMERICAN ENTOMOLOGICAL SOCIETY.

On the 22d of February, 1859, some fifteen persons met at No. 728 Erie street, Philadelphia, for the ostensible purpose of founding an Entomological Society, and during the remainder of that year, they met regularly for mutual improvement in Entomological knowledge, for the exhibition of specimens and for the formation of private collections. After a hospitable accommodation of two years and a half in the room of Mr. Chas. Wilt, 1310 South street, the Society moved to the hall which it now occupies, No. 518 South 13th street, which was built for the Society's use, by Mr. Jas. Ridings, and afforded at a moderate rent. On the 19th of April, 1862, the Society was chartered by the Legislature, as the "Entomological Society of Philadelphia," but on the 11th of March, 1867, this title was changed to the "American Entomological Society." This change was a wise one, as the previous name conveyed the erroneous idea that the institution was local, whereas it had ever relied on the country at large for support, and had acquired an essentially national character and a world-wide reputation as the only Society of the kind in America.

The seven volumes of the Proceedings which have been published contain an immense amount of useful information, and Americans may well be proud of the typography of these volumes and of the scientific value of their contents. In October, 1865, the Society commenced the publication of a little monthly bulletin entitled the *Practical Entomologist*; a journal which disseminated over the country a vast amount of valuable information of a practical nature, and which was suspended after an existence of two years, principally on account of the liberality of its publishers in charging but a most trivial and unpaying subscription price. This little monthly was solely edited the second year by the Senior Editor (and was really the forerunner) of the AMERICAN ENTOMOLOGIST. But it is not our purpose, nor is it necessary to state to our scientific readers all that this Society has accomplished. It has been the means of stimulating research in this most interesting and fascinating department of science; of recording many of the secrets contained in that book which is "printed, paged, collated and bound by the fingers of Omnipotence," and of thus adding to our font of true knowledge. It has in fact given American Entomologists a standing which they never before held in the eyes of the world.

We recently learned, therefore, with much regret, that the Secretary and Curator, Mr. Ezra

T. Cresson, had been obliged to secure another situation in consequence of the failure to raise the required amount to hire his services. In our minds the success of the Society hitherto has depended, in a very great measure, on the efficient and indefatigable efforts of this gentleman, and that it requires the constant services of one person to attend to the large correspondence, to the publication of the proceedings, and to properly care for and preserve the large collections—needs no argument. The Society has a publication fund of \$11,000, which was generously donated by the late Thomas B. Wilson, and which cannot be used for anything but the publication of the proceedings. It has also a general fund of \$5,000, the income from which about pays the general expenses, such as light, fuel, rent, etc., etc. But there is nothing secured for a Curator. During the life of Mr. Wilson, he most generously paid for the services of the Curator, but since that time the amount has been annually raised by subscription. People grow tired of subscribing so often however, and the finance committee failed to raise the requisite amount the present year.

Will the entomologists of this vast country stand by and see this national collection go to ruin and the Society degenerate, or will they put their shoulders to the wheel and rescue it from its present strait? If a Permanent Fund of \$15,000 or \$20,000 could be raised for the Curator, the Society would forever be independent, and relieved of the unpleasant necessity of demanding annual subscriptions. Are there not 300 or 400 persons in North America, who would each subscribe, once for all, the sum of \$50; or perhaps 150 or 200 who would each subscribe \$100? It seems to us there must be, and we would suggest the formation of a committee of five or seven of our most wealthy and influential entomologists, to take charge of the matter. If such gentlemen as Coleman T. Robinson, Baron R. Osten Sacken, Dr. J. L. LeConte, Wm. H. Edwards, Edward Norton, Samuel H. Scudder, and Dr. H. Hagen were to lend their influence, and if the proper steps were taken at some future meeting of the Society, we doubt not but the desired end could be accomplished!

As some of our exchanges may wish to illustrate any article they may copy from the AMERICAN ENTOMOLOGIST, we have decided to furnish electrotypes of our wood cuts, at one-half the cost of engraving; these electrotypes to be retained by the parties receiving them, if they desire it.

Orange-colored Fungus on Blackberry and Raspberry.

We have received from Charles Parry, of the Pomona Nursery, Cinnaminson, N. J., and from William Muir of Fox Creek, Mo., specimens of an orange-colored fungus, about the size of the head of a common pin, which towards the middle of May is found by them in great numbers on the lower surface of blackberry and raspberry leaves. As it ripens it seems to burst open and discharge an orange-colored dust, which consists no doubt of the "spores" or microscopically minute seeds by which the fungus propagates itself. The specimens occurred on the wild dewberry leaves, on which plant we have ourselves noticed it in Illinois, and Mr. Parry gives the following account of the way in which it has been gradually spreading on to the cultivated Blackberry and Raspberry, both which plants, as is well known to botanists, belong to the same genus (*Rubus*) as the dewberry (*Rubus canadensis*):

I think but am not sure that this is a fungoid growth; and if its ravages cannot be checked, it will prevent the culture of Blackberries and Blackcap Raspberries. I first observed it several years ago upon the dewberries round the fences; next it attacked the Doolittle Black Raspberry; and last year it made an inroad upon the Dorchester Blackberries. The fruit spurs that shoot out in the spring, after they are affected, lose the power of blooming and consequently set no fruit. It spreads quite rapidly, and the bushes affected have a thin spindling growth. Blackberries and Raspberries have no enemy that I know of that threatens to be as serious as this. We have not succeeded in arresting this scourge by any means that we have yet tried. Suppose, for instance, all the leaf-bearing portion of all the plants affected were cut away and burned. Would the new shoots that sprang up be diseased?

This last remedy might possibly be effectual, if applied before the fungus had burst and shed its spores; otherwise not. In any case it would be a very troublesome and expensive one. We should rather recommend dusting the infested bushes with sulphur, which seems to be a specific against most of these leaf funguses. In the meantime we shall be glad to hear from any correspondents on this practically very important subject.

Remarkable Peculiarity in the Insect World.

All the higher animals, such as Mammals, what are commonly called "Quadrupeds," Birds, Reptiles and Fishes, breed an indefinite number of times in the course of their lives. For example, nobody expects that, because a heifer has raised one calf, she is going to die as a matter of course; neither does a hen necessarily die, because she has already reared one brood of chickens. But with insects the case is quite different. Every female insect, with the single exception of a few social species, such as

Honey-bees and perhaps Aunts and White Aunts (*Termites*) perish in the course of the same season, after laying their first and only batch of eggs. Their race is then run—the goal is reached—and they retire from the course, to give place to that new generation of the same species, which, although it proceeds from their loins, they are yet in the great majority of cases destined never to behold.

ON OUR TABLE.

THE HARRIS CORRESPONDENCE.—We referred briefly to this most interesting book in our last number. From the miscellaneous nature of such a work it is, of course, impossible to give anything like a complete abstract of it. We think, therefore, that we shall best subserve the interests of our entomological readers, by indicating the modern names of such insects as are from time to time referred to therein, either by manuscript and unpublished names, or without any names at all. Generally the Editor has supplied this deficiency; but it is impossible for any one man to be equally conversant in all departments of entomology, and it is only by handing it from one to another that the torch of science can be made to burn its brightest.

P. 22. *Lamia anputator* probably refers to *Oncideres cingulatus* Say, which we figured A. E. p. 76. It is an interesting fact that Hentz found this insect to have sawed vast numbers of the hickory twigs off the tree, while they still contained the eggs, and that the eggs in a single twig were "half a dozen or more in number." Hentz wrote this letter ten years before Prof. Haldeman published on the subject.

P. 48. Fig. 5 is *Elasmocerus terminatus* Say.

P. 64. *Opilus? coccineus*, Harris MS. is *Thaenoclerus sanguineus* Say.

P. 79. *Doryphora 10-lineata? Say* is *D. juncta* Germar.

P. 80. Fig. 13 is *Phymaphora pulchella* Newm. = No. 776 on p. 107.

P. 97. Fig. 15 is *Anthophagus verticalis* Say.

P. 169. The "army-worm" of the cotton States is *Anomis xylyna* Say.

P. 175 (Plate II. Fig. 10), also pp. 247 and 301. *Limacodes ephippiatus* Harr. MS. is *Empretia stimulea*, Clemens.

P. 290. The larva described under the head of *Lophocampa maculata* and figured Plate III. Fig. 9, evidently does not belong to that insect; for it is distinctly said that "the perfect insect was not obtained." It is in reality the true larva of *tessellaris*, Sm. Abb., having black pencils; while that described on this same page under the head of *L. tessellaris* has orange-

colored pencils, and as Harris himself allows does not agree with Abbott's figure of the larva of *tessellaris*; although, as he very candidly remarks, "the moth is the same" (p. 291). To the moth produced from the larva with orange-colored pencils that feeds exclusively on the buttonwood or sycamore, whereas the other one feeds on a great variety of different trees, the name of *Harrisii* has been given by the Senior Editor. Singular to relate, different as the larvæ are, and different as are their foodplants, the moths are absolutely undistinguishable.

P. 298. Two very distinct larvæ are here described under *Dryocampa pellucida*. The first is probably that of *Dr. rubicunda*, which feeds on maple. The second is the same as that described under the name of *Dr. bicolor?* in *Proc. Ent. Soc. Phila.*, III. pp. 425-6, and may or may not be the true *pellucida*.

P. 299. *Oiketicus coniferarum*, Harr. MS. (Plate III. Fig. 4) is *Thyridopteryx ephemera-formis*, Haw. See p. 122 and pp. 242-4.

P. 307. *Astasia* = *Parathyris* = *Apatclodes* Packard.

We notice one error of the press which it may be as well to correct here. On p. 224 "the cabinet of Sir Jos. Blake" should be "the cabinet of Sir Jos. Banks," as is manifest at once from the last paragraph but one on page 164.

THE BUTTERFLIES OF NORTH AMERICA, with colored drawings and descriptions, by Wm. H. Edwards, published by the American Entomological Society of Philadelphia. Part 3; price \$2 50. We have on previous occasions outlined the design of the author, to issue this beautiful work in numbers at intervals of three months. With Part 3, now before us, is commenced a synopsis of North American species to be completed with the volume. This part also contains descriptions of and notes on *Argynnis monticola*, *A. Halcyone*, *Limenitis Proserpina*, *Lycana violacea*, *L. Lygdamus*, *Thecla lata*, and *T. acadica*. The colored plates illustrating these species are unsurpassed in splendor, naturalness of color and correctness of detail, while the typography and press-work are such that Americans may feel justly proud of the work. Orders should be addressed to E. T. Cresson, 518 South Thirteenth street, Philadelphia, Pa.

POPULAR AMERICAN ENTOMOLOGY; being a Guide to the Study of Insects, by A. S. Packard, Jr., M.D., Salem, Mass. Parts IV, V, and VI of this valuable work have been duly received. Part IV concludes the Hymenoptera. Beginning the account of the Lepidoptera, it

describes the more common Butterflies, giving in full the transformations of several species. Part V continues the Lepidoptera and contains two full-page illustrations on wood. Part VI concludes the Lepidoptera and commences the Diptera, and contains a beautiful steel plate illustrating the transformations of many of our moths. The press work is fully equal to that of the preceding Parts, and the work, when completed, will prove a valuable addition to American Entomological literature. Subscriptions received by the author. Each part 50c.

ANSWERS TO CORRESPONDENTS.

Cannibal Mites—*C. S. Davis, Decatur, Ill.*—The elongate-oval eggs found under the surface of the earth are those of some large Grasshopper—perhaps the Carolina Grasshopper (*Eliopoda Carolina*), a large species with the hind wings black with a cream colored border. The velvety scarlet mites about one-eighth of an inch long, which you found preying on these eggs, are a species of *Trombidium*, either identical with or very closely allied to the *T. sericeum* of Say. This habit of theirs, so far as we are aware, is a new fact, and a very interesting one without. The allied genus (*Erythrurus*), to which the so-called "Red Spider" of the gardeners and greenhouse men belongs, is not a cannibal, but a plant feeding group.

Gnats—*W. O. Hiskey, Minneapolis, Minn.*—The specimen sent is, as you supposed, not a Mosquito (*Culex*) but a Gnat (*Chironomus*). The latter may be readily distinguished from the former by having no elongate beak adapted for sucking blood. In both genera the males have widely feathered antennæ, and the larvæ of both reside in the water. Certain species belonging to the latter group occur in the spring of the year in enormous numbers in the neighborhood of large bodies of water; sometimes gathering in the air in such enormous clouds that they have been mistaken at a distance for smoke issuing out of buildings or hay-stacks supposed to be on fire.

Cut-worms severing Cabbage Plants—*N. C. Burch, Jefferson City, Mo.*—The dark greasy-looking cut-worms with a dull flesh-colored back, which have severed so many of your cabbage plants—some just above and others just below the surface of the ground—are the larvæ of the Lance Rustie (*Agrotis telifera*, Harris). This worm has been called the Greasy cut-worm by the Junior Editor, and an account of it with its transformations may be found in his "First Annual Report," pp. 80-81, accompanied with figures of the moth.

Beetle named—*J. M. Shaffer, Fairfield, Iowa.*—The beetles which you send and which were flying about in great numbers on the 4th of May, are the *Anisodactylus baltimoriensis*, Say.

Tiger Beetles—*J. M. Shaffer, Fairfield, Iowa.*—The second lot of beetles which you send, and which you found "flying and lighting on the low dry soil in a ravine, through which a small creek passed, and which was much frequented by cows," are the common Tiger Beetle, *Cicindela vulgaris*, Say.

Gigantic Water Bug—*D. A. A. Nichols, West-feld, N. Y.*—The large brown flattened insect which you "found crawling on the ground near the horse-barn," is the Gigantic Belostoma (*Belostoma grandis*, Linn.) spoken of on page 119 in answer to S. E. Munford of Princeton, Ind.

Mole Crickets—*Thomas W. Gordon, Georgetown, Ohio.*—The Mole Cricket which you send is one of our most common American species—the *Gryllotalpa borealis* of Burmeister. Mr. S. H. Scudder in his late Revision of these insects describes three N. A. species of which *G. borealis* has the most extended range.

Cocoons and Chrysalids named—*A. S. Fuller, Ridgewood, N. J.*—The large black chrysalis, measuring nearly two inches in length, and one inch in diameter, belongs to that large and beautiful moth known as the Regal Walnut Moth (*Ceratoecampa regalis*, Harr.) The front wings of this moth are pale olive, adorned with yellow spots and veined with reddish, while the hind wings are orange red. Its caterpillar feeds on Black Walnut, Butternut, Hickory, Persimmon, and Sumach, and is, when full grown, an immense green creature, with 10 long orange horn-like and prickly spines near the head, and other shorter black ones on the rest of the body. The smaller, mahogany-colored chrysalids taken from the earth belong, doubtless, to some species of Owllet Moth (*Noctua* family), but it is impossible to identify the species until the perfect insect escapes. The gray, silken cocoons, woven within a leaf and attached to the twig by a long silken cord, belong to the Promethea Moth (*Attacus Promethea*, Drury). The larger looser cocoons of the same color, attached lengthwise to different kinds of twigs, and among others to that of a blackberry, are those of the *Cecropia* Moth (*Attacus Cecropia*, Linn.). The cocoons which are more tightly woven, rounder, lighter colored, and usually spun within leaves, are those of the Polyphemus Moth (*Attacus Polyphemus*, Linn.). Finally the cases which hang pendant from a number of different shrubs and trees, both deciduous and evergreen, and which are generally covered with pieces of leaves or stems, belong to the Bag-worm (*Thyridopteryx ephemeraformis*, Haw.)

White-lined Morning Sphinx—*Stephen Blanchard, Oregon, Holt Co., Mo.*—The beautiful hawk moth which you send, distinguished principally by its roseate under-wings and by a broad pale band running from the apex to the base of the dark olive upper-wings, is the White-lined Morning Sphinx (*Deilephila lineata*, Fabr.) It is a tolerably common insect, and may quite frequently be seen, at twilight and even during the day, hovering, humming-bird-fashion, over Verbena and other flowers. Its larva feeds upon purslane, turnip, buckwheat, watermelons and even apple leaves, upon any of which it may be found in the month of July. It descends into the ground, and within a smooth cavity, changes to a light brown chrysalis, from which the moth emerges during the month of September. The most common color of this larva is yellowish-green with a prominent row of elliptical spots, each spot consisting of two curved black lines, enclosing superiorly a bright crimson spot and inferiorly a pale yellow line—the whole row of spots connected by a pale yellow line, edged above with black. Such is the accepted larva of this moth, and it is not generally known that a black variety occurs, differing totally in its markings from the green variety. This insect has a wide range, as it occurs in West India, Mexico, and Canada, as well as in all parts of the United States.

Insects named—*Dr. W. W. Butterfield, Indianapolis, Ind.*—No. 1. *Coptotomus interrogatus*, Fabr. No. 2. *Cnemidodotus 12-punctatus*, Say. No. 3. *Corixa* not described. No. 4. *Laccophilus maculosus*, Say. All the above are very common species. No. 20, the wingless Plant-louse found on a geranium, most probably from the great length of its honey-tubes belongs to the genus *Aphis* and is apparently undescribed. No. 21 is, as you suppose, *Vanessa Antiopa*; the female, as in the case of most butterflies, can be distinguished from the male by the abdomen being stouter, and tapered to a point instead of truncate at tip. Nos. 22 and 23 are *Druseria erechthea*, Guéneé, a very common owllet moth. We have observed that the spring brood of this insect are always several sizes smaller than the autumnal brood, and at one time we supposed the two forms to belong to distinct species. The three small larvæ "found feeding upon the younger leaves and unopened flowers of the woodbine," belong to some owllet moth, and apparently to some of the climbing cut-worm moths; but we cannot identify the species with any certainty. The two-winged fly, banded with black and yellow like a wasp, which you noticed flying round your honey-suckles, is a Syrphus Fly, belonging to the parasitic genus *Scawa*, and should therefore be carefully protected instead of being destroyed. Its larva is a legless maggot, and feeds most ravenously upon Plant-lice.

Peach Twig Borer—*Wm. Muir, Fox Creek, Mo.*—The livid brown worm, with whitish longitudinal stripes, which is boring into and ruining great numbers of your peach "buds" and shoots, is evidently the common Stalk Borer (*Gortyna nitela*, Guéneé), which we figured and described on page 22 of our second number. As you will observe by referring to that page, it inhabits the stems of a number of different plants, though the fact of its also boring into peach stems is an entirely new one. At Figure 140 this borer is represented as it appears when full grown. Those you send are but one-third grown, and as the point of entrance is always discernible by a slight discolored spot on the stem, you might save many of your "buds" which show this sign, by carefully cutting out the borer. In this way we have often saved plants of the Dahlia, to which this borer is very partial.

[Fig. 140.]



Color—Livid-brown and whitish.

The Apple-twig Borer—*A. Hinckley, Du Bois, Ill.*—The beetle that you find boring in the stems of your young apple-trees is the Apple-twig Borer (*Bostriechus bicaudatus*, Say, Fig. 141). Unlike the two common Borers of the Apple-tree, it is only in the perfect beetle state that this insect attacks the Apple, and usually it is the twigs of good-sized trees that it preys on, boring in just above a bud and working downward through the pith in a cylindrical burrow for the space of one or two inches. The male is distinguished from the female by having two little thorns projecting from the hind end of its body, and both males and females are found in these burrows, and always with their heads downward, showing that they bore the hole, not in the larva state like other borers, but in the perfect beetle state. Neither can they bore these holes as a breeding-place for their future larvæ; for no larvæ have ever been found therein. Evidently therefore they must bore them as a means of supplying themselves with food, which we should also infer from the fact of both sexes occurring therein in about equal numbers. With insects, as a general rule, it is only the female that labors for the well-being of her future family.

[Fig. 141.]



Color—Dark brown.

Apple-tree Borers on South Side of Trees—*Jno. F. Wielandy, Jefferson City, Mo.*—It has long been known that the Flat-headed Apple-tree Borer (*Chrysobothris femarata*, Fabr.) prefers what are known as "sun-scalded" trees, and that it is almost invariably found on the south or southwest side of the tree. This fact was recorded by the Senior Editor in the late *Practical Entomologist* (Vol. I, p. 26) and was quite recently reiterated by Elmer Baldwin of Farm Ridge, Ill., who states, (*Western Rural*, Apr. 29, '69) that "he has never known it to occur in a healthy tree, but always in those partially killed by sun-scald." Your experience confirms the fact.

Cocoons of the Cecropia Moth—*Thos. W. Gordon, Georgetown, Ohio.*—The large cocoons taken from various trees are not those of the Polyphemus, but of the *Cecropia* Moth. The cocoons of the former species are very closely woven, tough and hard, bluntly oval in form and of a pale buff color. Those of the latter are of an ashy-brown color, much more loosely woven and invariably more or less attenuated at each end.

Flea-beetles—*Col. Fred. Hecker, Lebanon, St. Clair Co., Ill.*—The minute brassy-brown flea-beetle that, as you say, covered your wheat-fields and meadows, but not your vineyard, by millions towards the latter part of April is an undescribed species of *Longitarsus*. In North Illinois this species is rare, though we have received several specimens from Canada West. Like other species belonging to the Flea-beetles, this one no doubt preys upon living vegetation.

Grape-vine Caterpillar—*E. S. Foster, Bush-burg, Mo.*—The caterpillar which is eating out the terminal buds of your grape vines is entirely new to us. We shall endeavor to watch its workings and to give you further information about it at some future day.

Strawberry Bugs—*Ino. M. Pearson, Godfrey, Ills.*—The highly polished black insects, about one-tenth of an inch in length and three-fourths as broad as they are long, which have lately swarmed on the strawberries around Alton, are the *Corimelana pubicaria* of Germar., and may be known in English by the name of the Flea-like Corimelana. They are not Chinch Bugs as some of the members of your society supposed. At Figure 138 of our present number, a good cut of the Chinch Bug is given, and you will at once perceive the difference upon comparing that figure with your Strawberry insect. This last, like the Chinch Bug, is a true bug (order *Heteroptera*) but belongs in a very different family (SCUTELLERIDE), all the insects of which are distinguished by the great size of the scutellum. In the Chinch Bug the scutellum forms that little triangular piece (see the Figure) immediately behind the thorax, while in the Strawberry bug it covers the whole body, the hemelytra forming but a pale dirty yellow stripe along each side. We ourselves found these bugs quite abundant on strawberries last spring, puncturing the stem and thus causing either blossom or fruit to wilt. It is likewise destructive to that plant in Canada, judging from a description given in the Canada Farmer for August 1st, 1867. A year or two ago, it was sent us with an account of its having ruined a crop of raspberries; and this year we receive it from Mr. G. Wilgus of Richview, Ill., with an account of its infesting both cherry and quince. "On cherry," as he informs us, "it occurs in very large numbers, causing the stems of the young fruit to wilt and shrivel. It also attacks the blossoms and leaves, but seems to do most damage on stems." Hence it may be considered as a pretty general feeder. In the summer time it may be found in very large numbers upon a variety of wild flowers, and it is also very injurious to certain garden flowers, and especially to the Coreopsis. Never having made experiments with a view to its destruction, we can not give a remedy. They might be captured by hand or with a sweeping net, or kept away from the vines by an application of cresylic soap.

Eggs on Apple-trees—*H. Compton, Wells Corners, Erie County, Pa.*—The eggs about the size of a common pins' head, laid in two parallel rows on apple limbs, and each egg bordered round its tip end with a fringe of short prickles, are those of a true Bug very common upon trees, of which we herewith present a sketch.

[Fig. 142.]



Color—Light brown.

This insect belongs to the *Reduvius* Family, all of which without exception are cannibals, and it preys upon a great variety of insects, and among others upon young canker-worms. Consequently it should be encouraged and protected, instead of being persecuted and destroyed. The eggs of the Soldier-bugs (genus *Arma*), another cannibal group of the true Bugs (*Heteroptera*), are very similar to those of yours; but instead of being laid in two rows, they are deposited in a round mass, and the prickles round their tip are much longer, slenderer and sharper.

Lady-bird Larvæ—*Emory S. Foster, Bushburg, Mo.*—The active little insects, marked with blue, black and orange, which you find in such great numbers on your grape vines, are the larvæ of the Convergent Ladybird (*Hippodamia convergens*, Gnér.). It is represented at Figure 143 a, together with the pupa b and the beetle c. They should be protected. Fortunately for the farmer and fruit-grower, Ladybirds are very abundant this spring, especially the species just mentioned, the Spotted Ladybird (Fig. 130), and the Nine-marked Ladybird (Fig. 37).

[Fig. 143.]



Colors—(a) blue, orange and black; (b) venetian red and black; (c) orange red, black and white.

They are, indeed, so very abundant, not only in your vicinity but in other parts of St. Louis county, Mo., and Southern Illinois, that a reasonable immunity from such injurious insects as they are known to prey upon, may be expected in those sections.

White Grub Fungus, again—*Win. C. Holmes, Plattsburg, Mo.*—You send specimens of the White Grub which, as you say, did a great deal of damage in your neighborhood last year. You also enclose a number of brown beetles which you rightly infer to be the

[Fig. 144.]



Colors—Dirty white and brown.

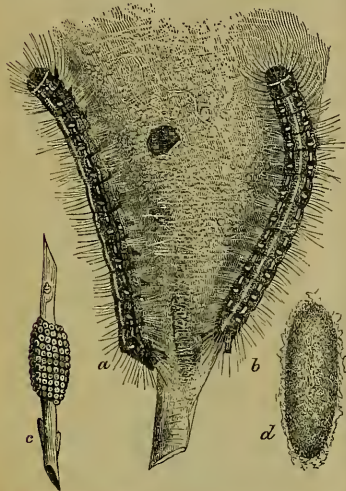
perfect state of these grubs. And finally you send some of the grubs with long sprouts arising from the neighborhood of the head, and wish to know what these sprouts will ultimately turn to. These grubs are attacked by the same kind of fungus spoken of and figured on page 186 of our last number. We present herewith another cut (Fig. 144) representing the sprouts of the length which they have now usually attained. These vegetative grubs are still a good deal of a mystery to us, but as we now have them growing in our garden, we may soon be able to give our readers some definite information as to the mode in which the fungus reproduces itself. Botanists would evidently call it a *Sphaeria*, but as cryptogams of this group bear their spores and reproduce themselves in a variety of different ways, it is difficult to conjecture what will be the ultimate form of ours. Meanwhile, as we desire to ascertain over how much territory this fungus extends, we shall be glad to hear from any of our subscribers who have noticed it this spring.

Rotten Pear Root—*Wm. P. Pierson, Onarga, Ills.*—The pear roots which you send are, to all appearances, affected with the "rotten root" about which so much was said at the meeting of your State Horticultural Society at Bunker Hill last winter. At all events if as you say "the roots of nearly two hundred of your finest looking trees are thus affected," we can assure you that you must not lay the blame to insects, for there is no insect work about it. We almost regret that it is not the work of insects, because, as they are something tangible we could in all probability overcome the difficulty, or at least check its spreading. But these fungoid diseases are so insidious and contagious that they are beyond our control, and as a general rule, we have to see the best of our trees smitten by them, without the least power to avoid the calamity. We do not know that this root disease has yet received any distinctive name, but it will probably receive due consideration, during the year, from your State Horticulturist, Dr. Hull. The doctor will not want for material, for we were lately called to the apple orchard of Mr. Groshen of Webster, Mo., where some thirty of what were last year the thriest trees, mostly of the early varieties, were dying from this same root rot, and it is in like manner decimating many other orchards in South Illinois and Missouri.

Since the above was written, we have conversed with Dr. Hull, and find that he has likewise received specimens of these dead roots. He does not think they are attacked by the fungus however, but believes they have simply died from having been exposed to the action of frost while the trees were being transplanted.

Bagworms—*Chas. Parry, Cumnansinon, N. J.*—The "worm that carries its cocoon on its back, and formerly fed on the Arborvite, but now relishes nearly all our nursery evergreens and many deciduous trees," is doubtless the common Bagworm, *alias* Basketworm, *alias* Dropworm (*Thyridopteryx ephemeraformis*). It can be readily got rid of by gathering its cocoons off the infested trees in the winter; for it is in these cocoons that the eggs are deposited.

Tent-Caterpillar—*Stephen Blanchard, Oregon, Mo.*—“The ‘worms’ infesting your trees which ‘cover the limbs with a web,’ are the common Tent Caterpillar.” [Fig. 145.]



Colors—Blue, black, white and rufous.

pillar (*Glisiocampa americana*, Harr.) For the benefit of the rest of our subscribers we give the above illustration of this caterpillar, *a* representing it from a side view, *b* from a back view, *c* showing the eggs from which it hatches, and *d* the cocoon which it spins. The moth which produces them is known by the name of the American Lackey moth, and is of a rusty-brown color, the fore wings crossed by two oblique, straight dirty white lines. This insect need never become troublesome, for its large web-nests are very conspicuous, and the worms may easily be destroyed while sheltering within them. Its eggs (Fig. 145 *c*.) are also easily discerned and destroyed during the winter.

Hawk's pellets—*Chas. D. G., Central, Mo.*—In our last number (p. 187) we expressed the opinion that the pellet composed of the hard shelly parts of a species of grasshopper was certainly discharged from the stomach of some Bird of Prey, and probably from that of some species of Owl. From what we have since heard from our ornithological friend, Dr. Velie, we think now that the pellet must have come from the stomach, not of an Owl, but of a Hawk. He writes as follows: “The pellet you mention must, I think, be the one ejected by the Broad-winged Hawk (*Buteo pennsylvanicus*, Wilson). On dissecting one of these Hawks, killed near Rock Island in the spring of 1865, I found inside it the legs and wing-cases of a species of grasshopper probably the same as that which you refer to. It also contained a number of the wing-cases of the Indian Chafer (*Cetonia inda*). I know of no other Hawk which feeds so exclusively, or nearly so exclusively, upon insects as does this one. I cannot now bring to mind any of the Owls which feed upon insects, they being all or nearly all nocturnal in their habits. All the Rapacious Birds eject these pellets, composed of the indigestible portions of quadrupeds, birds or insects.”

Plant-lice on Berberry—*J. R. Preston, Richmond, Ind.*—“The insects on your Berberry leaves are some species of Plant-lice (*Aphis* family). They were all dried and crushed when we received them, and as we could find no wings we can not tell you to what particular genus they belong. A good syringing with strong soap suds will doubtless clear your trees of them.

Tent-Caterpillar of the Forest—*Geo. Whitcomb, Charleston, Miss. Co., Mo.*—We copy your letter of inquiry entire, as it is short, and well describes the caterpillars which you send: “Enclosed I send you specimens of a Caterpillar which is devastating our trees, particularly apple, plum and oak. There are none on my peach trees yet. They do not make webs like the old-fashioned Caterpillar, and Mr. Miller, an experienced farmer, says they are a different species. Will you please let me know what they are, and what remedy, if any, for their ravages?”

[Fig. 146.]



Colors—Blue, black, white and rufous.

This insect is known as the Tent-caterpillar of the forest, so called because it occurs more generally in our forests than does the common Tent-caterpillar which is represented on the left hand column of this page (Fig. 145.) These two caterpillars closely resemble each other in colors and general appearance, and have been frequently confounded. The markings of the back, in the two kinds, are very dissimilar, however, as may at once be seen by comparing Figure 146 which gives a dorsal view of the Tent-caterpillar of the forest, with Figure 145 *b* which gives a similar view of the common Tent-caterpillar of the orchard. The moth produced by the species now under consideration was named *Glisiocampa sylvatica* by Dr. Harris, and differs only from *C. americana* in the space between the two oblique lines on the fore wings being usually darker than the rest of the wing, and by the lines themselves being edged inwardly with a deeper shade. Good figures of both moths may be found on Pl. VII (Figs. 17 and 18) of “Harris's Injurious Insects.” The Forest caterpillar does not shelter under a tent as does the true Tent-caterpillar, but it often spins a conspicuous web, upon the outside of which it congregates. It is therefore about as easily destroyed, as that species, in the manner suggested in answer to Mr. Blanchard. We have found it quite common this spring, not only upon the different trees upon which you yourself found it, but also, in one instance, on a peach tree. In 1868, we gathered a single egg-mass belonging to this species off a Peach-tree upon Judge Brown's place at Villa Ridge in South Illinois. These egg-masses are very similar to those of the other species; but may be distinguished by being perfectly cylindrical and by the two ends being doeked squarely off instead of sloping more or less obliquely upwards and downwards. In 1867 this Forest caterpillar was quite destructive in Western New York, but its numbers have since been greatly reduced, as we learn from correspondence to the *Country Gentleman*, by two parasitic insects which are known to attack it, the one a Two-winged fly (*Tachina*), the other a Four-winged fly (*Pimpla*).

Garden Mite—*C. H. Gill, Arlington, Phelps Co., Mo.*—“The bright scarlet animal which you found on the ground in the woods, is the *Trombidium sericeum* of Say. It is a true mite (*Acarus*) belonging to the same class (*Arachnida*) as the spider, and not to the true insects (*Insecta*).

*Vol. XXXII, pp. 47 and 63, and Vol. XXXIII, p. 301.

NOTICE.

All letters, desiring information respecting noxious or other insects, should be accompanied by specimens, the more in number the better. Such specimens should always be packed along with a little cotton, wool, or some such substance, in any little paste-board box that is of convenient size, and never enclosed loose in the letter. Botanists like their specimens pressed as flat as a pancake, but entomologists do not. Whenever possible, larvae (i. e. grubs, caterpillars, maggots, etc.) should be packed alive in some tight tin box—the tighter the better—along with a supply of their appropriate food sufficient to last them on their journey; otherwise they generally die on the road and shrivel up to nothing. Along with the specimens send as full an account as possible of the habits of the insect, respecting which you desire information; for example, what plant or plants it infests; whether it destroys the leaves, the buds, the twigs, or the stem; how long it has been known to you; what amount of damage it has done, etc. Such particulars are often not only of high scientific interest, but of great practical importance.

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DEAR SIR: Permit me to call your attention to a work I have in preparation upon the Butterflies of New England; it will form an octavo volume of from two to four hundred pages, amply illustrated with colored plates of butterflies, caterpillars, chrysalids and eggs, and will be published early in 1870. As far as possible, it will contain a complete history and description of every stage of each species known or likely to occur in New England and the adjacent regions; the geographical distribution of the butterflies, both in and out of New England, will receive careful attention, and the work will virtually form a manual for all the Northern United States and Canada.

To render the volume as complete and useful as possible, your co-operation is earnestly solicited in securing living or fresh specimens of larvæ, etc., from which colored illustrations can be made. These may best be obtained by confining a female of any species in a small, dark box—a pill box, for instance—where she will lay her eggs, which can easily be reared; if the food-plant of the larvæ is not known, I will be happy to give any information; or, the plant may sometimes be detected by observing over what species the butterfly seems to hover. Specimens are desired, of the egg, of each stage of the larva and of the chrysalis of every species; they should be sent promptly by mail in light boxes (tin is preferable) to the address below, marked, in addition, "Insects," to secure prompt attention. The specimens should be accompanied by the name and address of the sender and, when known, the name of the insect (or, far better, by the very insect that laid the eggs) and of the plant on which it feeds; if larvæ are sent, fresh moistened leaves of their food-plant should be placed in the box with them.

Complete lists of the species found in different localities are also desired, and especially, if accompanied by careful memoranda of the exact times of the first appearance and of the duration of each brood. It will be necessary to receive specimens from every possible quarter, to arrive at a definite knowledge of the habits of insects in different places. To secure this more effectually, I am willing to name any collection of local butterflies sent to me (with notes) about the first of October; such collections would be returned before the first of January; for the safety, however, of my own collection, and of others entrusted to me, it will be necessary to return at once, and unnamed, any collection showing traces of having been previously attacked by Museum pests.

For all favors or scientific intelligence received, the amplest credit will be given, and earnest attention is called to this appeal, as without material assistance, it will be impossible, in a single season, to obtain the necessary specimens to complete the undertaking.

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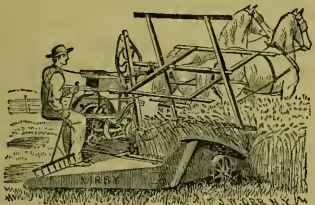
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COTTON INSECTS.

The Cotton Army-worm.

(*Noctua [Anomis] xyliana*, Say.)

Editors American Entomologist:

As the Southern cotton planters are deeply interested in learning something about the insects that prey upon their crops which they do not already know, I write to request you, in behalf of those who live in this particular section, to enlighten them upon the following questions, to-wit: In what form and place, and under what circumstances, does the Cotton Caterpillar exist during the winter season? If you answer, in the chrysalis state, at what period in the spring or summer does it emerge in the form of a fly? If in the spring or early summer, on what does it subsist until it attacks the cotton plant?

We think if these points were definitely settled, some plan could be devised by which this insect could be destroyed before it multiplies itself into an army to make havoc with our cotton crops. These questions have been discussed by an Agricultural Club organized in this county, and, although a good deal of information has been elicited, still there remains much to be learned before we can attain to a practical knowledge of the subject, and we have no means at hand by which this knowledge can be acquired.

I have seen several numbers of the AMERICAN ENTOMOLOGIST, which have been sent to the office of the *Liberty Advocate*, but have found nothing in elucidation of the questions propounded.

We desire also to know something about the Boll-worm, which I believe is universal in the cotton region, and which attacks the fruit of the cotton plant from the time it is first formed until it arrives nearly to the stage of maturity. Please give its history and mode of propagation; and tell us, if you can, how it may be destroyed or its ravages prevented.

Yours, &c.,

J. R. GALLNEY.

Bloomfield, Amite Co., Miss.

In answer to the above letter and to a published request made in the *Southern Ruralist*, we will at present briefly illustrate the natural history of two of the worst insect enemies of the cotton plant, namely the Cotton Caterpillar, *alias* Cotton Army-worm, and the Boll-worm. As we have ourselves never spent sufficient time

in the cotton-growing sections of the South to make any personal observations on these insects, we lean for much of our information on the observations of the Entomologist to the Department of Agriculture, Mr. Townsend Glover. Says this gentleman*—speaking of the difficulties under which these observations were frequently pursued—"I have encountered many hardships, difficulties and dangers, in exposing myself to unhealthy regions, in sickly seasons, where I necessarily performed tedious journeys, in which I was steamed or scorched by the hot sun during the day, and drenched by heavy rains or chilled by clammy dews at night, accompanied more or less by hunger and thirst, lassitude and disease. In the course of my wanderings I was annoyed by gnats and flies, which regaled themselves on my blood; irritated by ants, chigas and ticks, that filled my skin or flesh with eruptions and sores; assailed with fury by bees and wasps that tortured me with their stings; and I was warned of my danger by the hiss and rattle of serpents that lay concealed along my path. These dangers and annoyances, troubles and trials, were alternated by pleasures, joys and sudden delights, which no one can realize except the lover of science." Such is a sample of the trials which sometimes attend the proper study of a single insect, especially in the more southern States.

Whether or not corn be king in the North, cotton is undoubtedly king in the South, for it there absorbs almost universal attention. No policy which the General Government might pursue could so increase the prosperity of the Southern States as would two successive good cotton crops. A thorough knowledge, then, of these insects, which on the average of years destroy fifty million dollars' worth of cotton in the South, is of the utmost importance. Such a knowledge becomes still more necessary, when we find such advice going the rounds of the papers as that which we commented upon on page 15 of our first number.

There are four distinct caterpillars, producing four perfectly distinct moths, which have been designated in various parts of the United States

* Department Report for 1857, pp. 121-2.

as "Army-worms." The real Army-worm (*Leucania unipunctata*, Haw.) feeds upon grasses and cereals, and received its popular name from its habit of marching from field to field in immense armies. That this species may at once be recognized and distinguished from the insects presently to be described, we publish an account of it, with illustrations, in another part of the present number of our Journal, to which the reader is referred.

In the northwest corner of the State of New York, the Tent-caterpillar of the forest (*Clisiocampa sylvatica*, Harr.) has also been erroneously known by the name of "Army-worm." We briefly sketched the history of this species on page 208 of our last number, and reproduce herewith the figure of the worm (Fig. 147). Though it may sometimes be found crawling along roads in great numbers, and we recently saw a great many running along a railroad track in the heat of the sun, yet this Tent-caterpillar of the forest cannot with propriety be called an Army-worm, and our Eastern friends had best drop the title and avoid confusion in the future.

Again, the Cotton-worm (*Anomis xyliua*, Say), which we are now considering, is very generally known by the name of the "Cotton Army-worm," and often simply as "the Army-worm," in the South. The term as applied to this species is not altogether inappropriate, as the worm frequently appears in immense armies, and when moved by necessity will travel over the ground in "solid phalanx;" and so long as the word "Cotton" is attached—its ravages being strictly confined to this plant—there is no danger of its being confounded with the true Army-worm. The term has furthermore received the sanction of custom in the Southern States, and of Mr. Glover in his Department Reports. But there is in the South a fourth insect (*Laphrygma frugiperda*, Sm. & Abb.?) which is frequently known by this ominous name; an insect which also will attack cotton, though it prefers grass and weeds. This last species in its habits resembles the true Army-worm of the Middle States, more closely perhaps than does the Cotton Army-worm under consideration, and Mr. Joseph B. Lyman, in his recent work on "Cotton culture" (p. 92),

calls it the "Army-worm;" yet, to prevent confusion, the cognomen should be discontinued, and the term "Southern Grass-worm" (by which term it is already very generally known) should be strictly applied to this fourth species of the so-called "Army-worms."

The Cotton-worm was first scientifically described by Mr. Thomas Say, in the year 1827. In 1800, according to Dr. Capers,* it was first noticed as a destroyer of cotton, and was likewise very destructive in 1804, 1825, and 1826. Since the last date, as we learn from old volumes of the *American Farmer*, of Baltimore, Md., and from the Patent Office Reports, it has done more or less damage to the crop almost annually, in some part or other of the cotton-growing district. As with the real grass-feeding Army-worm of the Middle States, it swarms in particular years to such an extent as to utterly ruin the crop, while in other years it is scarcely noticed. This fact has led many to infer that there is a stated periodicity in its returns in such immense numbers; but the natural history of the worm confutes such an idea, while the records give no foundation for the inference. The sudden increase or decrease of this, as of other species of noxious insects, depends on climatic, as well as on other equally potent influences.



Colors—Blue, black, white and rufous.

[Fig. 148.]



Colors—(a) pale green; (b, c and d) green, black and yellowish; (f) brown.

The egg (Fig. 148 a) which produces the Cotton-worm is round, flat, and of a translucent pale green color, and when viewed under a lens appears regularly ribbed. These eggs are deposited upon the under side of the leaves, and, from their small size, are naturally difficult of detection. Each female moth deposits from 400 to 600, and according to the late Thos. Affleck, of Brenham, Texas, they hatch two days after being deposited, if the weather be moist and warm. The worms (Fig. 148 b, $\frac{1}{2}$ grown) at

* Cotton Culture, by J. B. Lyman, late of Louisiana. Orange Judd & Co., New York.

* Patent Office Rep., 1835, p. 74.

first feed upon the parenchyma or soft fleshy parts of the leaves, but afterwards devour indifferently, not only any portion of the leaves, but also the blossom-bud and blossom, together with the calyx leaves at the base of the boll, thus causing the lobes which hold the cotton to fall entirely back and allow the cotton to fall at the slightest touch. While young these worms readily let themselves down by a web when disturbed, but when older they make less use of this web, and jerk themselves away to a considerable distance when suddenly touched. They cast their skins at five successive periods, and come to their growth in the incredibly short space of fifteen or twenty days. Mr. Afleck even states that they usually enter the chrysalis state on the eleventh day after hatching; but we incline to believe that such a brief larval existence is extremely exceptional, and the length of time required for them to mature will not only differ in different individuals of the same brood, but will vary with the state of the atmosphere. At Figure 148 *c* is given a side view, and at *d* a back view of a full-grown worm. It has the normal complement of legs—namely 16—but the two foremost pair of abdominals, or those under segments 6 and 7, are so reduced in size that they are scarcely used in motion, and it consequently loops when walking.

We have upon two occasions received full-grown specimens of this worm, and they differ materially, both in depth of shade, coloration and markings, as indeed do almost all the larvæ of moths belonging to the same (*Noctua*) family. The most common color is light green, though they are frequently quite dark, with a purplish hue at the sides, and with black backs. Whether light or dark colored, however, they are more or less distinctly marked with pale longitudinal lines and black spots, as in the above figures.

Mr. Lyman, in his "Cotton Culture," says of this insect: "The first moths that visit a crop deposit their eggs and die. These eggs in ten days become little worms, which fall to eating the leaf on which they were hatched, and as they grow consume the plant and pass to another. But age comes on apace with these ephemeral creatures; the worm presently grows weary of devouring, selects a leaf, rolls himself in a little cocoon and dies." Of course this is a serious mistake to think that the worm dies, else how could it produce the moth which, as Mr. Lyman himself shows, afterwards issues from the cocoon. It is astonishing to find such gross errors creeping into our popular works, but then, the study of these contemptible little Bugs, even

if they do sometimes totally destroy the crop, is of course beneath the dignity of the man who can write a work on cotton culture!! The truth of the matter is that, when they have completed their growth, the worms fold over the edge of a leaf (Fig. 148 *e*), and, after lining the inside with silk, change to chrysalids (Fig. 148 *f*), which are at first green, but soon acquire a chestnut-brown color; after remaining in this last state (in which, though the insect is inactive, it is yet full of life, and undergoing wonderful development) from seven to fourteen days, or even longer, the moth escapes, the chrysalis being held fast within the cocoon by means of several very minute hooks with which the tail is furnished.

[Fig. 149.]



Colors—(a and b) golden-buff, with lilac-colored markings.

At Figure 149 *a*, this moth is represented with the wings expanded, and at *b*, with the wings closed. The general color of the upper surface is a golden-yellow inclining to buff, with a faint olive tint near the outer or posterior margin. The fore wings are crossed, as in the above figures, by more or less distinct, irregular, lilac-colored lines. But the chief characteristic is a dark slate-colored, or black spot on the fore wings, in which spot there are paler scales forming almost a double pupil as represented in the figures, while between this spot and the base of the wings there is a much smaller pure white dot. In general color and in the position of the larger spot, this moth bears a remarkable resemblance to that of the true Army-worm, (*L. unipunctata*, Fig. 154). Mr. Afleck informed us that the Cotton-moth invariably rests in the position in which we have placed it (Fig. 149, *b*), namely, with the head downwards, and that if perchance, it settles in any other position, it instantly "wheels around head down."

Remedies.

It must be admitted that very little satisfaction is given in the literature which we have of this insect, so far as regards an effectual remedy against its depredations, and, as we are ourselves unable to make observations or experiments, we shall be glad to publish for the general good, the experiences of any of our cotton-

growing subscribers. According to the best authority, there are three different broods of worms during the year, the first appearing in June or July, and the last, which does the most damage, appearing in August or September, or even later. Mr. Lyman, in the little work already referred to, says: "That nature has made no provision by which either the fly, the worm, the chrysalis, or the eggs, can survive the winter or exist for any length of time where the cotton plant is not a perennial." But this is surely an error, which Mr. Lyman would never have made, had he possessed a better knowledge of insect life; and as Mr. Glover found that the chrysalis was killed by the slightest frost, the insect evidently winters over in the moth state, as do many others belonging to the same tribe. Indeed, Mr. W. B. Seabrook gives strong evidence that this is the case, in a "Memoir on the Cotton Plant," read in 1843, before the State Agricultural Society of South Carolina, wherein he says: "That the Cotton Moth survives the winter, is nearly certain. An examination of the neighboring woods, especially after a mild winter, has often been successfully made for that purpose." We notice that this question of the hibernation of the cotton-worm is now being discussed at great length in late numbers of the *Southern Herald*, of Liberty, Miss., and the writer apparently concludes that the "caterpillar, while in the chrysalis state, burrows in the earth and there finds a home—a sure retreat from winter's chilling blasts." But we have already shown that the chrysalis is formed above ground, within a cocoon built by the worm, of cotton leaves and silk; and it is contrary to all analogy, that an insect should both spin a cocoon *above* ground to transform, and likewise enter *into* the ground for the same object.

The two principal remedies which have hitherto been relied upon are, 1st, hand-picking; 2nd, destroying the moths by fires, to which they are naturally attracted. The first method is sure, but tedious and somewhat impracticable on a very large scale. The second is most effectual if carried out when the first moths appear, whence we may readily see the importance of ascertaining the exact time in which they first appear in a particular district. If these two methods were persistently carried out throughout any given cotton-growing county, in the early part of the season they would of themselves be sufficient to save the crop; but the efforts of individuals are of no avail, where there are slovenly neighbors who neglect to perform these labors. It would therefore be of in-

calculable advantage, if something could be applied to the plants which would prevent the moths from depositing their eggs upon them, as the industrious planter could then set at defiance his more slovenly neighbor. Mr. Affleck was enthusiastic in his praise of cresylic soap as such a plant protector, and we have a long letter written a few weeks previous to his death, showing how he had found that no cotton moth had ever deposited an egg on any plant that had been sprinkled with a solution of this soap. In view of this fact, we hope that this solution will be thoroughly tested during the present summer. Caution must be had, not to use it so strong as to kill the plant, and its application should be repeated as often as is found necessary, for at least a month during the season of the first appearance of the moth.

The Boll-worm.

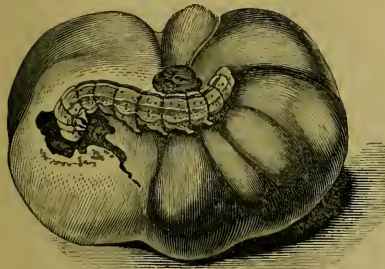
(*Heliothis armigera*, Hübner.)

We are more familiar with this insect than with the true Cotton-worm described above, for, in order to make its acquaintance, it is not necessary to reside in the South. It has, indeed, a very wide range, and a Mr. Bond, at the meeting of the London, (England,) Entomological Society, on March 1st, 1869, exhibited specimens of the moth from the Isle of Wight, from Japan, and from Australia; and, as might be expected from its extended habitat, the insect is a very general feeder. The "Boll-worm" has become a by-word in all the Southern cotton-growing States, and the "Corn-worm" is a like familiar term in those States, as well as in many other parts of the Union; but few persons suspect that these two worms—the one feeding on the corn, the other on the cotton-boll—are identically the same insect, producing exactly the same species of moth. But such is the fact! It attacks corn in the ear, at first feeding on the "silk," but afterwards devouring the kernels at the terminal end; being securely sheltered the while within the husk. We have seen whole fields of corn nearly ruined in this way, in the State of Kentucky, but nowhere have we known it to be so very destructive as in Southern Illinois. Here there are two broods of the worms during the year, and very early and very late corn fare the worst; moderately late and moderately early varieties usually escaping. The worm cannot live on hard corn, and it is usually full grown when the kernels are in the "milk" state.

But this glutton is not even satisfied with ravaging these two great staples of the country—cotton and corn—but voraciously attacks the

tomato in South Illinois, eating into the green fruit, (Fig. 150), and thereby causing such fruit

(Fig. 150.)

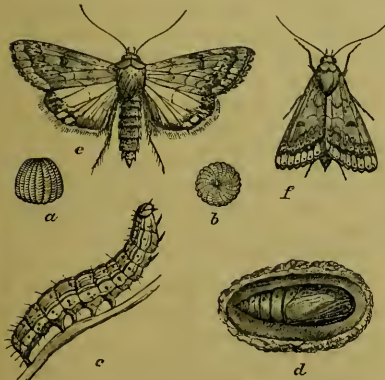


Colors—green, brown and yellow.

to rot. In this manner it often causes serious loss to the tomato-grower, and it may justly be considered the worst enemy to the tomato in that section of the country. Mr. Glover also found it feeding in a young pumpkin. But at present we shall consider it only in its role of Cotton Boll-worm; and shall recount its habits as such.

The egg from which the worm hatches (Fig. 151 *a*, side view; *b*, top view magnified,) is rib-

(Fig. 151.)



Colors—(*a* and *b*) pale yellow; (*c*) green, brown and black; (*d*) brown; (*e* and *f*) clayey-yellow, with greenish tint.

bed in a somewhat similar manner to that of the Cotton-worm, but may readily be distinguished by being less flattened, and of a pale-straw color instead of green. It is usually deposited singly on the outside of the involucre or outer calyx of the flower or young boll, and each female moth is capable of thus consigning to their proper places, upwards of five hundred eggs. Mr. Glover, in his account of the Boll-worm, pub-

lished in the Monthly Report of the Department of Agriculture for July, 1866, says: "Some eggs of the Boll-worm moth hatched in three or four days after being brought in from the field, the enclosed worms gnawing a hole through the shell of the egg and then escaping. They soon commenced feeding upon the tender fleshy substance of the calyx, near the place where the egg had been deposited. When they had gained strength, some of the worms pierced through the calyx, and others through the petals of the closed flower-bud, or even penetrated into the young and tender boll itself. The pistils and stamens of the open flower, are frequently found to be distorted and injured without any apparent cause. This has been done by the young Boll-worm; when hidden in the unopened bud, it has eaten one side only of the pistil and stamens, so that when the flower is open the parts injured are distorted and maimed, and very frequently the flower falls without forming any boll whatever. In many cases, however, the young worm bores through the bottom of the flower into the immature boll before the old flower falls, thus leaving the boll and involucre or envelope still adhering to the foot-stalk, with the worm safely lodged in the growing boll. The number of buds destroyed by this worm is very great, as they fall off when quite small, and are scarcely observed as they lie brown and withering on the ground beneath the plant. The instinct of the Boll-worm, however, teaches it to forsake a bud or boll about to fall, and either to seek another healthy boll, or to fasten itself to a leaf, on which it remains until at length it acquires size and strength sufficient to enable it to bore into the nearly matured bolls, the interior of which is nearly destroyed by its attacks, as, should it not be completely devoured, rain penetrates through the hole made by the worm, and the cotton soon becomes rotten and will not ripen. * * One thing is worthy of observation, and that is, whenever a young boll or bud is seen with the involucre spread open, and of a sickly yellow color, it may be safely concluded that it has been attacked by the Boll-worm, and will soon perish and fall to the ground. * * * The buds injured by the worm may readily be distinguished by a minute hole where it has entered, and which, when cut open, will be found partially filled with small black grains, something like coarse gun powder, which is nothing but the digested food after having passed through the body of the worm."

Like the Cotton-worm, this insect is very variable in the larva state, the young worms vary-

ing in color from pale green to dark brown. When full grown there is more uniformity in this respect, though the difference is often sufficiently great to cause them to look like distinct insects. Yet the same pattern is observable, no matter what may be the general color; the body being marked as in the above figures with longitudinal light and dark lines, and covered with black spots which give rise to soft hairs. In moving, the worm creeps with a steady gradual motion, very unlike the looping of the Cotton-worm. Our Figure 150 may be taken as a specimen of the light variety, and Figure 151 *c*, as illustrating the dark variety. When full grown, the worm descends into the ground, and there forms an oval cocoon of earth interwoven with silk, wherein it changes to a bright chestnut brown chrysalis (Fig. 151, *d*), with four thorns at the extremity of its body, the two middle ones being stouter than the others. After remaining in the chrysalis state from three to four weeks, the moth makes its escape. In this last and perfect stage, this insect is also quite variable in depth of shading, but the more common color of the fore wings is pale clay-yellow, with a faint greenish tint, and they are marked and variegated with pale olive and rufous, as in Figure 151, (*e* showing the wings expanded, and *f* representing them closed), a dark spot near the middle of each wing being very conspicuous. The hind wings are paler than the fore wings, and invariably have along the outer margin a dark brown band, interrupted about the middle by a large pale spot. Though there are but two broods of worms in the Middle States each year, there are, according to Mr. Glover, at least three broods in Georgia, the last brood issuing as moths as late as November, though some specimens remain under ground in the chrysalis state, and do not issue till the following spring. Those which we have bred have always issued as moths, in the fall, and would necessarily winter over in this last state.

Remedies.

Not being able to speak from experience, we have little to say under this head. Indeed, our principal object in touching on these Cotton insects, and in giving a clear and simple account of their habits and transformations, is to prevent our Southern readers from being confounded by the absurd accounts which are ever and anon appearing in their different journals. It is obvious from the nature of its work, that prevention is even more imperative with the Boll-worm than with the Cotton-worm. For this

purpose, fires are again recommended. We give the following experiment with vinegar and molasses, made by B. A. Sorsby, of Columbus, Ga., as quoted by Glover.

"We procured eighteen common-sized dinner plates, into each of which we put half a gill of vinegar and molasses, previously prepared in the proportion of four parts of the former to one of the latter. These plates were set on small stakes or poles driven into the ground in the cotton field, one to about each three acres, and reaching a little above the cotton plant, with a six-inch square board tacked on the top to receive the plate. These arrangements were made in the evening, soon after the flies had made their appearance; the next morning we found eighteen to thirty-five moths to each plate. The experiment was continued for five or six days, distributing the plates over the entire field; each day's success increasing, until the numbers were reduced to two or three moths to each plate, when it was abandoned as being no longer worthy of the trouble. The crop that year was but very little injured by the boll-worm. The flies were caught in their eagerness to feed upon the mixture by alighting into it and being unable to escape. They were probably attracted by the odor of the preparation, the vinegar probably being an important agent in the matter. As the flies fed only at night, the plates should be visited late every evening, the insects taken out, and the vessels replenished as circumstances may require. I have tried the experiment with results equally satisfactory, and shall continue it until a better one is adopted."

Mr. J. M. Heard, of Monroe County, Miss., patented in 1860, a device for trapping the moth, which consists of a tin plate placed on an inverted cone, and connected by a tube with a bait-pan made of the same material, which is to be partially filled with molasses mixed with a little anise, fennel or other essential oil. On account of the late war, this trap has not been properly tested, and is not now being manufactured. Mr. Heard has sent us one, and we shall certainly give it a trial; but it seems to us, that should it be even as good a trap as is claimed, it will be altogether too expensive an arrangement, when the great number required to properly protect a large cotton field is taken into consideration.

To destroy this insect in the corn-field or tomato patch, there is certainly no more effectual method than hand-picking.

THE TRUE ARMY-WORM (*Leucania unipunctata*, Haworth).

Editor American Entomologist:

I inclose a match-box with grass and two worms, which we think are Army-worms. They are here in myriads destroying the grass. Destroyed a hundred acres of blue grass meadow in five days, and are now advancing on me. What are they and their habits?

Carbolic acid (one part acid 20 parts water) kills them if they get a good trench with it, but is too expensive at that rate. They will cross a trail of it without injury, though they evidently dislike the smell. Have sent to town for coal tar to see if they will cross it when the ground is soaked with it. The advancing column is a half mile wide.

The hogs are very fond of them; will not notice corn when they can get Army-worms, but we have more of the latter than they can dispose of. A. E. TRABUE.
Hannibal, Mo., June 8, 1869.

Since the above communication was received from Mr. Trabue, we visited Hannibal and

vicinity, and we found that the Army-worm was even more numerous around New London, Mo., and especially on Mr. A. McPike's farm, which is five miles north of that town. We have also heard of its appearance in other parts of Missouri, especially in Cooper and St. Louis counties, as well as in St. Clair county, and in Coles and Franklin counties, in Illinois, and we therefore take this opportunity of giving a condensed account of it, by which it may be more easily distinguished from the Southern Cotton Army-worm, which formed the subject of our leading article. It will be well remembered by the people of the West, and especially of Illinois and Missouri, that the Army-worm was exceedingly abundant and injurious in the year 1861. Since that time it has never appeared so generally over such a vast extent of country, though in 1865 it appeared in considerable numbers around St. Joseph, in Missouri, and in 1866 did some damage near Quincy, Ill., as we learned from the Quincy *Whig*. But in most of the localities where it so abounded in 1861 it has scarcely been heard of since, and the unobserving resident in such localities would naturally conclude that it had vanished from the face of the country, and would be not a little puzzled to divine from whence it so suddenly came, in such immense armies, the present summer.

The truth of the matter is, that there are a few Army-worms in some part or other of the country every year, and we have for the past four or five years captured one or more specimens of the moth every fall. The worms very possibly occur by preference, as has been suggested by Dr. Fitch, in low swampy lands, where they would be little likely to be noticed. Occasionally circumstances are favorable to their multiplication, and whenever such is the case, their enormous fecundity enables them to appear as if by magic. The eggs hatch during the early part of May, in the latitude of South Illinois and Missouri, and the young worms may feed by millions in a meadow without attracting attention; but when they have become nearly full grown and have stripped bare the fields in which they were born, they are forced from necessity to travel in search of fresh fields, and it is at such times that they first attract general attention. A curious instinct leads them to travel in vast armies, and as they are now exceedingly voracious, devouring more during the last three or four days of their worm-life than they had done during the whole of their previous existence, they are very apt to strip the leaves from every blade of grass or grain on their way. On the other hand, they

are attacked by at least five different parasites, and when we understand how persistent these last are in their attacks, and how thoroughly they accomplish their murderous work, we cease to wonder at the almost total annihilation of the Army-worm the year following its appearance in such hosts. Furthermore there may be influences at work, other than parasitic, which cause an increase or decrease in the numbers of this pest. It is a significant fact that almost all great Army-worm years have been unusually wet, with the preceding year unusually dry, as Dr. Fitch has proved by record. The present year, wherever they have so far appeared, forms no exception, for the summer of 1868 was unusually dry and hot, while the present year has been decidedly wet.

The Army-worm, like all other insects, hatches from an egg, and this egg is evidently deposited by the parent moth at the base of perennial grass stalks. The worm varies but little from the time it hatches to the time when it is full grown. Some specimens are a shade darker than others, but on many thousands of specimens examined, we have found the markings very uniform, as represented in the annexed

[Fig. 152]



Colors—Dull black, white, dull yellow and pink.

cut (Fig. 152). When full fed, which is generally about four weeks after hatching, it descends into the ground where it forms an oval chamber and changes to a shiny mahogany-colored chrysalis (Figure 153).

[Fig. 153]



Color—Mahogany-brown.

Sometimes it scarcely penetrates beneath the surface, but forms a rude cocoon under what dry herbage there happens to be on the ground. Thus, the worms vanish from sight very suddenly, and this sudden disappearance is as mysterious to those who have no knowledge of natural history, as was their abrupt advent. We doubt very much if a single one, of the hosts which so recently animated the meadows, can be found in any of the localities above mentioned, by the time this reaches the eyes of our readers.

After remaining in the chrysalis state about two weeks, the perfect moth appears. The general color of the moth is light reddish-brown or fawn color, and it is principally characterized by, and receives its name from, a white spot near the centre of its fore wings, there being also a dusky oblique line running inwardly from their tips.

The accompanying illustration (Fig. 154), though

[Fig. 154.]



Colors—Light reddish-brown, white and dusky.

darker than it should be, will show wherein it differs from the Southern Cotton Army-worm, notwithstanding the colors of the two moths are so nearly alike.

In the fourth volume of the "Transactions of the Illinois State Agricultural Society" (1860), will be found a very complete account by the Senior Editor, of the Army-worm with four of its parasites, to which account we refer those of our readers who desire to learn more of this singular insect.

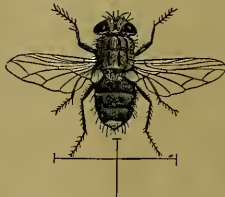
During our visit to Hannibal we ascertained that the worms originated in a large 100-acre field of very rich blue-grass, belonging to Mr. W. R. Flowerree. This gentleman makes a business of fattening cattle, and intended feeding off the grass in the fall; but that same field had neither been pastured nor plowed the year before, which in our minds was the very reason why the worms originated there. The Army-worm, like our cut-worms and almost all the insects of the great group of Owlet-moths (*Noctua* family) to which it belongs, is single brooded, and though a few of the pupæ may remain in the ground through the winter and not issue as moths till the following spring, yet the great bulk of them issue, as above stated, in about a fortnight after becoming pupæ, or during the month of July. These moths pair and the female deposits her eggs where nature teaches her that those eggs will have a chance to live and hatch; namely at the base of perennial grass-stalks, or on the stubble left by the mower. Consequently you effectually destroy the eggs and thus check the further multiplication of this insect, either by burning your meadow stubble in the dead of winter or by plowing it under in the fall. It were useless to enumerate the many facts which distinctly lead us to this conclusion; suffice it to say that they are numerous, and that the one mentioned above is corroborative.

Mr. Trabue has large meadows, separated only by a road from the blue-grass field of Mr. Flowerree; and he thought he could keep out the worms by simply making a V-shaped ditch; believing that they could not crawl over, so long as the earth crumbled. The first evening after it was dug, this ditch seemed to be effectual, and the bottom was covered with one seething,

twisting mass of the worms; but a heavy rain came on in the night following, after which they crossed without difficulty. Mr. Jas. Dimmitt however, who had 80 acres of wheat adjoining the fatal blue-grass field, effectually protected it by surrounding it with a ditch which had the inner side slanting under, towards the field it was intended to protect. It was indeed most fortunate that Mr. Dimmitt had hit upon the true method in the beginning, for his wheat was yet in that soft state, in which even the ear would have been devoured, and friend Trabue was not long in profiting by his example. We noticed that though the worms would nibble at clover, they did not relish it, and always passed it by untouched, whenever blue-grass or timothy were at hand. A large gang of hogs were making commendatory efforts to gobble up all those worms that were crossing the road in a particular place; but they utterly failed to check the onward march of this living, and to them, luscious food.

To one who has never before seen this insect in its might, the sight of the myriads as they return thwarted in their endeavors to cross, or of the living, moving and twisting mass which sometimes fills the ditch to the depth of several inches; is truly interesting. We were much surprised to find that, wherever we went, fully nine worms out of every ten had upon the thoracic segments, just behind the head, from one to four minute, narrow, oval white eggs, about 0.04 long, attached firmly to the skin; and our companions were as much surprised when we informed them that these were the eggs of a parasite, and that every one of the worms which had such eggs attached to them, would eventually succumb to one of the maggots these eggs produced. The large two-winged parasitic flies which deposited these eggs, were wonderfully numerous, buzzing around us and about the worms like so many bees, and the moment we caught one, we recognized it as the Red-tailed Tachina Fly (*Exorista militaris*, Walsh), which in 1861 was first reared and described by the Senior Editor. As this fly is one of the most abundant Army-worm parasites, and consequently one of its most effectual checks, we represent it at Fig. 155. There have been men foolish enough, in the past, to believe that, because this fly issued from the body of the Army-worm, therefore it

[Fig. 155.]



Colors—Gray, black and brick-red.

must be the real mother insect, and should be destroyed! No reader of the ENTOMOLOGIST will be apt to make such a grave blunder, for they will know when they observe this large buzzing fly, that it is doing them good service. This fly is of a dark gray color with a satiny lustre, and the last abdominal joint is brick red or reddish-yellow. When we recollect that besides this *Tachina* Fly which had provided for the destruction of nine-tenths of the worms, there are five other distinct parasites which are known to attack them, by depositing their eggs in the body of their victim, where these eggs cannot be seen; we shall have no cause to wonder if there should be no vestige of the Army-worm around Hannibal next year.

The Foe Sometimes proves to be the Friend.

We have heard of the Army-worm, sometimes passing through a wheat field when the wheat was nearly ripe, and doing good service by devouring all the chaff and leaving untouched the wheat; but the following item from Collinsville, Illinois, which we clip from the *Missouri Democrat*, contains still more startling facts:

“HARVEST AND CROPS.—Notwithstanding the unfavorable weather, many farmers have commenced the wheat harvest. The yield in this immediate vicinity will be superabundant. Some fields were struck with rust a few days since, but the Army-worm making its appearance simultaneously, stripped the straw entirely bare of blades and saved the berry from injury. These disgusting pests have saved thousands of dollars to farmers in this neighborhood. A few fields of corn and grass have been partially destroyed, but by ditching around fields, the worms' ravages have been confined within comparatively narrow limits.”

•••••
BELATED INDIVIDUALS of the PERIODICAL CICADA.

On page 64 of the present volume of the ENTOMOLOGIST, we stated that scattering individuals of the Periodical Cicada, and more especially of the 13-year brood (*C. tredecim*), frequently appear the year before or the year after their proper period. It was our good fortune to meet with two of the empty pupa shells of this insect, on the 7th of June, while Major E. S. Foster of Bushburg, Mo., caught a single perfect ♂ insect. Their song has also been heard in 1869 by several persons who are well able to distinguish it from that of any of the other species which make their advent among us each year. Yet the woods seem strangely quiet, when we recall the loud resonance of the 13-year Cicada, which animated them a year ago.

IS THE CURCULIO SCARCE THAN IT WAS
LAST YEAR?

On page 202 of our last number we published a letter from Judge A. M. Brown of Villa Ridge, Ills., stating that he found the Curculio much scarcer than it was a year ago; and we gave our own experience as corroborative of the fact in Missouri. We have been informed that at the June meeting of the Alton (Ills.) Horticultural Society, Dr. Hull gave it as his conviction that this conclusion was hastily drawn, and that the Curculio was more abundant than ever before, and that it was utterly impossible for them to obtain a crop of peaches in Southern Illinois. Now we care little for opinions, for we write for truth and are ever ready to stand corrected when there is occasion, but we are not in the habit of forming hasty conclusions, and though, as a general rule, we highly esteem the Doctor's opinions, we are unwilling that the *ipse dixit* of any one individual shall stand as record for all future. We know not how much territory the Doctor intended to embrace in his assertion, but as no qualification is given we suppose he refers to the whole Western country. As to the last statement, that it is impossible for them to have any peaches the present year in South Illinois, we leave the result to confirm or disprove it. We have ourselves made personal observations in Missouri, at various points along the Iron Mountain and along the Pacific Rail Roads, as well as at Hannibal, and can truly say that we have often had difficulty to find any trace of this little pest, especially where there was a failure of the crop a year ago. We have also made observations in Illinois, both at Alton and at Warsaw with the same results. And surely if the conclusion we formed a month ago had been as false and hasty as the Doctor claims, it would have been contradicted by a number of our readers. Now what are the experiences of others?

To commence with, near Rock Island, Ills., the plums have been punctured by the Plum Gouger about as extensively as we ever saw this insect work; but there are very few Curculio crescents on the same trees to be met with.

Mr. G. Wilgus of Warsaw, Ills., writes as follows upon this very important subject: “Most of my peach-trees are loaded with fruit. Only a few peaches appear to have been stung by the Curculio, and but a very small number indeed of those which bear the crescent mark have fallen from the tree, or contain either egg or worm. The wounds appear to have healed

over and the fruit remains sound, as you will see by the specimens sent herewith. I have examined scores of them in a large orchard, and from several varieties, and have found one worm only."

Mr. Wilgus sent us four peaches, containing in all eight *Curculio* cuts more or less grown over. In one of the eight the egg had hatched and the larva after burrowing a short distance had perished; in another one there was a fine healthy *Curculio* larva, about one-third grown; but in all the remaining six the egg had failed to hatch out.

Dr. Hull attributes the failure of the eggs to hatch out to the cold weather which has prevailed so generally this spring; and so far as this failure to hatch is concerned, we believe that he has assigned the true cause. Manifestly, however, the failure to hatch is one thing, and the paucity of eggs another thing; and we do not conceive that the cold snaps that prevailed this spring would prevent the mother-*Curculios* from laying their eggs as soon as the weather turned warm. Probably this mischievous little pest has been extensively preyed on during the season of 1868-9 by some one or more of those cannibal insects, which we showed in our second number to have this very desirable propensity; and thus the paucity of egg-layers necessarily led to a corresponding paucity of eggs.

Judge Brown of Villa Ridge, Ills., writes: "*Curculios* continue scarce."

Mr. J. H. Tice of St. Louis county, Mo., informs us that he had a plum tree, from which heretofore it has been impossible to get any fruit, and that it is this year so loaded that the limbs bid fair to break; the *Curculio* has not molested them.

Mr. C. W. Spaulding of Kirkwood, Mo., relates a similar experience to that of Mr. Tice; he says, however, that a few *Curculio* marks were noticed early in the season, but that the eggs failed to hatch.

Mr. A. Dean from Otto, Indiana, writes: "The prospect in this vicinity for a peach crop was never better than at this time. Insects of all kinds seem to be less numerous than usual."

The Rev. Chas. Peabody of Sulphur Springs, Mo., informs us that he has scarcely been able to catch a *Curculio*, and has long since abandoned the jarring of his peach-trees; the trees are loaded with fruit and the prospect good. The experience of Mr. T. W. Guy and of others in the same neighborhood is of a similar nature.

Mr. Saml. Wright of Hillsboro, Mo., who uses a *Curculio*-catcher, says the *Curculio* is very

scarce compared with last year, as he can hardly find one to a tree.

Mr. Jas. Waite of Hannibal, Mo., finds that there are altogether fewer *Curculios* in his neighborhood than there were last year.

Mr. W. J. Winters of DuQuoin, Ills., writes that they have no peaches in that immediate vicinity for the *Curculio* to work on, "though other fruits seem to be clearer from their sting this season than common."

Mr. W. C. Flagg of Alton, Ills., writes "I am of your and Judge Brown's impression, that the *Curculio* is out in smaller force this year."

On Mr. H. G. McPike's place at Alton, Ills., we found an abundant crop of plums and cherries, with no fallen fruit, and scarcely any of that on the trees exhibiting the well-known *Curculio* mark, though no precautions whatever had been taken to guard against its attacks.

Though satisfied with our own observations, we give the above evidence of a few competent fruit-growers in corroboration of our statement. Still, this general scarcity of the *Curculio* does not preclude its being abundant in certain localities, and for aught we know it may abound in the Eastern States. Indeed, if we are rightly informed, it is quite plentiful in some parts of Michigan. As a general rule, it will be found scarce only where stone-fruit was scarce a year ago, and as Dr. Hull had a fair crop of peaches in 1868 we should naturally have given this as the reason for the unusual numbers of the *Curculio* which he finds this year, had he not declared that none of them were bred on his place—a declaration which reflects no great credit on his neighbors. His peach crop is a failure this year, owing to frost in the early part of the season, and of course the *Curculios* concentrate on the plum trees; and as they have been so numerous as to enable him to catch "from two to five thousand" in a single morning, we pay him a high compliment for industry and perseverance; for surely we never saw plums hang more thickly or more free from stings than those on his trees. Moreover, if we had not been informed of what *had* been, and were left to make a decision from what *was* while we were there, we should have been still more thoroughly convinced of the comparative scarcity of this insect, for upon carefully overhauling a large bag-full of plums "the result of that morning's catch" we popped every *Curculio* into a bottle of alcohol, and afterwards found by count that there were just twenty-six, and after using the catcher on a number of those plum-trees which the Doctor had found were most frequented by the Little Turk we succeeded in capturing but three specimens.

Admitting that his place forms an exception to the general rule, we most good-humoredly cast home again the Doctor's accusation of "hasty," and leave the verdict with the people!

INSECT EXTERMINATION.

We clip the following from the *Vinland* (N. J.) *Weekly* of May 15, 1869. Mr. Landis evidently means business. He is taking the right step and if his advice is followed, and he succeeds in producing unanimity of action, the Vinlanders will soon obtain control over their liliputian foes.

To the Citizens of Vinland:

I am convinced that Fruit cannot be successfully raised in this community, or any other, without waging systematic and successful warfare against the insect enemies. This success involves a vast amount of present property and more in the future. With this success Vinland becomes pre-eminently the most valuable place in the Union for fruit culture.

To encourage success in this direction I therefore offer the following premiums, to be awarded under the auspices of the Agricultural Society:

Ten Dollars for the best Half Acre of Fruit Trees kept the cleanest from Tree Grubs, Curculios and Apple Moths.

Ten Dollars for the best Acre ditto.

Ten Dollars for the best Two acres ditto.

Ten Dollars for the best Four Acres ditto.

Ten Dollars for the best Five Acres ditto.

Ten Dollars for the best Six Acres ditto.

Ten Dollars for the best Seven Acres ditto.

Ten Dollars for the best Eight Acres ditto.

Ten Dollars for the best Nine Acres ditto.

Ten Dollars for the best Ten Acres ditto.

Together with a Certificate of Merit, handsomely framed.

The points to which it appears most necessary for people to direct their attention are the following:

First—Borers. Peach Trees—Dig them out with a knife—depend upon nothing else. Nectarine—Dig out the borers. Apple Trees—Dig out the borers. The first year they can be found with a knife; the second and third years require an annealed wire.

Second—*Curculio*. Only to be destroyed by jarring the trees and letting them fall upon a sheet, and burning them. Do not shake but jar the trees. This is to be done early in the morning, and as often during the day as necessary. They infest the Apricot, the Peach, the Nectarine, the Plum, the Apple, the Pear, the Quince and Cherry. Also gather all the fruit that falls to the ground immediately, as this fruit contains their eggs. They appear from the middle of May until July, but have to be looked for before and after these periods.

Third—*The Apple Tree Moth*. The great enemy of the Apple, the Pear and the Quince. The remedy for the apple moth is:

1st—Gathering the fruit as it falls to the ground, and burning it or feeding it to stock.

2d—Trapping them by coiled rope made of hay or rags (not straw) coiled three times around apple, pear and quince trees. These bands should be put upon the trees about the 20th of June and examined every two weeks and the caterpillars destroyed. They should be kept on until the middle of October.

The amount of labor this requires when done regularly and with system, is very small in proportion to the immense profit to be obtained. It ensures a full and certain crop of fruit. By this means apricots and plums can be as readily raised as anything else.

I respectfully recommend that associations be formed in all the school districts of people who will agree to keep their orchards clear of insects; who will meet together once a week, or oftener, for mutual understanding and information, and to take measures concerning the cleaning of those orchards that are neglected. This is of paramount importance until a proper law is obtained upon the subject. These meetings should be held at once, without any delay.

Citizens, fruit culture means painstaking labor. It requires the destruction of insects, and for this labor it will return you a thousand fold. This necessity is a blessing in disguise, as it elevates the business to an art, removing many farmers, also careless people, from competition, making the profits to the careful and industrious proportionately large. CHAS. K. LANDIS.

VINLAND, May 10, 1869.

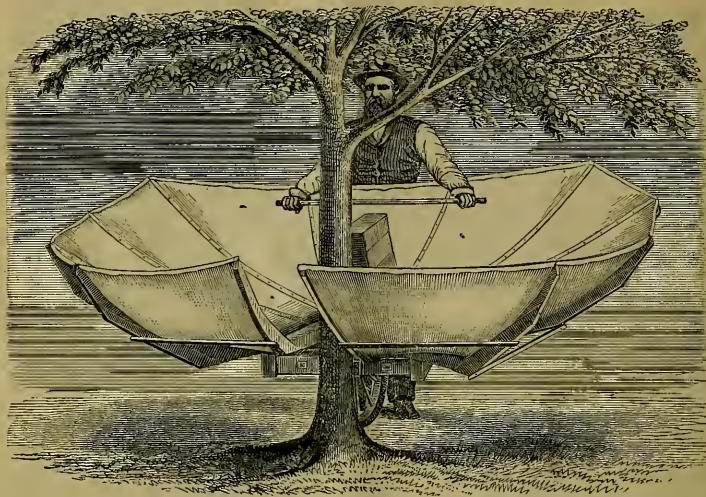
TO DESTROY COLORADO POTATO BEGS.

FAIRPLAY, WIS., May 25, 1869.

FRIEND BROWN—I noticed in your last issue an article about the potato bug. Now, as the season is approaching for this enemy of the potato to make its annual raid upon our fields, I thought I would send you a *cure*, which will most certainly put a stop to their depredations. We tried it last year, and destroyed millions of them, and consequently had a first rate crop of potatoes. It is this: Take one pound of Paris Green (cost 60 cents) and mix with two pounds of flour. Sift the mixture through a coarse muslin cloth, upon the potato tops, early in the morning, when the dew is on the tops. The bugs will drop to the ground by thousands, never to rise again. The above quantity of ingredients will answer for an acre of potatoes. Please tell everybody of it, so that they can all raise good potatoes, as I did.—(Geo. LITTLE, Sr., in *Galena* (Ills.) *Gazette*.)

[We can confidently recommend the above remedy as the most effectual and probably the cheapest yet known. Last year we tried Paris Green and ashes—one part of the green to five of ashes—and though it killed most of the larvæ it did not seem to affect the parent beetles. But we are inclined to believe that the Paris Green we used was not of good quality; for experiments the present year according to the above directions have been highly satisfactory. When first applied in the morning it seems to have but little effect, as the bugs continue feeding for some time as ravenously as ever, but as night approaches the ground becomes, by degrees, strewn with the dead carcasses of both the larvæ and beetles, and by the day following not a live bug will be found on the vines, if the application has been thoroughly made.—EDS.]

[Fig. 156.]



DR. HULL'S CURCULIO CATCHER.

We recently paid a visit to Dr. Hull's fruit farm, which is situated on the bluffs of the Mississippi, about five miles above Alton, Ills. We went there with the ostensible purpose of feasting our eyes on his noted cherry orchard, which contains nineteen varieties; and to tickle our palate with some of the fruit which hung in such rich clusters from all the branches of the different trees. The Doctor, by a judicious thinning out of the fruit spurs, early in the season, produces immense size of berry, and we never before witnessed such a handsome cherry crop, either in this country or in Europe, as he had the present year. But while there, we amused ourselves by sketching his celebrated Curculio-catcher, by the aid of which he has been enabled to effectually protect that large cherry crop from the ravages of the Curculio. Of course we could not make a comely picture of such an ugly and cumbersome machine, without introducing the Doctor's handsome phiz as an offset; and if there be any merit in the story of the old Egyptian Magician who portrayed so vividly that he exhausted the life of his subject, then we must have obtained a good portrait of the Doctor; for those present will bear witness that he turned wonderfully pale and all but fainted, when he discovered that he was being transferred to paper. But we will leave this mat-

ter to those few of our readers who were present, and who alone will appreciate the joke, while we give a description of the machine in the Doctor's own words, for the general benefit:

"To make a Curculio-catcher we first obtain a light wheel, not to exceed three feet in diameter, the axletree of which should be about ten inches long. We next construct a pair of handles, similar to those of a wheelbarrow, but much more depressed at the point designed to receive the bearings of the axletree, and extending forward of the wheel just far enough to admit a cross-beam to connect the handles at this point; one-and-a-half inches in the rear of the wheel a second cross-beam is framed into the handles, and eighteen to twenty-four inches further back, a third. The two last named cross-beams have framed to their under-sides a fourth piece, centrally, between the handles, and pointing in the direction of the wheel. To the handles and to the three last named pieces, the arms or ribs to support the canvass are to be fastened. To the front part of the beam connecting the handles in front of the wheel, the ram is attached; this should be covered with leather stuffed with furniture moss, a dozen or more thicknesses of old hat, leather or other substance, being careful to use no more than necessary to protect the tree from bruising. Ascertain the elevation the handles should have in driving, and support them in that position. We now put in place the stretchers or arms, six for each side, which are to receive and support the canvas. We put the front arms in position. These extend back to near the centre of the wheel on each side, and in front of the wheel (for large machines) say six feet, are far enough apart to receive the largest tree between them on which it is in-

tended to operate: The remaining arms are supported on the handles, and fastened to them and to the two cross and parallel pieces in the rear of the wheel. These are so placed as to divide the space at their outer ends equally between them and the first mentioned stretchers and fastened to the ends of the handles. Next we have ready a strip of half-inch board two and a half wide. One end of this is secured to the forward end of one of the front arms, and in like manner to all the others on one side of the machine, and fastened to the handles. Both sides are made alike. The office of these strips is to hold the outside ends of the arms in position; they also hold the front arms from closing. These outside strips also receive the outside edge of the canvas, which is fastened to them as well as the several arm supports.

"It will be seen that the wheel is nearly in the centre of the machine. To cover the opening at this point, a frame is raised over it, which is also covered with canvas. The arms, or stretchers, are so curved that the motion of the machine, in moving from one tree to another, should bring everything falling on the canvas to depressed points, one on each side of the wheel, where openings are made into funnels emptying into pockets or bags, for the reception of insects and fallen fruit. The whole machine should not exceed ten or eleven feet in breadth, by twelve or thirteen in length. These are for large orchard trees; smaller ones could be protected with a much smaller machine. If the frame work has been properly balanced, the machine will require but little lifting, and will be nearly propelled by its own weight.

"The Curculio-catcher, or machine, is run against the tree three or four times, with sufficient force to impart a jarring motion to all its parts. The operator then backs far enough to bring the machine to the centre of the space between the rows, turns round and in like manner butts the tree in the opposite row. In this way a man may operate on three hundred trees per hour."

To run this machine successfully, three things are necessary: 1st, that the land be decently clean, and not overgrown with rank weeds; 2d, that the orchard be sufficiently large to pay the interest on the prime cost of the machine; 3d, that the trees have a clean trunk of some three or four feet.

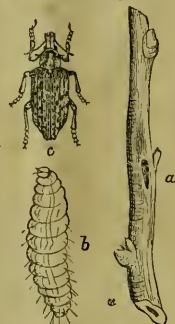
There are various modifications of the machine, and Dr. Hull has himself cheapened and simplified the one he has now in use, by doing away with the funnels and pockets for receiving the insects and fallen fruit. He now carries with the machine a bag and a broom, and as occasion requires, sweeps the contents of the catcher into the bag, which is afterwards dipped in boiling water in order to kill the inmates. This arrangement admits of separating and setting at liberty those friends which are knocked down with the foes; whereas, by the former method the righteous bugs were ignominiously

slaughtered with the unrighteous. As may also be seen from the above sketch, the frame covering the wheel is made of pine board, while the handles for propelling the machine are riveted *above* the canvas instead of being fastened *below* it, and the Doctor finds that this last arrangement gives him better leverage and greater control of the machine.

THE NEW YORK WEEVIL.

[*Ithycerus noveboracensis*, Forster.]

[Fig. 157.]



Colors.—(b) whitish; (c) gray and black.

During the last eight or nine years we have repeatedly received specimens of this large snout-beetle, with accounts of its injuries to fruit trees, and it seems to have been uncommonly numerous the past spring. It kills the twigs by gnawing off the tender bark, in the early part of the season before the buds have put out, and later in the year it destroys the tender shoots which start out from old wood, by entirely devouring them. It attacks, by preference, the tender growth of the apple, though it will also make free with that of the peach, plum and pear, and probably of other fruit as well as forest trees.

This beetle belongs to the same great Curculio family as does the Plum Curculio (*Conotrachelus nenuphar*, Herbst), but, with the rest of the species belonging to the same genus (*Ithycerus* = straight-horn) it is distinguished from most of the other snout-beetles by the antennæ or horns being straight instead of elbowed or flail-shaped as they are in the common Plum Curculio, for instance. The specific name *noveboracensis* which means "of New York" was given to this beetle 98 years ago by Forster, doubtless because he received his specimens from New York. But like many other insects which have been honored with the name of some Eastern State, it is far more common in the Mississippi Valley than it is in the State of New York, it being scarcely known as an injurious insect in the East. The general color of the beetle is ash-gray, marked with black as in the cut (Fig. 157 c), and with the scutellum or small semi-circular space immediately behind the thorax, between the wings, of a yellowish color. Its larval habits were for a long time unknown,

but we last year ascertained that it breeds in the twigs and tender branches of the Bur Oak, and we have good reason to believe that it also breeds in those of the Pignut hickory. The female, in depositing, first makes a longitudinal excavation with her jaws (Fig. 157 *a*) eating upwards under the bark towards the end of the branch, and afterwards turns round to thrust her egg in the excavation. The larva (Fig. 157 *b*) hatching from the egg is of the usual pale yellow color with a tawny head. We have watched the whole operation of depositing, and, returning to the punctured twig a few days after the operation was performed, have cut out the young larva; but we do not yet know how long a time the larva needs to come to its growth, nor whether it undergoes its transformations within the branch, or leaves it for this purpose, to enter the ground; though the former hypothesis is the more likely.

This beetle is a real "hard-shell," and there is no other way of diminishing its numbers than by catching and killing; but as it has the same habit as the "Little Turk," of falling to the ground when alarmed, the same methods of catching may be employed in the one case as in the other.

MOUNDING PEACH-TREES AGAIN. ✓

Editors American Entomologist:

Mr. R. L. Wells, in the ENTOMOLOGIST for June, recommends mounding the peach-tree as a remedy against the Borer. While I agree with him as to the benefits of that system, I have found by experience that there is danger in it if practiced as he recommends.

In 1856 I began peach-growing as a business. On setting my first lot of trees I was advised to cover the stock *no deeper* than it stood in the nursery, as trees had often been killed, it was said, for want of this precaution. So I had the trees set in that way. During the fore part of the summer I set a boy to hoeing the crop among the trees, and much to my annoyance I found that he had heaped the dirt up several inches around each tree. I immediately removed the earth from around a portion of the trees, intending to do so with all, but neglected to have it done. So, from ignorance in the first place, and neglect afterwards, the experiment was tried of mounding a portion and leaving the balance unmounded, in the absence of any thought of the effect it would have on the Borer. On worming the trees the next spring, to my sur-

prise there was scarcely a worm to be found in the mounded trees, while the others were badly affected.

We are slow to learn, and slow to put in practice what we do know, for before I made this, to me accidental discovery, it had been recommended by Downing and others, but to this day it is practiced to but a very limited extent.

The danger from this system will be found in where your correspondent says: "I shall continue to mound my trees in the spring and hoe away the mound in the fall." For the same reason that he gives I did the same thing, until a cold winter killed or badly injured all the trees so treated. The bark that had been covered up through the growing season for several years, had become as tender to the cold of winter as the real root bark, and furthermore it suited the instinct of the fly just as well, and the egg would be deposited accordingly, as near the tender thick bark as the earth would admit. So it has been my practice, since that second but more unpleasant discovery, to remove the earth and destroy the worms in the spring, leaving the bark exposed as long as it was safe to do so; that is, to heap it up again before the appearance of the moth, near midsummer. About two inches should be added to the mound each year, treading the earth well down close to the tree, for it suits the winged insect when a crevice can be found, to go below the surface, in search of the soft bark of the root. I have watched them going from tree to tree, seeking such an opportunity, which is often found in small trees that have been swayed about by the wind. But when she is compelled to use the wood-bark the worm works in a way the least injurious, not so as to girdle the tree, but in a narrow channel towards the root.

The advantages of this system are, first, that a less number of eggs are deposited; second, a greater proportion perish, the wood-bark not being congenial to them; third, what do survive do less damage, and are more easily reached by the knife than when down among the roots.

I think Mr. Wells is mistaken in supposing that the small worms found in such large numbers "on the exterior bark," are the Peach-borer. The natural food of the Peach-borer is the inner bark of the root, but the worms he describes seem to subsist on the gum that exudes from the wound in the bark, and are the effect and not the cause of the wound. According to my experience, the Peach-borer, like the Curculio, never deposits but one egg near the

same place, and seldom more than one by the same insect in the same individual fruit or tree.

A. DEAN.

OTTO, Ind., June 6th.

[We cheerfully insert the above experience from Mr. Dean, and hope that our readers will profit by it. We are a little suspicious ourselves that the worms spoken of by Mr. Wells (p. 201) were in reality, not true Peach-borers, but the larvae of a little two-winged gnat (*Mycetophila persica*, Riley's MS.) which live on the gum and detritus of the peach-tree, and which we have bred to the fly state. These little worms do no harm to the tree, and can always be distinguished from the young Peach-borer, by the greater relative length in proportion to the width of their bodies, and by being entirely destitute of legs; whereas the Peach-borer, no matter how small it may be, has always sixteen legs.—EDS.]

OVERCROWDED.

We have received such a deluge of letters and inquiries, during the past month, that, what with our many other duties, it has been impossible to answer them all in the present number. A great many of these letters are of such trivial importance that it is necessary to answer them by private letter; but all such as are not thus attended to, will in time be answered through the ENTOMOLOGIST. But few persons duly comprehend the arduous duties of a State Entomologist. Called hither and thither; with hundreds of insects at home whose transformations and habits must be watched, he often receives in a single mail, enough letters of inquiry, and specimens to name, to occupy him a full week. Oh that in this active, busy month of June, while Nature's pulses beat so audibly, we could multiply ourselves and be here and there and everywhere, and at the same time attend to all duties! but as we are but poor mortals, our readers will bear with us for any shortcomings!

NO AIR-HOLES NEEDED IN SENDING INSECTS.

Most persons who send us insects are in the habit of punching holes in the boxes in which such insects are packed; and sometimes these holes are large enough to allow the inmates to escape, and we are thus mortified at receiving only empty boxes. Not unfrequently the senders go to the trouble of punching these holes through thick tin boxes. Now we wish we could make our readers understand, that the punching of these holes not only involves entirely useless and superfluous labor, but that it is actually detrimental to

most living specimens. Insects do not smother as readily as do we human beings; many of them live at their ease deep down in the ground; some hide themselves in the hearts of trees, and others again swim in the water, or dwell in places where we should instantly suffocate. Indeed, moisture is far more essential than air to most insects, and we advise our readers to use as tight vessels as possible in sending them—especially if they are living specimens. We also advise the use of tin wherever practicable, for if the insect to be sent has strong mandibles, it is apt to gnaw through a pasteboard box and to escape; besides the tin keeps them, as well as the food on which they live, in much the freshest condition.

THE GILPIN NOT WORM-PROOF.

Mr. B. L. Kingsbury, of Alton, Ills., sends us the following: "There is a statement in the ENTOMOLOGIST (p. 160) that the Gilpin or Little Romanite apple is not troubled with the Codling Moth. A great mistake, so far as it applies to this section. I keep some over every year, and we have trouble to find sound ones enough to bake. It may be more exempt than some other sorts, but not enough so to be worthy of mention."

ANSWERS TO CORRESPONDENTS.

Plum-leaf Worms—W. D. Hickey, Minneapolis, Minn.—The minute six-legged green worms, with large black heads and a black thorn growing out of each side of their tails, which you find enclosed in a kind of web on a plum-leaf, are the larvae of a species of *Lyda*—a very interesting and anomalous genus of the Sawflies (*Tenthredo* family) in the Order of Clear-winged Flies. A similar but distinct species occurs on Wild Cherry (*C. serotina*); but although both kinds went underground in great numbers, we have always failed to rear either to the perfect state. When full grown these larvae are almost an inch long. Your specimen is remarkable for showing the hollow shells of the empty eggs still adhering in a double row to the lower surface of the midrib of the leaf.

Small White Moths—W. D. Hickey, Minneapolis, Minn.—The little white moths which you enclose along with the Sawfly larvae, thinking they may possibly be their ancestors, can have no possible connection with these larvae which belong to a distinct Order of Insects. They are the *Corycia vestaliata* of Guéneé. Singularly enough, they have been sent us from another quarter, under the idea that they produce certain small green worms upon Apple-trees, which from the description of them given by our correspondent are probably generated by an entirely different moth. It is always the male moth that has the hooks at the tip of his abdomen; and as in other male insects these hooks are, as your friend infers, used for sexual purposes.

Insects named—Chas. Vetch & Geo. P. Jones, Clariton, Mo.—No. 5, *Ulna impressa*, Melsb. No. 6, *Attagenus (Megatomia) ornatus*, Say. No. 7, *Aphodius granarius* Linn. (imported from Europe). No. 8, *Hoplocephala viridipennis*, Fabr. No. 9, broken to pieces. No. 10, *Agonoderus pullipes*, Fabr.

Seed-corn Maggot.—*G. Pauls, Eureka, Mo.*—The whitish maggots, $\frac{1}{4}$ inch long, and tapering at one end and blunt at the other,



Color—Whitish.

which have injured your seed-corn planted on new ground by devouring its substance, are the larvæ of some Two-winged fly. We have never before known seed-corn to be thus attacked in the West, but the Junior Editor has described a species* by the name of

the Corn Anthomyia (*Anthomyia zeas*, Riley), which infests seed-corn in a similar manner in New Jersey. At Figure 158 we represent this New Jersey maggot of the natural size, as it appears in the corn; and at Figure 159 a we give an enlarged view of it. After becoming full-fed these maggots leave the kernels of the surrounding earth and contract to pupæ (Fig. 159 b), from which in due time the fly escapes. The Corn Anthomyia is a small, modest-looking, yellowish-brown fly, with a grayish caste, and your maggots will very likely produce the same species, as they sufficiently resembled those from New Jersey. It appears that this maggot is again at work in New Jersey, for a farmer in Sussex county, in that State, lately reported to the New York Farmers' Club that his corn failed in a great measure to come up, though he could not discover the cause. By soaking the seed before planting in gas-tar or copperas, the injuries of this maggot might probably be prevented.



Colors.—(a) whitish; (b) light brown.

* See his First Annual Report, pp. 154-6.

Cut-worms.—*N. C. Burch, Jefferson City, Mo.*—The Cut-worms, one of which had severed a peach sprout about an inch below the surface, are full-grown specimens of the same species which you sent last month—the larvæ of the Lance Rustic (*Agrotis teliferus*, Harris). They have been less injurious lately than they were a month ago, because they have nearly all ceased feeding [June 10, '69], and have become pupæ or moths. We cannot recognize with certainty the beetle you describe, but it evidently belongs to the *Buprestis* family, and is most likely the common Flat-headed Apple-tree borer (*Chrysobothris femorata*, Fabr.) Compare it with Figure 16 of the Missouri Entomological Report.

New York Weevil.—*D. H. Kauffman, Des Moines, Iowa.*—The Snout-beetles that have been preying upon apple-twigs are the same New York Weevil which we illustrate in an article in this number, and which seems to be peculiarly abundant and mischievous this spring, as we have recently received specimens of it, along with grievous complaints of its depredations, from dozens of different quarters in the Valley of the Mississippi.

W. D. Tarril, Madison, Wis.—The insect sent is the same as that referred to above in the answer to Mr. Kauffman.

Insects around peach-trees.—*G. C. Broadhead, Pleasant Hill, Mo.*—The white larva which you found near the root of one of your peach-trees is the same as that we have illustrated (Fig. 161) in the present number, in answer to *G. Pauls* of Eureka. The other minute white twisting worms, about the thickness of a needle, are referred to in our remarks on "Mouthing Peach Trees" on page 223 of this number, and are not young borers.

Hollow Plums.—*C. E. Edwards, Bowling Green Ky.*—Such puffed-up hollow plums as you send, we have often seen before. This result is not caused by insects however. It is a horticultural nut, but one, which has not, we believe, been very satisfactorily cracked. An Iowa correspondent of ours had his entire crop destroyed by this peculiar affection of the fruit a year or two ago.

Large Green Worm in a Peach.—*G. Wilgus, Richview, Ills.*—The pale-green, 16-legged worm, specked with white and with a lateral white stripe, and about an inch long, which you found ensconced in the inside of a peach, is the larva of some large moth, but we cannot say positively to what particular species it belongs. We ourselves, only a few weeks ago, found a specimen of the very same worm burrowing into an apple in the orchard of *A. C. Hammond*, of Warsaw, Ills. In all probability the usual food of the larva is the leaves of the apple, peach, &c., and it is only occasionally and incidentally that it attacks the fruit. Similarly we are acquainted with quite a number of worms that usually feed upon oak-leaves, but will occasionally be met with eating out the heart of the "oak-apples" of the Black Oak.

Ichneumon Flies.—*Henry Klinehaus, Nyces, Pa.*—The small narrow white cocoons, spun altogether in a neat cluster on the branch of a dwarf apple tree, and which we represent herewith (Fig. 160), were made by some species of small Ichneumon-fly belonging to the genus *Color*—White, *Microgaster*. We have since bred the flies, and they scarcely differ from those which commonly attack the Tomato-worm (*Sphinx quinquemaculata*, Haw.) Of course these cocoon masses should not be destroyed.

Raspberry Worms.—*Benj. Border, Plymouth Meeting, Penn.*—The green worms about $\frac{3}{4}$ inch long on the raspberry leaves are the larvæ of the Raspberry Saw-fly (*Selandria rubi*, Harris). It was first described by *Harris* in 1850 in the New England Farmer, and is referred to in *Mr. Saunders's Report on Canadian Insects* (p. 194). It has occurred in great abundance in certain years in Illinois, especially at *Lacon* on the Illinois River, from which point we have ourselves received specimens.

Hairy Grape-leaf Folders.—*A. C. Davis, Furina, Ills.*—The small pale green caterpillars, with long white hairs, which fold up the leaves of your grape vines, are injurious and should of course be destroyed. They are the larvæ of the Grape-vine or Gartered Plume (*Pterophorus periscelidactylus*, Fitch), a pretty little tawny-yellow moth, with each of the upper wings partly split into two, and each of the lower wings entirely split into three fingers or plumes. You will find an account of it with figures in the Missouri Entomological Report, page 137.

Row of Eggs in Maple Twigs.—*Jabez Bower, Florence, Iowa.*—The double row of elongate eggs, each egg about $\frac{1}{4}$ inch in length, deposited in a series about $\frac{1}{2}$ inch long in the twigs of the Ash-leaved Maple, and also, as you think, in those of the Soft Maple, are those of one of the green grasshoppers belonging to the Catydid Family. Two of them hatched out on the road. From the great similarity both of the eggs and of the young larvæ in this group (*Orchelimum* and *Xiphidium*), we cannot determine to what particular species they belong.

Butterfly named.—*A. R. Bodley, M. D., Hillsdale, Mich.*—The "most beautiful butterfly," crossed with pale greenish-white and black bars, and with a crimson spot near the inner angle of the hind wing, which you do not find mentioned in any of the works you possess, and of which you send a rude sketch; is the Marcellus Swallow-tail (*Papilio marcellus*, Cram). Its larva feeds upon the Papaw.

Cockscoub Gall on Elm Leaf.—*G. W. Copley, Box 353, Alton, Ills.*—The galls on the elm leaf which were exhibited at the last meeting of your local Society, and which you rudely sketch, were evidently the Cockscoub Elm-gall, made by a species of plant-louse (*Thelesus ulmicola*, Walsh). You will find an account of this gall, with illustration, on page 108 of No. 6.

Grasshopper's Eggs.—*E. P. Burlingame, Shelbyville, Mo.*—The elongate pale-yellow eggs found in a clod in a corn-field are those of some grasshopper. We cannot be certain as to the species, but they are just about the size of those of the common Carolina Grasshopper (*Eliopoda Carolina*), which has black hind wings edged with cream-color.

Asilus Fly Larvæ.—*G. Pauls, Eureka, Mo.*—The "white borer-like worm" which you found under some weeds, and which we represent at Figure 161, is the larva of some large Two-winged fly, belonging most probably to the *Asilus* family. We know of no other kind of larvæ which have, like this one, two unguiform appendages on the very retractile head, and two spiracles on the back of both the first and eleventh segments. These larvæ are known to live in the ground, and to feed upon the roots of different plants. They transform in the ground to naked pupæ, with the limbs free, and during the month of July the flies issue. The larva of a quite common species (*Asilus sericeus*, Say) feeds upon the roots of the Rhubarb, and was bred to the perfect state by Harris.



To give you a good idea of these flies, we represent, (Fig. 162), from Harris, this Silky *Asilus* (*Asilus sericeus*, Say). When once these insects attain the fly state, they no longer relish the vegetable diet which satisfied them as larvæ, but they prey voraciously on other insects. One of these large flies is known in the West as the Bee-killer (*Trupanea apivora*, Fitch), on account of the pernicious habit which it has of seizing and sucking out the vitals of the Honey-bee, and you will find an account of it on page 168 of the Missouri Entomological Report.



Color—Brownish yellow.

New Insect-foe of the Blackberry.—*Chas. Parry, Cinnaminson, N. J.*—The little 4-winged flies, about 1/8 inch long when their wings are closed, and with their wings steeply roofed like those of most Plant-lice (*Aphis* family), belong to the closely allied Flea-lice (*Psylla* family) and to the genus *Psylla*. The Flea-lice are distinguishable from the Plant-lice, 1st by the very different veining of their wings, 2nd by the antennæ being knobbed at tip like those of a butterfly, 3d by their jumping as briskly as any flea, to which indeed they owe their scientific name, *Psylla* being the classically pure Greek word for a Flea. As with the Plant-lice, the Flea-lice are usually restricted to certain groups of plants, as, for example, the Birch, the Nettle, the Pear, &c. Only a single species has hitherto been described as found in the U. S.—the Pear-tree Flea-lice (*Psylla pyri*)—which so far has been exclusively met with in the Eastern States, and is supposed to have been introduced there from Europe. Your species may be called the Bramble Flea-lice (*Psylla rubi*), as you find it to inhabit the common Blackberry. For the benefit of our other readers, we copy here what you say as to the habits and the mode in which it operates upon the infested plant: "The suckers upon which this insect occurs in the spring commence to twirl round, and when not interfered with make a complete revolution before they resume their usual course. The leaves curl up and become matted around the curl, so as to make a safe harbor for the lice-like larvæ which during summer appear on the under surface of the leaves. I presume we can get rid of this insect, after the larvæ are produced, by cutting off the curls and burning them."

We can offer no certain explanation of the many-stalked fruit-spurs on the Blackberry, which sometimes blossom but never bear any fruit. There is no appearance of this phenomenon having been caused by any insect; and we incline to attribute it merely to the exuberant vigor of the plant, more particularly as you say that the flowers on these multiple fruit-spurs "are sometimes double like a rose." The few Bark-lice (*Lecanium*) found on these fruit-spurs can have nothing to do with the unnatural growth; for, as you yourself observe, they are found on other stalks as well.

Army-worm.—*Jno. H. Butts, M. D., Clinton, Mo.*—The worms which are doing such an immense amount of damage to the Timothy meadow and oats, in your neighborhood, is the veritable Army-worm, of which you will find an account in this number.

Green Grape-vine Worm.—*G. Pauls, Eureka, Mo.*—The large delicate green worm, covered with pale cream-colored spots and having a lateral yellow line, we have illustrated in the margin (Fig. 163). You say you

[Fig. 163.]



Colors—Green and cream-color.

found it injuring your grape-vines by devouring the blossoms and leaves, and that it seemed to prefer Hartford Israella and Iona first, and Concord and North Carolina next. It has this year also been found on the grape-vine by Mr. S. R. Muhleman of Woodburn, Ills., and we have ourselves found it feeding on the Raspberry, and upon the Red Bud (*Cercis canadensis*). In 1866 we bred the moth from a single poplar-feeding worm of the same kind, but this moth got so badly rubbed in its endeavors to escape, that we are unable to identify it. All we can tell you is that it is of a gray color and belongs to the great Oylet-moth family (*Noctuidæ*), some of the characteristics of this family being yet discernible on its injured wings.

Rose Slug.—*Geo. W. Copley, Alton, Ills.*—The yellow slug-like worms which abound on your rose bushes, and which cause the leaves to wear a seared and yellow appearance, are the larvæ of the Rose Sawfly (*Selandria rosea*, Harr.), a small shiny-black four-winged fly. A good douching with strong tobacco-water, or a sprinkling with white hellebore, would have killed them. They have now all left the bushes and entered the ground, from which they will issue as flies next August, and these flies will deposit eggs to produce a second brood of worms. Be on the look-out for their second advent! The species seems to be spreading fast in Illinois. Never until 1869 have we met with specimens near Rock Island, Ills., and this year it is quite abundant.

Beulah S. Morris, Olney, Pa.—We refer you to the above answer for the information you desire about the Rose slug. We cannot tell precisely what the white skipping insect is, unless you send specimens.

Insects named.—*Dr. Jas. Weed, Muscatine, Iowa.*—The elongate snout-beetle in the large quill is a common species of *Lixus*, and quite distinct from the New York Weevil which has done so much damage to fruit-trees this year. Of the two beetles in the small quill, the large gray one is *Leptostylus acutiferus* Say—one of the Capricorn or Long-horned Beetles, the larva of which bores into oaks and occasionally apple-trees. The small dark-colored one is *Podabrus modestus*, Say, which in the larva state preys upon timber-boring insects and is consequently your friend and not your enemy. The excavations into the external surface of the green apricots which you send are such as we know experimentally to be made for the sake of food by the common Curculio. There were three Curculio cressents in the specimens sent, and in one of these the larva had hatched out and commenced boring into the fruit.

Chrysalis of the Virgin Tiger Moth.—*Conrad Mullineckrodt, Augusta, Mo.*—The chrysalis which you found on a corn-hill, has, since its receipt, produced the Virgin Tiger Moth (*Arctia virgo*, Sm. & Abb.), a beautiful insect, with flesh-red wings, which are covered with stripes and lance-shaped spots of black. The brown bunch at the extremity of the body of the chrysalis, which you supposed to be a fungus, was the shrunken skin of the caterpillar, and this caterpillar had doubtless fed on your young corn, as a closely allied species is known to do.

Chrysalis of the Ursula Butterfly.—*A. Fendler, Alton, Mo.*—The curious chrysalis resembling that figured on page 192 (Fig. 134 b), which you found on the leaf of a Grape-vine, belonged to the *Ursula* butterfly (*Nymphalis ursula*, Fabr.) which is referred to in the article on "Imitative Butterflies." We have bred the butterfly from it.

Clover-worms—*E. P. Flanders, Galesburg, Mich.*—The larvae sent, which arrived in excellent order, and which, as you say, "were found in myriads in the bottom of a stack consisting partly of clover-hay," are

[Fig. 164.]



Colors—(1 and 2) brown; (4) honey-yellow; (5 and 6) golden-yellow and brown.

the veritable Clover-worms, of which we herewith present figures in all their stages. Figures 1 and 2 represent the larva, 3 the cocoon, 4 the pupa, 5 and 6 the moth, and 7 the white web in which the worm for the most part lives. The moth is scientifically known as *Asopia costalis*, Fabr. We copy your description of the way in which this worm operated, as it applies generally to the other instances in which it has been met with. "The hay close to the ground was stuck together with a sort of web, and was filled with white cocoons so thick that, before close inspection, one would pronounce it mouldy. The hay was also literally filled with their excrement; and after the last load had been removed, the hay-rack and also the barn-floor was fairly covered with the insect." As you suggest, this is the same worm that was described by the Senior Editor in the old *Practical Entomologist* (vol I p. 82; but the Junior Editor was the first to breed it to the perfect moth state, and he gave its complete history in the *Prairie Farmer* (Apr. 20, 1867). The moth is one of our prettiest species, being of a reddish brown color with golden-yellow markings and fringe to its wings.

Raspberry Brand—*J. M. Beecher, Newport, Mo.*—As you rightly infer, the orange fungus on the raspberry leaves which you send, is the same as that which we spoke of on page 204 of our last number. We lately saw a great deal of this fungus and have observed that it is almost entirely confined to the present year's growth of cane, and it has the curious effect of causing a dozen pale sickly shoots to spring from the ground where but one should properly grow. It furthermore seems to be more than a mere affection of the leaves, for if the shoots which are attacked by it be cut down—no matter how often—the new ones which spring up in their place, are always attacked by the brand. It seems to flourish best in a wet season and on a stiff soil. Fuller recommends underdraining for its prevention. The minute blood-red maggots which were upon the leaves, were not the cause of the brand, but were feeding upon it. They are the larvae of some minute gnat.

Rose-worms—*Geo. S. Grover, Warrensburg, Mo.*—The three worms of a pale green color and covered with conspicuous black spots, which were found feeding on a white rose bud, are the larvae of a deep rust-colored moth, the *Heliothis marginidens* of Guéniée, belonging to the same genus as the Cotton Boll-worm which we figure in this number. Since the worms were received they have become full grown, and have entered the earth. When full grown this worm is variegated with longitudinal stripes of black, white, rust-red or yellow, and looks very different from the immature uniformly black and green worm. In 1867 we bred a number of the moths from these rose-feeding larvae, but the same worm is a pretty general feeder, attacking with apparent relish the leaves of the poplar, the willow and the smart-weed. Its injuries are readily checked by hand-picking.

Plum-tree Plant-lice—*Dr. T. W. Gordon, Georgetown, Ohio*—The minute insects, mostly of a pale green color, without wings, but some of them black with wings, which so thickly infest the underside of your plum leaves, are apparently the common Plum-leaf louse (*Aphis prunifolia*, Fitch). The species is very variable, but may at once be distinguished from the Cherry Plant-louse (*Aphis cerasi*, Linn.) which infests the leaves of the cherry, by the paler appearance which they present when assembled under the leaves. Plant-lice of different kinds have been very numerous this year, and more especially with us, on flowers and vegetables. They may be killed by a thorough drenching with weak lye, strong soap-suds, tobacco water or cresylic soap; but whatever the solution be, it must touch the lice, or it otherwise will have no effect. Another most efficient method of clearing large trees of these lice, is that of introducing in their midst a number of their natural enemies, such as the Lady-birds and their larvæ (Fig. 165), the larvæ of the Syrphus-flies (Fig. 166), or those of the

[Fig. 165.]



[Fig. 167]



[Fig. 166.]



Large-wing flies (Fig. 167). The small birds should also be encouraged. We predicted on page 184, that the Apple-tree Plant-lice, which were so very thick on the bursting buds of the Apple, in the early part of the season, would soon disappear and do no harm. Two weeks after the article referred to had been written, scarcely one of these lice was to be found, as we learned from reports and from our own observation. We must give the small birds the greater part of the credit for the sudden disappearance of the lice. The warblers especially were very active in this good work, and among them none more so than the Pewee, the Maryland Yellow Bird, and the American Sparrow.

Ichneumon Flies—*S. J. Thorp, Troy, Ills.*—The little cottony mass which was found under some white cloths that were laid out on the grass to bleach, is formed by the larvæ of some little parasitic Ichneumon fly, belonging very probably to the genus *Microgaster*. We have frequently bred the flies from similar cottony masses. Some unfortunate caterpillar, infested with the maggot-like larvæ of one of these Ichneumon flies, had crept, exhausted, under the white clothes; and while there, the maggots worked their way out of its body and wove, in concert, the loose wooly mass, in the interior of which each one afterwards spun for itself a more compact cocoon.

J. E. Trabee, Hannibal, Mo.—The cottony masses which you find on the Army-worm, and which many suppose to be the eggs of that insect, are in reality, similar parasitic cocoons with the above. Instead of producing a new generation of Army-worms they will produce a swarm of that worm's deadliest foes, and should not in consequence be destroyed.

A new Curculio Humbug—*E. P. Flanders, Galesburg, Mich.*—The Patent Lamp to destroy the Curculio by attracting it as it flies round by night, of which you enclose the circular, is liable to the same fatal objection as the plan of the German Gardener, upon which we commented in No. 9 (p. 183)—namely, that the Curculio does not fly by night, and consequently would not be attracted even by the most brilliant lamp. Neither would this contrivance be of much use "in an orchard or about an apiary;" for among the moths it is chiefly the Owllet-moths that are attracted by a light in the night-time; and the Bee-moth as well as most of those which infest orchards, with the exception of those produced by Climbing Cutworms, belong to other groups, which have not that strange propensity to burn their wings off in the fire.

Eggs miscarried—*Judge A. M. Brown, Villa Ridge, Ills.*—The eggs you speak of, upon strawberry leaves, never came to hand.

Sweet-potato Beetles—*Subscriber, Banker Hill, Ill.*—The pretty golden and striped beetles which infest your sweet-potato vines are Tortoise beetles (CASSIDAE). That with the beautiful golden iridescence is commonly called the "Gold Beetle" (*Coptocycla aurichalcea*, Fabr) and its larva almost entirely covers itself with its black excrement, by means of a forked tail with which it is furnished, in common with the other species of the same genus. The striped black and yellow species may be known as the Two-striped Sweet Potato Beetle (*Coptocycla bivittata*, Say) and in the larva state differs from the other species of the genus, with which we are acquainted, in not shielding itself with its excrement; its pronged tail being ever enveloped after the first moult in the prickly cast-off skin, and being furthermore, generally held at an angle from the body. Both these beetles feed in the larva as well as the perfect states on the leaves of the sweet potato, but while the former is likewise very commonly found on the morning-glory and the bitter-sweet (*Solanum dulcamara*), we have never found the latter on anything but the sweet-potato. We shall in a future number give an illustrated account of these curious beetles.

A. E. Trabee, Hannibal, Mo.—The sweet potato beetles which you send are the same two species spoken of in answer to "Subscriber."

Beetle named—*Thos. W. Gordon, Georgetown, Ohio.*—"The small sample of animated nature" which you suppose would naturally be called the Gold Bug, is in reality known by that name, it being the same species (*Coptocycla aurichalcea*, Fabr.), as the first spoken of in the above answer to "Subscriber."

Injured Strawberry and Grapevines—*Wm. P. Pierson, Onarga, Ill.*—We are of your opinion, that the diseased and blackened appearance of the strawberry vines, and of the grape vines which you send, is caused by an insect. We are furthermore of opinion that the culprit is a little olive-gray bug scarcely 1-5 inch long, the *Capsus oblineatus* of Say. At all events we know this mischievous bug has been very numerous this year, and that its puncture has a peculiarly poisonous effect on most plants which it attacks; for we have seen pear twigs, grape canes, and potato stems totally killed by it, and looking exactly as though they had been burnt. If the vines which you send were not killed by this bug we can offer no solution of the problem. We shall endeavor to figure this insect in some future number.

Plum Tree Insects—*J. F. Waters, Springfield, Mo.*—The black plant-lice on your plum trees are the Cherry Aphis (*Aphis cerasi*, Fitch). See answer to T. W. Gordon. The black flies which hang on these trees in great quantities, and which are about $\frac{1}{4}$ inch long, with the wings white, and having prominent black veins and a stigmal black spot, are the White-winged Bibio (*Bibio albipennis*, Say). In the larva state it feeds on damp dead leaves, and has also been found feeding on oak galls by the Senior Editor. It cannot be considered injurious.

Apple-tree Bugs—*W. L. Youse, Hannibal, Mo.*—The two insects you send, and which you found on your apple trees, are both enemies and not friends. The beetle is the New York Weevil which we illustrate in this number (p. 221), and the large angular bug, very much of the same color as the beetle, i. e. brown speckled with grayish-yellow, and with the edges of the body protruding from the half-wings and the legs marked transversely with black bars, is the *Brachimera annulata* of Fabricius, and may be known in English as the Annular Plant Bug.

Hickory-stem Gall-louse—*Benj. F. Long*—The large roundish galls on the leaf-stems of the Black Hickory, and which open from above with cross slits, are produced by plant-lice (*Phylloxera caryocaulis*, Fitch). The red insects found in the gall were a species of *Thrips* in the larval or pupal state, and were preying on the true Gall-maker.

Grapevine Leaf-hopper—*R. M. Copeland, West Castleton, Vt.*—The jumping insects which are so destructive to the Virginia Creeper are the common Grapevine Leaf-hopper (*Tettigonia [Erythronera] vitis*, Harr). Syringe the vines thoroughly with strong tobacco water.

Twelve-spotted Diabrotica—*E. S. Foster, Bush-burg, Mo.*—The yellow beetle with twelve black spots which we herewith illustrate (Fig. 168,

[Fig. 168.]



Colors—Yellow and black.

twice natural size) and which has been so destructive to your water-melons and Hubbard squashes, is the twelve-spotted Diabrotica (*Diabrotica 12-punctata*, Fabr.). You say you have "noticed that water melons, Hubbard squashes and cucumbers, planted as much as two hundred yards from where such things were ever planted before, are entirely untouched by any kind of insect. Those that have suffered so severely are planted where such things have been grown two years in succession, immediately preceding." This is a most suggestive fact, and we advise our readers to profit by it. The same remedies that apply to the common Striped Cucumber beetle (*D. vittata*, Fabr), apply equally to this species. The large green worm you found at the foot of a hickory tree is the larva of the Polyphemus moth. (See Fig. 95).

R. D. Parker, Manhattan, Kans.—The beetles which are on your squash vines, "among almost innumerable Striped Cucumber bugs," are the same as sent by Mr. Foster, and of course are foes and should be destroyed.

Tent Caterpillar of the Forest—*M. McKenzie, M. D., Centerville, Mo.*—You say, "I enclose some caterpillars which are causing some uneasiness in this part of the State. They are in countless numbers, stripping the timber of its leaves. Black oak and Post oak are their favorite trees, and where these trees are plenty, as on the ridges and heads of hollows, the appearance is truly 'Winter in the lap of Summer.' Nothing but black trunks rising from the green earth, the mid rib alone of the leaf being left. White oak in bodies, they give the go-by, but if it is scattering among the other oaks, they attack it also. Most of the people here depend on mast to fatten their pork, and it is a great item." The caterpillar is the Tent Caterpillar of the Forest, as you will discover by referring to Figure 146 of our last, or to Figure 147 of this number. As they almost invariably spin their yellow cocoons in a cylindrical roll of leaves on the trees which they fed upon, these cocoons are easily perceived and should be immediately destroyed as far as possible, for the moths will have begun to issue by the time this number reaches you. The probabilities are, (since you ask our opinion) that in your neighborhood these caterpillars are preyed upon by parasites as mercilessly as they are known to have been in the East, for all three of those which you sent were attacked; and in such a case they will not be likely to trouble you as much next year as they have this.

Strawberry Destroyer—*Geo. W. Copley, Alton, Ill.*—We quote your query in full: "As anything new will be of interest, I would ask you for some information in regard to the freaks of some (as yet) unknown strawberry destroyers. So far as I know they have confined themselves to the strawberries of Mr. James Godfrey of Monticello, and threaten to make sad havoc. He finds the berries piled up in small piles, from a dozen to a pint in a place. Do you know what does this strange work? I have thought it might be the work of a field mouse. It can hardly be an insect or bug. Whatever it may be, it does not discriminate between green or ripe ones, all share the same fate. Any light on this subject will be gladly received." We can give no explanation of this curious procedure, and if any of our readers are better posted, we shall be glad to hear from them.

Eggs of Bugs on Strawberry—*A. S. Fuller, Ridgewood, N. J.*—The gray eggs which you found on a strawberry, with a delicate fringe, visible only under a lens, around their upper border, are the eggs of some friend in the shape of a cannibal bug (*Colobius* family). They were all attacked by a minute parasitic Ichneumon fly however, and instead of obtaining the young bugs we obtained these parasitic flies.

"Galls" on Leaves of Soft Maple—*J. M. Shaffer, Fairfield, Iowa.*—The peduncled wart-like excrescences, on the leaves of your Soft Maples are not of fungoid origin, but are produced by a minute species of mite. See page 57 under the same head.

Frog-spittle Insects.—*J. B. Hartwell, Wilkesonville, Mass.*—The Frog-spittle insects belong to the genus *Aphrophora* in the *Ceroptis* Family of the Order of the Whole-winged Bugs (*Homoptera*.) We have ourselves found the *Aphrophora quadrangularis* of Say very abundant in the larva, and occasionally in the perfect winged state, in the well-known "frog-spittle" upon grass and various weeds growing among grass. Usually but a single larva is found in a single mass of "frog-spittle," and of course this so-called "frog-spittle" is nothing but the sap pumped out of the infested plant and discharged from the body of the larva. The perfect insect, which is fully one-quarter of an inch long, is of a pale dull brown color with oblique bands of dark brown; but the larva is of a shining black color with pale yellow markings, so as to be very unlike the winged fly. There are several other species of Frog-spittle insects, one of which inhabits in great numbers the twigs of the Red Osier Dogwood. Mr. E. K. Baxter, of Sharon, Vt., writes, as you point out, in the *New England Farmer* of May 22, 1869, that some species or other belonging to this genus of insects "has done much damage in Vermont to the hay crop during the past two or three years," and that "it is believed by some that in consequence of its depredations the quantity of hay grown on some fields was one-third less, to say nothing of the depreciation in the quality of the crop." This is perfectly possible, provided that the insects were sufficiently abundant; but we ourselves have never met with them in any such exuberant numbers.

Eggs of Ground Beetle.—*E. J. Ayres, Villa Ridge, Ills.*—The mass of yellowish-white eggs deposited in close connection under the shriveled bark of such pear twigs as were poisoned and killed by the punctures of the olive-yellow bug (*Capsus oblineatus*, Say), came duly to hand. Each egg is about 0.025 long, and about $\frac{1}{4}$ as wide. Since their receipt they have hatched, and the young larva apparently belong to some Ground Beetle (*Carabus* family). The moment they are hatched they become quite active, and greatly resemble that which we illustrated on page 34 (Fig. 26). The eggs of these Ground Beetles are said by European authors to be usually deposited under stones, and a short distance under ground; but very little is known of the natural history of this great group, and this is especially the case with our North American species. In the first place, the larva are difficult to find, as they love to seclude themselves; and secondly, as is the case with most cannibal insects, they are difficult to raise to the perfect state, and do not well bear confinement.

New Insect-foe of the Potato.—*Isaac Hicks, Old Westbury, Long Island, N. Y.*—The flat turtle-shaped insect, about $\frac{1}{4}$ inch in diameter, found in such profusion (26 specimens) on potato-stalks by your son, is one of the handsomest of the Tortoise-beetles (*Cassida clavata*, Fabr.) It has never yet been published as infesting the common potato, although several allied species of Tortoise-beetles are great scourges to the Sweet Potato. We recently, however, heard from Mr. G. P. Austin, of Omaha, Nebraska, that a friend of his in Massachusetts, Mr. Blanchard, found this insect quite commonly in that State both on the cultivated potato and on the Bitter-sweet (*Solanum dulcamara*.) Hence we may safely add it to the list of the Insect foes of the Potato published in Nos. 2 & 3 of this Journal.

Native Silk-worm Moths.—*J. A. Bigelow, Elkhart, Ind.*—The moths which issued from cocoons which were kept in the house all winter, and which were taken in the fall from apple and cherry trees, are two of our most common species of Native Silk-worm Moths. No. 1 is the *Cecropia* Moth (*Attacus Cecropia*, Linn.), and No. 2 is the *Promethea* Moth (*Attacus Promethea*, Linn.) Their larvae scarcely ever become sufficiently numerous to be considered injurious.

Tomato Stalk Borer.—*E. J. Ayres, Villa Ridge, Ills.*—The worms which you find in your tomato stalks are, judging from your description, the common Stalk Borer (*Gortyna nitela*, Guénée), which we figured on page 206 of our last number, in answer to Wm. Muir, of Fox Creek, Mo. As there stated, it bores into a variety of plants, and we have often found it in the stalks of the Tomato.

Breeding Cages.—*H. S. Redney, Potsdam, N. J.*—We must refer you to what was said on page 99, in answer to D. P. Smith, on the subject of breeding insects. The breeding cage there described answers every purpose. The food-plant of the insect you intend to breed, can be kept fresh in the bottle of water, and the insect may either enter the ground to transform, or spin up in some corner of the cage, according as its nature prompts it. We generally have the tin tube which is in the centre of the bottom-piece of sufficient size to hold a wide-mouthed quinine bottle. To facilitate the breeding of different species, two small cages will be found better than one large one. Ours are $8\frac{1}{2}$ inches square; and 18 inches high. If the stems of the plants do not fill the mouth of the bottle, it should be stopped up with cotton-wool, so as to prevent the drowning of the larvae.

Elm-tree Borer.—*Willie M. Gregory, Beva, Ohio.*—We have bred to the perfect state, several of the borers which you find in dry elm wood, and which we informed you (p. 168) would produce some long-horned beetle belonging to the *Cerambyx* family. The beetle was named *Physocnemum brevicornium* by Say, and is a rather pretty species. It measures nearly $\frac{3}{4}$ of an inch in length, and is principally characterized by its deep purplish-blue wing-covers, which are slightly constricted and have three white short lines about the middle. It breeds in live as well as dead elm, but usually only in such trees as are partly dead.

Peach-twig Borers.—*Geo. Fisher, East Liverpool, Ohio.*—We are entirely unacquainted with the minute brown borers which are infesting your peach twigs. They will produce some small moth. We hope you will watch them, and when they are full grown, send us a good lot of specimens so that we can breed them. In order to do this you will have to sacrifice some of your peach twigs, but we advise you to speedily destroy all those which are not thus to be laid on the altar of science, by cutting off the infested twigs and burning them.

Eggs of Periodical Cicada in Savin Twig.—*Jas. A. Greason, Ironton, Mo.*—We received the Savin twig (*Juniperus sabina*) disfigured by the punctures of the Periodical Cicada, and which was taken from a tree that has died from these injuries. Though we stated on page 65 that this insect never deposited in evergreens, you will find, by referring to page 117, that we were glad to correct the error.

Elm-tree Saw-fly.—*A. R. Whitney, Franklin Grove, Ills.*—The large smoky-winged fly, which you found on an elm tree, and which has the head, thorax, and first two segments of the abdomen black, with the rest of the abdomen reddish-brown, is the ♂ Elm-tree Saw-fly (*Cimbex laportei*, Harris). The larva of this insect is a pale green 22-footed worm and feeds upon the leaves both of Elm and Willow.

Beetles named.—*C. Farker, Washington, D. C.*—No. 1 is *Brachinus Americanus*, Lec. No. 2, *Bombidum rufipes*, Dej. No. 3, *Tachys pulchellus*, Ferté. No. 4, broken all to pieces. No. 5, *Endroba vitula*, Lec. No. 6, too much injured to identify.

Snout-beetle.—*H. Kleinhaus, Nycos, Pa.*—The large brown Snout-beetle, speckled with dirty white, of which you desire the name, is the *Ilybius confusus* of Kirby. We know nothing of its habits; but all the species of this genus are timber-borers, and usually in pine.

Cannibal Beetle.—*Mrs. Mary Treat, Vineland, N. J.*—The savage green beetle which you describe, was doubtless some species of *Calosoma*. (See Fig. 46.) Send specimens.

White Grub Fungus again.—*A. W. Beule, Savannah, Mo.*—The White Grubs with sprouts are attacked by the same fungus which we have several times spoken of. (See pp. 186 and 207.)

White Grub.—*Geo. S. Grover, Warrensburg, Mo.*—The grub which has injured a great many fields of corn in your neighborhood is the common White Grub.

Cut-worms.—*G. C. Brodhead, Pleasant Hill, Mo.*—Your cut-worm is the "Greasy Cut-worm," the larva of the Lance Rustic (*Agrotis telifera*, Harr).

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May D. H. BRIGGS, Norton, Mass.

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To render the volume as complete and useful as possible, your co-operation is earnestly solicited in securing living or fresh specimens of larvae, etc., from which colored illustrations can be made. These may best be obtained by confining a female of any species in a small, dark box—a pill box, for instance—where she will lay her eggs, which can easily be reared; if the food-plant of the larvae is not known, I will be happy to give any information; or, the plant may sometimes be detected by observing over what species the butterfly seems to hover. Specimens are desired, of the egg, of each stage of the larva and of the chrysalis of every species; they should be sent promptly by mail in light boxes (tin is preferable) to the address below, marked, in addition, "INSECTS," to secure prompt attention. The specimens should be accompanied by the name and address of the sender and, when known, the name of the insect (or, far better, by the very insect that laid the eggs) and of the plant on which it feeds: if larvae are sent, fresh moistened leaves of their food-plant should be placed in the box with them.

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For all favors or scientific intelligence received, the amplest credit will be given, and earnest attention is called to this appeal, as without material assistance, it will be impossible, in a single season, to obtain the necessary specimens to complete the undertaking.

SAMUEL H. SCUDDER,
Boston Society of Natural History,
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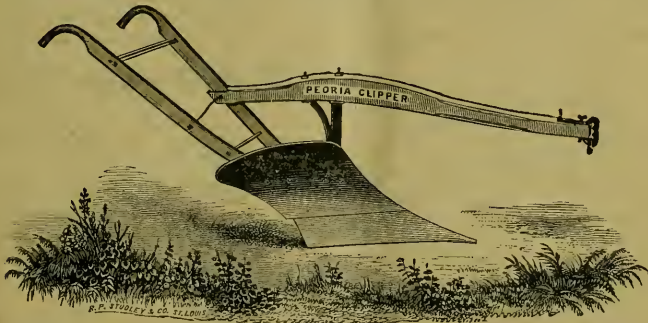
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American Entomologist.

VOL. 1.

ST. LOUIS, MO., AUGUST, 1869.

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THE CLOSE OF THE FIRST VOLUME.

A year has nearly passed away since our little enterprise, THE AMERICAN ENTOMOLOGIST, was launched. We have been highly gratified at the manner in which it has been received; and, judging from the many congratulatory letters that have come to hand, it has not failed to give some satisfaction. Indeed, very many of our subscribers have expressed astonishment that such a paper can be published at the low price of \$1.00 a year, and they wonder how we make it pay. In truth, it has not paid, though we were determined to carry it through to the end of the volume according to promise. From the number of names now on our subscription books, and from the general interest manifested in the undertaking, we feel confident that such a publication as ours is needed, and shall continue it with the following changes:

The second volume, like the first, will consist of twelve numbers, but instead of issuing these numbers at regular monthly intervals, they will be issued at intervals of about five weeks, in order that the volume may end with the year 1870.

Instead of 24 pages, as formerly, each number will consist of 32 pages.

The quality of the paper and of the ink will be superior to that heretofore used, by which means we hope to give still greater clearness to our illustrations.

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We shall make the ANSWERS TO CORRESPONDENTS a more important feature of the paper, and shall space the matter so that it can be read

with less difficulty. In short, we shall approach, as near as possible, the appearance of the present issue, which in typography and general cast may be considered a sample of what the future numbers are intended to be.

The price will be \$2.00 per volume in advance, and we shall continue to furnish one copy free to any one sending us a club of five names.

If the above changes please our readers, and we confidently believe they will, we hope each and every one of them will obtain another name and send it along with the renewal of their own. In this way the present subscription might easily be doubled, and the ENTOMOLOGIST be thereby thoroughly established. The first number of Volume II will be sent to no one who does not order it, so send in your subscriptions early!

We solicit communications on pertinent subjects both from our practical and scientific readers, and whenever such communications are of sufficient interest, we shall gladly publish them, but at the same time we shall make free use of the editor's prerogative of rejecting, whenever we deem it necessary. Heretofore we have paid nothing for what few communications have been published in our columns, but believing that time is as valuable to others as to ourselves, we shall hereafter pay a liberal price per page, for all articles that are accepted.

In conclusion, we tender our most sincere thanks to our numerous friends of the Agricultural and Horticultural Press, for their many kindly notices, and to those of our subscribers who have interested themselves in our behalf. Hoping to still merit their favors, with best wishes to all, we conclude the First Volume of THE AMERICAN ENTOMOLOGIST.

INSECT BAROMETERS.—An exchange says that "if the ants have cleared their holes nicely, and have piled the dirt up high, it seldom fails to indicate a clear day, though it may be cloudy until 11 o'clock in the forenoon. Spider webs will be very numerous about the tops of the grass and grain some cloudy mornings; and fifty years' observation have shown the writer that these little weather guessers seldom fail in their prediction of a fair day."

THE ROYAL HORNED-CATERPILLAR.

(Ceratocampa [Citheronia] regalis, Fabr.)

This insect, which is the subject of our colored plate, and which is there illustrated in its three different stages of larva (*a*), chrysalis (*b*) and moth (*c*), is one of the largest and most beautiful of its order, and its splendor is scarcely equaled by any other North American species. It was originally described in 1793 by Fabricius, under the name of *Bombyx regalis*, and was afterwards placed in a new genus (*Citheronia*) erected by Hübner. Dr. Harris,* who made it the type of a family (CERATOCAMPÆ), and who describes and figures it under the name of *Ceratocampa regalis*, called it in popular language the "Regal Walnut Moth;" but as it is found in well nigh equal abundance on the Black Walnut, Butternut, and Persimmon, and oftentimes on the Hickories and Sumachs, and as it is much oftener seen in the caterpillar than in the moth state, we prefer that it shall be popularly known by the above translation of its scientific name.

Harris's engraving of the caterpillar scarcely gives a just conception of it, and was evidently taken from an alcoholic specimen. Our figure was taken from a living specimen which was found feeding on the leaves of the Persimmon in Union County, in South Illinois, and it measured over five inches when crawling. Full grown specimens were also sent to us last year from Bushberg, Mo., and from Brighton, Ills., and we found one in the neighborhood of St. Louis, Mo.; but the insect is quite scarce even as far south as the above mentioned points, and occurs still more rarely farther North.

It is single-brooded, and sometimes remains in the ground, in the chrysalis state, fully eleven months of the year. The moths, in the latitude of St. Louis, usually issue during the last half of June, and the caterpillars are found full-grown from the middle of August to the middle of September. We have never seen the young caterpillars, but in 1828, Dr. Harris found three of the eggs of this fine insect on the Black Walnut, speaking of which he says: "They were just hatched at the time and the caterpillars were near to them resting on a leaf. The position of these young insects was so peculiar as to attract attention, independently of the long branching spines with which the fore part of their body was armed. They were not stretched out in a straight line, neither were they hunched up like the caterpillars of the Luna and Poly-

phemus moths; but, when at rest, they bent the fore part of the body sideways, so that the head nearly touched the middle of the side, and their long horn-like spines were stretched forward, in a slanting direction, over the head. When disturbed, they raised their heads and horns, and shook them from side to side in a menacing manner. These little caterpillars were nearly black; on each of the rings, except the last two, there were six straight yellow thorns or spines, which were furnished on all sides with little sharp points like short branches. Of these branched spines, two on the top of the first ring, and four on the second and the third rings, or ten in all, were very much longer than the rest, and were tipped with little knobs, ending in two points; they were also movable, the insect having the power of dropping them almost horizontally over the head, and of raising them up again perpendicularly. On the eleventh ring there were seven spines, the middle one being long and knobbed like those on the fore part of the body; on the last ring there were eleven short and branched spines. After casting its skin two or three times, the caterpillar becomes lighter-colored, and gradually changes to green; the knobs on the long spines disappear, their little points or branches do not increase in size, and finally these spines become curved, turning backwards at their points, and resemble horns."

The full grown caterpillar,* with its immense green body and its horn-like spines looks truly formidable, while a peculiar habit which it has of spitefully wriggling from side to side, very un-

*As no comprehensive description of either the larva or chrysalis has been published, and as the horns of the larva are not quite correctly represented in our figure, we annex the following descriptions which were drawn up from three living specimens.

Description of full grown larva.—Average length when at rest, 4.90; diameter, 0.60 inch. General color, green with a yellow cast. Smooth and polished. Thoracic segments narrowest, and of a delicate celestial-blue. Segment 1 quite small with two tolerably long, straight, serrate, orange-colored horns projecting from it anteriorly over the head, and six other minute black horns, each with a yellow base: 2, larger, with two polished black spots in front, each constricted in the middle, and with eight serrate horns, four of them small and black and the other four quite long, backwardly curving and of an orange-brown or Venetian red with black extremities: 3, largest of all, with horns as on 2, and with two much larger black patches in front, running on to posterior portion of 2: 4, 5, 6, 7, 8, 9 and 10 each of about a size and each with six short black backwardly slanting, compound or serrated spines, which spring from a somewhat elevated celestial-blue ground, which in some specimens forms a distinct blue transverse ridge: 11, with but five of these spines, the two dorsal ones being supplanted by one which is central and larger: 12, with seven spines: 4 to 11 inclusive have each a lateral posteriorly and downwardly oblique, cream-colored band, which is abrupt anteriorly and edged above with smoky-black, but which merges gradually into the green posteriorly. Sigmata large, oval and black, with a smoky line running from each to the lower horn. Cervical shield small, yellowish-brown and with two cuneiform black spots between the larger horns. Head, caudal plate and anal prolegs outwardly, of the same orange-brown color as large horns; the caudal plate with a minute black wart each side, and the anals each with one at their lower edge. Thoracic legs also of the

*Inj. Insects, pp. 398-9.

like the up-and-down movement of the *Sphinx* tribe of caterpillars, gives it a still more menacing appearance; yet it is entirely harmless and cannot possibly hurt any one, for as we have proved by experiment, the prick of its spines has no poisonous effect whatever. Mr. Abbot tells us that this caterpillar is called in Virginia the Hickory Horned Devil, and that when disturbed it draws up its head, shaking or striking it from side to side; which attitude gives it so formidable an aspect, that no one, he affirms, will venture to handle it, people in general dreading it as much as a rattle-snake. When to convince the negroes that it was harmless he himself took hold of this animal in their presence, they used to reply that it could not sting him but would them.* How many more intelligent white folks are there who have the same superstitious fear of this caterpillar! It is solitary in its habits, and after acquiring its growth, descends from the tree on which it lived and enters into the ground. Here it forms an oval chamber, and within five days works off its prickly skin and becomes a chrysalis. The chrysalis is pitchy-black, short, thick, and with protuberances and ridges as in the figure. It remains in this last state through the fall, winter and spring months, and the moth escapes from it at the time above specified, leaving a strong thick shell behind, which readily retains its proper form. The male moth is readily distinguished from the female by his smaller body, but more especially by his antennæ being larger, and strongly pectinate or toothed along their basal half, while hers are impectinate and of a uniform thickness throughout.

Both the chrysalis and the moth have a characteristic strong odor which cannot easily be described for the lack of comparison, though it reminds us forcibly of the peculiar odor of the English Broad Bean.

Though a great feeder, this insect is altogether too rare to be classed with those that are injurious, especially as its food-plants are abundant.

same color with black extremities. Abdominal prolegs orange with black pads and a distinct black outer mark extending upwards somewhat on to body. Venter of the same green as tergum, except between prolegs, where it inclines to orange.

Chrysalis.—Length nearly two inches; greatest diameter, 0.75 inch. Thick, comparatively short; black, with four elevations anteriorly, two of which are rounded and on top of thorax, and the other two bluntly oblong and run transversely across first abdominal segment. There are also two slight longitudinal interrupted ridges along the back of the three succeeding segments. The larger abdominal segments each with a narrow transverse ridge near both the anterior and posterior edge. The teeth on these ridges entirely obsolete in some, and but partly so in others. A slight anal projection terminating in two small dull points.

*Sm. & Abh. Ins. of Georgia I, 121.—Quoted by Kirby & Spence.

INSECTS INJURIOUS TO THE GRAPE-VINE.

The Grape has been cultivated from the very earliest dawn of civilization, and has justly been esteemed as one of the most delicious of fruits. Its culture in the United States assumes vaster proportions from year to year, and as our people are fast learning the luxury and the health-giving properties of good grapes, and as our native wines are fast taking the place of the imported kinds, Grape culture has scarcely begun to assume that importance which will soon attach to it. Of all the evils with which the Grape-grower has to contend, none are greater or more difficult to overcome than are the injuries of insects; and this is especially the case in the Mississippi Valley, where the number of species destructive to the Grape in one way or another, seems to be greater than in other parts of the country. In view of these facts we give in this number the first of a series of articles under the above heading. In these articles we intend to treat of, and illustrate most of the more injurious species, and to suggest the means for their prevention or destruction.

The Gigantic Root Borer.

(*Prionus laticollis*, Drury).

[Fig. 169.]



Color—Yellowish-white.

It will be remembered by most of our readers that on page 19 of our first number, we gave a

[Fig. 170.]



Color—Mahogany-brown.

description of a new Grape-root Borer, which had been received from W. D. F. Lummis of Makanda, Ills. This was the first account ever published of such a borer, and it was impossible to state definitely what particular insect it would prove to be in the perfect state. We inferred, however, that it was the larva of the Cylindrical Orthosoma (*Orthosoma cylindricum*, Fabr.), which is represented in the annexed cut, (Fig. 170) for the reason that we

had bred this beetle from a larva found in decaying pine wood, and which resembled in every respect, so far as our description went, the one sent by Mr. Lummis. We have lately bred to the perfect state three of these Grape-root boring larvæ, and one which was found in an Apple-root, and they all four of them prove to

[Fig. 171.]



Color—Mahogany-brown, verging on black.

belong to a different though a very closely allied species to the one we suggested by inference. The beetle we have bred from these larvæ is the Broad-necked Prionus (*Prionus laticollis*, Drury), of which we herewith present a likeness (Fig. 171.) It is usually of a darker color than the Cylindrical Orthosoma, and as

may be seen upon comparing the figures, it differs materially from that species by its larger size and broader form. Our figure represents the female, which differs from the male in having shorter and narrower antennæ, though her body is usually larger. There is another species, the Tile-horned Prionus (*Prionus imbricornis*, Linn.,) so called from the joints of the male antennæ lapping over one another like the tiles or shingles of a roof—which very closely resembles the Broad-necked Prionus, and in Illinois is much commoner. It may be distinguished at once from this last by the antennæ of the male being about 19-jointed, and those of the female about 16-jointed;* whereas both sexes of the Broad-necked Prionus have 12-jointed antennæ. In other respects, these two beetles are almost exactly alike, so that, if the antennæ happen to be broken, it is not very easy to tell one from another. So far as we are aware, it is not known upon what kind of tree the Tile-horned Prionus feeds; and from the very great similarity of these two beetles, their larvæ will probably resemble each other very closely.

The *Prionus* family to which all these in-

* Having examined nearly 20 males of this species, we have found the antennal joints to vary in number from 18 to 20, the same specimen often having a different number of joints in the right and left antenna. In one ♀ the antennæ are both of them 16-jointed, in another ♀ they are both of them 17-jointed. The typical number of joints in the Coleopterous antenna is only 11; and the number being so variable in these many-jointed antennæ is in accordance with the general rule, that multiple parts are often variable.

sects belongs is distinguished from the more extensive *Cerambyx* family of the Long-horned beetles, by sundry peculiarities, but principally by the broad flat thorax and the large robust jaws, and by the upper lip being nearly or quite obsolete. It has generally been supposed that their larvæ were equally well characterized by having the first segment of the body smaller than the second, but although Rösel described and figured the larva of an European species (*P. coriarius*) with the first segment smaller than the second,* Mon. E. Perris has figured the larva of another European species (*P. obscurus*, Oliv.), which has the first and not the second segment largest,† while the two N. A. representatives of the family which we have herewith figured likewise have the first segment largest in the larva state.

Above at Figure 169 we have represented, of the natural size, one of the immense Grape-root boring larvæ of this Broad-necked Prionus, and below‡ will be found a technical description of it drawn up from several living specimens. Though no account of this insect's injuries to the Grape-vine had been published up to the summer of 1868, we find that its work has been known for several years amongst the practical vineyardists of the Western, or to speak more correctly, of the Middle States, and Mr. George Husmann, of Bluffton, Mo., has known it since 1850. Last summer, while visiting certain orchards and vineyards in company with the *ad interim* committees of the Illinois and Missouri State Horticultural Societies, we discovered it in the

*See Westwood, *Introd.* I., p. 390.

†*Annales de la Soc. Ent. de France*, 1856, Pl. 6, Fig. 262.

‡Larva of *Prionus laticollis*, Drury. Average length when full grown, 3 inches. Color pale yellowish-white, partly translucent, with glaucous and bluish shadings, and a distinct dorsal line of the last color: 13 distinct segments. Segment 1 rather horny, somewhat longer than 2, 3, and 4 together, broadening posteriorly, slightly shagreened and whiter than the rest of the body, with a rust colored mark anteriorly, and a slight groove along the middle. Segments 2 and 3 shortest and broadest, the body tapering thence gradually to extremity, though there is usually a lateral ridge on segment 12 which dilates it rather more than the segments immediately preceding it. This segment 12 is also the longest, the terminal one being quite small and divided into three nearly equal lobes. A swelled hump crossed with two impressed transverse lines, on segments 4, 5, 6, 7, 8, 9, and 10. Stigmata rust-colored, 9 in number, the first and largest being placed on a fold in the suture between segments 1 and 2. Head brown, verging to black on anterior edge. Mandibles large, strong, black, with one blunt rounded tooth, giving them a somewhat triangular appearance; antennæ 3-jointed and brown, especially at tip; labrum fulvous, fuzzy and with a brown base; maxillary palpi 4-jointed, the basal joint much swollen, the terminal joint brown, and a ring of the same color at sutures of the other joints; labial palpi 3-jointed; the basal joint also swollen, and the terminal joint and sutures of the others brown. Six rudimentary 2-jointed fuscous feet as shown at Figure 172. Venter tubercled as on the back, these tubercles being especially prominent on segments 6, 7, 8 and 9, where they recall prolegs. The young larva differs only in lacking the rust-colored mark on segment 1.

[Fig. 172.]



terminal joint brown, and a ring of the same color at sutures of the other joints; labial palpi 3-jointed; the basal joint also swollen, and the terminal joint and sutures of the others brown. Six rudimentary 2-jointed fuscous feet as shown at Figure 172. Venter tubercled as on the back, these tubercles being especially prominent on segments 6, 7, 8 and 9, where they recall prolegs. The young larva differs only in lacking the rust-colored mark on segment 1.

vineyard of Dr. C. W. Spaulding, of Kirkwood, Mo., and we have since received specimens from several Grape-growers, and have frequently met with it ourselves. In June, 1867, Mr. O. B. Galusha, of Kendall county, Ills., sent a worm in all respects similar to it, which was found boring into the root of an apple tree. In June, 1866—as recorded in the *Practical Entomologist*, Vol. I., p. 90—a single specimen of what, judging from our description, was probably the same larva, was received from Dr. Trimble, of New Jersey, with a statement that it was destroying many dwarf pear-trees near Ham-mouton, N. J., by boring them close to the ground. Unfortunately this larva died before completing its transformations. We have also received Osage orange roots from Kansas which were being bored by the same insect, and it is apparently partial to rotten oak stumps, for not only have several persons who are well able to judge, assured us that they have found it in such stumps, but Mr. A. Bolter of Chicago, also found it in such stumps in Kentucky, and sent us the specimens for identification. At the meeting of the Missouri State Horticultural Society at Columbia last fall, Mr. I. N. Stuart even avowed that he had found it partly grown, not only in seedling apple trees but in the roots of corn stalks.

Last March we received a long letter from Mr. Robert S. Munford, of Munfordsville, Ky., minutely describing this borer, and the manner in which it destroyed three hundred dollars' worth of his apple trees; while Mr. C. R. Edwards, of Bowling Green, Ky., writes that they have been quite injurious to his grape-vines of all varieties, though his *Jonas* suffered most from their attacks. The following paragraph by A. J. H., of Vineland, N. J., which appeared in the *Gardener's Monthly* of January last, would indicate that it has the same pernicious habit in the East as well as in the West:

"On page 354 October number of *Agriculturist*, reference is made to a 'vine borer' in Missouri that cuts off vines below the surface. It is also mentioned and partially described in the last *Gardener's Monthly*. This 'borer' is an old friend (?) of mine. It is found principally in old rotten oak stumps; I hardly ever dig one out without finding several of these worms. They are about two inches long, tapering from head to tail, white bodies and black heads. I lose on an average about fifty vines and dwarf pear trees annually by these little villains; probably twice as many pears as vines. I have had several apple trees cut off by them, and one standard pear. The tree roots seem often to be eaten entirely up, but the vine roots are only cut through as if they had obstructed the line of travel. This is no new insect, but will I

think be found troublesome whenever dwarf pear and vines are planted among decayed oak stumps."

As already stated, we have proved that the Apple boring specimens are identical with those found in the Grape, and there can be little doubt but the various accounts given above, refer to the same species, or at all events to one of the two allied species mentioned at the beginning of this paper; and when we consider that Dr. Harris gives the Lombardy poplar and the Balm of Gilead as the food-plants of the Broad-necked Prionus, we may justly conclude that this species is not at all particular in its choice of diet. In view of this fact it may be known as the Gigantic Root Borer, by which name it will at once be distinguished from the old Grape-root Borer (*Egeria politiformis*, Harris,) which has long been known to attack the roots of the Grape in the more Southern States, and which is a 16-footed worm, of almost the exact appearance of the common Peach Borer.

In all the instances that have come under our notice, this Gigantic Root Borer had cut for itself a perfectly cylindrical hole straight up through the heart of the root, and in those instances where the root was barely large enough to contain the worm, nothing was left but a thin shell of bark, which however was always entire, so that the culprit could not easily be seen. In one instance we found that a vine had been entirely severed at the surface of the ground after the leaves had fallen, and that the borer had afterwards descended some six inches further down and entered the main root, where he formed for himself very comfortable winter quarters. The specimen which we bred from the apple was found on the place of Mrs. Dr. J. B. H. Beall, near Eureka, Mo., and it had entirely hollowed out every root of a young tree, and had finished by severing it at the butt. Specimens which we have had feeding in a large earthen jar have invariably burrowed into the roots of both Delaware and Concord grape roots with which they were furnished, and never touched them from the outside.

In all probability it lives nearly three years in the larva state, for three distinct sizes may be found. Those we have bred left the roots they were inhabiting when about to become pupæ, and formed for themselves smooth oval chambers in the earth, wherein they eventually cast their larval skins and assumed the form represented at Figure 173, but in all probability they transform within the root, when in more natural conditions. This change takes place towards

[Fig. 173.]



Color—Whitish.

orange roots. May it not, however, be possible that the larvæ found in New Jersey in old rotten oak stumps by A. J. H., of Vineland, N. J., and in oak stumps in Kentucky by Mr. Bolter, belonged, not to this species, but to the Cylindrical Orthosoma which we have sketched above (Fig. 170), and which we have ourselves actually bred from decaying pinewood? As a general rule, to which at present we do not remember a single exception, the larvæ of the Long-horned Boring Beetles either inhabit green and living wood or else decaying and dead wood, the same species never attacking both kinds of wood indiscriminately; and we know that the larva of the Cylindrical Orthosoma so closely resembles that of the Broad-necked Prionus, that A. J. H. as well as ourselves might possibly have confounded the two together. At all events, it is quite certain that the Cylindrical Orthosoma must thrive upon other kinds of timber besides pine; for we found this species very abundant in 1861 in Union county, South Illinois, where there are no pine trees growing, and where at that period the so-called "poplar" or whitewood was universally used in buildings in place of pine imported from the North. To sum up the whole in few words, until larvæ found in decaying oak wood are bred to maturity, we cannot be certain that they will produce the same beetle that infests living grape-vines and living pear and apple trees. And unless this be so, there is no danger to be apprehended from growing grape-vines and fruit trees among decaying oak stumps.

Little can be done in the way of extirpating these underground borers, when, as in the present instance, their presence is only indicated by the approaching death of the vine. Still, every vine-grower should make it a rule to search for them whenever he finds vines suddenly dying from any unknown cause, and

the end of June, and the perfect beetle appears in about three weeks afterwards.

From what has been said above, it is quite certain that the Broad-necked Prionus bores in the larva state indiscriminately in the roots of grape-vine and apple, and no doubt also in those of the closely allied pear. According to Harris, it also infests the roots of different kinds of poplar, and specimens received by us from Kansas inhabited Osage

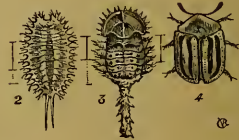
upon finding such a borer should at once put an end to his existence. The beetle, which may often be found during the summer and fall months, and which not unfrequently rushes with heavy, noisy flight into our lighted rooms, should also be ruthlessly sacrificed whenever met with. In order to be on the safe side, we also advise not to plant a vineyard on land covered with old oak stumps, and not to use oak stakes where those of cedar can be had as conveniently. Whether, in reality, the vine-grower will run any risk by not following this advice, depends upon the considerations enumerated in the preceding paragraph.

INSECTS INFESTING THE SWEET-POTATO.

Tortoise-beetles.

(*Cassidæ*.)

[Fig. 174.]



Colors—(2) dirty-cream; (3) brown; (4) black and yellow.

The insects which attack the Sweet-potato plant are few in species, and belong almost entirely to that group of beetles popularly known as Tortoise-beetles. With the exception of the Cucumber Flea-beetle (*Haltica cucumeris*, Harr.), figured and described on page 27, and a few solitary caterpillars, we have never found any other insects on this plant; but we regret to say that these Tortoise-beetles are of themselves sufficiently numerous in individuals and species to often entirely destroy whole fields of this esculent, and they are especially severe on the plants when newly transferred from the hot-bed.

These insects are at present included in the great CHRYSOMELA family of beetles, though they were formerly placed in a separate family (CASSIDÆ) by themselves, and there certainly are few groups more strongly characterized. They are almost all of a broad sub-depressed form, either oval or orbicular, with the thorax and wing-covers so thoroughly dilated at the sides into a broad and flat margin, as to forcibly recall the appearance of a turtle, whence the popular name. Many have the singular power, in a greater or less degree, of changing their color when alive, and as we shall show further on, some of them shine at will with the most brilliant metallic tints.

Insects, as with the higher animals, usually void their excrement in such a manner that they effectually get rid of it, and in some cases they take pains to fling it as far from them as possible, by means of their hind legs. We have especially noticed this cleanly habit in the Oblong-winged Katydid (*Phylloptera oblongifolia*, DeGeer), of which we have had numbers breeding in confinement during the past two summers. They almost always fling their excrement straight from them, so that if they are in a horizontal position, it adheres to the sides of their cages instead of falling to the bottom. In the great majority of insects the anus is situated at, or near the last ring, and usually on the ventral side, so that the feces are easily left behind; but the larvæ of several species of beetles that have the peculiar habit of covering themselves with their own excrement, have the anus not on their bellies, but on their backs. We have already shown, on page 26, how the larva of the Three-lined Leaf-beetle (*Lema trilineata*, Oliv.) which sometimes proves quite injurious to the Potato in the East, has this habit, and how it is enabled to thus cover itself by the singular position of the anal vent which is on the back of the last segment. A closely allied European species, but belonging to a different genus (*Crioceris merdiger*) has the same habit. In this country there is also another yellowish oval jumping beetle (*Blepharida rhois*, Forster), which in the larva state covers itself with its excrement. In this instance the anus is at the end of the last segment, but it is sufficiently extensible at the will of the insect, to allow of the accomplishment of the feat. This last larva is a disgusting looking thing, and is very abundant on all three of the Sumachs—*Rhus aromatica*, *glabra* and *copalina*—preferring them in the order of their naming.

But the larvæ of the Tortoise-beetles are *par excellence* the true dung-carriers, for they excel all others in this merdigerous art. In the instances related above, the load is carried immediately on the back, but our Tortoise-beetles are altogether more refined in their tastes, and do not allow the dung to rest on the body, but simply shade themselves with a sort of stercoraceous parasol.

The larvæ of all the species that have been observed are broad and flattened like the beetles, and have the margins of the body furnished with spines which are often barbed, (Fig. 169, 2). Usually there are thirty-two of these spines, or sixteen on each side of the body.* Four of these

are situated on the prothorax, which forms two anterior projections beyond the common margin; four of them—the two anterior ones longer than the others—are on each of the two following thoracic segments, and each of the abdominal segments is furnished with but two. There are nine elevated spiracles each side superiorly, namely, one immediately behind the prothorax and eight on the abdominal segments. The fore part of the body is projected shield-like over the head, which is retractile and small. Almost all the larvæ of the beetles belonging to the great CHRYSOMELA family, of which the Colorado Potato Bug may serve as an example, have, besides the six legs at the anterior end of the body, an additional proleg, or protuberance which serves as such, at the posterior end; but the larvæ of our Tortoise beetles have no such proleg, and the six anterior legs are short, thick and fleshy, and with the retractile head, give these larvæ, from a side view, as great a resemblance to a turtle as have the beetles.

Though lacking an anal proleg, however, they are characterized by having a movable forked tail, in the shape of two long prong-like horny filaments which both spring from a broad neck situated immediately above the anus. The anus projects and curves over the back at the will of the insect, and by the aid of this fork and of some of the lateral spines, it forms the parasol of dung which so nicely protects it.

When we read of those Hottentots who cover different portions of their bodies with the unclean intestines of sheep and oxen, we feel shocked at such barbarism, and can scarcely comprehend how human beings can defile themselves with the like disgusting materials. Such men must be pitiable indeed, for they can have no other object than the gratification of their filthy and beastly pleasures. There is nothing so repulsive about our insect Hottentots, for the dung parasol of our Tortoise-beetles has neither offensive odor or appearance, and its true character is generally sufficiently disguised by being intermixed with the cast-off skin and prickly spines; and though those species, first referred to, which immediately cover their backs, often look sufficiently unclean, we know that they thus act at Nature's bidding and for a useful purpose.

All the Tortoise-beetle larvæ which we have

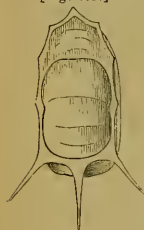
instead of only 1, and which we may therefore call *Cass. quinquepunctata*, has only 20 of these spines, or 10 upon each side, all of them simple and not sprangling, and no abdominal joint bearing more than a single lateral spine. This new species differs further in the wing-cans being of a dingy olive color, finely speckled with yellow, and with one large round yellow spot a little before the middle of each. It was taken abundantly some years ago by the Senior Editor in a particular locality near Rock Island, Ill. In the larva, also, of *Chelymophra erivararia* Fabr. the spines, according to Packard, are simple. (*Guide*, etc., p. 504.)

*The larva of an undescribed *Cassida*, the size and shape of *unipunctata* Say, but having 5 black spots on the thorax

bred, have come to their growth in about three weeks after hatching. They cast their skins at three successive periods, and these skins are slipped on to the fork, where in most instances they remain. On carefully detaching from a full grown larva the dung with which these skins are mixed, these three successive skins are easily recognized, the smallest being at the extremity and the largest at the base of the fork. They are especially recognizable in the mottled species (*Cassida guttata*, Oliv., Fig. 179) mentioned below, which removes most of its dung before each moult.

The eggs from which these larvæ hatch, and which we do not recollect to have seen anywhere described, are deposited singly upon the leaves, to which they are fastened by some adhesive substance. They are of irregular angular form; flat, and somewhat narrower at one end than the other; ridged above and at the sides, but smooth and obovate below. They are usually furnished with spine-like appendages, which however are sometimes entirely lacking. Those of *C. aurichalcea* (Fig. 175) are 0.04

[Fig. 175.]



inch long, and of a dull dirty-white color.

When full grown the larvæ fasten the last two or three joints of the body to the underside of a leaf, by means of a sticky secretion, and in about two days change to pupæ. The pupa is also flat with usually four or five broad but thin and transparent serrated leaf-like appendages on each side of the abdomen, and the prothorax which is greatly dilated and covers the head, is furnished around the edge with smaller barbed spines. The broad leaf-like spines at the edges of the body are bent under while the transformation is being effected, but are soon afterwards stretched stiffly out with a forward slant. The pupa loses the pronged tail, but as the old larval skin is left adhering to the terminal segments the prong of dung still protects it in most cases. The legs and antennæ are not free in this, as in the pupæ of most other beetles, but are soldered together as in the chrysalis of a butterfly, and yet it has the power of raising itself up perpendicularly upon the tail end by which it is fastened. The pupa state lasts about a week.

Having thus spoken in general terms of this anomalous group of beetles, we shall now refer more particularly to a few of the species. Most of those mentioned below infest the Sweet-po-

tato both in the larva and perfect beetle states. They gnaw irregular holes and when sufficiently numerous entirely riddle the leaves. They usually dwell on the underside of the leaves, and are found most abundant during the months of May and June. There must be several broods during the year, and the same species is often found in all stages, and of all sizes at one and the same time. In all probability they hibernate in the beetle state.

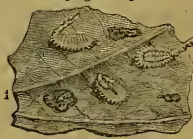
We have already proved by experiment that Paris green—one part of the green to two of flour—when sprinkled under the vines, will kill these insects, though not near so readily as it does the Colorado Potato Bug. Moreover, as these Tortoise-beetles usually hide on the under side of the leaves, and as the vines trail on the ground, it is very difficult to apply the powder without running some risk from its poisonous qualities. We therefore strongly recommend vigilance when the plants are first planted, and by the figures and descriptions given below our readers will be enabled to recognize and kill the few beetles which at that time make their appearance, and thus nip the evil in the bud.

The Two-striped Sweet-potato Beetle.

(*Cassida bivittata*, Say.)

This is the most common species found upon the Sweet-potato, and seems to be confined to

[Fig. 176.]



that plant, as we have never found it on any other kind. Its transformations were first described by the Junior Editor in the *Prairie Farmer Annual*, for Colors—Black and yellow. 1868, (p. 53.) The larva (Fig. 174, 2 enlarged; Fig. 176, natural size), is dirty-white or yellowish-white, with a more or less intense neutral-colored longitudinal line along the back, usually relieved by an extra light band each side. It differs from the larvæ of all other known species in not using its fork for merdigerous purposes. Indeed, this fork is rendered useless as a shield to the body, by being ever enveloped, after the first moult, in the cast-off prickly skins, which are kept free from excrement. Moreover, this fork is seldom held close down to the back, as in the other species, but more usually at an angle of 45° over or from the body, thus suggesting the idea of a handle. In Kirby & Spence's Introduction (p. 426), may be found the following passage in reference to the positions in which the fork of the larvæ of these Tortoise-beetles is carried. "The instrument by which they effect

this is an anal fork, upon which they deposit their excrement, and which in some is turned up and lies flat upon their backs; and in others forms different angles, from very acute to very obtuse, with their body; and occasionally is unbent and in the same direction with it." Reaumur is referred to as authority for these statements, and the language would lead us to suppose that the forks were thus variously carried by different species; but Reaumur never said anything of the sort. His language has been poorly rendered, for he distinctly referred to the different positions which the same insect could give to the fork, and we believe that the peculiarity mentioned above has never been observed in the larvæ of any other species of the genus.

When full fed, this larva attaches itself to the underside of the leaf, and in two days the skin bursts open on the back, and is worked down towards the tail; when the pupa, at first pale, soon acquires a dull brownish color, the narrow whitish tail, which still adheres posteriorly, being significant of the species. (See Fig. 174, 3.)

The beetle (Fig. 174, 4) is of a pale yellow, striped with black, and though broader and vastly different scientifically, still bears a general resemblance to the common Cucumber beetle (*Diabrotica vittata*, Fabr.)

The Golden Tortoise-beetle.
(*Cassida aurichalcea*, Fabr.)
[Fig. 177.]



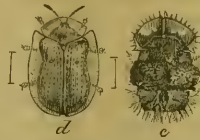
Colors—(a) brown and black; (b) brown.

Next to the preceding species, the Golden Tortoise-beetle is the most numerous on our sweet-potatoes; but it does not confine its injuries to that plant, for it is found in equal abundance on the leaves of the Bitter-sweet and on the different kinds of Convolvulus or Morning Glory. The larva (Fig. 177 a, natural size; b, enlarged with the dung taken from the fork), is of a dark brown color, with a pale shade upon the back. It carries its fecifork immediately over the back, and the excrement is arranged in a more or less regular trilobed pattern. The loaded fork still lies close to the back in the pupa, which is brown like the larva, and chiefly

characterized by three dark shades on the transparent prothorax, one being in the middle and one on each side, as represented at Fig. 178, c.

The perfect beetle (Fig. 178, d), when seen in all its splendor, is one of the most beautiful objects that can well be imagined. It exactly resembles a piece of golden tinsel, and with its legs withdrawn and body lying flat to a leaf, the uninitiated would scarcely sup-

[Fig. 178.]



pose it to be an insect, did it not suddenly take wing while being observed. At first these beetles are of a dull deep orange color, which strongly relieves the transparent edges of the wing-covers and helmet, and gives conspicuousness to six black spots, two (indicated in our figure) above, and two on each side. But in about a week after they have left the pupa shell, or as soon as they begin to copulate, they shine in all their splendor, and these black spots are scarcely noticed.

The Pale-thighed Tortoise-beetle.
(*Cassida pallida*, Herbst.)

This species can scarcely be distinguished from the preceding. It is of a somewhat broader, rounder form, and differs in lacking the black spots on the wing-covers, and in having the thighs entirely pale yellow, while in *aurichalcea* they are black at the base. It likewise feeds upon the Sweet-potato, and its larva differs only from that of the former, in its spines being brighter and lighter colored, and in having a dull orange head, and a halo of the same color on the anterior portion of the body.

The Mottled Tortoise-beetle.
(*Cassida guttata*, Oliv.)*
[Fig. 179.]



Colors—(a and b) green; (d) gold and black.

This species (Fig. 179 d), which is the next

*This species, as we are informed by Dr. Le Conte, is referred by Boheman to the genus *Coptocycla*, which differs from *Cassida* by more slender, not distinctly clavate and nearly filiform antennæ. Dr. Le Conte has kindly promised to furnish us a synopsis of our *CASSIDÆ*, which we hope to publish in either the first or second number of the next volume.

most common of those found on the Sweet-potato in the latitude of St. Louis, is at once distinguished from all the others here described by being usually black, with the shoulders black to the extreme edge of the transparent wing-covers. It is a very variable species, and is frequently more or less speckled or mottled with gold, while more rarely it has a uniform golden appearance.*

The larva, which is represented enlarged and with the dung removed at Figure 179, *a*, is of a uniform green color, with a bluish shade along the back, which shade disappears however whenever the insect has fasted for a few hours. It carries its dung in irregular broad masses, often branching as in the species next to be described. The pupa (Fig. 179, *b*), is also of a uniform green color, with a conspicuous black ring around the base of the first abdominal pair of spiracles. Before changing to pupa and previous to each moult, this larva is in the habit of removing the dung from its fork.

The Black-legged Tortoise-beetle.

(*Cassida scirpipes*, Oliv.)

[Fig. 180.]



Colors—(*a* and *b*) white and black; (*c*) brown.

This species, which is likewise found on the Sweet-potato, is a little the largest of those we have mentioned. The beetle (Fig. 181) has the power, when alive, of putting on a golden hue, but

[Fig. 181.]



Colors—Golden-yellow and black.

which are long, tipped with black; and besides a dusky shade along each side of the back, it has two dusky spots immediately behind the head, and below these

*This species has very probably been described under different names. It is *C. cruciata*, Fabr.; *C. signifer*, Herbst, and from larvae found on the same batch of plants, and differing in no respect whatever, we have bred specimens which were determined by Le Conte as *C. trabeata*, Lec.

last, two larger crescent marks of the same color. The dung is spread in a characteristic manner, extending laterally in long shreds or ramifications. (See Fig. 180, *a*). The pupa (Fig. 180, *c*), is dark brown, variegated with paler brown as in the figure, while the spines around the edges are transparent and white.

THE BLACKBERRY FUNGUS.

(*Uredo ruborum*.)

The current number of the AMERICAN ENTOMOLOGIST has just brought me the first notice which I have seen of the *Blackberry fungus* attacking the cultivated blackberry. The inquiry is now fairly started, and I hope that those who possess the knowledge and experience will testify what they know in relation to the subject.

This fungus has been long and familiarly known to *mycologists* by the name of *Uredo ruborum*, Link. It is not unfrequent on some species of the blackberry (*Rubus* of the botanists), especially the dewberry, or *Rubus canadensis*. The specific name, *ruborum*, was derived from the generic name, *rubus*, of the plants on which the fungus is found. As we become better acquainted with this enemy of good fruit, we shall find more cause for gratitude than surprise, that the cultivated blackberry has so long escaped its pestiferous influence.

As just stated, the native dewberry seems to be the home of this *Uredo*; but the indication now is, that it may soon become a cosmopolite among the blackberries. I have seldom found it on the common blackberry (*Rubus villosus*), except in cultivation, and never on the raspberry (*R. occidentalis—idæus*, etc.) It makes its appearance on the under surface of the young leaves, in the form of a reddish-yellow incrustation, paler, at first, and becoming more red from age. It consists of small, flattened tubercles, densely crowded together. As these develop they become more prominent, and soon burst, discharging a yellow dust, which is the proper seed, or *spores*, of the plant. The *spores* are of microscopic dimensions—too small for the unassisted eye to distinguish; and, consequently, may be dispersed to a great distance by the winds.

My experience in the *cultivation* of this destructive fungus commenced some sixteen years ago. I then selected some choice native blackberry plants, when in fruit, and transplanted them into my grounds. The ensuing summer, a single plant exhibited the *Uredo*. The *second*

year there were several; and the *third*, still more infected with it. They were taken up; those that appeared healthy were replanted in another enclosure, and the *tares* carefully gathered, and cast into the fire.

The next season, one plant in the new plantation proved to be infested with the fungus. From this initial point, the infection rapidly spread, until the whole row of fifty feet was completely ruined, and committed to the flames.

Nor did my misfortune end here: I had, in the meantime, planted a row of the Lawton blackberry parallel with it, and thirty feet distant from the native row. The second season, the fungus appeared upon them also, and spread so rapidly that in the space of four years they too were wholly consigned to the flames.

After that, I obtained sets from a healthy plantation, and planted them in a locality remote from the affected ground; and have thus escaped further trouble from the *Uredo* for a number of years.

Three years ago I planted Wilson's Early in the ground from which the infected plants had been removed some six or eight years before; and they have continued healthy.

These are the *facts* of my experience in cultivating the *Blackberry fungus*; but what is the *theory*? As has been remarked, the very minute spores can be carried far and wide, by the winds; but where is the place of their nidification? Where do they vegetate, take root, and grow? Is it in the root, the stem, or the leaf? on the surface, or in the interior? These are difficult questions to answer, without more observation and scrutiny than have yet been made. Even analogy does not afford us much assistance—for there seems to be something *sui generis* in the character of this parasite; and in its morbid effects upon the whole plant, not usually pertaining to the fungi peculiar to leaves. The young leaves present a discolored and sickly appearance, before the fungus is visibly developed on their interior surface. In the first season the injury may be confined to the leaf and the young shoot which sustains it; but the second year the root sends up numerous slender, feeble canes, which are manifestly diseased before there is or can be any development of the fungus on the leaves.

The probable inference, from the facts presented, is that the disease is at first localized in the leaves, from which the whole plant becomes contaminated, producing a constitutional malady. Or, what is scarcely less probable, and perhaps more in accordance with recent developments in mycology—the disease may be pri-

marily seated in the organism of the plant—the visible growth upon the leaves being little more than the fructification of the fungus.

The increased number, the diminished size, the feeble, sickly appearance of the infected canes, forcibly remind us of the somewhat analogous effects of the *yellow*s upon the peach tree.

The remedy—perhaps the only available remedy—for this formidable fungoid disease is, the one which I have employed and found effectual: *the complete destruction of the infected plants, and the avoidance of infection for the future.*

The conclusion of the last sentence looks to some prophylactic means, whereby the spread of the disease may be prevented. In the kitchen garden or farm fruit-patch the remedy which I have proposed can be applied, without great detriment to the owner. But when large nurseries become infected, which annually send out hundreds of thousands of plants, sowing the mischief broadcast over the whole land, who can estimate the injury which they inflict? It is impossible. It has been said that "eternal vigilance is the price of liberty." It is equally so in this case. The utmost vigilance and care must be taken by nurserymen to cleanse their stock from this vegetable leprosy; and purchasers must be equally vigilant in selecting plants from healthy nurseries. This is their only safety.

Experience teaches further, that those who cultivate the blackberry should keep a watchful eye upon any native intruder, which might introduce the insidious disease into their fruit-grounds.

[The above excellent article from Dr. Michener, of New Garden, Pa., which we clip from the *Practical Farmer* of that State, will be read with interest by those who have been, or who are likely to be, troubled with this fungus, which we have referred to on previous occasions.—Ebs.]

CURCULIO NOTES.

Editors American Entomologist:

There are two questions connected with the habits of the *Curculio*, of great practical as well as scientific interest, about which there appears to be considerable difference of opinion. The first of these is, Does the *Curculio* produce more than one brood in one and the same season? The other is, What agency, if any, has this insect in producing or promoting the rot in peaches and plums?

Having fought the "Little Turk" with some diligence the current season, I have had an op-

portunity of making observations that may throw some light upon both these questions.

The females began to deposit their eggs towards the latter part of April, some two weeks later than usual in this latitude, the season being backward and unusually cold; and about the first of June the full-fed larvæ were observed to be leaving the fallen fruit and going into the ground. By this time, the Curculio Catcher having been kept running every day when the weather would permit, there was a very marked diminution in the numbers of the insects, and very soon after there were very few to be found. But about the last week in June there was a sudden and large increase in the numbers caught, and the supply was well kept up until within two weeks past when they seemed to be again pretty nearly caught out. That this fresh supply was composed of young Curculios, the product of the eggs deposited in April and June, and not of old ones or immigrants from other orchards, is proven, if proof were needed, by the suddenness of the increase, by the fact that many of them were found copulating, and by the further fact that most of them were so soft from their recent emergence from the earth as to be readily crushed between the thumb and finger. Finding many of them in the act of pairing, as I often found them in their first appearance in the spring, I supposed them to be preparing for the production of another generation the present year. But the closest observation has not enabled me to find a single instance of their depositing an egg. I cannot find, on peach or plum, a single recent crescent-shaped cut. To satisfy myself more fully, I imprisoned about fifty of them in a box with a glass cover, and gave them a daily supply of green plums and peaches; but, though they fed voraciously upon the fruit, not a single egg was deposited. Hence, I conclude that the Curculio does not, usually at least, produce more than one brood in the same year.

With regard to the second question. I presume that all who are at all familiar with the habits of the Curculio know that it feeds upon the fruit, preferring that which is approaching maturity. Very few know, however, how ravenous its appetite is. The peaches and plums given to those I had imprisoned, were literally peppered all over with holes, some no larger than a small pin's head, and some large enough for the insect to bury itself bodily in the flesh of the fruit. Even a handful of peach leaves thrown in with the fruit, were perforated in a hundred places. Now, that a wound in the skin of a peach just swelling to maturity with

its abundant juices, should produce rot, is in accordance with both reason and observation. In every instance where I could detect the rot in its incipient stages, and before the surface had become so much disorganized as to destroy all trace of it, I could distinctly see the abrasion of the skin from which, as a center, the decay had proceeded. I caught a Curculio feeding upon a peach. It had made a hole half as large as a grain of wheat. I marked the place, and in a few days found a rotten spot with the hole in the centre.

Let me give you further proof. I have five trees of the Hale's Early peach which have produced two crops of fruit before the present year, not a single specimen of which ever ripened. They rotted before maturity to the last peach. This season, one of the very worst for rot that I have ever known, these trees have ripened a full crop of sound fruit. I kept the Curculio caught off them as completely as was possible, and pulled off all decaying fruit as soon as it made its appearance. Those fruits that were eaten into rotted, the rest remained sound.

I have several other trees of the same variety in another orchard that were well loaded with fruit. These were neglected, except that they were well cultivated. The result was that not a single peach ripened. My neighbors who failed to fight the Curculio but trusted to luck, lost their crops of this variety entirely, or saved them in part only by gathering the fruit so green that it was more fit for grapeshot than human food. At South Pass, as I am informed, those only who persistently caught the Curculio had any decent Hale's Early peaches.

I do not wish to be understood as maintaining that a peach never rots unless the skin is first broken. On the contrary, I believe that, if the decaying fruit is permitted to hang upon the tree or to lie festering in the damp weeds and grass on the ground beneath, it will breed a pestilence that even the soundest fruit may not resist. Every decaying peach is covered by a forest of fungi, each one of which, in a single day, perhaps, ripens and scatters its myriads of invisible sporules. These, in their turn, vegetate and produce other forests, and so the rapid reproduction proceeds until the orchard is foul with the seeds of a disease, whose contagion none but the hardiest fruits can escape.

It seems to me clear, therefore, that the rot of peaches and plums is caused, in most cases at least, by the punctures in the skin of the fruit made by the Curculio in taking its food, and that this mischief is done by the young brood, the old ones having perished.

It is possible that the rot in apples may be caused in this same way. Certainly, the small black specks, (mostly near the stem) that deform so many of our apples, are the result of Curculio bites. A. M. BROWN.

VILLA RIDGE, ILL., July 22, 1869.

THE SCARCITY OF THE CURCULIO.

Editors American Entomologist:

I have read your article in the July number of the ENTOMOLOGIST, headed "Is the Curculio scarcer than it was last year?" I do not wish to have this matter lost sight of, but at this time desire only to state that at the end of the fruit season, say in the October number of the ENTOMOLOGIST, with your permission, I will reply to your strictures. We are always ready to go back on our statements when found to be incorrect, or stand by them if true. E. S. HULL.

ALTON, ILL., July 11, 1869.

COMPARATIVE SCARCITY OF THE CURCULIO AGAIN

Our remarks on the comparative scarcity of the Curculio, which appeared in the last number, have not, thus far, elicited any conflicting experience, except that Mr. H. H. McAfee, of North Illinois, writes us word, July 17th, that the little Turk is plentier there this year than ever before, making almost a clean sweep of plums, both wild and tame. On the contrary, Mr. F. R. Elliott of Cleveland, Ohio, writes as follows: "Adding to your records of the scarcity of the Curculio this season, you may set down the whole of northern Ohio. At least my own observation and correspondence confirm its comparative absence as well as the fact that many egg deposits failed to mature to the injury of the fruit. Cherries have been quite free. Peaches are nearly so, while plum trees that for years have given no fruit, are this season loaded down, and with only an occasional case of Curculio." We also find the following resolution touching on this matter in the report of the July meeting of the Meramec (Mo.) Horticultural Society:

Resolved, That the Meramec Horticultural Society finds that the Curculio is this year decidedly less abundant and destructive than last year in their neighborhood.

After a very full expression of opinion, the resolution was unanimously adopted.

The personal experience of the Senior Editor is, that a solitary plum-tree in his garden, which had never previously retained a single plum beyond the month of June, was loaded down with plums up to the middle of July; but very few

plums having been up to that time stung by the Curculio. Since the middle of July, however, the new brood of Curculio have made their appearance in great force, and plums are being stung by them every day up to July 28th, so that it is *very* doubtful if any fruit will be allowed by them to ripen. Possibly it might be to the operations of this new brood that Mr. McAfee, writing on July 17th, either especially or exclusively referred. This new brood seems to have also been remarkably abundant near Alton, in South Illinois. For Dr. Hull has sent us no less than 158 Curculios, all captured by him July 21st from 19 late plum-trees; whereas in 1868 he estimated the number of Curculios to be met with on jarring fruit-trees in the month of July, at about one specimen only to every ten trees.* If they had been in this same proportion in 1869, he would only have met with about 2 Curculios instead of 158, on his 19 plum-trees. Lest any one should suppose that the Alton Curculios haunt plum-trees towards the end of July just for fun, and not for mischief, Dr. Hull has been obliging enough to send us in addition four plums, in each of which he actually saw the Curculio deposit an egg on July 21st.

* See AMER. ENTOMOLOGIST, 1., p. 11.

A POSSIBLE CAUSE OF THE BEE DISEASE.

MR. EDITOR:—I am a reader of the *Bee Journal*, and also a beekeeper and very much interested in bee-culture. I see by the *Journal* that a disease or something else is destroying the bees in many parts of the country, and learn from the February number that in many localities the devastation has been very great. I made a little discovery in my bees last summer, which may perhaps throw some light on the subject. Whether it is anything new or not I can not tell; but this is certain, that I have not read anything written on the subject as yet that furnishes any satisfactory explanation. If you see proper to publish what I have to say you are welcome to do so, and let it go for what it is worth.

I have not suffered materially from the mysterious malady hitherto, but last summer and fall I noticed a good many dead bees around my hives, especially in the morning. I went to examining some of them, and, to my surprise, in the abdomen of almost every bee that I examined, I found a *living* worm or maggot, nearly or quite an eighth of an inch long. The head portion or that part which I took to be the head, was much larger than the rest of the worm. From the head it gradually tapered back to a point. On the largest end, or head, of this maggot there were two very minute black dots, resembling eyes. This maggot is found in the upper part of the bee's abdomen, and by taking the bee in my fingers, and drawing it apart, the worm can be readily detected. When taken out and laid on the hand, it could be seen to expand and contract in a very lively manner.

A bee-keeping friend of mine put some of the dead bees in a glass bottle, and in a short time this maggot hatched, producing a fly nearly as large as what is called the Hessian fly—a perfect insect.

Now, does this worm destroy the bee, and if it does, will it not destroy a whole colony, as well as a few bees? In some localities I could not find any of them in the fall, after it became cool enough to prevent the bees from flying. My opinion is that if it would kill a few bees, it might destroy a whole swarm just as well. I incline to believe that the waste of a swarm

during the summer months, is occasioned by this maggot, more than by all other causes combined.

Will not the readers of the *Bee Journal* investigate this matter next season, to ascertain whether this maggot prevails to any considerable extent in the apiaries of the country? I would like to know whether any one else has observed anything of this kind among his bees.—*P. H. Philbrook of East Sanbornton, N. H., in American Bee Journal for May.*

[The larva described above as infesting the bees, is evidently that of some two-winged fly (*Diptera*) belonging probably to the *Tachina* family. The larger end which Mr. Philbrook took to be the head, is in reality the tail end, and the "two very minute black dots, resembling eyes" are the spiracles or breathing holes of the insect. The larvæ of nearly all the two-winged flies that appertain to the great *Musea* family, are attenuated towards the head and blunt and larger posteriorly, that of the common House-fly affording a capital illustration. That this parasite was the cause of the death of the bees in this particular instance there can be little doubt, but we scarcely think that it can be the cause of the "mysterious bee exodus" of which so much has recently been written. Yet the matter is well worthy of investigation, and we hope that every apiarian who suffers from the "bee disease" will examine the dead bees from a view to finding such a parasite. We should also feel under obligations to Mr. Philbrook if he will send us a number of the dead bees containing the maggot, or of the flies bred from such maggots, so that we may be enabled to determine the species.

In Europe the most formidable foe of the hive-bee is a similar maggot, which sometimes produces the well-known disease called "foul-brood." It is the larva of a small black fly belonging to the genus *Phora*, and known as the Bee-fly (*Phora incrassata*, Meigen). The larvæ of this genus of flies, so far as known, are all parasitic, and Bouche found them attacking a large European hawk-moth. As the European bee-fly attacks and kills the young bee while the latter is yet in the cell, and as Mr. Philbrook found his maggots in full-grown bees, the chances are, that this American bee-fly will belong to a different genus.—Eds. AM. ENTOMOLOGIST.]

THE COTTON ARMY-WORM.

(*Anomis aytlina*, Say.)

[From a Letter from Dr. D. L. PHARES, of Woodville, Miss.]

This insect hibernates as a moth in piles of cotton seed under shelter, under bark and in crevices of trees in dense forests and other secure places. It may often be seen on pleasant days in winter. It seems to carry but few eggs through the winter, and these it deposits in this

latitude (31° 3') in June, rarely in May with very warm spring.

Mr. Capers is mistaken as to date of its first appearance as a cotton-destroyer. In 1788 it "destroyed, at a low estimate, 200 tons of cotton in the Bahamas." In Georgia in 1793, it so completely destroyed the crop, that from 400 acres, Major Butler gathered only 18 bags.

The egg, I think, has never been correctly described. Examined by myself, and others in my presence, it appears when magnified as if moulded in a very deep saucer—shaped precisely like a scull-cap with rows of pin heads from base to apex as thickly set as possible. The egg of the boll-worm you give very correctly Fig. 151, *a*.

PREVENTIVES.—The two methods you name have both been successful on a small scale; and could planters be induced to *act in concert*, would be wholly successful on any scale. Gen. W. L. Brandon, of this county, in 1846, when the caterpillars appeared in such vast numbers, gathered by hand-picking *thirteen pork barrels full of them*, thus destroying all on his farm. But a storm occurring some weeks later brought in millions of the moths from other farms where the caterpillars had not been destroyed. I could mention many other proofs of the success of this and other methods of destroying this as well as the boll-worm.

The carbolic acid has been pretty thoroughly tried, and has proved a failure, as will cresylic soap, for obvious reasons, whether applied as here last year by steam atomizer or otherwise.

The time to use fire or traps is May and June, for both these insects. If we have none in any stage the first of July, we cannot possibly have any later.

The character of the season determines their numbers, and in this locality we cannot be injured by them this season.

CUT-WORM TRAP.

We have been much interested in a suggestion of D. N. Brown (who, by the way, is one of the *practical* men, and not a hobby-riding theorist), for the prevention of injury to grape vines, and especially young ones, and also of young black-berry plants. He simply digs a hole on one side of the plant, close to it, and as the cut-worm is a very clumsy insect, in his effort to reach the plant he falls into this hole. He has found in the morning as many as twenty in one hole. In setting out the grape vine, he makes a hole the width of a spade and six inches deep. This method he has practiced two years, with good success. He says that recently he has found cut-worms lodged in the rags he had placed in the forks of his apple trees as a protection from the Codling Moth.—*St. Joseph (Mich.) Herald.*

DESTRUCTIVE FUNGUS ON THE AUSTRIAN PINE.

Some months ago we were informed by Mr. Edwards, of the Evergreens, La Moille, N. Ills., that his Austrian Pines were suffering grievously from the attacks of some insect or other. Not being able to find any signs of insect-work in the specimens of the twigs and leaves sent us, and suspecting the presence of some insect enemy on the roots, we personally visited the locality. On a close and careful examination, it proved to be, not a bug, but a fungus, that was the author of all the mischief.

In the Austrian Pine, in its normal and healthy condition, wood that is four or five years old still retains its leaves in a green and living state. In trees that are badly infested by this fungus scarcely any green leaves can be found on wood that is more than two years old, those few that still hang on being dead and brown; and in addition a good portion of the leaves of less than two years growth is dead and brown, especially towards their tips. On a close examination about the last of May, such dead leaves will be found to be banded in many places with a thin white film—the *Mycelium* of the Botanists; and already from many of them there will have burst forth a roundish dark-brown fungus about the size of the head of an ordinary pin. A month or two afterwards almost every leaf will exhibit several such funguses, which finish by bursting open above and showing the unpalpable black-brown dust which performs the function of the true seed, and is known to botanists as “spores.” Of course it is through the instrumentality of these spores that the disease is propagated from tree to tree, and from bough to bough.

Mr. Edwards informed us that he first noticed this disease of the Austrian Pine six years ago; that it has been gradually spreading with him; and that now fully three-fourths of his nursery trees are more or less affected by it. Several that he showed us looked as if they had been scorched by a big prairie-fire; and a large number, as we were informed, were annually rendered unsaleable and had to be dug up and destroyed. He thought that large trees thirty or forty feet high—of which he had six or eight on his premises—were never attacked by this fungus; but on careful inspection we discovered one such tree which bore a single limb that was infested. Strange to say, the closely allied Norway pine, which grew intermixed with the Austrian, showed not the least sign of this peculiar disease; and Mr. Edwards states that, so far as

he is aware, the Austrian Pine is the only species that is ever attacked in this manner.

Dr. Hull, in the Transactions of the State Horticultural Society (1868, p. 36) speaks of “one of the blossom-like fungoid plants, growing out of the pores of the leaves of the Norway fir,” having opened out under the microscope and discharged a minute powder. Hence we infer that a fungus analogous to this of the Austrian Pine attacks the Norway fir; and that, as only one species of Evergreen was attacked at Mr. Edwards’s place, each species of Evergreen is, as a general rule, restricted to its own fungus.

Sulphur is so generally effective against these fungoid diseases of living plants, that we strongly recommended Mr. Edwards to experiment with it. At some future time we hope to be able to chronicle the result, whether successful or otherwise, of any experiments that he may have made in this direction.

ASH AND MOUNTAIN ASH.

Every botanist and almost every nurseryman knows that there is no botanical affinity whatever between the tree commonly called “Mountain Ash” and the true “Ash.” The former belongs to the Family *Rosaceæ* and to the same genus (*Pyrus*) as the Pear, the Crab and the Apple; the latter belongs to the Family *Oleaceæ* and to the genus *Fraxinus*. The former bears a fleshy fruit (*pome*); the latter a key (*samara*). In many other respects the two trees are as different as chalk is from cheese; and if we are to group them together simply because they are both popularly surnamed “Ash,” then we ought also to group together the Horsechestnut and the Chestnut, because both are popularly surnamed “Chestnut.”

In a recent Paper on the Bark louse, Dr. Shimer has taken leave to inform us, that he found the true Imported or Oyster shell Bark louse of the Apple not only on the Plum, but also “on the Mountain Ash (*Pyrus americana*).”^{*} So far so good. We do not doubt these facts; because we ourselves published them long ago, and there is nothing anomalous or extraordinary in them.

But Dr. Shimer is not satisfied with registering facts, whether old or new, which as a general rule he is perfectly capable of doing. He has a great propensity for philosophizing upon his facts; and this is where he often breaks down most miserably. For example, after showing that this Bark louse occurs on Apple, Plum, and Mountain Ash, all three of which

^{*} *Trans. Ill. St. Hort. Soc.*, 1868, p. 228.

trees belong in reality to the very same natural Family (*Rosacea*), and two of them to the very same genus (*Pyrus*), he appends the following precious corollary, evidently supposing that a Mountain Ash is an Ash:

In these cases the affected trees, Plum and Ash, stood close to apple trees covered with barklice scales. This is very interesting, as proving to my mind that the apple barklouse is capable of living on trees, not only of different genera, but also on those of widely different families. After seeing this we can readily appreciate the correctness of the declarations of Mr. Curtis, that this insect is identical with the *Coccus arborum linearis* of the Elm—a thing which appears inconsistent with the modern notions of the habits of plantlice [barklice?]

Whether or not it be possible for the very same species of barklouse to live and thrive upon species of plants belonging to distinct botanical families, is another and a very different question, which partly depends upon the meaning which we may choose to attach to the term "species." But most certainly the facts, quoted with such a flourish of trumpets by Dr. Shimer, so far as they go, prove the exact opposite of what he wants them to prove. For Mountain Ash is not "Ash," neither is Horsechestnut "Chestnut," nor is Buckwheat "Wheat," nor is Fool's Parsley "Parsley."

HOW THE CURCULIO FLEES BY NIGHT.

The Curculio is a winged insect, and will fly by night as well as in the day time. The Doctor had tested that to his own satisfaction the past season. He had put dozens in a glass vessel, and between dark and break of day, at any time of night when he was awake, and he was up frequently, he could hear them fall from the top of the glass to the bottom, showing conclusively that they are an insect of nocturnal habits.—*From a lecture on "Insect Enemies of Fruit," delivered before the Newark (N. J.) Agricultural Society, by Dr. I. P. Trimble.*

If the Doctor were to be suddenly incarcerated in some dungeon along with a few dozen other mortals, and if, while there confined, he and his companions should be wakeful and restless during the night; wonder whether it would prove that man is by nature a nocturnal biped, and further that he flies as well as walks in the night time!

THE PERIODICAL CICADA—OUR FIRST BROOD ESTABLISHED.

We learn from several of our exchanges that the 17-year "Locusts" have made their appearance in Connecticut. Thus the genuineness of this 17-year Brood of the Periodical Cicada (our Brood 1st) which Dr. Fitch recorded as having appeared in 1818 and 1835, is established beyond all doubt. Look out for these insects next year in the "Kreitz Creek Valley" in York county, Pa.!

BE ON THE GUARD!

In an article entitled "Mind how you pack Insects" (p. 54) we have already warned our readers of the evil that might result from the careless packing of live insects which are to be sent from one part of the country to another. The following item from the August number of the *American Agriculturist*, would indicate that the dreaded Colorado Potato Bug has been introduced into some of the Eastern States by just such careless packing:

COLORADO POTATO BEETLE.—That which we feared has been done. The Colorado Potato Beetle has been scattered along our Eastern States. A friend in Paulding, Ohio, sent specimens in a thin pasteboard box which reached us in a smashed condition, with one remaining larva to show what it had contained. The perfect insects are doubtless distributed all along the line of the mail route. We last year requested our friends to exercise care in this matter, for fear of some such accident, and it has now happened. The beetles have escaped, and we may look for them anywhere at the East.

We shall watch with interest the result of this carelessness. Paulding is near the western border of the State of Ohio, and persons along the railroads which run through the northern parts of Ohio and Pennsylvania, should be on their guard, and use the utmost vigilance to exterminate the pest wherever it first appears. If nothing but larvae escaped from such a box, the probabilities are that they would starve before finding fresh food; but if perfect beetles have been let loose, then we fear the worst.

PROPHECY FULFILLED.

Just as we predicted nearly a year ago,* the Colorado Potato Bug is spreading like a devouring flame through the great potato-growing State of Michigan. In reference to specimens received from Branch, Kent, Ionia, Shiawassee, Genesee, Kalamazoo, Calhoun and Jackson counties, Prof. Cook, of the Agricultural College, Lansing, Mich., replies as follows:

These are the Colorado Potato Beetle (*Doryphora 10-lineata*, Say). In traveling over the State during the last week, I found them thoroughly scattered. How they have become so suddenly diffused is hard to explain.—*Western Rural*, July 29, 1869.

* AMER. ENTOM., I. p. 42.

TO BANISH ANTS FROM APARTMENTS.—Of all the methods advised that of using rotten lemons is the most effectual, as the odor completely drives the ants away.—*H. Hamet in L'Insectologie Agricole.*

ON OUR TABLE.

From W. C. Flagg, Secretary—Transactions of the Illinois State Horticultural Society for 1868, being the Proceedings of the Thirteenth Annual Meeting at Bunker Hill, Dec. 15th, 16th, 17th and 18th, with Proceedings of the Local Societies, etc. This is a Report of 350 pages, with an appendix of 21 pages giving the tables of fruits recommended by the Society and by individuals. It is published by the Prairie Farmer Company, is gotten up in neat style and well bound; and altogether forms a most valuable Record of Illinois Horticulture for the year 1868. Full of interest, it evidences care in its make-up, and reflects great credit on Mr. Flagg, as have done all the previous Reports of the Society.

From Wm. Gossip, Secretary—Proceedings and Transactions of the Nova Scotian Institute of Natural Science, Halifax, Nova Scotia.

From R. W. Furnas, President—Second Annual Report of the State Board of Agriculture of Nebraska, Omaha, 1869.

From the Publishers—Cotton Culture, by Jos. B. Lyman, late of Louisiana, with an additional chapter on Cotton Seed and its Uses, by J. R. Sypher. New York, Orange Judd & Co.

A POISONOUS WORM.

"In an exchange we find mention made of the case of a young girl being stung by a tomato worm, and dying from its effect. They are quite frequently found on the vines. They are about the size of a man's finger, and two or three inches long, and of a green color."

Paragraphs like this are just now as abundant as is usual at this time of the year, both in the Political and in the Agricultural Press. As we have already explained, they are sheer humbug and delusion, manufactured out of whole cloth. It is as impossible for a tomato-worm to sting with the horn that grows out of the hind end of its body, as it is for a dog to sting with its tail or a hen to sting with her wings.

The Junior Editor having changed his place of residence, begs that all letters be addressed to him, hereafter, at 221 North Main street, St. Louis, Mo.

On account of the delay in engraving our cover, the mailing of this number has been retarded fully one week.

The publishers of those papers which advertise to club with ours, will please take notice of our change of subscription price,

ANSWERS TO CORRESPONDENTS.

Wheat Midge, alias Milk Weevil, alias Red Weevil—*Chas. Corbit, St. George's, Delaware.*—The orange colored maggots in the heads of your wheat were undoubtedly the larvae of the common Wheat-midge. We found a single belated specimen in the wheat which you sent us. We cannot explain the heads in your field all turning brown, except on the supposition of certain peculiar weather producing this effect on the variety you cultivate under the name of "California Wheat." If the brownness of the ears had been caused by the Wheat-midge, then the uninfected ears would not have turned brown; whereas you say that the heads changed color "all over the field." Neither can we see any trace of fungoid action, as in the case of what has been generally termed "Blight" in the West this season, but is more properly known as "Mildew." In true Mildew, it is only a portion of every ear that is affected, and even with the naked eye, the powdery structure of this black fungus can be distinguished. In your ears, on the contrary, the entire chaff is of a nearly uniform pale brown color, without any indication of fungoid structure, even when greatly magnified. As to the "small black insect" on the heads of your wheat, which you suppose to have been a true *Thrips*, your conjecture is a very probable one; but without specimens before us we can offer no positive opinion.

Large Fish-Fly—*A. R. McCutchen, Lafayette, Walker Co., Ga.*—The large fly bearing a resemblance to the Hellgrammite Fly (Fig. 56, c) in color and general appearance, but differing from that insect in having shorter, darker and toothed or pectinate antennæ ♂♀, and in having the black veins of the fore wings interrupted with whitish spots, is the *Chauleiodes pectinicornis* of Linnaeus. You say it flew into your room at night and "made a noise similar to that of a bat." Its larva doubtless lives in the water and has similar habits to that of the Hellgrammite Fly. That of an allied species, (*Ch. rastroicornis*, Ramb.), the male only of which has pectinate antennæ, has been described by the Senior Editor as living under the bark of floating logs, and as destitute of the remarkable paddle-like gills or branchiae of the belly, which enable the larva of the Hellgrammite Fly to live permanently under water. No other larva belonging to this genus is known to science. (See *Proc. Ent. Soc., Phil.*, II, pp. 263-5.)

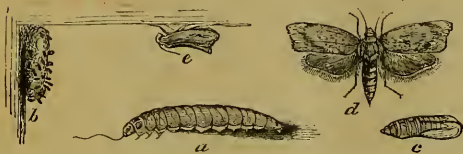
Cottonwood leaf-galls—*Mrs. J. B. Taylor, Seneca, N. Y.*—The hollow roundish galls, about the size of a hazel nut, on the stem of so many cottonwoods leaves are produced by the Poplar-stem Gall-louse (*Pemphigus populicaulis*, Fitch). Early in the year a single wingless louse punctures the stem of the nascent leaf, till the irritation causes this hollow growth, inside which the mother-louse brings up a large family of descendants, most of which by the middle of the summer acquire wings. The gall then gapes open and the insects escape.

Insects Named—*J. G. Goodrich, South Pass, Ills.*—The cinnamon-brown beetle with two longitudinal white stripes, which fell on your paper (July 7,) while you were writing, is the perfect form of the noted Round-headed Apple-tree borer (*Saperda bivittata*, Say). The spotted Lady-bird is a light variety of the 15-spotted species (*Mysis 15-punctata*, Oliv.)

Four-lined Leaf-bug on Currant—*M. B. Bate-man, Painesville, Ohio.*—The yellow bugs which you forwarded by Mr. Meehan, and which are about $\frac{1}{8}$ inch long, with four black longitudinal lines, the two outer ones of which each terminate in a black dot, are the Four-lined-Leaf-bug (*Capsus 4-cittatus*, Say.) You say "this insect is found to be quite injurious to the leaves of the Currant bushes and various kinds of Shrubs, such as Weigelia, Dietzia, etc., in some gardens in Cleveland—though not at all common as yet—and has only been seen there for the past year and the present. It commences feeding in May and continues for several months, and evidently breeds on the bushes, as young ones are seen now half grown along with the old ones." We think the plants might be protected against their attacks by a proper use of cresylic acid soap. The *Capsus* family, to which this insect belongs, is one of the most extensive families in the Order of Half-winged Bugs (*Heteroptera*).

Bee Moth—*Stephen Blanchard, Oregon, Holt Co., Mo.*—The large mass of white silken cocoons which you

[Fig. 182.]



Colors—(a) gray; (b) whitish; (c) brown; (d and e) gray and brown.

took from your bee-hives, and which have greatly injured your bees, destroying fully half your swarms, are the cocoons of the Bee Moth (*Galleria cereana*, Fabr.) They contained the pupae and we never saw such immense fat specimens before. At Figure 182 we illustrate this insect in all its stages (*a* worm, *b* cocoon, *c* pupa, *d* ♀ moth, and *e* ♂ moth,) and quote the following paragraph from the Missouri Entomological Report, where you will find a full account of this bee pest.

It should invariably be borne in mind that a strong stock of bees is ever capable of resisting, to a great extent, the attacks of the worm; while a starved or queenless swarm is quite indifferent to its attacks. In a common box hive, a good way to entrap the worms after they are once in a hive, is to raise the front upon two small wooden blocks, and to put a piece of woolen rag between the bottom-board and the back of the hive. The worms find a cozy place under the rag, in which they form their cocoons, and may there be found and killed, from time to time. Much can be done in the way of prevention, by killing every morning the moths which may be found on the outside of the hives. At this time of the day, they allow themselves to be crushed with very good grace; and if two or three be killed each morning, they would form an important item at the end of the year, especially when we recollect that each female is capable of furnishing a hive with at least 300 eggs.

Immunity from the ravages of this worm can only be guaranteed where a thorough control is had of both hive and bees. Hence the great importance of the movable frame hive.

White Grub Fungus—*L. M. S., Boone Co., Mo.*—You will find by referring to back numbers of our paper that it is a fact that the White Grub actually sprouts, i. e. a living fungus actually grows at times from the sides of its mouth.

Canker-worm Parasites—*J. Petit, Grimsby, C. W.*—The white oval cocoons attached to the body of a Canker-worm produced on the road a species of *Microgaster*, which is a genus of Ichneumon flies. What seemed at first sight to be two clusters of eggs attached to the bodies of two Canker-worms proved to be net-work cocoons inclosing each of them a parasitic larva. Both cocoon and larva are new to us, but in all probability belong to some genus or other of Ichneumon fly, which in the larva state had preyed upon the Canker-worm. The dead Canker-worm was secured to the leaf upon which it rested by this cocoon.

Beetles Swarming around the Lawn—*Saml. Thompson, M. D., Albion, Ill.*—The deep, rich, velvety-green beetles, about $\frac{1}{8}$ inch long, with the wing-covers bordered and sometimes marked above with fulvous, while the underside of the body is of a brilliant metallic green with purple reflections, is the Trim Flower-chafer (*Gymnetis nitida*, Linn.) You say you found these beetles (July 16) flying in great numbers over the lawn near the ground and especially round a Weigelia bush, and that they appeared so active and excited, that you at first thought they were Bumble-bees. In the larva state they feed on the roots of plants, and are sometimes quite injurious to the Strawberry. The larva bears a strong resemblance to that commonly known as the White Grub, but, in common with that of the Goldsmith beetle (*Cotalpa lanigera*, Linn.)—a brilliant yellow insect—it has the curious habit of invariably traveling on its back notwithstanding it has six legs on the underside.

While the common White Grub or May-beetle larva travels clumsily with its legs, this grub by turning on its back travels as easily and as rapidly as an ordinary caterpillar. The species does not occur in North Illinois, but is sufficiently abundant in the south part of the State and in central Missouri.

Tiger-beetle Larva—*R. J. Dodge, Brooklyn, N. Y.*—The singular larva, about $\frac{1}{8}$ inch long, with a gigantic head and strong hooked jaws, and with two remarkable hooks on the middle of its back, is that of a Tiger-beetle (*Cicindela*.) You say that "it lives in a vertical hole in the ground, about three inches deep and of the diameter of its head, and remains at the surface, its head just level with the earth, ready to catch any small insect that may come along." These are the general habits of all the known species of this genus; and as not a single species found in America has been bred, so far as is on record, from the larva state, it is impossible to say to what particular species your larva belongs. According to the latest revision, there are no less than 64 distinct species found in North America, most of which are to be met with within the limits of the United States.

Not Bark Lice—*W. McCray, Black Oak, Caldwell Co., Mo.*—We can assure you that your trees have not died from Bark-lice, for the numerous specimens of the bark which you send have no trace of this pernicious insect upon them. The minute round elevations on these specimens of bark are very often to be seen on dead limbs and twigs of fruit trees. We can offer no explanation of the death of these trees, unless, as you yourself suggest, they were killed by "the severe cold weather that came early last winter."

Large compound Gall on Grape-vine—A. S. Fuller, Ridgewood, N. J.—The mass of irregular succulent swellings on the stem and leaf stalks of the grape-vine (you do not mention the variety), each swelling

[Fig. 183.]



Colors—Pale-green and rose.

about the size of a large pea and often having a rosy cheek, is produced by a pale reddish gall-gnat, the *Lasioplera vitis* of Osten Sacken. At Figure 183, we represent the gall you sent, and at a section of one of the swellings, showing the cavities which contain the orange-yellow larvae which are the authors of the work. These larvae leave the galls and enter the earth to transform. Baron Osten Sacken observes that many of these cavities are abandoned by their inmates and invaded by numerous *Thrips*, and we noticed the same state of things with your gall, the *Thrips* being cannibal and preying upon the gall maker.

D. W. Kauffman, Des Moines, Iowa.—The series of fleshy bulb-like swellings on the terminal shoot of a grape-vine, are the same as figured above in answer to A. S. Fuller. The only two cells that were not empty in the specimens sent by you (July 11th), contained each of them a parasitic larva spun up in its cocoon and belonging apparently to the *Proctotripes* family. Of course this parasitic larva must have preyed upon the gall-making larva, which would otherwise have vacated the cell. On pages 106 and 107 we have figured and described two other kinds of galls made by gall-gnats upon grape-vine.

Proctotripes

Insects Named—Mrs. M. Trent, Vinland, N. J.—1st. The elongate shiny-green beetle, about half an inch long, that has “devoured alive such numbers of insects, larvae as well as perfect insects, within a few weeks,” is *Tennochila virescens*, Oliv. The other genera of the group to which this insect belongs (*Trogosita* family) feed upon vegetable matter, either living or dead, certain European species being very destructive in granaries; but Westwood expressly states that no insect belonging to this group attacks either living or dead animal matter. Hence it would seem that the facts which you have observed are new to science. Certainly the living specimen which you sent us, and which reached us in vigorous health, had fed most heartily on the road on the bodies of the moths which you supplied as food for him. 2d. The “funny little caterpillars, feeding both upon the fruits and upon the leaves of the raspberry, and decorating their bodies with bits of leaves, dried anthers of flowers, or any small light substance they can get, such as bits of paper or of thread,” must be the *Aptodes rubicora* of the Junior Editor, first described in the Missouri Report. They produce a small pale-green moth. 3d. The large black larva that seizes cut-worms by the throat and creeps upon them most extensively, is probably that of *Celosoma calidum*, Fabr.—a handsome black beetle with copper-colored dots which we figured on page 48, Fig. 46. This larva—which as you say has a general resemblance to that of a Ladybird, except that it is so much larger—is described by Fitch as seizing cutworms by the throat and “clinging thereto with the grip and pertinacity of a bulldog.”

Destructive Larva—B. F. Lee, Marshfield, Mo.—

The larvae you sent arrived in such ill-shaped and confused masses that we could make nothing of them. You say “they not only destroyed the cabbage, potatoes and other vegetables, but had the impudence to enter the nursery by thousands and destroyed every leaf of about 6,000 quince cuttings, and 1,000 pear grafts; then began on the apple grafts, but disappeared before doing them much damage.” We regret that you did not pack them better, or give a description of their appearance. We hope you will do so another year. The bristly black worm, covered with what seems to be eggs, is the larva of the Buck Moth (*Saturnia maia*, Hüb.), for a fuller account of which, see page 186 in answer to G. W. Copley. What you take for eggs on its body are the cocoons of a parasitic ichneumon fly.

Eggs of Tree Cricket on Grape-vine—A. S.

Fuller.—The row of contiguous holes, which cause the grape cane to partly split, and which look as though they had been made by a stout pin, are caused by the Snowy Tree-cricket (*Ectanthus nireus*), and had formerly contained its eggs. You will find this insect figured on page 38. We hatched a number of them this spring, but reared but one female to the full grown state. They fed entirely on plant lice at first, but when these were denied them, they fell to devouring one another, practically carrying out the doctrine of “might is right,” until the strongest individual was left alone, the conqueror of the field.

New York Weevil—Charles Waters, Springville, Wis.—The snout-beetles are the same N. Y. Weevil of which the history was given in Number 11, page 224,

Grape-vine Leaf-gall—*A. A. Hilliard, Brighton, Ills.*—The numerous green fleshy excrescences on the underside of the leaves of your Clinton Grape-vine which we represent herewith, (Fig. 184,) are galls caused by the

[Fig. 184.]



Color—Green.

Grape-leaf Gall-louse. The best way of getting rid of these diseased leaves is to pluck them as soon as they show signs of the galls, but their increase is made very uncertain by numerous cannibal insects which prey upon the gall maker. There were preying upon the specimens you sent numerous wooly larvæ of a genus (*Scymnus*) of small dull colored Lady-birds; two Lace-wing larvæ; numerous whitish maggots which have since contracted to pupæ with two oblique processes at the tail end, and which belong to the genus *Leucopis* of the Two-winged Flies; the red larvæ of some species of *Thrips*; and lastly two full grown specimens of the Insidious Flower-bug, (Fig. 138, b) another fact which confirms the opinion given on page 196 that this bug is a cannibal. This gall occurs most abundantly on the Clinton grape-vine, but is likewise found on other varieties of the Frost Grape, such as the Taylor, Huntington and Delaware, on all three of which varieties we have found it the present year. The louse which forms the gall was first described as *Penphigus vitifolia* by Dr. Fitch, of New York, though it does not belong to that genus. Dr. Shimer, of Mt. Carroll, made some interesting observations on the habits of this insect,* and made it the type of a new family (*Dactylo-spharidae*) and of a new genus (*Dactylosphara*.) The distinguishing features of this supposed family are certain appendages attached to the legs which Dr. Shimer calls *digitali*, though the characters of the wings point unmistakably to the genus *Phylloxera* of the true Plant-lice. We shall not now discuss the validity or propriety of this new family, as we intend to give a more complete account of this louse in our future articles on Grape insects; but we will say here that Dr. Shimer is unfortunate in grinding out new genera and new families, for he has proposed a new family and genus (*Lepidosophes*) for the common Apple-tree Bark-louse (*Aspidiotus [Mytilaspis] conchiformis*, Gmél.) based upon similar appendages, which he found on its legs; whereas if he had been better posted he would have known that these appendages are characteristic of al-

most all Bark-lice. † There has lately appeared a new Grape-vine disease in Europe which has attracted very general attention and has done great damage to the vineyards in many sections. This disease is in the form of little cankerous spots which cut off the supply of nourishment and cause the roots to rot. These spots are produced by the punctures of a louse (*Phylloxera vastatrix*, Planchon.) in all respects resembling that which there produces a gall on the leaf very similar to the gall of this country which we have figured; and according to an article by "J. O. W.," (a signature that indicates good authority,) which appeared in the Jan. 30th number of the *Gardener's Chronicle* of England, the insect which occurs on the root is actually identical with that which produces the gall on the leaf. Some authors, and among them J. Liechtenstein, who first drew attention to this disease, even contend that this European Leaf-gall is identical with ours, and that it has been imported from North America.

† See Figures by V. Signoret of feet of *Lecanium vitis* and *L. Coffea*, etc., Pl. XI, Tom. VIII, *Annales de la Soc. Ent de France*, 4e Serie.

Grape-vine Insects—*G. Pauls, Eureka, Mo.*—The large pale-yellow 8-spotted beetle which has so badly eaten the foliage of your grape vines, is the Spotted *Pelidnota* (*Pelidnota punctata*, Linn). It feeds in the larva state on old rotten stumps and roots of such trees as the Pear and the Hickory, and comes out as a beetle about the first of July, in your latitude. The brown insect with a prolongation like the beak of a bird in front, and two yellowish spots on the edge of the back, which has punctured your tender grape stems, and in many instances caused them to turn brown and wilt, is a tree-hopper (*Euchophyllum binotatum*), which occurs quite commonly on the Red-bud and other trees. Its favorite home, however, is the Hop-tree or Tree-trefoil (*Ptelea trifoliata*), on the twigs of which it is very abundant in all its stages, from the smallest larva to the full-grown bug. We have sometimes seen them ranged longitudinally on such a twig, like a file of soldiers in close military order; and under such circumstances a white waxy matter exudes copiously from the bark, which attracts tree-ants like the honeydew of the Plant-lice. In English this species may be called the Two-spotted Tree-hopper.

T. W. G., Georgetown, O.—The spotted beetle sent by you is the same species (*Pelidnota punctata*) mentioned above.

Museum Pests—*Chas. P. Faulkner, Bridgeport, Conn.*—The beetle infesting your collection of insects is not the *Anthrenus varius* nor *A. muscorum*, but the common Bacon-beetle (*Dermestes lardarius*), which has the same mischievous propensities as the other two. Its larva, however, is much more easily captured than that of the *Anthrenus*, not having the same peculiar gliding and dodging motions. In the present number we publish a letter from Dr. Le Conte, on the best means of preserving a collection from these pests.

Wheat Maggots—*S. K. Faulkner.*—The pale green slender maggot, one-fourth of an inch long, which blighted about one in fifteen of the heads of your wheat, by devouring the substance immediately above the upper joint, was undoubtedly the larva of the American *Meromyza* (*Meromyza Americana*, Fitch), a full account of which, with figures, you will find in the Missouri Entomological Report, pp. 159-61.

*Proc. Acad. Nat. Sc. Phil., January, 1867.

Parasites on "Hateful Grasshopper"—S. K. Faulkner, Whitesville, Andrew county, Mo.—The deep scarlet-red parasites which you find attacking the grasshoppers (*Caloptenus spretus*), and which, as you say, are causing said grasshoppers to rapidly die off, are mites belonging to the same class (*Arachnida*), of articulate animals as the spider. They have evidently but six legs, and we have found parasites under the wings of the common house fly in this country, which scarcely differed from them. We believe these parasites have never been described, but as similar six-legged red mites belonging to Latreille's genus *Astoma*, are known to attack the house-fly and other insects in Europe, ours in all probability belong to the same genus, and the Senior Editor has suggested the name of *Astoma locustarum* for the species in question. (See *Practical Entomologist*, vol. 1, p. 126.) These mites have been very common the present year on the Hateful or Colorado Grasshopper, and we have received specimens of the latter from Holt county, Mo., so thickly covered with the mites, that we have no doubt that they seriously affected the health of the "hoppers."

Crippled Moths—Chas. P. Faulkner, Bridgeport, Conn.—The wings of almost all moths will fail to expand to their proper proportions, if, on bursting forth from the pupa state, the moths have no facilities for climbing so as to allow their wings to hang down, while the fluids of the body are gradually being disseminated through the appropriate channels. A large heavy moth, like the *Polyphemus*, would probably be unable to climb the sides of a glass jar, but almost all small insects will do so with ease. The popular idea that house-flies have air-pumps in their paws, to enable them to walk up glass windows, is a myth! It has been proved that they can walk up the sides of an exhausted receiver; and besides, many insects without any pad (*onychium*) between their tarsal claws walk upon glass as readily as a house-fly. In all such cases, the tarsal claws seize hold of the small roughnesses in the glass, which are imperceptible to the naked eye.

Insects on the Oleander—T. W. Gordon.—The flattened oval scales attached so thickly to the leaves of your Oleander, are a foreign species of bark-lice. A little diluted kerosene—say one part water and one of kerosene—would perhaps be the best thing to kill them and thus cleanse your plants. The black beetle of form and size of a split pea, with two blood-red spots on the wing-covers, is the Twice-stabbed Lady bird. (See Fig. 185.) It was undoubtedly preying on the bark-lice, and if unmolested would soon have cleared the plant.

Insects found on Apple Tree—J. W. Waters, Springfield, Mo.—No. 1 are the eggs of the Rapacious Soldier Bug (*Reduvius rapinatorius*, Say), which you will find illustrated on page 207, Figure 142. No. 2 is the Twice-stabbed Lady-bird (*Chilocorus bivulnerus*, Muls.) which is figured above, (Fig. 185). They are both beneficial insects, and were doubtless preying on the plant-lice on your trees.

Beetles Named—J. M. Shaffer, Fairfield, Iowa.—The beetle that comes into your house in great numbers is *Agonoderus pullipes*, Fabr. The black blister beetles caught last fall on "Rag-weed" are *Lytta atrata*, Fabr.

Gigantic Water Bug—E. M. Downing, Beloit, Wis.—The large bug of which you can find neither description or name, and which would eat nothing that was given to it, is the Gigantic Water Bug (*Belostoma grandis*.)

[Fig. 186.]



Color—Light-brown.

It lives in the water and feeds on other aquatic insects and small animals. As we are ever and anon receiving this insect for determination, we reproduce herewith its photograph (Fig. 186.) by which it may at once be recognized by the rest of our readers.

Worm eating into green Tomatoes—D. L. Hall, Alton, Ills.—

The worm eating into your green tomatoes is not as you suggest, the Boll-worm described in last number, but that rascally Stalk-borer (*Gortyna nitela*, Guen.), which bores into such a variety of plants and which we have on several occasions referred to. (See especially Figs. 11 and 140.) It has long been known to bore into the stalk of the Tomato, but now you add to its crimes that of attacking the fruit, and we have this summer found it even boring into the fruit of the Strawberry.

Miscellaneous—Geo. W. Copley, Alton, Ills.—The golden green "bugs with the Fenian uniform," which you found quite plenty amongst your standing wheat, are *Chrysochus auratus*, Fabr., or the Gilded Chrysochus. These beetles belong to the great *Chrysomida* family and feed on the leaves of the Dog's-bane (*Apocynum androsaemifolium*), but their larval habits are, we believe, unknown. The black prickly caterpillar found on a rose bush is the larva of the Buck Moth, heretofore referred to. The yellow louse which is so badly crumpling the leaves of the Red currant, is the Currant Plant-louse (*Aphis ribis*, Linn.), long known to thus attack the Currant both in this country and in Europe, but never known to occur on the closely allied Gooseberry. The apples you send were affected with the common apple rust. The common form of this rust is caused by a microscopic plant of fungoid growth, but a very similar appearance is caused, as we know from experience, by the shallow gnawings of a small grass-green worm which produces a yellowish-brown moth (*Lozotania rosaceana*, Harr). It is the normal habit of this worm to fold up and devour the leaf, but it is also very fond of gnawing off the rind of green apples, and such gnawed places soon become brown and rusty and sometimes crack.

A Mixed Mess—F. F., Hamilton.—The insects you sent presented a most heterogeneous and broken appearance on their arrival, the inevitable result of the loose manner of packing. We cannot undertake to name or say anything about dried specimens of insects that are not well packed and numbered.



Colors—Black and blood-red.

Insects Named—*H. A. Mudgett, Lower Cedar, Minn.*—No. 1, *Platynus cupripennis* Say. No. 2, *Cassida pallida*, Herbst. (Gold-beetle; common on Morning-glory and Sweet Potato vines. See article in this number.) No. 3, *Chlorion sericeus*, Forster. No. 4, the striped species is *Agonoderus pullipes*, Fabr.; and the brown species is *Anara musculata*, Say. No. 5, *Lytta cinerea*, Fabr. (Ash-gray Blister-beetle, figured page 24, fig. 14 a.) No. 6, *Harpalus pennsylvanicus*, Fabr. (figured page 34, Fig. 27.) No. 7, *Lytta murina*, Lec. (Black-rat blister-beetle, figured page 24, Fig. 14, b.) No. 8, *Bolbocerus furtus*, Fabr., a dung-beetle. No. 9, *Calosoma calidum*, Fabr. (figured page 48, Fig. 46.) No. 10, *Pasinachus elongatus*, Lec. (figured page 48, Fig. 47.) No. 11, *Prionus imbricornis*, Linn. ♀, a timber-borer. No. 12, two very distinct species of wire-worms, which are the larvae of Click-beetles or Skijacks (*Elatr* family.) Out of the above 12 insects, Nos. 1, 3, 4, 6, 9 and 10, are cannibals and therefore generally our friends; No. 8 is neutral; and the rest are vegetable-feeders and injurious. "The Gold-beetle," (No. 3) when alive changes from reddish gray to golden; but when dead it soon loses the fine golden polish. Your finding No. 7 working on potatoes so abundantly in the forepart of July that "some fields were nearly ruined by it," is very interesting, as it confirms what we stated page 49, as to the true Black Blister-beetle (*Lytta atrata*) not occurring till the latter part of August and September. You must surely be mistaken about the larva of No. 11 being very plenty in unbroken prairie land. The different species of this genus are timber-borers, usually attacking the roots of woody shrubs and trees, and could not exist in the larva state on prairie land, except where there are hazel-roughs, etc.

Lightning-hoppers—*Thos. W. Gordon, Georgetown, O.*—The downy greenish-white "hoppers" which you found on plum trees, are the larvae of the Frosty Tree-hopper (*Paeidoptera pruinosus*, Say), an insect which occurs also on a great variety of other plants, and which in the mature state is of a dull lead-color, dusted over with a fine white powder. The group to which this insect belongs (*Fulgura* family) may be called in English "Lightning hoppers," which is the meaning of the scientific term for them. Dr. Harris has very appropriately named the allied *Membracis* family "Tree-hoppers," the *Cercopis* family "Frog-hoppers," alluding to the frog-pittle insects, and the *Tettigonia* family "Leaf-hoppers;" but hitherto the "Lightning-hoppers" have had no English name. In reality they do leap like a flash of lightning.

Bag-worms—*T. W. Gordon*.—"The "small moving cocoons," which have literally striped many of Mr. Wilson's quince trees, are the common Bag-worm, *alias* Drop-worm, *alias* Basket-worm (*Theridopteryx ephemeriformis*, Haw.), to which we have often alluded. The specimens were but one-third grown, and had eaten and gnawed every thing in the box in which they were packed; their bags looking more like bags of paper than of leaves, when they arrived. The larger "cocoon" was an old ♂-bag of the same species.

Saml. Thompson, M. D., Albion, Ills.—The cases containing worms which are injuring Mr. Jos. Sheavington's cedar trees are the old and young bags of the same species spoken of above. We shall shortly publish an illustrated article on this insect.

Woolly Gall on White Oak—*A. S. Fuller*.—"The woolly gall of a dull buff color, found on the twigs of the

[Fig. 187.]



Color—Light-buff.

and at *b* we give one of these pip-like bodies separated and showing where the fly escapes from it. Osten Sacken has recorded the very singular fact, that in old, but not in recent specimens, the two sexes sometimes differ considerably in their color. (*Proc. Ent. Soc., Phil., IV., p. 351.*) This is a good illustration of a polythalamous gall.

Cabbage pests—*John A. Williams, Harrodsburg, Ky.*—The elongate cylindrical mahogany-colored horny worms, about $\frac{3}{8}$ inch long, which you state to "feed on the roots of the cabbage, sometimes destroying the entire crop," are the larva of some species of Click-beetle (*Elatr* family). From their shape and hardness, these larvae are called "Wire-worms." We cannot determine the particular species, as, from the fact of this family remaining many years in the larva state, but very few indeed have been bred to maturity. In all probability your species feeds, not exclusively upon cabbage, but generally upon all garden crops. We have several such species in the North, but they all differ from yours. Alderman Mechi, one of the most scientific farmers in England, claims to have destroyed the wireworms in his fields for many successive years by sowing salt at the rate of about six bushels per acre, just as the small grain was coming up. The Flea-beetle which you state to "prey on the leaf of the young cabbage-plant," is the same wavy-striped Flea-beetle which you will find figured and illustrated in *A. E.*, pp. 158-9.

Bugs gathering on Pear Shoots—*E. J. Ayres, Villa Ridge, Ill.*—The black shiny insects, about one-tenth of an inch long, which you "at first noticed swarming on the ground and collecting on the ends of the Rosin-weed" but which have lately "collected in great numbers on the shoots of the young pear trees," are the same Flea-like Corimelana (*Corimelana pulicaria*, Germ.), spoken of on page 207 in answer to *Ino. M. Pearson*.

Potato-bug—*J. B. Cartwell, Wilkinsonville, Mass.*—The Potato-bugs which you have "frequently found feeding on the leaves of Potatoes and Tomatoes, but not in sufficient numbers to be seriously injurious," are the same species of Tortoise-beetle (*Cassida clavata*) referred to in our last No. (p. 228), as found on potatoes both in New York and in Massachusetts.

T. GLOVER

Insects named—*H. T. Birch, Antioch College, Yellow Springs, Ohio*—No. 1, *Vespa maculata*, Linn. (See Fig. 111.) No. 2, *Callidium (Phymatodes) variabilis*, Fabr. No. 3, *Pachyta epaniponnis*, Say. No. 4, *Campoplex lateralis*, Fabr. No. 5, *Encyrtus curvulus*, Say. No. 6, *Leptura sphaerocollis*, Say. (var.) No. 7, *Graphisurus fasciatus*, De Geer. No. 8, *Stenopterus sanguinicollis*, Say. (var.) No. 9, *Molophilus (Helimatus) bimaculatus*, Say. No. 10, *Calosoma Whitei*, Lec. No. 11, *Calosoma longipennis*, Dej.—*externum*, Say. No. 12, *Danaeus Kirbyi*, Lec.—*affinis*, Kirby. No. 13, *Cicindela capreolus*, Lec. No. 14, *Dichelonychia*—No. 15, *Labidomena trimaculata*, Fabr. No. 16, *Heteronychia relicta*, Say. No. 17, *Phyllophaga quereina*, Knoch. No. 18, *Cheridium capistratum*, Fabr. No. 19, *Anthophagus latibrosus*, Fabr.—*hevari*, Panzer. Nos. 20 and 21, *Planorus carolinus*, Linn., both ♀♀. No. 22, *Gastrophys splendidus*, Oliv. No. 23, *Uloa impressa*, Welsh. No. 24, bred from Maple-feeding larva, *Trochilium aenei*, Clem. No. 25, *Melanodytra striata*, Say. No. 26, *Copris ammon*, Fabr. No. 27, *Phenolia grossa*, Fabr. No. 28, *Calligrapha scalaris*, Lec. No. 29, *Ponobius tonentosus*, Say. No. 30, *Harpalus fumus*, Say—*halius*, Dej. No. 31, *Saperda puncticollis*, Say—*trigeminata*, Randall. No. 32, *Tacetus Schaumi*, Lec. No. 33, *Pygota undata*, Wied. No. 35, *Diplocheila major*, Lec. No. 36, *Corymbites altheipus*, Lec. We are indebted to Dr. Le Conte for the proper determination of Nos. 2, 6, 12, 31, and 32.

Apple-tree Worms—*Charles Waters, Springville, Wisconsin*.—The small white moths, which, as you say, "came by millions the last of May and laid their eggs on the tips of the new shoots of the apple trees, from which eggs there hatched out maggots with a black head, so that in a few weeks the tops of the apple trees were alive with worms," are too much torn and rubbed to identify the species with any certainty. No such moths are at present known to infest apple trees in the manner you describe. So far as we can judge from the very poor specimens sent, we think your moths are the *Corycia costulata* of Guenée, the habits of which insect are, we believe, unknown to science. The "maggots with a black head" cannot be identified from your brief notice of them.

It could scarcely have been the canker-worm that stripped the apple trees last year of their leaves in July, for that insect appears the end of May and in June. The canker-worm is a measuring-worm. You give no description whatever of those which you speak of.

Oak-fig Gall—*A. Fendler, Allenton, Mo.*—The dense cluster of yellowish galls, spongy and bladder-like, and all closely pressed to each other, which you found on the twigs of the White Oak, are caused by the Stout-horned Gall-fly (*Cynips forticornis*, Walsh)—a small ant-like wingless species which exists only in the female sex, like many other gall-flies. Dr. Fitch supposed this gall to be produced by what he called the Oak-fig Gall-fly (*Cynips g. ficus*, Fitch.) "a small black fly with the lower half of its head, its antennae and legs pale dull yellow, its hind shanks dusky and its abdomen beneath reddish-brown." But it was long ago proved by the Senior Editor that Fitch's supposed gall-maker is a mere Guest-fly, inhabiting a gall which is in reality made by the Stout-horned Gall-fly. (See Osten Sacken's Paper on Gall-flies, *Proc. Ent. Soc., Phil.*, IV. pp. 353, 368-9).

Insects named—*Dr. D. L. Phares, Woodville, Miss.*—1st. The Hawk-moth is *Cherocampa tersa*, a not very common species. 2d. The Cicada captured May 10, 1869, in a grove where the Periodical brood comes out 1858, 1871, etc., is a genuine *C. tredecim*. Its occurring two years before the regular time is very remarkable and unusual. Still, many analogous irregularities are recorded of several other insects: and supposing all the different broods of this insect to have sprung from a common origin, we must bear in mind that it is only through such irregularities as these, in the first instance, that distinct broods with distinct periodic times could ever have been permanently established. 3d. The larva "found in branches of pear, hickory, etc., cut off by the parent insect," is most probably, judging from your drawing, that of the Twig-girdler (*Uncidicus singularis*) which we figured and described in a former number.

Small Apple-leaf Worms—*Herman Conpton, Wells Corners, Pa.*—The pale-brown worms about half an inch long, with shining black head and neck are, we believe, the larvæ of the Eye-spotted Bud-moth (*Spilonota oculana*, Harris). If so, they will change into the pupa state within the folded leaves, and will come out in July in the form of a small dark gray moth. The only available mode of fighting them is to gather the infested leaves which they have tied together with silken cables, and destroy them. We notice that some specimens have already spun their cocoons among the leaves. So far as we are aware, this worm does not occur in the West.

Rose-bug on Apples—*A. Dean, Otto, Indiana*.—The yellowish beetles, about $\frac{1}{8}$ inch long, which "generally infest the Persimmon tree, but have left it and are eating the young apple trees that are near by, not a single one having escaped," are the common Rose-bug (*Microradactylus subspinosus*, Fabr.) You will not prevent their injuries by cutting down your Persimmon trees, because this beetle preys voraciously both on the Rose, the Grape, the Plum, and the Cherry as well as on the Apple and Persimmon. As it lives underground in the larva state, feeding upon the roots of plants, its injuries cannot easily be warded off. The only way is to shake down the beetles and destroy them.

Unicorn Apple-tree Caterpillar—*G. C. Bradford*.—The reddish-brown caterpillar with the second and third segments green, and a prominent horn just behind them, which has the habit of holding up the tail, is known to feed on the Apple, Dog-wood, Plum, Alder and Winterberry. It is the larva of a moth with the fore wings light brown, variegated with greenish-white and dark-brown, and the hind wings ♂ whitish with a dusky spot on the inner hind angle, and those of ♀ dusky. This moth is the *Notodonta unicornis* of Sm. and Abb., and may be called in English the Unicorn Notodonta.

Large Water Beetle—*S. E. Munford, Princeton, Ind.*—The large flattened shiny blackish beetle, with a dull orange border, and the wing-covers thickly covered with numerous minute longitudinal impressed lines, is a large species of water beetle, (*Cybister fimbriolatus*, Say,) and your finding it flying around a barrel of rain-water is in accordance with its habits. Thanks for your flattering encomium.

Beetles around Peach Trees—*E. Hollister, Jr., Alton, Ill.*—The deep brown or blackish shiny beetles, about one-third of an inch long, which you find around the roots of your peach trees, are the *Helops pullus*, Say, and may be known in English as the Mournful Helops. We have found them very common the present year around both apple and peach trees, and especially around such as have been troubled with borers. We believe they only seek the decaying wood, and they are consequently not injurious.

A Quick Traveler—*G. C. Brodhead, Pleasant Hill, Mo.*—The blue-gray animal with 30 long legs, the last pair prolonged backwards like antennae, which ran so rapidly along the wall of your room at night, is not a true insect, but belongs to the Myriapods, and is known as *Cermetia forceps*. Though these creatures inspire dread in the hearts of housekeepers, we believe they are perfectly harmless, having frequently handled them and had them crawl over us.

Unknown Moth—*W. G. Barton, Salem, Mass.*—We do not recognize from your description the small moth that you captured in August. The butterfly which Harris calls *Cynthia Lavinia*, Fabr., but which is more commonly known as *Junonia coenia*, Bdv. and Lec., is very common in South Illinois; and in one particular year it was met with in tolerable abundance near Rock Island, in North Illinois, although before and since that year we have never seen there a single specimen.

Corn Borer—*F. M. N., Farmington, Conn.*—The borer which is doing such damage to the corn in your neighborhood is evidently the larva of the Stalk-borer, (*Gortyna nitela*, Guen.) previously referred to. It was dry and shrunken upon arrival and we thought at first it might be the Spindle-worm of Harris, (*G. zea*) but upon soaking it in water, it proved to be the first named insect beyond a doubt.

Horns of Stag Beetle—*C. R. Edwards, Bowling Green, Ky.*—The chestnut-brown horns belong to the large Stag-beetle, or, as it is sometimes called in your State, the Buck-beetle (*Lucanus elaphus*, Fabr.) It lives in the larva state in rotten logs of the Sweet Gum, and cannot be considered injurious. The ♀ has not by any means such immense horns as the ♂. Properly speaking, they are not in either sex horns, but jaws.

Imported Gooseberry Worms—*C. P. Faulkner, Bridgeport, Ct.*—White hellebore powder is the best thing to destroy these worms when picked; but the evil may be nipped in the bud by hand-picking the leaves on which the young larvæ have hatched out. Such leaves may be readily recognized by their being full of small roundish holes.

Worm on Bark of Walnut Tree—*Frank S. Fuller, Gardner, Johnson Co., Kansas.*—The worm which you found on the bark of a Walnut tree, and which was "as spiteful as a rattle-snake," was entirely rotten and unrecognizable when it arrived, though it apparently belonged to the *Notodontia* family of moths.

Rotten Root—*J. M. Beecher, Newport, Mo.*—The Early Harvest Apple-tree, planted in spring of 1867, evidently died from some kind of Rotten root, and the minute white twisting worms were feeding on the dead roots and acting as scavengers,

Large Dragon-fly—*Geo. S. Grover, St. Louis.*—The large Dragon-fly which was sent to you by a friend in Warrensburg, Mo., and which has a brown body marked with pale blue, is the *Aschna constricta* ♂ of Say. In the ♀ the blue color is always replaced by green. It is a very common species, and like all the other Dragon-flies—known likewise as "Darning-needles," Mosquito-hawks, etc.—is beneficial to man, devouring great numbers of smaller and injurious insects.

Stinging larvæ—*E. H. King, West Liberty, Muscatine Co., Iowa.*—The small blackish larvæ with long sprangling prickles, which you find on Black Walnut, are those of a large and handsome moth, *Saturnia maia*. When of larger size, these larvæ will sting the back of the hand like a nettle, though on the horny palm they can exert no influence. It has long been known that the Colorado Potato-bug avoids Peachblow potatoes as much as possible.

Raspberry Worms—*E. H. Beebe, Galena, Ill.*—The little green 22-footed worms, smooth when they are young, but covered with two-fold sprangling prickles after the last moult, which you found preying upon the Raspberry in Kane county, Ills., are the larvæ of the same Raspberry Saw-fly (*Selandria rubi*, Harris,) already referred to in the answer to Benj. Borden, on page 224 of No. 11.

Plum Cureulio—*Henry Dulzer, St. Charles, Mo.*—You wish to learn to identify the common Plum Cureulio (*Conotrachelus nenuphar*, Herbst.) We can assure you that you took the right steps and that the beetles you bred (July 16,) from "so-called German Prunes" that were injured, and which four weeks previously you placed in a glass jar with sand and loose earth, are the genuine article.

Leaf Galls and Caterpillars on the Sugar-berry—*S. L. Scofield, New York.*—The tree you found while visiting in Fairfield county, Conn., and of which none of the residents could give the name, is the Sugar-berry or Hack-berry (*Celtis occidentalis*.) The flat galls upon the leaves are caused by some species of Gall-nut, and the caterpillars feeding upon these leaves were half grown larvæ of the White-marked Tussock Moth. (See p. 79, Fig. 67.)

Hellgrammite Fly—*S. Irons, Lebanon, Ohio.*—The gigantic fly which you never saw in your section of country before, is the above named insect (*Corydalis cornutus*, Linn.), which we figured on the front page of number 4. As you perhaps have not that number, we send you a copy.

Dark Grape-worm—*T. W. G., Georgetown, O.*—The large dark caterpillar, found under a grape arbor, is the larva of *Thyreus abbotii*, Swainson, a dark brown moth, with the edges of the wings deeply scalloped and the inner half of hind wings yellow. It has long been known to attack the Grape-vine.

Too fond of Honey—*T. W. Gordon.*—The long legged animal which your wife found in a jar of honey is *Cermetia forceps*, spoken of in this number in answer to G. C. Brodhead.

Caterpillar of Polyphemus Moth—*A. De Wyl, Mt. D., Jefferson City, Mo.*—The large green caterpillar found on a plum tree in your orchard is the larva of the above named moth, which we figured on page 121.

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